

# ***The Bermuda Triangle***

## Les Lawry-Johns

**MOST people have heard of this mysterious tract of the western Atlantic, where things and people disappear without a trace. It seems that they are either sucked down or sucked up into another world. In any event, they're never seen again in this one. Wouldn't it be handy if we had easy access to this vortex, where we could dump certain things which cause us so much heartache? Wouldn't it be nice if we could dump certain people there who. . . . What's this all about you may ask?**

Well, it's about several things really. Take the name Bermuda to start with. Ultra used it years ago when they were Ultra and not Thorn. Then a Bermuda was a monochrome TV set in a slim light wood cabinet with a gold surround with or without motorised tuning. In other words, you knew what it was and give and take a little what you could expect. The fact that there might have been a Bermuda radiogram was of little moment.

Now however a Bermuda can mean anything from five or six different colour models, say ten different monochrome sets, to a bar of chocolate. You may rightly say that the name was never meant to be anything other than a brand identification, and that there is a model number. Of course, of course. But you try telling that to the dear old lady who says that the picture has gone off her wireless and that she only watches the home service.

"Hallo, I want you to come and look at my wireless. The picture has just gone off."

"Yes, so has everyone else's, there's a power cut on. Your light has gone out as well, hasn't it?"

"No it hasn't. It's not as bright as it used to be and the man downstairs says it's the battery, but I don't believe him because it has been perfectly all right for months."

"No dear, we don't mean your torch, we mean the electric light, the one with the switch on the wall."

"I don't use that when I'm watching the wireless."

So you see, it's difficult to find out what it is you are supposed to go and service, even when there isn't a power cut on.

### *A Brilliant Band of Colour*

Not that this was the case when Mr. J phoned to say that his Ultra colour set was doing funny things. We knew only too well which model it was since we'd sold it to him only a few days earlier. His description was alarming. After the set has been on for say two hours, there is an occasional brilliant band of colour across the screen, of such short duration that it's difficult to describe. Arriving on the scene hotfoot, with another new Ultra lurking in the back of the van, we studied the displayed picture for some time before the condition showed.

A brilliant blob of primary red with a slightly offset pure blue shot across about half way down the screen, with the picture still visible above and perhaps below although it was difficult to say for sure.

"There you are," said Mrs. J. "I told you it was red and green."

"I only saw red and blue," said Mr. J.

When it happened again, I too saw a green area. I also saw complications. To me this was a tube fault which would probably clear itself if left on long enough, but we had

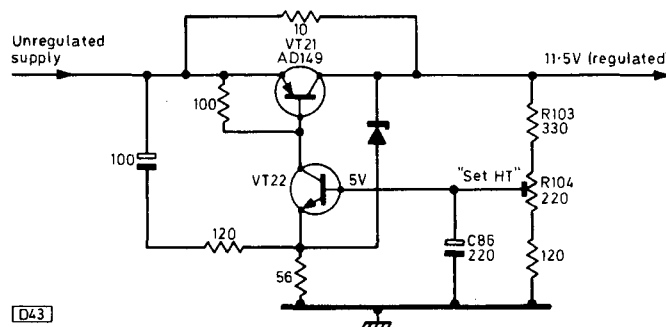
already registered the tube in the customer's name for the four year warranty and he didn't want his set doing funny things for any length of time. So we collected it and left the other new one.

To confirm our suspicions, we rang Thorn. After a time a nice young man with a slightly bored voice (who blames him, talking to confused engineers all day long) said that they'd had this trouble with new 9000 models (our's was an 8800) and that the new tube was having a short lived freak out (our expression, as we are not very technical) and that this was sending a spiky waveform back to the decoder which responded by creating the condition described. He said it would not occur with the colour off therefore. If we were worried, remove C194 ( $1\mu\text{F}$ , IC5 pin 5 to IC4 pin 11 – PAL switch drive coupling capacitor) from the decoder panel and fit a  $12\text{k}\Omega$  resistor in its place. If that didn't do it, replace IC4 (reference oscillator i.c.) or IC5 (demodulator/matrix/PAL switch i.c.). Thank you we said, in a subdued voice, and hung up. We're still waiting for the effect to recur so that we can put in a  $12\text{k}\Omega$  resistor and know whether the trouble has cleared, but it won't happen for us as yet. We'll report our findings later.

### ***Varying Size Picture***

This then was one point of our Bermuda triangle. The next was a 14in. Ultra portable with the Thorn 1591 chassis. The complaint was that the picture would decrease in size, going darker at the same time and with the sound reducing in sympathy. Obviously the supply line was falling to a low point and then recovering, only to fall again. This could be due to several causes, so we first checked at the body (collector) of the AD149 regulator transistor where we found that as expected the voltage was rising to the normal 11.5V and then slipping quickly down, to about 8V, then recovering in a fluttery sort of way. On test the AD149 proclaimed its innocence, as did the 10 $\Omega$  wire wound resistor in parallel with it. We then moved down to VT22 (see Fig. 1) which samples the 11.5V supply line and reports its findings to the regulator transistor which should respond accordingly.

VT22 should have 5V at its base when the supply line is 11.5V, and this 5V is initially set up by the preset control R104. The transistor and its associated components seemed to be in order when checked with the ohmmeter, so we switched on again and checked for the 5V at the VT22 base. The 5V was anything but 5V (but didn't exceed it). The



**Fig. 1: L.T. regulator circuit, Thorn 1590/1591 chassis.**

At his point we noticed that the panel surface in this area did not present its normal appearance. It was slightly darker. We investigated with a finger and carefully examined said finger. It appeared to be oily. With ruthless efficiency, we cleaned off whatever it was. Some devilish fluid straight from the triangle no doubt. Wherever it had come from (no leakage from electrolytics), once it had gone the voltage remained stable.

The third Bermuda came by way of Derek who seems to have acquired the knack of getting himself involved in the most embarrassing situations without even trying. You may remember our account in the November issue where he got himself washed in a car wash and subsequently doused by a pint of bitter in Harold's (never a dull moment) bar. His latest escapade was the result of trying to do a good turn for his friend Derry. It appears that Derry had had a late night out in London and had caught the last train back, more by luck than management. However, his luck didn't hold out because as soon as he got aboard he fell asleep and didn't wake up until the train arrived at its final destination, having stopped at every station down the line including the one where Derry should have parted company with it.

"I'm acoming for you son," said Derek sleepily. So saying he tumbled out of bed and put on his slippers. Still clad in his pyjamas and without so much as a dressing gown, he started up the mighty engine of his Renault and thundered off down the motorway towards the stranded Derry who by now was again sound asleep in the railway waiting room.

Beating a hasty retreat back up the motorway, they were some ten miles from home when the car broke down. Many things were tried that night, things which would cause ordinary men to turn pale. But it was of no avail, the car would not start.

I heard all this when Derek was again helpful when his neighbour's set broke down and he struggled in with it.

"Thanks," I said, putting down the reader's query which had been puzzling me for the last half hour before closing time.

Taking the back off and switching the set on produced no rustle up of e.h.t. Checking on the beam limiter board, where all good boys start, showed about 60V at one end of



**R907 (1.5Ω to chassis, where the voltage should be 1.3V). Did it just die, or was it killed?**

"I'm not surprised," I replied in my most superior manner.

"Oh, I supposed they've been twiddling the knobs," I desperately hoped.

They hadn't. All the twiddling in the world wouldn't produce the slightest vestige of the required variation of the screen's triads. With sinking heart we swung up the convergence board to expose the decoder panel. What's this then? A replacement chroma delay line, apparently fitted in haste or in desperation.

As I was checking this area, Derek volunteered the information that the previous repairer had had any amount of trouble with the colour or absence of it, had carried out a lot of work to the detriment of both his health and happiness, but had finally succeeded and had then retreated to his doctor, sitting in the waiting room staring vacantly into the distance.

It appeared then that disturbing the set had disturbed something on the decoder board. Turning the set on its side to expose the under side of the decoder board, we chased up a few blind alleys before finally arriving at the delay line driver VT310 where we should have started. No voltage anywhere. Investigation showed R389 (see Fig. 2) to be open-circuit and discoloured. Replacing this  $220\Omega$  resistor brought back colour (albeit wrong), and as we could find no reason for the failure we concluded that the original delay line had had an intermittent short in it which had caused the colour to fail and had driven the other poor fellow up the pole before he found out what was wrong and replaced it. Unfortunately, he had not checked the effect of this on the supply resistor and had not questioned his luck further once the new delay line had resulted in glorious colour.

Lowering the set down to its proper level brought back natural colour. Raising it  $45^\circ$  caused the faces to turn a funny colour (not really green). We again checked around but could find no loose cores or the like, and once again we had to conclude something. We concluded that the c.r.t.'s shadowmask was loose and took up its correct position when the set was likewise. So there!

# 'Twas on a Monday Morning...

Les Lawry-Johns

I WAS busy wondering what to do when this policeman came in. "It wasn't me" I maintained stoutly, remembering my breaking and entering days.

"I've been told you repair things" he said pleasantly.

"If you'd like to bring it in we'll do our best" we assured him.

"I have it with me" he said, taking off his helmet.

Now we've been asked to service many things in our time, but never before a policeman's helmet.

"What's gone wrong with it?" we asked, expecting it to contain a transistor transceiver or some James Bond gadget.

"The top loop's O.K. but the bottom one has broken away from the badge so that the matchstick won't hold it steady."

Lots of people wonder what a Scotsman wears under his kilt. If they want to know, all they have to do is catch a train from King's Cross (if they live in the south) to Edinburgh Waverly station and stand at a windy corner and they'll soon find out. If you've wondered about policemen's helmets however I'm now in a position to tell you. They contain matchsticks. Not whole ones mind you, but short pieces to go through the small loops to keep the silver top motif in position.

With the badge on the bench it could be clearly seen that the lower fixing had broken away and it was a matter of fixing the peg back on in the right position so that it would enter the hole at the front at the same time as the upper one (which went downwards) entered the top one. But the angle needed to be right.

Surprisingly enough, the badge was chrome on copper as was the peg, so soldering was no problem, only the angle. It took two attempts to achieve a correct fitting, but we did it and on it went and in went the matchsticks to keep it in position.

## *An Electronics Wizard with a Thorn 8000*

That was the first job of the day, the rest will perhaps be of more interest as they concern television sets (what's the name of this magazine?). A Thorn 8000 was the first one to hit our bench: the owner was an electronics wizard and in no time at all he'd whipped out the circuit diagram and spread it on the bench. "Here's the trouble", he stated. "The line oscillator is not functioning. That's why there's no picture. I've checked this, this, this and this, the voltages are wrong here, there, and here. It's probably something simple but I can't put my finger on it."

I gazed at him in open-mouthed admiration. "You mean, you've done all that and it still doesn't work?"

"No", he explained. "It wants a 'scope on it and mine at work is too big to cart home. Can you put one on it?" "Can't afford one", I confessed. "I did have one once but it only made a lot of squiggles that I couldn't understand so I gave it up and I've felt much better since".

He looked at me suspiciously. "I suppose you can't read that Avo either". I said that I could read the Avo when I

took my glasses off but the trouble was the needle stuck about a third of the way up the scale so even here there wasn't much to write home about from a servicing point of view.

He smiled at his wife who waited patiently during this exchange. "I can see we're in good hands here dear, let's go and get the shopping done and we'll call back later to see how our friend has got on".

## *Dropper Troubles*

Before they went he mentioned that the lower end of the dropper consisted of two sections of five and six ohms, and that the six ohm section had failed some time ago so that the surge limiter was now only five ohms instead of eleven. Would I do that as well while I was about it?

So off they went, leaving me to ponder upon what my mum had told me years ago. Never decrease the value of a dropper she had said. So I thought I'd have a look at this first. It was one of the vertical ones with several tappings rather than the later horizontal fat one with a few. Idly putting the meter across the sections I found not only that the six ohm section had gone (and was not in use) but that the top section (56Ω in the feed to the line output stage) was also open-circuit.

Oh dear, I thought. The poor chap has been chasing an elusive butterfly in a neck of the woods where there aren't any butterflies. So we put in a new dropper with a 12Ω section and of course the rest. Upon switching on, the e.h.t. rustled up nicely and the resulting picture, apart from some misconvergence, seemed quite nice too. A twiddle here and there was all that was necessary. Not wishing to embarrass the chap in front of his wife we wrote the bill out with the bare essentials, merely stating that we had restored supplies to the line timebase etc.

When they called back they were pleased that the job was done and of course he asked what the basic fault had been. "The line oscillator was not being allowed to develop its full potential, and as you asked, we replaced the dropper".

He smiled, I smiled and his wife smiled too. So off they went leaving me to bash the Avo top on the bench to clear the movement as it had fallen bottom on the floor to cause the sticking in the first place.

## *A Call from Ernie*

The phone pulled me away from a particularly awkward unit audio. It was Ernie, who is the landlord of one of our local pubs. He said he'd lost his colour and would I pop down. I said I would and perhaps he could take a brandy in the meantime as this might help him.

## *Cartridge Warning*

Just for the record (oh no!) we thought you might like to hear about the unit audio which had come in because the cartridge was damaged. We fitted a new cartridge and

plonked Jim Reeves on the turntable. There was the usual loud hiss as the stylus made its way toward "I fall to pieces", but the resulting melody was very very low and distorted. We raised the pick-up arm and moved it back. This gave a good response as did a finger on the leads to the cartridge. The amplifier was clearly in order, so we tried again.

Volume up, lots of response as the arm did its thing, lots of hiss but no Jim. Now that boy has sung loud and clear for many years on that record and if the surface noise was there, why wasn't Jim? So as not to bore you more than is usual, we'll cut a long story short. It amounted to two new cartridges being defective in a row.

The moral of this is always to have a shelf full of cartridges, because more than one may be defective and you might be led to think you are going dotty like you do when you find two new valves or transistors faulty in exactly the same way. Consumer protection? There ought to be a society for the protection of us.

### **Who's been Barred?**

Now to Ernie. To get upstairs to the pallid TV I had to go through the bar. "Here Les", he called. I made my way to the part of the bar where he presided.

"I must tell you about a friend of mine before you go up". His head jerked sideways as he said this. Thinking he wanted me at a more private part to impart some gossip, I moved along in the direction his head had indicated.

"What have you gone up there for?" demanded Ernie. As he said this I saw his head jerk again and realised that it was a nervous twitch rather than an invitation to a private tête-à-tête. I then realised why he had such an amazing success rate with the female species. I moved back to his end.

"This friend of mine has just taken a pub over in Essex", confided Ernie. "You know the first bloke he barred?" I mentally ran through a list of suspects who would be likely to cause a riot in a bar. I confessed I couldn't think, so as not to steal his thunder. "The bloody vicar", said Ernie triumphantly. "Would you believe it, the bloody vicar? ... When he got a few jars down him he was preaching to everyone so as soon as he came in all the locals cleared off and the bar was practically empty. So he barred him. He's doing very well now. Would you believe it?"

Well as a matter of fact I do believe that vicars, like a lot more of us, live under quite a bit of stress, attending to the troubles of others rather than attending exclusively to themselves, and that a couple of drinks helps to relieve the stress. And one usually leads to another.

### **Restoring the Colour**

However, upstairs the hybrid Pye produced very little in the way of colour, just a few unlocked bands across and these were weak. Knowing the area however, where the signal is pretty weak, we were not inclined to go on a witch hunt. Propping the mirror in front of the set, and tuning in a test card, we were able to achieve reasonable colour by setting up the reference oscillator a.p.c. bias preset RV10 on the front left of the decoder panel. Good colour could not be achieved because of failing green gun emission, but the results looked fairly pleasing and no one complained. Failing emission of one or more guns is a fact of life which has to be lived with as sets get a few years over their heads, and as even regunned tubes are pretty expensive, the customer is often content to jog along with less than perfection.

Returning to the bar, we reported our findings and asked if Ernie was happy with them. Ernie shook his head but said yes.

### **Smoke Signals**

Our next call was to a GEC 2040 colour set – the single-standard hybrid model. Investigating the complaint of "lots of smoke from that side", we removed the screening cover of the line output section. A glance at the line output transformer (not the original) was sufficient: one winding burnt away. "Not another one" cried the distressed owner, "that one hasn't been in a dog watch". As this was a new customer (Ken's had a nervous breakdown, so we've got quite a few new ones) we couldn't help much but it transpired that it was in fact well over a year since the new one had been fitted. So in the van went the GEC.

Next call was to an ageing Philips G6. No picture, smell of burning plastic. Makes your eyes smart. Remove screening from right side X-ray department. No X-rays, PL509 fairly hot, no voltage step up to the e.h.t. rectifier. Overwinding warm and smelly. Give estimate but advise caution as tube is known to be somewhat low. Think about it and ring us later.

Next call was to another ageing Pye dual-standard colour set. Owner would like a new set but is in love with the folding door presentation of this one and would prefer to keep it if possible. Suppressing a scream of "oh no, not another one", we asked if there had been any smoke. "Only a bit", we were informed, "but there was no real picture, only a blur".

We cautiously rotated the focus control at the rear. It didn't want to rotate and made a nasty scraping noise. This meant that it had been overheating, which in turn meant either a faulty focus rectifier (single stick) or a shorted disc capacitor (270pF high pulse – C230) or both as the control is returned to chassis via the line output transformer and usually suffers when there is trouble in the above pair. We didn't have a control with us and as replacement is no joke over went the set, off came the legs and the large and heavy beast was persuaded into the van.

### **Smoking Bush TV175**

Back on the bench there was a Co-op version of the Bush TV175. Smoke. Pitch type line output transformer, less pitch. Unload van and attack the Co-op set. Whip out transformer, unsolder wiring loom, solder to new replacement and fit. We do not fit the replacements complete with loom as although these are easier to fit their life expectancy is uncertain. We obtain our replacements from an advertiser in this magazine, and over the years have found them most reliable.

### **The Awkward Ones**

We will not bore you with the difficult jobs of that day. The ITT CVC8 with intermittent gain due to dry-joints on the bottom i.f. modules. The Pye CT200 with dry-joints in the i.f. gain and filter module. The Philips G8 with intermittent width variation due to a faulty line output transformer. Variation of primary colours on a Thorn 3500 due to the thick-film resistor unit which the nits use in place of the reliable separate wirewound RGB transistor load resistors used in earlier versions.

Needless to say they didn't all get done that day, and when we get our humour back we may tell you all about it.

# Beware the Ides of March

Les Lawry-Johns

THE first time I saw that ITT CVC9 I had a funny feeling. I didn't know then that it was going to get me as hopping mad as a mad march hare, similarly to the one we had some time ago which gave faultless performance on our bench but always showed hum bars when returned to the customer.

I know what you're thinking: check the bridge rectifier in the l.t. supply; change the regulator AD161 (or whatever); and check the 33V stabiliser D11 down the bottom on the tuner supply.

We did. We did more in fact, much more. All electrolytics in the l.t. supply circuit substituted, yet another AD161 tried (they're not all suitable even when new), yet still perfect at our place, hum bar at the customer's pad. We eventually got acceptable results by adding an extra, large electrolytic on the l.t. line somewhere on the regulator where there isn't one, and then rushed away like the coward we are and tried to forget it.

Don't get me wrong, we are second to none in our admiration of the CVC5-9 series, but there have been those occasional instances. . . . And now this one. It appeared to be simple at first. The fusible 56Ω resistor R380 in the h.t. feed to the line output stage had sprung open, denoting an overload in the line output stage. This chassis has a 630mA delay fuse in series with this supply, the resistor springing open rather than the fuse failing if there is a prolonged but not severe overload. The earlier CVC5 had a 400mA fuse in this line: it used to pop off regularly, but that's another story.

Well, we thought. Not a sudden surge of current like a capacitor shorting or a short in the PY500 efficiency diode. No, there were no shorts to be found. So we resoldered R380 and, with the screening off the line output stage, switched on and waited. Our neon glowed a few inches away from the stage and the e.h.t. rustled up. Kermit appeared on the screen and sung a sad song. No overload. We then left it happily working while we got on with a car radio which worked perfectly on a negative supply and positive earth but not with a negative earth as we required after replacing a shorted sound output stage. It should have worked both ways as diodes are used in the supply line to ensure this. Sure enough, one diode was open-circuit, presumably cooked by the original overload. Locate and replace the diode and it worked both ways. Good.

Where's Kermit gone? Nothing on the CVC9 screen, and the PL509 line output valve overheating with only 15V drive on its control grid (should have been more like 70V). Two things to consider. Either the PL509 was drawing grid current, or there was lack of drive from the PCF802. Change the PL509. Lovely picture but not Kermit. Never mind.

We then watched the drive voltage at the control grid

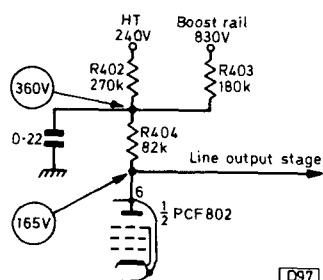


Fig. 1: Supplies to the anode of the PCF802 line oscillator stage in the ITT series CVC5-9 chassis. The main supply is via R403: the feed via R402 is a start up supply.

gradually falling bit by bit until the new valve was glowing red and unhappy. Switch off, refit the original valve and unsolder the screen grid supply resistor R421 (which again is a spring-open type, so this was quite easy). With this open, the line output stage is inoperative and tests can be made in a leisurely manner. The h.t. goes up a bit with the reduced load and this does alter things a trifle, but full line drive was not to be expected since the anode (pin 6) of the PCF802 line oscillator valve gets some of its supply from the normal h.t. line via R402 to get it started and then more from the boost line via R403 (see Fig. 1) when the line output stage comes into operation. We could not expect full line drive therefore as the h.t. at pin 6 remained at a little below 100V. It didn't fall however, and everything seemed to be in order in the line oscillator stage.

As we had already replaced the PCF802 earlier in the proceedings this was out, as were the line oscillator capacitors which we still viewed with suspicion as the result of earlier experience. Join up the screen grid feed resistor R421. Up comes the line drive and the picture for a while, and then of course it all sort of tapered off.

And then it hit me like a hammer on the head. The line drive was dropping to a figure just below what it is before the line output stage comes into operation. Where's R403? Follow pin 6 print across to R404, follow on to R403. There it is. Look on the component side. Buried beneath a transformer of course. Remove the tranny and there it is. Nice colours though. Unhook one end, about 300kΩ instead of 180kΩ, doubtless going up further under load. Replace with a 220kΩ 2W type (nearest we had). Refit the tranny, switch on, and test for a long enough period whilst we dressed up the grey scale and convergence.

## Double Trouble

When the estate car drew up outside I recognised it and the driver, but not the dog in the rear guarding the Ferguson 3713 colour set. It was Mr. Doubleday bringing in his TV set as is his wont. A nice man Mr. Doubleday, but he has one distressing habit. He always repeats the last word of each statement he makes.

In he came carrying the Thorn 8500.

"Hallo Mr. Doubleday," I greeted him. "Nice dog you've got there, what is it?"

"It's a German pointer, pointer," he said. It was clearly going to be an interesting few minutes.

"What's up with the old set this time?" I enquired, for the want of something to say.

"It won't go, go," he replied. "Even when I push in the little red button it only hums and goes click, click."

"Oh dear," I said, trying hard not to say an extra dear.

Now Mr. Doubleday is no fool, he knows his onions. "There's probably a short, short," he confided.

"I agree, agree", I blurted out, and was immediately sorry. He didn't even notice.

"I'll be back about five, five. The reception is still no good where we are you know know", he rushed on. "See you then then."

He lives just outside the Medway towns, not far from the Bluebell Hill transmitting aerial but lower down the hill. It would appear that the mighty signal serves everyone except those in its shadow. Incidentally, there's a pub at the top of

the hill called the Upper Bell and one at the bottom called, would you believe it, the Lower Bell. There's more irrelevant information to follow, so don't go away.

Now to the set. Switching on produced nothing so the cut out was out. Pressing the button produced a hum and then a click as the cut out cut out (this sort of thing gets you after a while). Having been fooled in the past, we checked the current through the cut out. 4A. This was a brief check, and the anti-surge fuse didn't have time to blow. With that relatively small overload, clearly the mains filter capacitor and the rectifiers could not be at fault so suspicion fell upon the line output transistor.

The collector of the transistor is connected to the top of the line output transformer via a brown lead and a series choke. Unhooking this is a matter of seconds. With this off the set came on with the tube heaters glowing, so either the transistor was at fault or there was a short associated with the circuit.

Withdraw the chassis partly and lower the right side panel to gain access to the line output stage's working parts. With the brown lead disconnected, the collector of the line output transistor is isolated except for the heatsink which is fairly hefty but insulated by its chassis pegs. Checks proved that there was a leak from the collector to the emitter. There's the usual tuning capacitor (C406) present, but this is rarely at fault and wasn't on this occasion. Other checks showed no fault so we fitted a nice new transistor, using a 2SC643A to replace the original BU105/02.

All clear. Reconnect the brown lead and make sure that the focus plug hasn't been pulled off in the struggle. Switch on, slight buzz and up comes the e.h.t. Nice. Connect aerial and select bottom button to tune to London (leaving top three alone as they are tuned to Bluebell Hill but our aerials do not look that way). Not a bad picture.

Switch off and refit the chassis fully in. Insert screws and replace rear cover, at the same time switching on again to see that all is well. It wasn't. Buzz and click and we were back to square one.

Check again. New line output transistor not new any more. Slide out chassis. No shorts, no cause. Oh well. Fit another transistor, recheck and try again with the chassis still partly out. Lovely. Leave for some time, no trouble.

Carefully slide chassis in. At the moment it was fully in there was a sharp click and another line output transistor bit the dust. Not much fun. Close inspection showed that as the chassis was pushed fully into the cabinet the e.h.t. cable doubled back and touched the input to the rectifier, whereupon the insulation failed at that point and bang went the line output transistor. There was nothing wrong with the rectifier, only the cable near the e.h.t. clip end. This was shortened and the clip refitted, thus killing two birds as it were since the defective bit was out and the cable no longer doubled back. Another new transistor (must order some more) and all was at last well.

### **Some Quickies**

Life then settled down to the dull routine of run of the mill jobs. A lady brought in a Murphy V1400 which is a 14in. portable made in Japan.

"No sound" she said. There was no sound until we put it on its face to remove the cover. Then the sound came back. Tilt the set up and off went the sound. This proved to be nothing more than a slightly defective volume control (knob at the front, thus pressure restored sound), and this responded to cleaning.

What she had omitted to mention however was that ITV

on channel 23 couldn't be tuned in though the higher channels could. As it happens, with this type of tuner the top can be easily taken off, or rather the side as the side was at the top . . . you see. This revealed the single slab stator and the thinner rotor plates on either side in each section. The rotors were not fouling, so we cleaned off the grease on the spindle in each section and on came the ITV, now easily tuned.

Next was a nice white Waltham portable, only a week or so old. Would we help? Blown fuse, shorted diode in bridge. Replace diode, replace fuse, worked for a short time, fuse blew. Another diode shorted, would you believe it? Put another one in and another fuse, only to find that the primary winding of the mains transformer was now defective with shorted turns. Consult with customer about implementing warranty.

Thorn 1500 with intermittent vision and sound signals. Guess at faulty BF197 transistor in final i.f. stage. Guess right for a change.

### **Two hours, then it went ping**

Finally a Philips G20T325 (320 solid-state monochrome chassis). No results due to the h.t. line resistor R4465 having sprung open (feed to the line output stage). Check possibilities, no fault. Solder up resistor, picture and sound o.k. H.T. a trifle high: reset R5630 for 158V HT1 line. Then the mains fuse shatters.

Why? Check around, find that the bridge rectifier is shorted on one leg, negative as usual. Remove faulty bridge and carefully fit another *of the wrong type* (they say that confession is good for the soul). Despite the fact that there were plenty of BY179s around, I had carefully selected a BY164 (42V, 120V VIRM) and put it slap across the 240V mains input. Incredibly it held and functioned.

I woke up in the early hours of the morning, suddenly fully aware of what I'd done.

"What's the matter now" asked my always sympathetic spouse. "Is the wind worrying you?"

"I haven't got the wind" I snapped, and then realised that there was a force nine gale outside. "Was that slim Philips black and white set collected?"

"Yes, nice fellow too."

"He won't be nice when he brings his set back: I put the wrong rectifier in and it won't last a dog watch." I slipped back into a troubled sleep, with green bridge rectifiers dangling before me instead of black ones.

Sure enough he came back and I explained my error. He said he was glad it wasn't the set, as he was beginning to think there was one of those gremlins loose inside.

Opening up the set I was amazed to find the fuse intact. "How long did it last?" "About two hours and then it went ping." This meant that the spring of the line output stage h.t. supply resistor R4465 had sprung open again. Not the rectifier at all: back to the original illusive intermittent fault.

I hurriedly removed the BY164 and substituted the correct BY179. Resoldering R4465 and then switching on produced normal results. To me this meant either that the h.t. rectifier thyristor was leaking after a period, or that the line output transistor was acting up. Despite the earlier drain on our resources of these latter items we still had a few left of the correct type – the 2SC643A will replace the BU105, BU204, BU205 and BU206 (not the BU108, BU208 and BDX32 however). So we fitted a new line output transistor and left a voltmeter connected to the HT1 line to see whether it crept up over a period. It didn't, so we concluded that the BU205 had been at fault all along and that the failure of the BY179 had been only a red herring.



# CA Tastrophe

*Les Lawry-Johns*

I'M not a cat lover. On the other hand, I don't hate them either. Our own cat Spock has her endearing, selfish little ways, but I wouldn't dream of harming her. Except that is when she brings in a poor flapping bird and proceeds to torture it. Then I could kill her without a second thought, regretting it later of course. She lives, however, and grows fat. The fatter she is, the less likely she is to succeed in catching a bird. So we live in peace. This is just as well because whenever I have lost my temper with a cat I have always come off second best.

A little while ago, I was called to a house to attend a Bush CTV1122 which had "gone bang". As I was removing the rear cover I became aware of two things. First, there was a horrible smell which had not been immediately obvious lingering around. Secondly, the window near me was wide open on this cold day.

The lady of the house explained that her cat had had kittens, and that a horrible tom cat had been in and had left the smell in addition to having made an attempt to kill the kittens. As she returned to the kitchen, shutting the door behind her, I resumed my job behind the Bush. . . . Being partly concealed, I was not noticed by the thing which entered through the window. It was the ugliest ginger tom cat I have ever seen, and it was obviously going to have another go at the kittens. I rose to my full height.

"Got you, you horrible swine," I hissed. "Now you'll pay." The cat glared at me with hate filled eyes. Every hair on its scraggy body stood out, and it looked twice as big as it had done a moment ago. Its back arched and it spat out its challenge. Who would be the victor in this battle of the giants?

I made the first move: my screwdriver sped through the air with deadly accuracy. The cat leapt on to the sideboard and the screwdriver knocked a chunk off the coffee table. Oh dear. I looked for another weapon. The vacuum cleaner hose. Just the thing to put an end to this vile beast. I swung it viciously as the cat leapt again, and all the silver on the sideboard was scattered in all directions together with family pictures and a bowl of mixed nuts.

The cat then really got going. It literally tore round the walls, never once touching the floor. Down came the curtains and several other items which had adorned the walls. I aimed another blow at the beast and missed again. Missed the cat that is, I didn't miss myself since the metal end of the hose rebounded off the wall, knocked my glasses off and sliced my ear.

Since the curtains were no longer covering the window the cat vanished with a parting hiss, leaving behind the most horrible smell, easily eclipsing that of a burnt up tripler. By this time the lady of the house had reappeared. Viewing the devastation, her eyes widened with horror. "Has the set blown up completely this time? Look at my curtains and silver and everything . . ."

"Calm down" I urged her, quickly replacing the silver and pictures and things. "That tom cat came in and turned the place upside down and attacked me, that's all. Send for the police, it'll have to be shot."

Having rehung the curtains, some sort of order was restored. . . . So rather shaken I returned to the Bush to

investigate the source of the bang. Lower left 3·15A mains supply fuse missing except for its metal ends. Remove power board. Lots of burn marks and damaged print around the base of the thyristor (BT106) and down to the surge-limiting thermistor which didn't look up to much either. After cleaning up the area carefully, we fitted a new thermistor and a new BT106, then checked the diodes and everything else in sight. All seemed well, so like a fool we put it back without looking at the print on the decoder panel.

With a nice new 3·15A anti-surge fuse in we switched on. On came the sound and the e.h.t. rustled up. Easy job after all.

"Picture o.k.?" we enquired from our position behind the set.

"No," said the fair lady.

"Oh," we said as we clambered around to the front. Turning up the brilliance and contrast did nothing. There was only a dull blue glow which remained unaltered by anything. Tube base voltages revealed that the first anodes were normal but the cathodes high. The bang must have damaged the SL901B demodulator i.c. we decided, reasonably enough. We didn't have one with us. So we put the thing together and took it to the van, promising to return it the following day all being well.

On the bench, out came the decoder panel, out came the desoldering braid, out came the i.c. and in went a new SL901B. Brightness restored, contrast o.k. Careful tuning brought in some sort of colour, that is if you like green faces. Despite the fact that we had replaced the upper i.c., we were still too stupid to examine the board closely on the print side.

Pressing the buttons a few times restored normal colour about once out of every three goes. This was not a good average, so we checked the ident control which didn't help matters. Looking on the black side we concluded that the lower i.c. had also been dealt a mortal blow. Out came the decoder panel, out came the desoldering braid, out came the SL917A and in went a new one. All to no avail and the time was galloping away.

"Bistable, bistable, it's that cat's fault," I mumbled. Out came the board once more (I've never got round to a set of extension leads, as we don't deal with that number of these models and we rarely have faults on the decoder anyway) and this time we did what we should have done in the first place. Careful examination of the print around the ident detector transistor 3VT11 (BF194) showed discolouration. The transistor in fact was open-circuit base-to-emitter. Clean up the tracks, fit for a new BF194, and flesh is flesh (leaving Kermit out of this).

So ends this catalogue of disaster. The moral is: if you have a blow out, check up on the semiconductors on the adjacent panel. Oh, and never try to kill a cat.

## *Thorn 1600 Chassis*

A young fellow brought in a nice white mains portable and asked us if we could repair it. It was an Ultra Model 6831, fitted with the Thorn 1600 chassis. As we were removing the rear shell, he remarked that it had been with a firm many miles from here for a period of eight weeks, and that they had given it up as a bad job.

"Will it take more than a few minutes to do? Only my friend's waiting in the car and there are double yellow lines you know." A swift check revealed that the BU205 line output transistor was a dead short, and it was obvious that a lot of other work had been done around the line timebase. The alarm bells rang. Take care they rang.

"Leave it with us a few days and we'll let you know" we said cautiously. Off he went, leaving us to sort out what had been done and why. The BF337 line driver transistor VT15 had been replaced and appeared to be in order. With a weather eye on our depleted stock of line output transistors (Mr Doubleday you remember) we removed the side panel which holds the line output transistor and to which the body of the TIP31 regulator transistor is bolted (having released the latter), noting that the top screening cover was missing. This enables the flyleads of the line output transistor to be removed and the BU205 to be replaced.

We fitted an approved replacement for the BU205 and hooked up a large wirewound resistor in series with its collector lead in order to protect it in the event of it being switched on for too long. This appeared to be unnecessary, as it did not switch on at all when we had cleared the decks for action and switched the set on. The BF337 was overheating however. Checking the base and emitter produced an immediate change of conditions however and the line output stage started to function, the tube heater lighting dimly etc. Obviously we had prodded something into life. It was time for thought.

The RC network connected across the primary winding of the driver transformer T1 (see Fig. 1) is essential to prevent "ringing", which would tend to keep the BF337 conducting. If the BF337 was overheating, it was conducting too long. So it was prudent to check these damping components, particularly as application of the meter could have perhaps sealed one up so that normal working was resumed. Investigation showed the components to be R139 6.2k $\Omega$  (2W) and C122 0.0056 $\mu$ F (polystyrene). Ah ha. In the event however the capacitor was not at fault: we had jumped to yet another wrong conclusion. . . . Such was our confidence however that we removed the wirewound resistor from the feed to the line output transistor's collector and then switched on. Nothing.

We again applied the test prod to the base of the BF337, and on came the tube heater and a raster appeared on the screen. The raster then vanished and there was a click from the line output transistor. Hurriedly switching off we found the line output transistor to be a dead short and we were back to square one.

Convinced that the trouble was in the driver stage, we carefully checked all the components there, after removing the BF337. An ohmmeter reading from the base connection to the h.t. line showed 5M $\Omega$ . We shook the meter and rechecked the range. The reading should have been more like 500k $\Omega$ . No, 5M $\Omega$  it was. R138 turned out to be a tiny 470k $\Omega$  resistor which had gone high, not allowing the base of the BF337 to discharge. Fitting a larger 470k $\Omega$  resistor

and refitting the BF337 and another new line output transistor (2SC643A) produced normal working and another threatened nightmare was averted. This is the first time we've encountered this one.

Our usual troubles with the 1600 chassis have been around the e.h.t. rectifier: either the rectifier (pencil type) itself or insulation breakdown has been our lot. It should be appreciated that the e.h.t. lead is screened and that the screening is earthed. This can be a source of trouble, but is fairly obvious and unlikely to cause heartache. The proximity of the screening cover seems to promote discharge from, and breakdown of, the insulation of the e.h.t. rectifier's end caps.

### LT Transformer Trouble

We had a call to service a Pye hybrid colour set the other day. It was fitted with the 691 single-standard chassis, which has the metal housing over the line output transformer and e.h.t. tripler as opposed to the more open arrangement of the later 697 chassis which has the vertical printed panel on the right side. The later models use a revised mains transformer with a thermal cutout incorporated in the body of the transformer. Earlier versions did not have this, and under some fault conditions the transformer can overheat and suffer damage before the mains fuse fails. The set we visited had suffered this condition, and it was not the first we've encountered.

The complaint was that the picture and sound had gone off and that there was a smell of burning before the set went dead. When these symptoms are reported, our first suspicion is the small bridge rectifier which provides the l.t. supplies. If there is a short in the h.t. line or in the line output stage, the mains fuse normally fails and puts an end to any hanky panky. A smell of burning however means either a short in the boost line feed to the c.r.t. first anodes (the sound continuing for a time) or some l.t. fault if the sound fails immediately.

Our first action therefore was to withdraw partly the right side unit and turn it, having ensured that there were no shorts from the PY500 top cap to chassis. Turning the unit exposes the h.t. and l.t. supply components. An ohmmeter test on the BY164 bridge rectifier confirmed that there was a direct short from the positive leg to the a.c. input. Removing the BY164 is only a matter of moments, and once removed a recheck showed that the short was indeed in the rectifier and not in the circuit. A new rectifier was fitted and the unit replaced.

A new 2.5A anti-surge fuse was then inserted, but this blew immediately the mains was applied. When the meter was applied to the l.t. transformer primary winding it swung over further than normal and confirmed our suspicion that this was at fault and not the filter capacitor or any other easily replaced component. Leaving things as they were, we beat a hasty retreat back to the workshop where we found that we had just one spare transformer. Returning to the house thus armed, we inverted the power unit and extracted the defective transformer. It has only about six connections, so the new one was easily fitted. Another new fuse and we were ready to go again. Switch on and the immediate rush of sound confirmed that the short had been cleared. The picture was good and little more needed doing.

The lesson then is that if the model is the original dual-standard or the subsequent single-standard one with the metal box on the right side, a defective bridge rectifier can ruin the mains transformer if the set is not switched off immediately the sound and vision fail.

And, oh yes, do be kind to moggies.

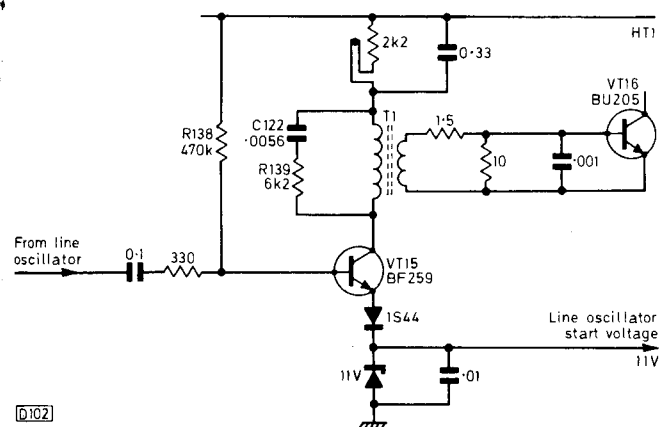


Fig. 1: Line driver stage, Thorn 1600 chassis. In earlier versions VT15 was type BF337.



# Gate Crusher

## *Les Lawry-Johns*

WHEN we featured a servicing article on the Waltham Model W125 large-screen monochrome receiver in the August 1977 issue we promised to report further on the set as its fault habits developed. We haven't come across many common faults so far, apart from the need with all of them to adjust the height control (which has a spindle protruding through the rear cover and so presents no trouble) after a short while in service. We have had some encounters however, one of which is worth relating . . .

The phone rang. It was Mr. Shuttlecock.

"That Waltham TV we got from you a few months ago is going funny. Can you call today?"

"What's it doing, Mr. Shuttlecock?"

"It keeps going dark and then coming up light again. My wife thinks it's something loose as nothing's been tightened up since we had it."

"How often does it do this Mr. Shuttlecock?"

"Oh it might be all right for hours, then it'll go right dark and come up again and stay all right for a few more hours."

"I'd better collect it and have it here for a while. I'll bring you another set."

So off we went and installed another set and brought the Waltham in for inspection. Needless to say it wouldn't play for us at all. Just stayed at the same brightness level for hours. Until we adjusted the front contrast control that is, then it started its pranks, the signal strength increasing dramatically to produce a very dark and over contrasted picture. So the trouble was not after all a variation of brilliance, rather one of varying a.g.c. Oh dear.

The triode section of the PCL84 (see Fig. 1) functions as an a.g.c. gate, sampling the voltage across the video amplifier's cathode resistor R122. This voltage is applied to the triode's cathode, the actual operating or conducting level of the triode being determined by the voltage applied to its grid by the contrast control R503 and the preset contrast

control R130. The d.c. voltage at the anode controls the a.g.c. line, all other things being equal. Where to start? Change the PCL84 was the coward's way out and was promptly tried. With no success of course.

Some time was then spent chasing the variation of a.g.c. control voltage until we removed the aerial, something we should have done in the first place of course. It was then confirmed that the triode's grid voltage varied very occasionally, a cold check revealing that once in a while the resistance from the PCL84 triode's grid to chassis would suddenly change. All the resistors in this circuit are of high value except for the preset R130 which is only 25kΩ.

Our brilliant mind instantly grappled with this problem, and after due time we came to the conclusion that all was not well with the preset R130. Changing this brought about complete stabilisation of the contrast, and what could have been a very awkward job was polished off without too much trouble – except for the sound.

Now no persons living or dead had mentioned this. On test however, we noticed that the sound suddenly became "thin". Whilst it remained audible, it certainly weakened and lost bass. Due to the intermittent nature of the fault, it took us some time to arrive back at the  $0.01\mu F$  coupling capacitor C215 which is by the side of the screened section to the left and slightly lower down from the PCL86 audio output valve. Replacing this brought back normal sound, which is very good in these receivers, in no small part due to the generous loudspeaker.

### *A Visit to King's Drive*

So we were now in a position to return the set. It should be clearly understood that the Waltham W125, originating as it does from a land where there is no shortage of wood, is no lightweight. Having removed it from the estate car it was necessary to drop the tail gate before taking the set into the house, as the dog had decided to accompany me and given half a chance he would have hopped out for a sniff round. I then had to negotiate Mr. Shuttlecock's front gate, which is spring loaded. Having done this and arrived at his door we were a trifle puffed. In answer to our third ring Mr. Shuttlecock opened the front door and after an exchange of pleasantries led us into the room where the TV set lived.

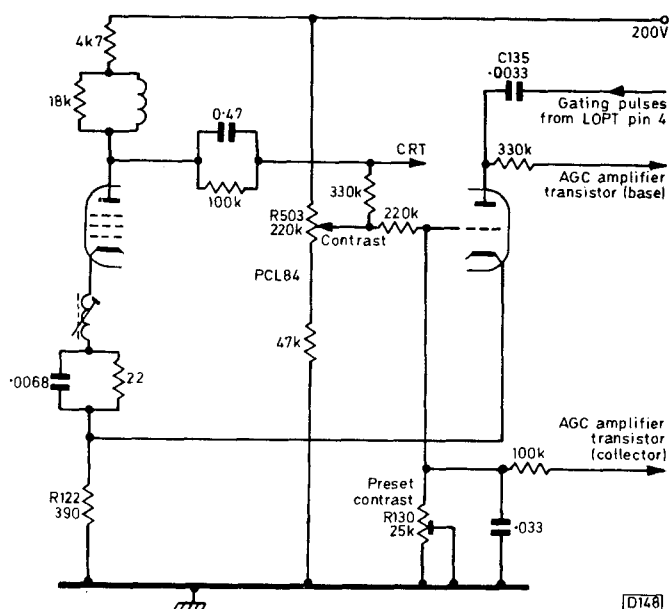
Having fixed the set so that it displayed a rock steady picture we were subjected to an intensive interrogation by Mr. Shuttlecock as to what the exact trouble had been. We explained in some detail, none of which conveyed anything at all to him, but he was determined to extract the last detail. At last he appeared satisfied. We turned to pick up the loan set and depart when Mrs. Shuttlecock arrived.

"Ah, the television set is back", she cooed. "Now tell me Mr. Lousy-Jones, what exactly was wrong. I would like to know".

"Oh dear" I stammered. "I've just told your husband all about it." "Ah yes," she persisted. "You must tell me as he has such a bad memory you see".

So out came the old spiel again, Mr. Shuttlecock's head nodding in agreement. At last I was able to escape.

Picking up the loan set, I was obstructed by Mr. S busily rearranging furniture, mainly directly in my path.



*Fig. 1: A.G.C. gating circuit used in the Waltham Model W125 – the PCL84 triode is gated at its anode.*

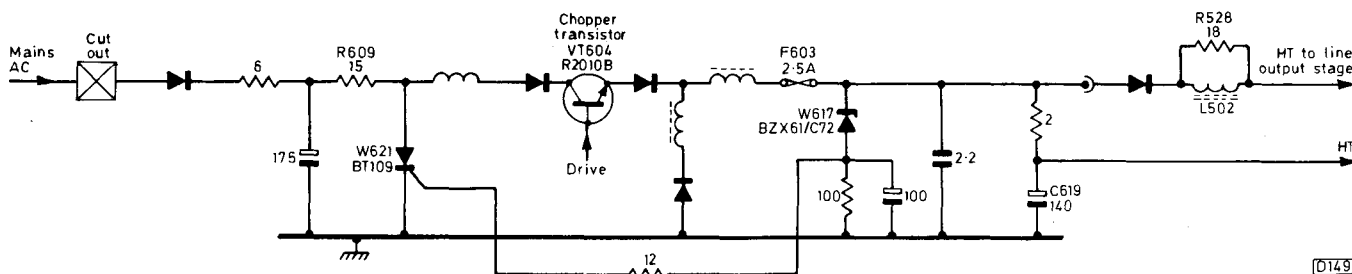


Fig. 2: Path from the mains input to the line output stage h.t. supply point in the Thorn 3500 chassis. Various problems included the core having fallen out of L502.

"Could you open the door?" I begged him.

"Ah yes, ah right, yes of course". He opened the front door and shot off down the path to open the gate. I followed and was about to pass through the gate when he let it go and shot toward the estate car.

The gate swung as I was passing through and combining with my forward movement dealt me a mortal blow in the groin.

"Ahhhhhhhhh!" My scream rang the length of King's Drive and Queen's Walk. The pain was so intense that had the set not been mine I would have dropped it. As it was I waltzed around howling with pain and fear for the damage that might have been wrought.

"What on earth's the matter," enquired Mr. Shuttlecock. "The neighbours will think you've got a screw loose."

"You let the gate go and it's damaged me for life."

"Oh dear", commiserated Mr. S. "Your face is green, I'd better go and tell my wife what has happened." This was too much for me. Hopping in the front I drove off as fast as my legs would enable me to change gear.

### Wanted by Five

On our return there was a batch of jobs "wanted by five o'clock." First was a UA3 unit audio. This unit has stereo v.h.f. radio as well as medium and long a.m. The complaint was not the usual one of one side dead or the unit totally out of action due to defective audio i.c.s - we'd been looking forward to the time when we would get one in without this chip trouble. Here it was.

Records played nicely and full output from the audio unit, but the radio reception was very poor both on a.m. and v.h.f. So we started by making an assumption, which of course turned out to be the wrong one. We ruled out the v.h.f. tuner and the stereo decoder, and concentrated on the supply voltages to the common i.f. stages, transistors etc. All proved to be in order, and signal injection didn't help much either. We then did what we should have done in the first place and studied the circuit diagram more closely. This showed that the detected a.m. output is also fed into the decoder i.c. Replacing this restored normal reception, which only goes to show that making assumptions (in this case that the only common ground was the mixer, i.f. and supply) can save time on some occasions but waste far more on others.

### Cut Out Cuts Out

Back to TV for the second job, a Ferguson colour set fitted with the 3500 chassis. Cut out operates as soon as it's pressed. Correction. Cut out operates almost immediately. During the very brief operating period (say one second) R609 (see Fig. 2) heats. Remove the supply plug to the line timebase. No difference. Check chopper transistor R2010 (VT604). Dead short emitter to collector. Replace and

check for shorts. When the line timebase supply plug is inserted a short or near short is recorded. Make a more direct reading on the line output transistor (R2008) and find this also a dead short. Nagging doubt creeps into usually blank mind. Let's make an assumption (not another one surely?).

If the chopper supply transistor shorted, the sudden voltage rise should cause W617 to conduct (it should conduct at 72V) and turn on the crowbar W621 which should cause the cut out to operate. Well apparently it was. Yes, but why the shorted line output transistor? Better check W617. Missing. Only the wire ends protruded from where it once was. Check the crowbar. This seemed to be in order.

As we were fitting a new 72V zener (W617 - BZX61/C72) we got to thinking. If the rise in voltage had caused the line output transistor to short, why hadn't the 2.5A fuse F603 failed? Removing it and taking off our glasses so as to be able to see properly we found it marked 5A. Ah....

So with a new chopper, new line output transistor and new zener, plus a 2.5A fuse of course, we felt brave enough to switch on. Buzz, loud sound hiss (no aerial), rustle of e.h.t., tube heaters alight. High pitched "tweaking" sound and we just knew the picture would be rippled.

Insert aerial. Colour o.k., sound o.k., picture rippled. Slap another electrolytic across C619. Better but not cleared. Check R528 (18Ω, wired across L502). Turned to dust. Replace, but hardly any difference. These components are in the supply line to the line output stage: R528 is inside sleeving, and is revealed when the beam limiter board is lifted. Bearing in mind that there had been a difference when R528 was fitted, we tried a capacitor of around 0.15μF across L502. Ripple cleared. Funny. Enter friend Ray.

"Can I take a set-top aerial to try over the flats Les?" he bawled.

"Of course. I say, why should a capacitor across L502 stop a ripple usually associated with lack of smoothing in the chopper line?"

"Cos the core's dropped out of L502 and it's not smoothing. I thought everyone knew that" said Ray.

"Of course, of course", I mumbled. "I was about to

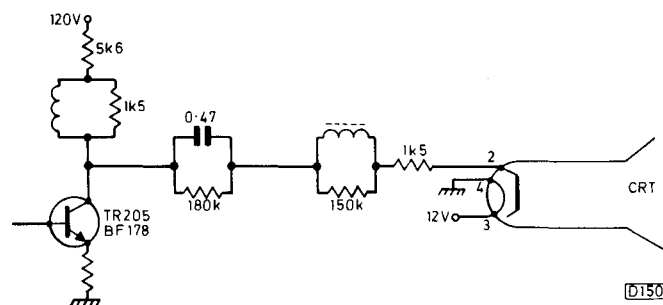


Fig. 3: C.R.T. cathode drive circuit used in the Indesit T12LGB monochrome portable.

check the presence, or rather the absence of – well where would it be?”

“Probably dropped out of the bottom on the way in”, said Ray. “I’ll send you one up later.”

“And he did. And it did. And that’s all there was to that one. Just between you and me, young Ray is not so hot on 1933 Ferranti radio sets.

### Tube Tapping

Still demoralised and confused, we commenced to direct our considerable talent to an innocent Indesit T12L BG which just happened to be sitting there. The complaint was that the picture would vanish and leave an over bright raster. Switching on produced a normal speckled raster (no aerial) which suddenly became speckless (speckleless?) and over bright, suggesting that the supply was absent from the collector of the video output transistor.

Having located the video output stage (TR205, BF178) we found the collector voltage normal (about 60V), also that the speckles had returned denoting normal operation. Removing the fixing screws, we withdrew the chassis whereupon the fault condition returned. A quick stab of the meter revealed that the video stage was still working but alas so was the screen.

Feeling a trifle frustrated, we decided to attack the tube base voltages. Now these small tube bases always confuse me, and it takes some time for me to sort out which pin is which. The first anode was easy as it was at over 300V. The trouble was, I couldn’t find the cathode’s 60V. Blind panic began to take over. It wasn’t surprising however because the screen was once again over bright. I made several assumptions (each of them wrong) before I calmed down and became merely irrational. I spoke to myself sternly: first positively identify the cathode pin.

This proved to be pin 2, with a 1.5k $\Omega$  resistor (Fig. 3) leading back to the video circuit, first via a choke wound on a 150k $\Omega$  resistor, then on to a 180k $\Omega$  resistor shunted by a capacitor, then to the collector of the BF178. I left a meter on the collector and another on the c.r.t. base socket which was now a normal 60V at pin 2. I’d just about given up hope of the fault returning when it did. Collector 60V, c.r.t. cathode 0V. Oh dear. It had been so long since I’d had a monochrome tube with a heater-cathode short that I had omitted to take this into consideration. Removing the tube base socket restored the 60V, putting it back produced 0V. I cursed loud and clear.

“Now what have you done” asked my angel, tender and considerate as always.

“I’ve spent some time trying to find out what’s wrong with this, when all I had to do was tap the tube neck, like this, and it would have shown up right away” I moaned, tapping the tube neck. Immediately the short cleared and back came the speckles.

Tap it again and back comes the short. Tap tap. No short. Tap tap tap. No short. Test for hours, no fault.

In the meantime my adorable one was having her say as usual. “Instead of tapping it, why don’t you slap a transformer in like you did on mum’s.”

“Because mum’s isn’t expected to work on a 12V battery, that’s why.”

“Perhaps they don’t want to work it from a battery.”

“Shut up and get that cat off the bench.”

The decision as to whether or not to order a new tube was not necessary as the short has not recurred (so far).

Thinking back to Mr. Shuttlecock, the only comfort I gained from all this is that at last I understand what is meant by “gated pulses”.

## next month in

# TELEVISION

### ● SERVICING THE PHILIPS G8 COLOUR CHASSIS

In answer to many requests, we are embarking on a detailed examination of this popular chassis which was first introduced in 1970. The various panels will be dealt with and their common faults listed.

### ● VERSATILE SYNC PULSE GENERATOR

Despite its simplicity, the sync pulse generator described in our May 1977 issue suffers from inaccessibility. For some applications, constructors may wish to modify the circuits and extend the functions. In response to this need we are describing an inexpensive (around £25) unit using readily available components. It is robust, and a number have been built and tried out in various applications. The design should fulfil virtually everyone’s needs, particularly in the CCTV field. The circuit is straightforward, yet features automatic interlacing. Construction is non-critical.

### ● INTRODUCTION TO THE ‘SCOPE

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# Never tap an Aerial with a Two Penny Piece

Les Lawry-Johns

SOME very queer things have been happening lately.

Take the other day for instance. In walked this young chap carrying a white portable TV set of doubtful origin: you know the type, made in Korea or somewhere and obtained through a club (the set not the chap).

"I'd like you to look at this set for me."

So I stared at it hard for quite a while, which didn't seem to do very much except that I get spots before the eyes if I look at white things too long.

"I don't mean look at it, I mean tell me what's wrong with it," he said.

Not wishing to be awkward, we plugged it into our ever ready, cater for everything, multisocket. Its own aerial didn't do much at all, and an outdoor aerial produced only a very noisy picture and hissy sound.

We pronounced our judgement: "It doesn't work very well."

"I know that" he said impatiently, "I'd like to know why it gave a perfectly good picture on its own aerial until I tapped it with a coin."

Working at fantastic speed, our computer brain added up the possibilities and came up with the probabilities.

"We hope it was a copper coin sir. Could be nasty had it been silver."

"It was a two-penny piece, but what difference could that make?"

"Well, considering the conductivity difference between copper and silver, plus other things, a ten penny piece could have had five times the effect."

He looked at me icily. "I have never understood currency fluctuations, but I still cannot see how this affects my television."

Sherlock Holmes took over.

"I should imagine you were wearing some sort of man-made fibre attire, had been engaging in an energetic pursuit, or had been driving a car, wearing gloves and rubber-soled shoes."

That did it. "Well I never" he said, or words to that effect. "I had been out running in my track suit."

"Ah well Mr Watson, you had charged up to a very high potential, and tapping the aerial, as you did, discharged you through the set you see."

"Well I never" he repeated. "I hope I haven't caused too much damage."

"Leave it with us and we'll see what can be done. Look in tomorrow."

So off he went and, rather intrigued, we had a look at the set. The aerial socket was not isolated and was directly coupled to the tuner. Oh dear, the tuner. Most inaccessible. We were finally able to undo the front fixing nut after removing the tuning knob, and with some difficulty extracted the tuner to the extent of the leads.

The cover was secured by a wire clip in the shape of a sawtooth waveform. Removing this didn't really help, so the leads had to come off. The tuner was then placed on the operating table.

We were interested in the r.f. amplifier transistor. Where was it? Where it should have been there was a pinhead with four tiny connections, one leading through into the next compartment. We concluded that this was the collector. The

base leads (two) were joined and the emitter went to earth via a 1k $\Omega$  resistor. Open-circuit base-emitter.

We had nothing like this except some much larger types used in varicap tuners (and you think these are small?). Viewing the space available however, it seemed possible to use a larger transistor. So we went from the sublime to the ridiculous and selected from the transistor stock a BF180 with nice long legs. Leaving the collector long and cutting the others shorter, we were able carefully to fit it in with the able assistance of the full nursing staff. Connecting up confirmed that the masterly surgery had not been in vain.

Getting the tuner fully back into position was another story, but a dull one.

Mr Watson was very pleased and rather relieved, since he'd borrowed the set from a friend.

## Mrs. Smallpiece's Green G8

It was getting near the end of a very frustrating day. Almost everything that could go wrong had. We were just finishing off an Indesit T24 with the left hand, whilst the right was engaged in cleaning the head of a cassette recorder, and at the same time we were telling a chap how to fit a cartridge to the playing deck he had just purchased from a discount warehouse because they couldn't tell him.

The phone rang. It was Mrs. Smallpiece. We had fitted a regunned tube in her G8 (Philips colour) about eighteen months earlier and only the previous day had put in a new tripler, so she'd paid out a bob or two.

"It's gone all bright green and that seems to fade away" she said in her low, seductive voice – the kind that makes you think X certificate thoughts.

"I'll be there before you can say no" I assured her as different possibilities (fault ones of course) cascaded through my mind.

Finally managing to fit the back on the Indesit (no mean feat), and disposing of the remainder of the peasants, we put "closed" on the door and prepared to kill the dragon that was troubling Mrs. Smallpiece.

"Now what are you up to?" enquired my little prairie flower.

"I've got to have a look at Mrs. G8's smallpiece" I stammered. "It's gone all green."

"You went there yesterday, didn't you?"

"Yes, it's a pity last thing like this but I can't leave it love."

"Well it's time Ben had his run. We'll come with you and I'll read the evening paper while you're in the house."

"Right-ho precious, glad of a bit of company really."

So we packed all the gear in our ageing estate car, including the dog and the first G8 signal panel that came to hand, and off we went.

Mrs. Smallpiece answered the door and ushered me into the room where the sick G8 lived.

"Thank you for coming so quickly" she murmured. "You must be very busy."

"I have a fair bit to do" I admitted, looking at her long dark hair. She said the set had made a sparking noise and the screen had then flashed up bright green. Whilst I moved the set out and removed the rear cover, she sat in an

armchair opposite and presented a very pretty picture herself.

Switching on the set produced a heavy spark across the focus spark gap on the tube base socket, heavier than 5kV could have done. A new tripler yesterday, intermittently excessive focus potential today. There was no more discharge however, so for the moment we concentrated on the green screen which the beam limiter was trying to cope with.

As expected, voltage tests revealed a very low voltage at the collector of the green output transistor, only about 50V instead of well over 100V as on the red and blue output transistors. We concluded (wrongly) that the spark had damaged the green output transistor, and to hurry things up a bit we whipped out the signal panel and slipped in the replacement. This was the third mistake in as many minutes, surely our darkest hour.

Switching on again I raised my head over the top and looked at Mrs. Smallpiece (legs first frankly). "Better now?" "No dear, it's still green."

So was I. Head down, no more would our concentration wander. Green collector just as low as before. Remove green flylead from panel, voltage much higher. Oh dear, what could be pulling the voltage down on the tube base socket... or in the tube?

With the green lead reconnected but the tube base socket off the tube the voltage remained higher, but still not as high as red and blue. With the tube base on, the voltage on the green cathode fell dramatically. Clearly the tube had suffered as the result of the discharge across the focus gap, or across the tube base socket.

Green gun, grid-to-cathode or heater-to-cathode. Grid-to-cathode leakage didn't bear thinking about. We could cope with a heater-to-cathode leak however.

Switch off set, take off tube base socket. No readable leaks on tube pins. Think carefully. Heater is supplied by a transformer, and the supply is not earthed at the transformer end (see Fig. 1). Check tube base print. One heater pin print goes to chassis. Cut through print, leaving heater connections intact but not earthed.

Right leg getting cramped. Move leg out and tread on removed signal panel. Crunch. Try not to panic. Will repair panel later. Fit tube base socket. Check leads. O.K. Switch on.

"How's that?"

"Still green."

Anguish. Panic. No, wait. Wait just a second. Look at screen. Green yes, but not brilliant. Check output transistor

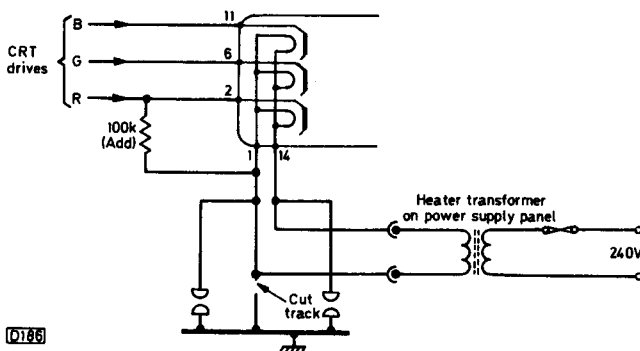


Fig. 1: Dealing with a heater-cathode short on the Philips G8 chassis.

collector voltages. Green lower than the other two. Remember. The panel we picked up was the one which hadn't been checked. The only one not checked, you fool. Why did you have to go and tread on the one you took out?

Checking showed only a crumpled preset. Delve in tool box. Got one. Plug in soldering gun. Out preset, in new one. Change panels. All cathodes now at same potential. Plug in aerial. Lovely, but hang on. The new but suspect tripler is still in and the tube heater is still floating. Stagger out to car.

"Having trouble love?"

"Won't be long now. Once more into the breach dear friends."

In went another tripler. In went a 100kΩ resistor from the heater to the nearby red cathode to keep the potentials just about even.

Clear up and engage in small talk with Mrs. Smallpiece. Just getting down to the nitty gritty when a large young man enters. Must be six feet four, about twenty I'd say.

"Everything all right mum?" "Yes love", says Mrs. S. "Les says it wasn't much really". "Made him sweat though, didn't it?" It did, it did.

So this is a clear example of blundering inefficiency. My inefficiency. *Item one:* The spare panel should not have been taken out unless it had been proved good. *Item two:* The fact that the green output transistor's collector voltage was low did not necessarily mean that the transistor or its operating conditions were wrong. The first move should have been to remove the flylead from the panel to the c.r.t. base and if the voltages on the panel returned to normal there would have been no need to let loose wild geese. *Item three:* Concentrate on what you are doing, not on what you might be doing.

## SYNC PULSE GENERATOR

### Parts List

#### Counter Chain and Logic:

IC1 - IC4	7490
IC5, IC6, IC14	7404
IC7	7445
IC8	7420
IC9, IC11, IC15	7400
IC10	7410
IC12, IC13	7430
R1 - R4	4.7kΩ
C1 - C4	330pF
16 off 0.01μF	disc ceramic decoupling capacitors

#### Power Supply:

T1	12-0-12V secondary at 1A. Marshall's MT213
IC1	7812 regulator
IC2	7805 regulator
D1, D2	1N4001
C1	2,000μF 25V electrolytic
C2, C3, C4	0.1μF polyester
C5	250μF 25V electrolytic
R1, R2	470Ω
F1	1A plus holder
LP1	Mains neon
S1	Mains switch d.p.d.t.
Two five-pin DIN sockets	

#### Monostable Oscillator:

IC16	74123
R1, R2	4.7kΩ
C1, C2	1000pF ceramic plate
VR1	10kΩ trimpot

#### Mains Locked Oscillator:

R1, R2, R7, R8	3.3kΩ
R3	5.6kΩ
R4, R9	10kΩ
R5, R6	330Ω
R10, R13	100Ω
R11, R12	560Ω
R14	1.8kΩ
R15	100Ω
VR1	1kΩ trimpot
C1	0.1μF polyester
C2, C3	0.01μF polyester
C4, C5	0.47μF polyester
C6, C7, C8	22μF/16V electrolytic
C9, C10	4,700pF ceramic plate
C11, C12	100μF/16V electrolytic
Tr1, Tr3 - Tr6	BC107 etc.
Tr2	2N3702 etc.
D1 - 4	1N4148

# Hot Pyes

*Les Lawry-Johns*

TIME after time we've noticed that if you get one awkward one in of one type you're bound to get half a dozen of them in a row. A little while ago we were plagued with Thorn 3500 chassis, one after the other, all awkward, nothing easy. Then came the Philips G8s, one after the other again until we cried out in anguish, enough, enough, let's have an end to it. The other day though it was the turn of the Pye group hybrid models – 691, 693 and 697 chassis, Pyes, Ekcos, Invictas, etc. Normally these sets are no trouble to us at all: one can usually put a couple of items in one coat pocket, a couple of tools in another and carry a soldering iron etc. to the scene of the crime in full knowledge that if the customer has described the symptoms correctly the job will be done in minutes. You know the sort of thing: picture went off, sound still o.k., a smell of burning (or saw smoke) and switched off (or the set went off completely as the fuse failed). The one or two items in this case would be a 100k $\Omega$  1W resistor, an 0.1 $\mu$ F 1kV capacitor and the usual fuses normally in the trouser pockets anyway.

## **The Stock Troubles**

Avid readers will have no trouble in identifying this common fault. The 0.1 $\mu$ F capacitor (C224) decouples the boost line feed to the c.r.t. first anode presets, coming via the 100k $\Omega$  resistor (R227). The capacitor shorts, the resistor cooks and the fault then becomes the same as if the 0.47 $\mu$ F boost capacitor has shorted, the difference being given in the description, i.e. smoke or a smell of burning which doesn't occur when the boost capacitor goes short-circuit because the PY500 immediately passes excess current and the fuse fails.

For the benefit of less avid readers, or if the symptoms have not first been properly described, the way to tackle the condition is as follows. Check the fuse. Connect an ohmmeter from the top cap of the PY500 (or PL509) to chassis. If there is a low reading (should be about 1M $\Omega$ , give or take a few hundred thousand – let's not be mean about this, say the needle moves on the  $\times 1$  scale or more likely swings over to give a definite reading) there is a short on the boost line. There are two likely conditions (lots of others, but two likely). One is that the 0.47 $\mu$ F boost capacitor C218 on the line output transformer assembly has shorted, the other that R227 has become a charred image of its former self due to C224 shorting, the 100k $\Omega$  now being more like something under 100 $\Omega$  (hence the unspecified movement or deflection on the low ohms range). The clue is in the appearance of the 100k $\Omega$  resistor. If it's clean and brightly showing its brown-black-yellow bands, suspect it not. Neither suspect C224 of course. Snip one end of C218 (the fat capacitor) and read again.

Ah, you may say. This is all very well, but where do we look for the 100k $\Omega$  resistor, to see if it is feeling poorly? Ah, we reply. It all depends. If the right side section is mainly a metal box, look underneath on a tag panel about half way between the PL509 and the PCF802 valve bases, with the 0.1 $\mu$ F capacitor laying along toward the shift controls (early models), or smack in the middle on later models (691). If the right side is occupied by a vertical printed panel

(later 697 chassis), note the top centre red box with the fuse inside. Look down the centre about a third of the way down, just above the transformer, and there it is, with C224 leading off to the right. All right?

## **Unstable Sound**

Well now, none of this applied to our row of Pyes, and more's the pity. The first one seemed simple enough to start with. No valves glowing. Early model, metal box on right side. Move it out to check the supply line. O.K. Check PY500 and PL509 heaters. O.K. Move the box unit back but fail to notice that the rubber sleeve has slipped down from the end of the focus unit (the e.h.t. end). Find break in heater circuit on left side colour-difference amplifier panel – crack in track to one of the PCL84 heater pins. Repair track. Valves light up. Lovely picture and sound. Sharp crack as e.h.t. discharges to convergence panel. Picture still o.k. Sound goes funny. Very slow motorboating, low sound clear, loud sound increases the rate of motorboating to make the effect garbled.

This could be due to an open-circuit electrolytic in the power unit or a fault in the audio module, possibly a faulty transistor. Check the easy thing first. Clip a high capacitance electrolytic across the supply to the module. No improvement. Fault must be in module.

Now the module in these earlier models is a Mullard LP1162. The most common complaint is failure of the output transistors. This cooks up the 2.2 $\Omega$  resistors which are connected between the emitters for bias purposes. Replacement is no joke, as we've mentioned before. Rush down to van and say unkind things to sleeping guard dog who continues sleeping. Rummage in spares box. Two modules. One used, one new. Rush up with both. Fit new one. Similar symptoms as before. What now? Don't know. Check this, that and the other. Remove front control panel again. Remove module again. Fit used one. Lovely clear sound. I hate modules. Make sure e.h.t. cannot discharge again. Carefully mark modules u/s.

## **No Signals**

Carry on to next set not too far away. Ekco with the 697 chassis. Varicap tuner. Raster and noise on screen, just as if aerial is disconnected. Aerial is disconnected. Plug in aerial. No change. Check tuning. Suspect loss of h.t. to the two 9.1k $\Omega$  resistors on top of the tuning panel (Fig. 1). H.T. present, and just over 30V at the TAA550 zener. Now what?

Remove tuner panel and check voltages. A.G.C. o.k. at A. +12V at B, nothing at C. This is where the tuning voltage should be. Check again and hold tuner steady. Tuning voltage o.k. at around 10V and lots more noise. Reach round and tune in sound and vision. I.F. unit on one knee, tuner on other, very uncomfortable. Let go of tuner. No tuning voltage, no sound only hiss. Move legs. Sharp point on i.f. panel penetrates trousers. Has to be 200V h.t. Move more quickly and wish I were dog in van. Examine tuner more carefully. Intermittent short to earth from tuner



voltage point C when tuner is moved. Take off cover and find tiny piece of wire which had no right to be there.

This was a bit of a relief actually, because we've had our fair share of trouble with varicap tuners of various types. It's usually a faulty transistor or wires touching (just) the side wall, but we had one where the tuning voltage was lost due to a coil inside the screened compartment intermittently touching the wall of the compartment (lid soldered on).

### Intermittent Blue

So having restored normal signals and replaced the tuner and i.f. panel we thought we'd finished. No such luck. "While you're here," said the gaunt Mr. Moneypenny, "perhaps you'll clear a minor thing. The blue keeps going." I like this "minor" business. It implies that it won't take a moment, any fool could do it if he wasn't so busy, and of course it won't be worth charging for.

Anyway, the blue did drop out as we watched the test card, and promptly dropped back in again. We diagnosed a poor contact under the blue PCL84 on the CDA panel. Inverting this, we were surprised to find hardly any sign of deterioration. All was bright and clean. No poor solder, no cracks, nothing. Tapping around above the panel produced blue drop out all around the area however. More gentle disturbance finally seemed to cast suspicion on RV27, the B-Y drive control which is part of the blue preamplifier transistor VT31's load, as the collector voltage of this transistor came and went as the preset was moved one way and then the other. Fitting another preset seemed to clear the condition, but on checking the control later nothing seemed to be wrong with it at all.

### Dealing with Weak Line Hold

Back on the bench sat yet another specimen, this time a Dynatron set resplendent with a black front control panel with lots of little chrome knobs, but still a Pye at heart. Again the 697 chassis (glad of this really, because we're still not completely at home with the later solid-state 725 etc. with vertical swing panels). The note read "loses line hold after one hour, also poor brightness and colour." Coward to the last, we tackled the poor colour and brightness first. A new PL802 worked wonders for the brightness and definition. Soldering suspect joints under the panel and improving the earth contacts to the rear edge clips seemed to clear up the colour.

Now for the line hold. Always tricky on these sets, purely because of the vertical right side panel. The PCF802 line

oscillator, line hold control etc. are at the bottom and are most inaccessible. So we don't use normal methods of fault tracing on these sets when such line troubles raise their ugly heads.

Remove the side and top edge connectors, partly withdrawing the unit. Remove the cover of the line output transformer and the clip earth connectors. Remove the front PK headed 4BA screw which secures the e.h.t. tripler. Lower the panel. Components can now be seen. First check the 47k $\Omega$  flywheel sync circuit flyback pulse integrating resistor R203. If it looks discoloured or reads less than 47k $\Omega$  on the meter, change it. If it's much less than 47k $\Omega$ , check the discriminator diodes D40 and D41 which can suffer if R203 goes low. Remove one end of R210 (in series with the line hold control) and check its value (100k $\Omega$ ). If much less than 100k $\Omega$ , replace it. Even if it's not at fault now it soon will be and can cause other troubles. Then check the large 16 $\mu$ F electrolytic and the smaller 1 $\mu$ F and 4 $\mu$ F ones. These are C215, C213 and C210 respectively, in the line oscillator circuit. If these checks are inconclusive, change the PCF802 and the feedback capacitor C211 (320pF). This completes the normal checks.

Swing up the panel, refit the tripler screw, line output transformer cover, not forgetting the grommets at either end, and the earthing clips, especially that of the focus unit. Replace the edge connectors and refit the unit. If the convergence is wrong or there's something else not working, recheck the edge connectors. This method of attack has proved its worth over and over again. Indeed, after this the Dynatron dyned very well.

### Explosions

We have always had difficulty in identifying which Dawe brother is which. Jack Dawe had bought a 26in. Invicta set from us some four years ago (697 chassis), whilst his twin, Owen, had more recently (about two years) bought a 20in. Thorn set (9000 chassis). We had not heard a word from either by way of trouble, which is not bad when you think of it, although we have had a drink with them from time to time.

Anyway, in walked Mr. Dawe. "Hallo Owen," we greeted him.

"I'm Jack" he corrected me. "Where's the complaints department? That rotten set you sold me's gone wrong. I bought it only four years ago. Frightened the life out of our dog when it went bang. He hasn't been the same since. And there was a flash on the wall at the back, or so the wife says. I wasn't looking at it at the time myself."

"How's the wife Jack?" I enquired. "Shelagh isn't it? Lovely girl! Went bang eh? I wonder why?"

"I'm on my way home now," said Jack. "You coming?"

"Rightho Jack, I'll follow you up just as soon as I've put a new mains dropper in this brand new set that I've just unpacked."

So off we went up the hill. Pity his wife's name wasn't Jill, but we mustn't invent names just for effect, must we?

When we got there the poodle was running round in circles, apparently chasing his tail.

"Been doing that ever since the set went bang" said Jack.

"Probably checking up to see that he's still all there" I suggested helpfully, being an expert on dogs.

Taking the back off the Invicta we were not surprised to find a nasty mess on the top centre of the right side vertical panel. The mains input is taken directly to the 2.5A fuse, with tracks leading to the edge connectors which lead back to the on/off switch. The supply then comes back again to the panel to the rectifiers etc. This means that the supply

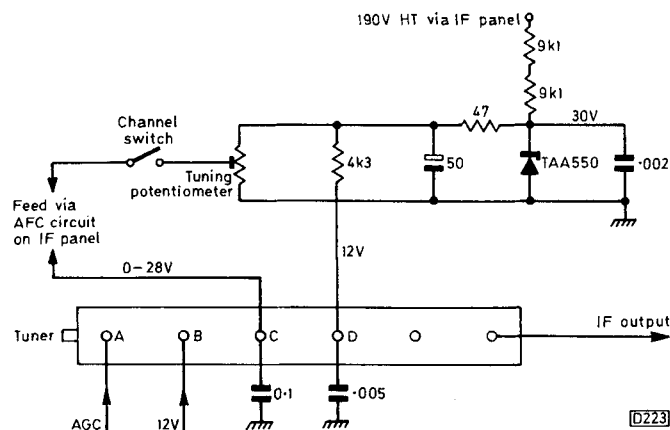


Fig. 1: Varicap tuner supplies, Pye 693/697 chassis. There are six channel selector switches/tuning potentiometers.

fuse and its connections are alive when the set is off, a point well worth bearing in mind.

When there's been a minor explosion, it's difficult to say exactly what the chain of events were. There's some molten copper and a blackened area. The idea is to clean up the panel, accepting the fact that there's been conduction across the panel between the tracks, the cause of the trouble in the first place rather than the failure of a component. First establish which tracks did which job (when they were there) and carefully wire up as neatly as possible, cutting away any remaining sections of conductive panel. Some confusion is possible, so the original circuitry must be kept clearly in mind.

There's another and very important factor. Some long thin tracks run down from the top edge connectors, near the area likely to have been damaged. Although they may have been intact at the time of the original trouble, subsequent handling of the panel may have extended any fine cracks farther across the paxolin, fracturing these tracks. This can lead for example to field collapse due to the 20V supply to the height control suddenly being lost. Careful examination can save an awful lot of trouble later.

Having patched the patient up nicely, the set was tried out. Picture rather dark at maximum brilliance. Fit new PL802. Plenty of brilliance. Convergence had wandered over the years, but responded to a few minor adjustments. All in all, not bad for four years' service.

Incidentally, the audio module is replaced by an i.c. on some of these 697 chassis, and there's a separate 1N4002 diode to supply the i.c. instead of the supply being derived from the bridge rectifier.

A further note may be necessary. We've outlined what happens when there's a breakdown of the panel insulation itself. This condition should not be confused with the type of blow out that occurs when the mains filter capacitor, wired across the on/off switch, goes short-circuit. This shatters the fuse of course, but can also damage the print beneath, discolouring a small area of the panel. If the panel itself isn't damaged but the tracks are, check the capacitor which will almost certainly be found shorted.

The next job was to seat the poodle in front of the set so that it could see that it wasn't going to go bang again. Being satisfied on this point, it no longer chased its tail or whatever it was. With the poodle straightened out we thought that a quiet five minutes would be in order. It wasn't.

### **No Raster**

A Pye 691 was apparently no longer entertaining its elderly owner. Off we went armed to the teeth, to wrestle with the final electronic cock up of the day. We won't bore you with the old girl: suffice it to say that she didn't stop nattering from the time we entered to the time we exited. The set however was a different matter.

The fuse had failed and there was a short from the top cap of the PY500 to chassis. Oh well we thought (as best we could against the old girl's incessant chatter), back to the old routine.

Turn up the unit to have a look at the resistors. We expected R227 (100k $\Omega$ ) to be charred – as mentioned earlier. It wasn't. Or rather they weren't. In fact the 100k $\Omega$  resistor had been replaced by two 56k $\Omega$  resistors in series, and these were obviously in the best of health. Looking around however we found the 100k $\Omega$  resistor (R210) to the line hold control burnt out instead. This made the look under the unit worthwhile after all.

Now whilst this could affect the h.t. supply to the line

oscillator, it wouldn't explain the boost line short which we foolishly attributed to the 0.47 $\mu$ F boost capacitor on the line output transformer. Having fitted a new 100k $\Omega$  resistor to the hold control, we were then stupid enough to remove the side panel of the transformer housing to expose the said capacitor, instead of checking something else first. Needless to say the 0.47 $\mu$ F capacitor proved innocent when disconnected at one end. Then the penny dropped.

Take out the PY500. No short then present. Heater-cathode short in the PY500 you stupid clot. Why didn't you check that first?

Well, if we had we wouldn't have found the duff 100k $\Omega$  resistor to the hold control. All right then, make excuses for yourself, after all it is getting late and the old girl is still on about her sister who died three years back.

Right then. New PY500, new fuse, no shorts. Switch on, lovely sound, real nice that sound. Wonder why the valves aren't lighting up? The sound which sounded so nice by the way wasn't really sound, just a nice loud hiss since the aerial was not in. Put the aerial in. No difference.

Wait a minute. Even if the valves were not lighting, that's nothing to do with the sound. It's not a 691! It's got a varicap tuner that needs h.t. dropped to supply the 30V for tuning. Quick check. No h.t. Now the old girl is on about her school days. Wish she'd stop for a moment so that I can think. Turn the power unit round. A.C. supply o.k. at one end of the surge limiter resistor, not at the other end. 5.6 $\Omega$  wirewound. Fit another. Try again. Sound o.k., news reader now competing with old girl.

Right. Why don't the valves light up? PY500 is getting heater supply and is new. What about the PL509? Open-circuit heater.

Oh dear, where's it all going to end? Fit new PL509. Heaters light. Allow time for set to warm up. Rustle of e.h.t. Can now see news reader. Not bad. Square up all round and wonder what the sequence of events must have been. Switch set off and wait for lady to stop going on about present day school standards. At last we manage to get our bit in and escape. Name on the cheque, Nightingale. Not very clever and logical was it? We do try to be but confusion usually sets in toward the end of the afternoon. Getting old.

## **TV TELETEXT DECODER**

### **TROUBLE-SHOOTING AND REPAIR SERVICE**

To assist constructors who may encounter difficulties with this project, *Television Technical Services* are offering a trouble-shooting and repair service for the various modules. The charges are as follows: modulator £2; input card £4.50; memory card £3.50; display card £4.50; i.f./data recovery card £4.50 (including alignment) or £6 to include published modifications. These charges include the cost of replacing minor components, and return postage. Any expensive replacement parts needed will be notified to constructors. Modules should be sent with remittance and package able to withstand return mailing. Write or phone for a quotation if you wish to send all four boards for testing.

**Television Technical Services,  
PO Box 29,  
Plymouth, Devon.**

**Tel: 0752 813245**

# Bubble, Bubble, Audio Trouble

## *Les Lawry-Johns*

WHEN Mr Fortune smiled at me I knew I was in for an awkward one. He's an engaging Scot with a very dry sense of humour that leaves you wondering where the leg pull ends and the fact begins. You may remember his brother Dick (the Scot from New Zealand) who did so well at last year's sheep dog trials.

Anyway, Mr Fortune had a friend who had a Decca colour set which had been giving trouble with the sound, first going faint and then disappearing altogether.

"No bother" we said. "Bring it in and you'll be taking it out before you can say Hootsman".

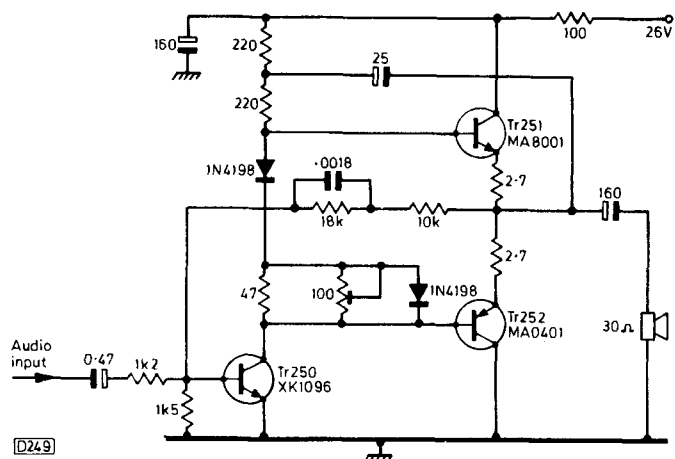
## A Decca 20 Series

It came in all right. But it wasn't at all what we thought it would be. In the first place the model number didn't ring any bells. It was a CS2227 and was the first of these fairly old sets to come our way. We were quite unprepared for the audio output stage – a small panel up on the left side, containing the driver and output pair of transistors.

As there was no response at all from the loudspeaker we checked this first since it was freely accessible. A meter across the tags on the low ohms range showed no reading. With a smile matching that of Mr Fortune we removed the tags and connected them to a test speaker of some  $15\Omega$ . Still nothing, and the smile faded.

Recheck the speaker in the set. It now read  $25\Omega$ . Oh dear, I couldn't have connected the prods properly in the first place. Reconnecting the clips to their original place we turned our attention to the audio panel (Fig. 1).

It was easily removed. Still with the meter on the low ohms range we checked the npn output transistor Tr251. Base to collector about  $30\Omega$ , base to emitter the same. This one was o.k. then (bad mistake). The pnp transistor Tr252 was open-circuit base to emitter. This was it then.



*Fig. 1: The audio circuit used in some early Decca single-standard colour sets (20 series chassis). Most of the rest of the circuitry is similar to later versions of the Decca CTV25 series, though a different set of component reference numbers was used. Sets using this chassis are the CS2225, CS2227 and CS2520. Another difference is the use of an MC1351P intercarrier sound i.c.*

Remove it from its heatsink and look up a likely replacement, which appeared to be a BC143. Fit this and switch on, having replaced the plug and flylead. Low, distorted sound. BC143 getting hot.

Check voltages. Full supply across BC143, no drop across the npn transistor Tr251. Penny dropped. Idiot. Failed to check it for shorts. Dead short emitter to collector. Remove and fit BC142. Check carefully, driver and diodes, small preset etc. All o.k. Refit and switch on. Burst of sound, then nothing. Oh dear (again).

Check voltages, all o.k. Still no sound. Connect test speaker. Lovely sound. Recheck set's speaker. Reads 50Ω and needle wanders up to infinity. Fit new speaker in cabinet. Sound now perfect. "All right?" we enquired.

Mr Fortune's friend shook his head sadly and said "Grrulley brunnesal yiggle frungle".

Mr Fortune interpreted for his friend. "The sound sounds fine but if you were round here you would appreciate that it's also helpful to have a picture to go with it. It was there but went when the sound came back, I suppose we mustn't expect too much. . . ."

With a heavy heart I became aware of a smell from the right side of the set. Tripler. Oh no.

"We'll leave it with you and call back later" said Mr Fortune. "My friend is getting impatient."

So saying, off went the jovial Scot with his friend now happily wagging his tail, leaving me with a smoking tripler which did little to sweeten the atmosphere of the shop.

## A Music Centre

Having finally cleared up the Decca, we thought we would tackle what appeared to be a straightforward job on a Ferguson music centre fitted with a Thorn 78S main deck. The complaint was no sound from either channel, though one side failed before the other. True to form, we did all the wrong things and reached (jumped to) conclusions and what have you which we had no right to reach or jump to.

Standing the thing up on its end, we released the necessary screws to enable the main panel to be removed for a quick look. Seeing a couple of burnt out resistors in one of the output stages we removed the supply plug and strip connector, plus the f.m. aerial plug to enable the unit to be separated completely.

The 315mA mains fuse had of course failed, and the burnt out resistors were the usual  $2.2\Omega$  (or thereabouts) ones which in this case join the collectors (see Fig. 2) of the output pair of pnp and npn transistors in one channel (four separate heatsinks). We assumed that there was a collector to emitter short and confirmed this with a meter check. Stupid to the last, and being distracted by the phone and enquiries about other jobs, we studiously fitted another pair of output transistors and collector resistors, stuck in a new fuse and coupled up. Smoke from the resistors, pop went the fuse. "You bloody fool, you forgot to check the drivers etc."

The same collector to emitter short was still there, but on removing the associated driver the short had gone and in fact the output transistors were not at fault, neither were the

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two previously removed. Looking at the circuit didn't really show how the resistors had cooked up as the result of one faulty driver, but a close check of the whole audio channel revealed that of all the six transistors and two diodes involved only the output pair and one diode were in fact in order.

Four new transistors and one diode were fitted and the channel then functioned fine (new resistors as well of course).

Turning our attention to the other channel we found that here only the a.f. amplifier and pre-driver transistors were defective, the effect of this being to turn the rest off (no burn ups). All this can be told in next to no time. In fact it took several hours, such is my blundering incompetence. I'll learn one day, you'll see.

#### Back to More Familiar Ground

You would think that after that repairing an Ultra colour set with a Thorn 3500 chassis in it would be a picnic. I thought so too, so I am barmy as well. Not half as barmy as the chap who introduced me to it however.

He came in and said "would you have time to come out to the car and have a look at my set so that you can give me an estimate for its repair?"

I replied of course "what sort of car radio is it?"

"It's not a car radio, it's an Ultra Bermuda colour television and it only wants an aerial socket. I've just brought it and don't want to spend too much on it. The people I got it from said it only wanted a socket, you see."

Here we go again, here we go again.

Reason prevailed and he and his dad got the set out of the car and on to the bench it went. It appeared to be in good condition generally, but I was not inclined to believe that the original owner would have parted with it simply because the aerial socket had broken. This however precluded it being demonstrated.

So while they stood there I fitted the required aerial socket. We then tried the set. Somewhat to my surprise, a picture of sorts appeared, but with very poor convergence. This partially responded to adjustment, but I was aware of some overheating from the convergence board. This sort of thing is usually associated with defective diodes, and it didn't take long to find that W571 was short-circuit. With this replaced and the controls reset, the picture was very reasonable and the tube seemed to have plenty of emission.

#### In Search of the Sound

We then went in search of the sound, of which there was no trace. The loudspeaker proved to be in order, but the voltages in the output stage were way out, as were those in the driver and audio amplifier stages (see Fig. 3). All four transistors appeared to read right in situ, but just to be sure each was removed and tested. The only one at all suspicious was the pnp output one VT404 which seemed to have very slight base to collector leakage though hardly enough to cause the wild voltage inaccuracy. To be certain this was replaced, but nothing seemed to change.

The trouble seemed to be that there was no turn-on voltage at the collector of VT401. This should be 0.5V in order to coax the driver VT402 into passing current. This meant that VT401 was shut off, either because its base voltage was too high or its emitter voltage was too low. We pointed an accusing finger at C402, which could have been short-circuit. It wasn't. The base circuit components seemed to be in order, so we concentrated on the emitter circuit.

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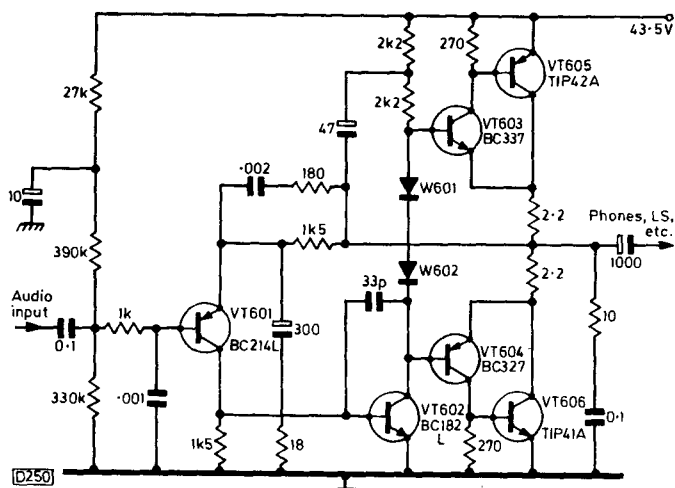


Fig. 2: Some contrasting audio circuitry, used in a Thorn music centre. One channel only of this stereo unit shown. Both channels were dead, for different reasons.

The voltage here wasn't too far out but on close inspection was somewhat lower than it should have been. This could have been due to leakage through C407. It wasn't.

Now stop and think. If VT401 wasn't passing current, there should be no voltage across R409 and there should be the same voltage at the emitter of VT401 as at the emitters of the output transistors. This latter voltage was not the correct 26V but more like 60V since VT404 was turned off. So the voltage at the emitter of VT401 should have been 60V instead of the nearly correct 26V or so! This could be explained if R409 was way up from its rated value of 4.7kΩ: it wasn't.

Panic started to creep in. The voltage at both ends of R409 was only about 26V and was varying slowly. Now this resistor is near the top of the board and quite suddenly the meter jumped and the sound returned only to fail as the prods were removed. Belatedly the penny dropped and panic was replaced by bitter hatred. Once again we'd missed the obvious. Very careful examination revealed a hair crack on the panel passing through two tracks. Scrape, clean and bridge with wire. Normal sound and correct voltages. At last.

## The Lot Went Off

Moving the set to make a final check on the picture there was a sparking noise and the lot went off, only to come back on immediately. What next?

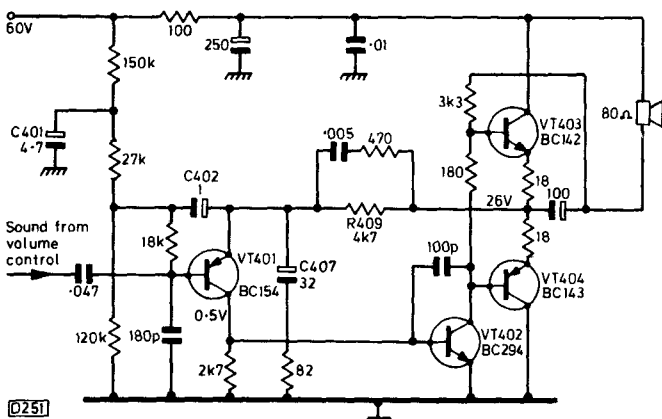


Fig. 3: Another collection of d.c.-coupled audio stages, this time the circuit used in the Thorn 3000/3500 colour chassis. Odd voltages were caused by printed panel defects rather than component failures.

We wearily turned our attention to this new problem. It turned out to be nothing more than a poor contact on the on/off switch, where the live mains lead had never been properly soldered to its tag.

Now the thing functioned properly. Now we knew why the set had been sold. All it wanted was an aerial socket.

## A Visit to Oaktree Drive

"Would you call to look at my set, it's the HMV, the picture's gone fuzzy? You know where we are, Oaktree Drive. Anytime". It was Dr Elmtree. So we wrote in the book Dr Oaktree, Elmtree Drive. Another 3500 chassis. Fuzzy picture. Probably means it's out of focus. Make sure we have a tripler in the outside service box. Yes. After tidying up a couple of loose ends we set off to attend to Dr er-who?

Now once the old computer has an address fed into it we are not really conscious of where we are driving until we get there, because thinking (as you may have gathered by now) is not one of our strong points. Arriving at our destination we were quite surprised to find it marked Oaktree Drive. Must have changed the name, we thought. Bashing on the solid oak door we were vaguely aware that there were too many oaks around to be true.

I was ushered into the room where the TV set lived by the elderly lady who had answered the door, but when I looked round she had vanished and in her place stood a stocky man who seemed to find something interesting in the ceiling. I thought I'd better attract his attention. "Dr Oaktree, I presume?"

He spoke. "Dr Elmtree is not here at present, I'm Dr Sideshow".

He said this still looking upward. I too looked up, in case there was something I was missing. He swivelled his eyes down to look at me, with his chin still held high.

"There's nothing to look at up there. I've only got my head up like this because there are two points sticking out of my collar which impale themselves in my neck if I lower my head. My wife has a habit of not taking the bones out of my collars before they're washed and ironed. Then when she finds the bones in a mess she takes them out and puts in cherry sticks. I wouldn't mind this but she forgets to break the points off and through the collar they go you see."

And off he went, struggling to undo the collar. What was that he'd said, Dr Elmtree? Could have sworn it was Oaktree. Perhaps I'm in the wrong house. No, there's the HMV. Oh well, there are some funny people about. Better have a look at the TV set.

Picture o.k. Suddenly bright blue and hazy. Not the tripler then. Just another one of those "reliable" thick-film resistor units crumbling up again (RGB output stage load resistors). Rummage in spares box and find three 8.2kΩ 7W wirewounds which are near enough. Use with three 47kΩ carbon resistors (to chassis) to replace the thick-film colour drive output load resistive unit. Remove panel and spread out nearby *Girlie* magazine to catch any drops of solder. Easy job really, but some care is needed to insert the new resistors into the correct positions.

Ten minutes on panel, another ten studying *Girlie* magazine.

Not a bit like *Homes and Gardens*.

Wrap up job. No one at all around now. Let myself out having called out a few "hallos" up the stairs and into the kitchen. All the same if I'd been taken bad or electrocuted myself or something. Don't forget to send bill in, and try to get name and address right, Sideshow, eh?

# Odds and Ends

*Les Lawry-Johns*

QUITE often we come across slightly unusual faults during the servicing day (the nights are for sleeping these days, er, oh never mind). These snippets often go unrecorded, which is a pity because they could be of value to someone or other or could be of general interest.

## **No Picture, Buzz on Sound**

When Mr Dumpling brought in his Philips 210 we thought it would be another faulty line output transformer or shorted boost capacitor.

"There's no picture. The sound is o.k. except for a buzz." And off he went with Mrs Dumpling to get some shopping.

Taking the rear cover off and switching on, our attention was directed to the right side line output section and, allowing time for the set to warm up, we inserted our trusty neon through one of the holes in the screening cover between the two valves and were mildly surprised to see it light up to proclaim an operative line output section. Peeping through we could also see the glow of the DY802 e.h.t. rectifier. This meant that full e.h.t. — barring accidents — was being applied to the tube's final anode.

We then looked at the end of the tube, before taking tube base voltages, expecting that the first anode voltage at pin 3 would turn out to be absent. We didn't get that far however because the tube heater wasn't glowing. Since the tube heater is the final one in the chain, this could mean only that there was a short to chassis before the heater current could reach the tube. The alternative would be that the tube vacuum was lost, but if this had been the case there would have been fireworks from the final anode etc., and since the e.h.t. appeared to be o.k. this was not the case.

Which heater preceded that of the tube? The PCL82 audio output valve's. Of course, hence the buzz or hum. Out PCL82: you stand accused of having a heater-cathode short and probably damaging your cathode electrolytic if not your bias resistor. How say you?

The PCL82 admitted full guilt, and was sentenced to be detained in the waste bin awaiting the pleasure of the refuse collector (dustman). A check upon its bias resistor and capacitor showed no damage, so all that was required was a new valve and on came the tube heater with a good picture and hum-free sound.

Lucky Mr Dumpling.

## **Goosey Capacitors**

One thing about this place. We do have people coming in with lovely names. Like Mr Charge for example. Just close your eyes and you can see six hundred brave horsemen rushing into the valley of death. Guns to the right of 'em, guns to the left of 'em, on they charged to their doom and everlasting glory.

Mr Charge had the voice to go with it. Loud and incisive, no messing.

"I have a complaint to make," he boomed.

"Hallo Mr Charge" I greeted him, resisting the temptation to call his Dis. "Haven't seen you for a long time. Still rushing around I see."

"That set I bought from you, the damned thing's gone wrong."

My brows were just starting to knit together trying to think when we had sold him a set when his face broke into a smile.

"Fifteen years ago that was, my boy. Shouldn't have gone wrong as quick as that surely?"

It was true. Fifteen years ago we had sold him an Invicta 7007 as a second set. "We do apologise Mr Charge. Fancy it letting you down like that. Can't rely on anything, can you?"

Now the 7007 was one of the first dual-standard sets to emerge from the Pye group, being a Pye V700D in a white ivory plastic case. By and large these nice little sets have had their fair crop of troubles, mainly droppers, valves and the like, but this one had never required attention, probably due to only occasional use. Apparently Mr Charge now wanted to give it to a maiden aunt but found that on trying it out there was severe lack of height etc. The weak link on these sets, developing as the years go by, is leakage in the waxed paper capacitors, mainly in the field timebase. This could possibly be aggravated by their close proximity to the e.h.t. cap. Longer capacitors cannot be used as they would actually touch the cap. As it was, those fitted looked a sorry sight, the brown wax severely blackened, with spikes of goo sticking toward the e.h.t. cap.

In the event every one of the capacitors of this type, of which there are about seven in the field timebase, recorded leakage. They are not particularly easy to replace. Whilst this tedious job restored normal field scan, the sync was very poor, both field and line, leading us up to the top centre panel where the 0.1 $\mu$ F sync coupler C89, of the same type, was also leaky. This cleared up the poor sync, but for good measure we checked up on other capacitors of the same construction. Every one showed leakage to some degree. It was well worth the effort however, as the tube was as good as new.

## **Tuning Troubles**

We've had a fair number of the nice little ITT portables (VC300 chassis) in for service and few have caused us much heartache. One did however.

Normally the complaint is that the picture is distorted, with a severe hum bar, or that this develops after a short time. The bridge rectifier is usually responsible and replacement with a more reliable type presents little difficulty.

Some time ago however one came in with the complaint that the signals would be intermittently lost, leaving plenty of noise on the screen and sound.

It didn't take long to find that the tuning voltage (Mullard ELC1043 varicap tuner) at the 32V end of the 8.2k $\Omega$  supply resistor R3 (see Fig. 1) was varying, although the 90V end (derived from the line output stage) was steady. The resistor appeared to be o.k., so we suspected the zener IC1 of not zenering. This proved to be correct, a TAA550 sorting that one out. Upon inspection however the 12V mixer supply resistor R28A seemed to be in danger of



coming apart, so this was replaced for good measure. On test the set behaved itself for a couple of hours. It was duly wrapped up therefore and later collected.

After a week it was back. "Same thing," he said.

We checked on what we had done but found no fault. On test the little fellow behaved faultlessly for hours on end.

Again it was collected, and we explained that we could not fault it. A week later, back it came. "Same thing," he said.

On test it worked all right for some time, then suddenly the picture became very grainy and faint and the sound hissy.

This was not the same at all. So we turned our attention to the main board, where the tuner lived (the tuner voltage selectors etc. are on a separate panel with the bridge rectifier, fuses etc.). The slightest touch on the panel in the vicinity of the tuner restored normal reception, and at first it appeared as though the aerial input cable to the tuner was at fault. Not so.

The voltages applied to the tuner were correct and remained so. We've known similar symptoms to be caused by faulty panel connections to the first i.f. stage: this avenue was explored since although the tuner was suspect the customer would probably not expect any further charge as he considered that the original fault was still present – and a new tuner would have to be chargeable. As the probing continued it became possible to bring on the fault condition almost at will, now by applying pressure to the tuner although this had not been the case earlier.

We removed the tuner from the panel and inspected it closely on the bench. This failed to show up any shorts, and the transistors read right. This time we fitted the tuner back minus its side panels and took voltage readings.

When the fault was present there was no voltage supply to the r.f. amplifier section of the tuner. The track which feeds this section runs along the top of the tuner panel from the mixer stage, where the voltage was present. Whilst there was no visible break in the track, a wire connected along its length restored permanent operation. Due to the proximity of the peripheral components, the tuner had to be removed once more to fit its side covers.

### Mishetsfaulty

Deeply sun tanned, he carried the ITT CVC8 in as though it was a toy.

"Just got back from the Gulf and the telly's popped off. Can I pick it up later on?"

"Certainly Percy" we assured him. "Leave it a couple of hours and we'll have a quick shufti."

"KataKerrack mate," he thanked me. "Shufti inter bardine."

I didn't know then that when I did see him later he would be considerably the worse for wear.

The set itself was no trouble. Blown line timebase supply fuse due to a shorted 0.47 $\mu$ F 1kV boost capacitor. In they went and the set was as right as ninepence in no time at all.

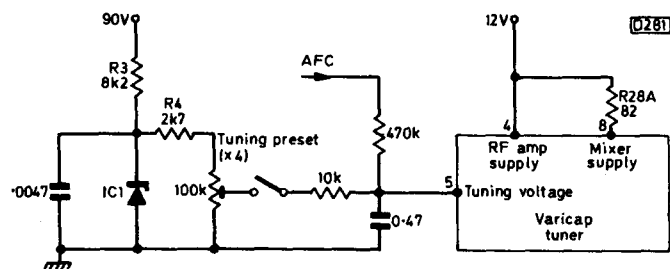


Fig. 1: Varicap tuner supplies, ITT VC300 chassis.

Which is more than we can say about Percy when he came back.

"Ish my shet ready?" he enquired boozily. "I've been up the club wish my mates. Haven't had a good drinkinmums. Goinbackther inaminit." He saw the worried look upon my face.

"I'm all right," he proclaimed. "I'll jush puththesetinthe car."

"I'll put it in for you and I'll drive you home" I said firmly.

He held up a large hand. "Stannaswire, my friend. I'm not drunk." Whereupon he picked up the set and staggered to the door.

"Don't worry about me mate" he bawled. "I'm as sure footed as a mountain goat."

Funny sort of goat. More like a beserk bear I would have said, as he fell on to one knee and the set went crash on its end.

"Oh dear, oh dear," mumbled Percy. "I've gone and dropped it."

So back on the bench went the set and Percy ambled off, promising to return later when he felt better.

When the set was tried it appeared to function all right except that the sync was lost. Bearing in mind the sudden blow it had been dealt, we concentrated on connections rather than components. Nothing appeared to be adrift between the large left side and smaller lower centre panels however.

Much time was lost until we tried a lead made up with a crocodile clip at each end, connecting one end to the main frame and the other to an earthy bit of the print around the centre of the lower centre panel. This restored normal working, so we then had to follow the tracks around, remaking anything suspicious and for good measure using the heavy Weller iron to remake the main frame tabs to the board. After this everything was straightened out and on test the set performed well until we helped a sober and subdued Percy to put it into his car.

### Another ITT Hybrid

After this it was inevitable that the next set would be another ITT one of the same ilk (hybrid CVC5 variety).

In waltzed this pretty little thing, smallish with all the curves in the right places for a few short years, depending on the diet later. For now she was a picture. Lots of personality, bubbling over with fun and confidence.

"My boyfriend said you would take care of me" she bubbled coquettishly. "Our TV won't go and mum and I do depend on it when we haven't much on in the evening."

Senile decay dropped from me like a cloak falling from an unveiled statue, revealing the drooling wolf that lurks in all of us.

"I'll pop round to have a look at it, say ten or eleven this evening?"

She gurgled with laughter. "Isn't that nice of you. Actually it's in the car though. Gerald put it in before he went to work this morning."

This stumped me for a duck. She must have a very modern mother. I whipped over the pad. "Could I have the name, address and telephone number please," I asked. "For the records you know."

"The name is Take." "Mum and I live at 29 Spring Lane, but the 'phone hasn't been connected yet as we've only just moved in."

So I wrote on my job pad: Miss Take ITT.

I'll spare you the rest of the dialogue. Anyway, Gerald would collect it later. Off she trotted, taking her sparkling eyes, teeth and hair with her. Oh what it is to be young and sure that the world is your oyster.

So to the set. What a mess. Again no sync and the convergence was so far out that it didn't need a picture to tell you so. With the previous set in mind we checked the earthing on the lower centre panel etc. Nothing doing. It was evident however that this panel had suffered some damage in the past and had been patched up. Carefully checking around the sync separator section seemed to produce one or two things that didn't add up, so we removed the sync separator transistor to enable us to measure the associated components more accurately.

The transistor taken out should have been a BF117. It was a BC142, which has a much lower voltage rating, but was perfectly in order. With this out however we were able to measure the  $3.3\text{M}\Omega$  collector-to-base bias resistor which proved to be high. Replacing this and the BF117 restored some semblance of lock, although both the line and field timebases took time to settle down. To cure this necessitated a new PCL805 and PCF802, and we were then left with the severe misconvergence.

Viewing the three separate rasters with some trepidation,

we first set the static magnets to get them somewhere near correct. In seconds the convergence was perfect all over, only the static needing adjustment. Lucky me. But why? I wonder if Percy knows Miss Take?

### Pye 725/731 Chassis

Just for the record (again), the Pye 725 chassis seems to be showing its weaknesses. One or two are: the focus unit, which goes up in flames; the  $0.1\mu\text{F}$   $1.25\text{kV}$  capacitor C563 across which the c.r.t. first anode supply is developed – it's above the line output transformer and behind the focus unit; and of course the inevitable mains filter capacitor ( $0.22\mu\text{F}$ , C915) which shatters the  $3.15\text{AT}$  mains fuse. By the way, was it really necessary to insert the two screws which secure the front end of the line output transformer cover so tightly, and couldn't the cover have had the screws at the rear and the clips at the front, just to make things a bit easier? C563 goes short-circuit, overloading the line output stage with the result that the h.t. fuse F971 (1A) blows.

## Letters

### LACK OF HEIGHT

In *Your Problems Solved* in the July issue the problem of lack of height with the Thorn 1590/1/3 series of monochrome portables came up. I've had considerable experience of dealing with these sets, and have found that the usual cause of this condition in practice is either variation in the value of R86 which is in series with the height control, or the flyback diode W5 becoming leaky. – P. F. Bardsley, Stalybridge, Cheshire.

### COMMON-EMITTER VARIANT

I've found the series on *Transistors in TV Circuits* very interesting but would like to query the account of the bootstrap arrangement in the field driver/class B output stage given in the June issue, where it's stated that both stages are common-emitter circuits. One of the properties of a common-emitter circuit is that there is a  $180^\circ$  phase reversal between the input and output. But in this case – see Fig. 1(a) – the a.c. voltages at the inputs (bases) of the complementary output transistors TR2/3 are in phase with the output which is taken from the emitters, with the collectors grounded, i.e. the circuit is an emitter-follower.

S. W. Amos goes on to say that if this were so "a very large voltage swing" would be required to drive the bases. Surely this is in fact the case, since bootstrapping the driver's collector load (R1) means that the a.c. voltage at the top of this resistor is in phase with that at its lower end so that the driver "sees" a much higher load impedance than the actual resistor value, thus allowing a large voltage gain to be obtained.

The two output transistors then match this high impedance to the low impedance of the scan coils, providing current gain with negligible voltage loss, which of course is one of the advantages of using an emitter-follower.

The output transistors could in fact be considered to be voltage driven. If they were mainly current driven as suggested, the bias resistor R3/4 might need to be bypassed to a.c. since there would otherwise be a considerable voltage drop across it due to the potential-divider effect of the

resistor itself and the input impedance of the upper, npn transistor in parallel with the load resistor. The high input impedance of an emitter-follower plus the apparently high value of the driver's collector load resistor means that this voltage is negligible however so that a bypass capacitor is unnecessary. – R. Wallace, Teignmouth, Devon.

*S. W. Amos comments:* R. Wallace is correct in saying that the input and output signals of a common-emitter amplifier are in antiphase – but only when the output is taken from the collector circuit as shown in Fig. 1(b). If the output is taken from the emitter circuit as in Fig. 1(a) and (c) the output signal is in phase with the input signal. Fig. 1(c) is probably a better way of showing a common-emitter circuit than the usual way – Fig. 1(b) – because it's so clear that the emitter terminal is common to the input and output circuits. Perhaps my explanation of the circuit's behaviour would have been clearer had I said "if TR2 and TR3 were emitter-followers their high input resistance would have made it difficult for TR1 to drive adequate current into them. In fact the voltage drop across R1 would probably have equalled the supply voltage before full output was obtained from the amplifier. But by making TR2 and TR3 into common-emitter stages their input resistance is reduced to a value at which TR1 can supply the input current with ease and the voltage developed across R1 and the input of TR2 and TR3 would be only a fraction of the supply voltage even when the amplifier is delivering maximum output."

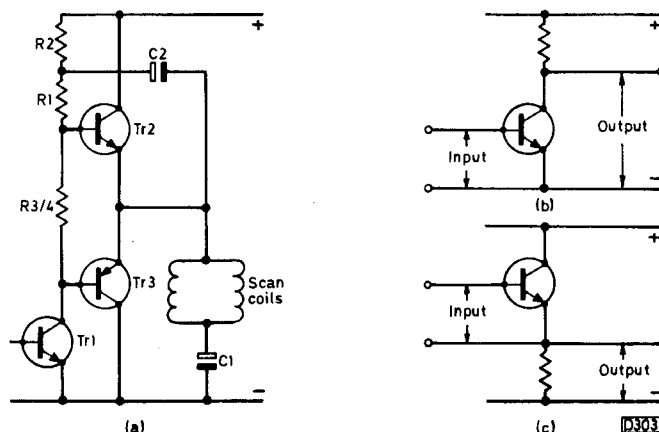


Fig. 1: Common-emitter or emitter-follower circuit?

# Never Knock a Neck

Les Lawry-Johns

I didn't like the look of them from the moment they walked in. She was short and fat and an ignoramous to boot. He was short and lean with a pinched look and another ignoramous to complete the pair.

## *The Saga of Grace and Sid*

"If we bring our set in and tell you what's wrong with it, will you put a picture valve in?" she demanded. Before I could think up a telling reply, he staggered in with an ageing dual-standard Bush.

Breaking off the conversation I'd been having with the cat, I surveyed the wreck with a pessimistic eye. "Getting on a bit, isn't it? Think it's worth doing?"

"That's a good set that is," said the self-elected female spokesperson. "It only wants a picture valve."

Having been a coward all my life, particularly when faced with a loud mouthed woman, I connected the set to the mains and stuck an aerial in the socket.

The sound came on reasonably well, but after a long delay all that appeared on the screen was a very very dim raster which did not respond to the brightness. Obviously the tube. Just to confirm this I took the back off and checked the tube base voltages. All correct, grid swinging with the brightness control setting, but with no effect on the dim raster.

I told them that all the valves in the world wouldn't help and that the tube was at fault.

"How can it be the tube?" said the brain of Britain. "There was a lovely picture on it last night, wasn't there Sid?"

"I can't see it being the tube," Sid said dutifully. "Lovely picture last night, just like Grace said."

"Well there ain't no picture on it now," I bawled. "The tube's clapped. Finished. Bugged it is." So saying I tapped the neck of the tube with the handle of a screwdriver.

A nice flash of black and white picture appeared for a split second, then relapsed back to the dim raster as before.

"Do that again," said Sid. "I saw something come on there, there must be something loose."

"Loose, loose, of course it's loose. It's loose inside the tube you twit. Look." I gave the neck another clout. On came the picture in a brief flash, then off it went again.

"Well," said Grace. "That won't cost much to put right, a little thing like that. We'll go up to two pound but no more."

"Oh yes, two pounds all right," pronounced Sid.

That was enough for me. On went the back, out came the aerial, off went the mains. "Sorry, perhaps you ought to get a second opinion. It's beyond me."

"You mean you're not going to do it?" Grace quivered with indignation.

"No I'm not and that's that."

So off they went with lots of uncomplimentary remarks clouding the air as they left.

Later that day they stalked in again.

"We came back to tell you you don't know anything about television sets. There's nothing wrong with that tube. Tell him Sid."

"You nearly made me throw that set away," moaned Sid. "But I took the back off and just cleaned the dust off from under that rubber cap on the side of the tube and the picture is perfect. And I don't know anything about 'em."

"I do," said Grace. "I used to work in a TV factory and I'm telling you the tube ain't gone. You didn't ought to be 'ere you didn't."

Lots more was said before they went.

My fault of course. I shouldn't have knocked the neck.

I wonder what they said later when it reverted to the open-circuit condition again and there was no more dust to wipe off. I'll never know.

## *Troubles with a VC300*

Kevin came in. He's done quite a few good turns for me in the past, so when he brought in a small ITT Featherlite VC300 which was worrying him I didn't hesitate to take the repair off his hands. The first symptom was field collapse, but the resultant white line was wriggling a bit. So we attacked the field circuit first, and quickly found one of the output transistors (T11, TIS91) open-circuit. In went another and the scan opened up, but with an undulating raster which proclaimed a nasty hum on the main 11V line. This was due to the mains bridge rectifier of course, and another went in without much ado.

This left a clear picture except for a few random flyback lines which appeared to move about the screen as though the sync was about to be lost and the picture about to roll, which it didn't and the field lock was very firm.

Flyback suppression, I mumbled to myself. Now although we've serviced these sets time and again, we were not familiar with the flyback suppression circuit and it was a bit irritating to observe that the lines would vanish for minutes at a time and then reappear, particularly if the panel was disturbed. This prompted us to diagnose (wrongly) a dry-joint or the like. Some time was spent chasing around from the field timebase to the blanking transistor T5.

At last we changed this (using a BF337 as a substitute), and were rewarded with a clear picture which lasted for about fifteen minutes before the picture became impossibly grainy with hissy sound. Back on familiar ground unfortunately. Check aerial socket, cable to tuner, remove tuner from panel. Take off covers. Put tuner back, check voltages. First stage transistor emitter voltage wrong and varying. Trace to where the emitter resistor is returned to earth via a screening peg. Nice crack around peg. Resolder. O.K.

Remove tuner, refit covers and put tuner back. No more trouble. Thanks Kev. With friends like you I don't need enemies.

## *Taffy's Turntable*

We thought you might like to hear this one. We were asked to call to attend to a radiogram which had the complaint that although the radio section worked the turntable would not turn. We left it until there was another

call in the area and then popped in to see old Taffy.

"What's wrong Taff?" Taffy growled and gurgled as was his wont (he'd had a taff during the lunch hour) so we decided to find out ourselves.

Usually this type of BSR changer grinds to a halt due to old, thick grease on the centre spindle. This stops the motor rotating, which it doesn't like and is thereafter reluctant to spin again even when completely free. It has to be spun a few times with perhaps a spot of oil on the top bearing until it gets its magnetism sorted out when it will then start up on its own. The turntable did indeed seem to be stuck fast on the centre spindle. Having freed it and lifted it off we were prepared to clean the centre spindle and the turntable bush, and lightly oil them. We were not prepared for what we found however. There was no motor fitted.

"Taff, Taff. Are you there Taff?"

"Whassermatchure, woswrong?"

"There's no motor in your radiogram Taff."

"No motor, no motor. Wodyoumean no motor? Theremusbe one. The radio's been going all morning. Matter of fact" – as his head cleared he climbed on his dignity – "matter of fact the thing's been working for six months on Radio Two. Never shift it."

"You don't need the motor to work the radio Taff. It only turns the records round."

"You'll have to ask the wife about that. She looks after all that sort of thing. She fixed it some time ago when the music was going slow. The music has been all right since but I haven't played any records you see."

"Is the wife around Taff?"

"No, she's in Finland. She sent me this greetings record but I can't play it because it won't go round. That's why I asked you to call."

Back to square one.

Feeling somewhat baffled, I went back to the radiogram and Taff wandered off to another room, grumbling to himself. Removing the rear cover of the gram, we found the motor on the floor of the cabinet, still with its leads connected. Switching on the juice made the motor buzz, but it wouldn't go round. Applying a drop of oil to the top bearing and raising the spindle up and down a few times seemed to free it off. Spinning it by hand helped it to start and away it went after that on its own. A careful search also located the three circlips which hold the motor fixings on top of the rubber bushes, so back the lot went and having cleaned off the centre spindle and bush the turntable spun freely.

"O.K. now Taff. Where's the record the wife sent you?"

In came Taff. Mumble, mumble. Eventually he found it. His wife's message was loud and clear. After the first greeting, she said. "You'll have to get the gram done before you can play this. Tell the man that the motor is underneath because I couldn't get the clips back and it won't go round anyway."

Taff gave me a baleful look. "If you'd played that before you started, you'd have known where the motor was." I quit.

### **Distorted Picture**

The next call was nearby. I wish I hadn't bothered. It was yet another Pye 691 hybrid colour set.

The complaint was a distorted picture. Folded up from the bottom, then widespaced lines up to two thirds, then a bright kink, then severe compression up to the top.

The owner sat at the table and gave me his advice.

"It won't take long to do. The last chap fixed it in a couple of minutes with a screwdriver. I suppose it'll take

you longer if you're not used to the set."

"Why didn't you get him to come back and do it again?"

"He doesn't do them now. He gave me your phone number, so I thought I'd give you a chance if you're just starting up."

Off came the back cover. The field output transistors were the older BD124 types on the horizontal heatsink. Check these. Apparently in order. Check the AC128 driver transistor. Again o.k. Check resistors, o.k. Check electrolytics in turn, disconnecting each first. All had capacitance, none showed any significant leakage. Legs aching, panic setting in. No spare panel, no service manual. Check diodes, o.k. All supply voltages present and mid reading on BD124s not far out. Try presets. Produce weird effects but nothing of any value. Could be on convergence panel? Some messy work had been done here. Give up.

"Sorry, it'll have to go back to the workshop."

He sat at the table and drummed it with his fingers. "The last chap said it would need a panel before long. Have you got one?"

"Yes, but I'm not sure that's the answer."

"Can I have it back for tonight? – it's not much fun looking at the portable."

"It's not much fun sorting this out either!"

So load the thing into the waggon and take it back to the shop. Back at the ranch there were lots of other things to sort out but we finally got on to the Pye. Try another field panel. No joy. Open up the convergence panel and make good scorched connections, poor pots and dry joints. Check electrolytics. No joy.

Check continuity of circuit from field panel to convergence and to scanning assembly. All o.k. ... Scanning assembly ... Oh no! Try to check windings and thermistor. Not conclusive, only confusing.

Lady wants leads soldered on to transistor radio battery box which is falling to pieces anyway. Fit new box and connectors. Back to Pye.

Have we got a spare scanning assembly? Yes. Strip off tube base, blue lateral, convergence assembly and scan coils. Fit new coils, connect up but can't find one lead. Finally find it jammed up behind front of new assembly. Check connections, refit convergence, blue lateral assembly and base socket. Won't go on properly. One tube pin bent. Get it on.

Make sure all is in order. Switch on. Joy at last. Set up and converge. Return set to owner.

"Picture's not as bright as it was before you took it." Fit new PL802. No picture at all. Remove CDA panel and make good deteriorated soldering and small cracks around PL802. Nice bright picture.

"How much?! You blokes must be making a fortune at this job."

### **No Signals**

I thought I'd make an early start the following afternoon, as I'd an uneasy feeling that things were not going to be plain sailing. Four colour sets and one mono, no two the same (for a change).

We made the nearest one the first call. This turned out to be Mr. Peacock's Dynatron. The Pye group chassis fitted was a 697. No picture, no sound except a loud hissing noise. That was Mr. Peacock's description. Bright as a new pin we first made sure that the aerial plug was in. It was.

Take the back off. Wave a neon over the line output section. Lights up, plenty of juice over that side. Check h.t. on CDA panel. None except at supply plug and socket on the right side of panel. Easy. Remove panel and note nasty

black mark round track from socket. Clean up and jump a lead from the socket to the nearest relevant solder blob. Assemble and clip up. Switch on.

Sound o.k. Picture arrives after a time. Tune in after battle with remote control and receiver buttons. No colour. Check here, there and everywhere (Mr. Peacock watching). Find plug out of decoder panel, probably caused by upending CDA panel. Refit plug. Colour returns to screen and to my cheeks. Mr. Peacock was looking mystified.

"I thought the sound side was all transistor" he said.

"It is."

"Well, when you were checking with your meter, why did you mutter to yourself about no h.t. I always thought transistors could work on low voltage."

Oh Gowd, I thought. Here we go again.

"The transistors were being supplied. That's why they were hissing at us. But the tuner wasn't tuning you see."

"Oh I see. The tuner needs h.t. Fancy that."

I was in a hurry so I didn't go on any further and left him thinking that tuner transistors must be pretty hefty devices.

### **Very Dark Picture**

The next call wasn't far away. This was to a Ferguson set with a 3500 chassis. I was only praying that the tripler hadn't gone and bugged up the e.h.t. transformer, which appears to be our lot of late. Mrs. Dewdrop answered the door.

"Hallo Les," she greeted me.

"Hallo Dorothy, doing some decorating I see."

"Yes, I hang one strip of paper per day so I don't get bored with it." It takes all sorts to make a world, but that's about the daftest thing I've heard for a long time. It's not my business however and I wasn't going to ask what she did the rest of the day.

So we attacked the TV. In fact there was a very dark picture in the background, so the tripler was o.k. after all.

A dark picture on a 3500 means that the beam limiter should be the first item to receive attention. R907 (1.5Ω) should have about 1.5V across it (manual states 1.3V). If the voltage is higher, the brightness is backed off. The line timebase current flows through this resistor to earth so the resistor monitors the line output stage current and, if the circuit is not defective, it limits the beam current.

The voltage across R907 read over 3V, so there was either excess current flowing due to a fault in the line output stage or the resistor was not all that it should be. The dark picture seemed to be of the right size, and the c.r.t. first anode voltages on the convergence board were well up.

So we switched off and measured the 1.5Ω resistor which read 3Ω. We'd thoughtfully put a packet of 1.5Ω wirewounds in the box (spares box, not the TV) so it didn't take long to put a new one in. The voltage was now nearly 2V, which was still high. Checking around showed no faults, and the picture was good with plenty of brightness. So we didn't argue with it. By this time Dorothy had hung her daily strip, so all work was now complete.

### **Smoking Bush**

Off we went to the next set, a Bush monochrome one that had smoked. It was an elderly dual-standard 23in. receiver (TV148 series).

Investigation showed that one of the h.t. feed resistors on the left side lower electrolytic block had been cooking. This was 3R59, 3.3kΩ. It feeds one lead over to the timebase panel, another over to the receiver unit. There was a low resistance reading to earth, and unplugging the leads proved

that the short was on the receiver unit. So we disconnected the system switch and swung down the chassis in order to peer behind it with the aid of our little torch. The tracks lead off here and there, but a close look on the component side revealed a blackened disc ceramic. Snip, snip and out it came. No short. In went another disc with the right voltage on it but the capacitance somewhat smudged. Swing up chassis. Make sure plugs are in and system switch is in 625-line position.

Switch on. Nice noisy raster, lovely rushing noise on sound. Plug in aerial. Push in buttons. Nothing to speak of at all. Check that aerial is in u.h.f. socket, ignore the three buttons which give whistle (who wants 405?). Finally tune in terrible picture. Oh dear. Surely the smudgy disc capacitor couldn't do this?

Call Mr. Latterly who assures me that the picture was good before the smoke. Then he noticed what I was trying to tune in. It was a BBC-2 test card.

"We never get BBC-2."

Wearily I plugged the aerial into the v.h.f. socket and selected the other buttons for 405. Bright BBC-1, not bad ITV.

"That's more like it. Did you think we had a BBC-2 aerial?"

### **Intermittent Colour**

Feeling a little tattered we moved on to the next casualty, which we confidently thought to be a 3000 chassis HMV. On turning it round and seeing the row of knobs on the left side realisation burst. It was a 2000 chassis, and since the complaint was no colour I was frightened. This was mainly because we don't meet many 2000 chassis, and those we do meet generally need only power components – zeners, wire wounds etc.

The lady of the house refreshed my memory of the complaint. No colour for some time and then it tries to come in and sometimes does, but never right away.

"Is there anything I can get you?" she asked solicitously.

"Do you think I could have a mirror and a hairdryer?"

She looked at me and my hair. "It does look a little rough, but do you think this is the right time to do something about it?" she ventured.

I combed my hair viciously. "I need them for the set, not for me. The dryer to warm things up a bit and the mirror to see when the colour comes in."

She went out and I remembered that I had a dryer in the spares box in the van. This was just as well because when she came back she was wheeling an enormous hooded affair on a stand.

She did however have a suitable mirror, so with this propped up in the right position and my dryer blowing away like made we were ready to attack the enemy.

The decoder board is at the bottom centre and we carefully covered the suspect areas with hot heat. Chrominance amplifiers, colour killer and reference oscillator, nothing escaped our ruthless scorched earth policy. It didn't do much good though, except for occasional half-hearted bursts now and again.

I tried to be clinical, though this never really comes off. Remove panel in its entirety and examine closely. So we unplugged the plugs and removed the board. We looked and looked, checked here and there and finally pronounced our judgement: "buggered if I know."

So back went the panel, in went the plugs and on went the set. Glorious colour. Considering the age of the tube, it was well nigh perfect. A tweak up on the gray scale and nothing was left to be desired.

"Aren't you clever," said Mrs. Post.

"I suppose I am really" I admitted.

"What was wrong then?"

"Er, there was apparently an intermittency in the chrominance interconnecting connections you see."

"You mean a poor connection."

"Yes, I suppose you could say that."

"And the hairdryer found it?"

"Er, no. It might have done but it didn't. Perhaps it will next time." So off we went again. So much for the 2000. Kids' stuff really. Sets like that don't frighten me.

### **Ah Doric, I Knew Him Well**

Which left one. Ah Doric, I knew him well.

As a matter of fact it was the first time one of these sets had come my way. I'd no servicing information on it, which doesn't make a lot of difference because I have great difficulty in reading anything anyway. I always seem to try to do things first and then have a go at reading the instructions afterwards. The owner however had a complete manual, which was presented to him when he retired from his firm a couple of years ago - together with the set of course.

I was amazed to find the imposing looking set in front of the window, with the coaxial cable connected to a small set-top aerial which was perched in the centre of the carpet.

"Do you always have the aerial there?" I asked.

"Most of the time," he said. "Except when we want BBC-2 when we put it on top of the set."

The reception area wasn't all that good, and it seemed a clear cut case of spoiling the ship for a hap'th of tar. Our's is not to reason why however.

Apparently the picture would completely lose it's "body" after an unspecified period, becoming a sort of plastic near negative with only some colour noise in the background.

Without consulting the manual, this suggested an i.c. or transistor failure somewhere between the detector and the splitting point of the luminance and chrominance signals. Wherever that was.

So we consulted the manual and got involved with an "SF" panel which we eventually found wasn't there (only on cable receivers it said). We had another go and found the relevant panel for "aerial" receivers, ending up on the top of the decoder panel around some likely looking BC148s.

Since the picture was acceptable at that moment, the voltages tallied with those given in the manual. When the "plastic" condition occurred, the voltages on one went haywire.

Consulting the circuit again we found that this was d.c. coupled to the preceding one which was reading right. So the d.c. coupling wasn't.

In fact the coupling agent was the luminance delay line so we hadn't got our diagnosis right in the first place. The one thing we didn't have with us was a luminance delay line, but to prove the point we jumped a lead across the suspect one and the picture stayed on and the voltage remained right. We expected a degraded colour picture, but it was as good as it had ever been with the aerial in the centre of the carpet (what's a ghost or two when you already had three!)

We told Mr. Sparerib that we would be back with a delay line later, but that he wouldn't notice the difference until he had a better aerial.

So back to the workshop, to the turntables that won't turn, the auto-ejects that won't eject, the cartridge player that went bang and the telly's which won't tell.

# next month in

# TELEVISION

## ● ELIMINATING GHOSTS

One of the most trying reception problems is ghosting, the reception of reflected signals that don't coincide with the direct one. Apart from giving an unacceptable picture, ghosts play havoc with tele-text signals. There are various ways of alleviating the problem, but a certain amount of experiment is usually necessary. The best solution is the use of adjustable stacked arrays. Bill Wright explains how to go about this.

## ● VERSATILE REMOTE CONTROL SYSTEM

Plessey's latest remote control system is claimed to be the most versatile yet, using two purpose-designed i.c.s. Pulse-position modulation is used to provide high rejection of spurious signals and thus error-free operation. The signals can be transmitted via either an ultraviolet or an infra-red link. The system can be adopted for other purposes as well.

## ● FAULTS ON THE 9000 CHASSIS

In 1975 Thorn once again startled the TV industry with the introduction of the 9000 colour chassis with its Syclops combined chopper regulator/line output stage. John Coombes provides a summary of faults and servicing hints based on three years' experience of the chassis.

## ● VARICAP TUNER CHANNEL DISPLAY

Alan Damper describes a novel circuit using LEDs to show which channel has been selected by a varicap tuner. An incidental advantage is that maximum brightness corresponds to correct tuning. The system is useful mainly as an aid to DX-TV reception. The prototype caters for twelve channels, but the number can be reduced or increased as required.

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# Twisted Tails

Les Lawry-Johns

WE'VE had hot Pyes and burning Bushes, but the one we came across the other day takes the cake (Alfred's). You could call it a cooked up cake.

A nice young lady came in to pick up a few bits and pieces and casually mentioned that the next time she passed she would pop in a portable TV set which had been involved in a fire and could possibly be of some use for spares.

Sure enough, a couple of days later she popped in and left a twisted mass of plastic with us. Unfortunately, we didn't know her name or address and just accepted the mangled mass as a kind of burnt offering. When time permitted, we did a cut away job to see what was left inside. Much to our surprise the inside was practically untouched and was obviously almost new. If the on/off knob had not been welded to the front panel it could have been used.

Carefully arranging the component pieces on the bench we switched it on and everything functioned as it should, so we thought it worthwhile ordering a new cabinet from the makers.

On the phone this proved to be somewhat more difficult than we had anticipated. We explained that the set had been in a fire not of its own making, and that the complete outside shell was required.

A verbal tussle then ensued. We would have to specify exactly which parts were to be ordered. I never, in my ignorance, realised how many bits and pieces go to making up the cabinet of a portable TV set. Each piece was the subject of earnest discussion and apparently would be dispatched separately. So far four pieces have arrived, and by the time the rest have been accounted for the postage and packing will have cost more than the new one of the same type we have for sale. It would also appear that somehow we have ordered two of each piece!

Anyone want a £70 portable for £140?

We are never without a hybrid Pye colour receiver for very long. The report on this one said that for some time there had been a sparking noise from the back, the picture had been blurred and that finally there was lots of smoke and off it went.

Inspection showed that the long gondola type focus unit (697 chassis) was just a mass of twisted plastic which could not be separated from the VDR rod inside. This had broken anyway (hence the sparking from the rear, as the excessive voltage hopped across the focus spark gap with the slider wire contacting the rod above the break ... I think). The final demise came when the first anode supply  $0.1\mu\text{F}$  decoupling capacitor shorted and the associated  $100\text{k}\Omega$  resistor cooked, as usual.

Replacing these items necessitates access to the component side of the panel, and a glance down inboard of the line output transformer showed R203 (the  $47\text{k}\Omega$  reference pulse integrating resistor) to be in no fit state to be left in. In fact it just crumbled to dust when touched, so how the line hold had been locked we'll never know.

With these itmes in we were ready to check through the rest of the supply lines. These seemed to be in order. We could not check the thing however because we were out of the long VDR focus units. Phoning around proved that Don, Ray, Fred and Harry didn't have one either, which meant a delay.

Ever the impulsive type, we decided to hook up one of the square, thick-film types to a point of lower potential.

Now I don't know if you've ever looked at the tripler units used in these Pye group hybrids, but one of the three outlets is marked "focus" and connects to C226 on the transformer. Connecting the high end of the thick-film focus unit to this point, the centre to the focus lead and then earthing the low end produced just the right potential. The set was back in action and fit to fight another day.

Nothing to do with TV (as usual), but what is the answer to this one?

We ordered and received from a wholesaler some clock radios (UK made). One when unpacked was obviously not new, and on close inspection the guarantee card had been filled in and dated December 1977. We contacted the wholesalers (and their rep) who said they would collect it. Some time later they did. Some further time later a replacement was received. When unpacked, it proved to be the same set with the same filled in guarantee card.

We again contacted the wholesalers. "Good Lord" they said. "Fancy that!"

Will you collect it and supply us with a new one or give us a credit note for it?" we asked.

"Well, it's not really our pigeon. It's really between you and the makers you know. We have a directive from our head office that our responsibility ends when we have supplied goods to the dealer."

"Second-hand goods?" we queried.

"As far as were were concerned, all goods supplied by us are new."

So we thought about this and taxed the rep on his next visit. He said he knew how it had happened. When his branch were out of stock on some items they obtained them from another. It was obviously not intentional on their part, but they had sent one which had previously been returned to the makers for service by them instead of by the dealer who had given the customer a new set instead of loaning them one until their own was returned.

This left one used set which was now with us, and still is. The makers say they have discharged their obligations and have serviced the set, and that it is up to the wholesalers to put things right.

Back on the phone to the wholesalers who have now closed the branch where we obtained the set and are no longer trading in this part of the country. ... Anyone want a new-used clock radio?

We called upon some friends to put their set right - an ageing ITT/KB VC4 used as a second set but still in mint condition except that the picture was dark and lacking width. Whilst we worked on the set, the lady of the house (a

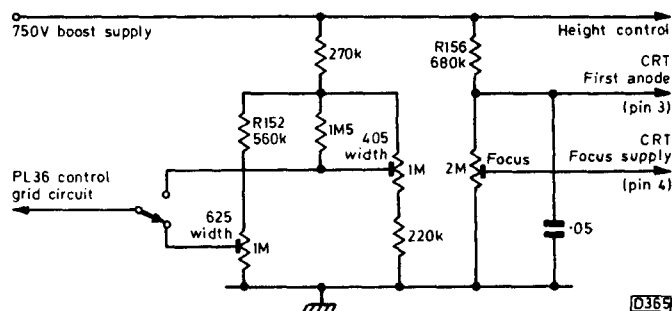


Fig. 1: Boost supply feeds in the ITT/KB VC4 and similar dual-standard monochrome chassis.

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			IF TUNER ASSEMBLY	3431 0495	9.00
			TRIPLER	—	5.00

formidable character henceforward referred to as "our Glad") worked on the dog, an inoffensive black spaniel named Soot. In fact the set responded to our labours quite well, which was a good deal more than Soot did a short time later.

The lack of width turned out to be due to no more than a high-value resistor (R152, 560k $\Omega$ , see Fig. 1) in series with the 625-line width control, while the dark aspect was due to low voltage on the tube's first anode (pin 3 – there was also low voltage on the focus pin 4 with the control fully up). Following the supply lead back, we came to R156 which is a 680k $\Omega$  resistor going to the boost line. This had also gone high, and being in series with the focus control (to chassis) the result was that the voltage available at the top of the focus control had got lower and lower as R156 went higher and the focus control's value remained the same. So in went another 680k $\Omega$  resistor and the set then gave a full-width picture with plenty of brightness to spare.

While all this was going on, our Glad laboured with Soot.

The idea was to comb out the tangled fur and clip off the surplus. Soot was becoming more and more anxious as Glad approached his rear end, and when Glad picked up the scissors his nerve snapped. It's one thing to have your sensitive areas combed, but when they are in danger of being clipped it is time to take action.

Giving a yelp of protest, Soot made for the door but found it closed. With his back to the door he prepared to do battle. He was not going to give up his vital organs without a fight. Glad was not used to dissent in the ranks however.

"Come here you stupid hound" she bawled in a voice which nearly shattered the windows. At the sound of that familiar trumpet Soot's courage deserted him. He slunk

back to the spread newspapers and Glad's clutches. Just then Glad realised that I was ready to go.

"Sorry Les" she hollered. "This dozy dog made me forget you. How much do I owe you?"

I told her, but apparently her purse was in the kitchen.

"Hold on to him for a minute love she said more quietly.

"Comb his ears or do something to keep him happy. They need clipping too."

So off went Glad and I soothed Soot.

"Has he got beautiful ears then?" I murmured, combing the long silky ears. "Does he want the naughty fur cut off? Yes, 'course he does." Being an expert on dogs, I grabbed the scissors and snipped at the long fur.

Soot gave an almighty scream and belted off dripping blood all over the carpet. At the same time I was surprised to find that as well as the fur I was also holding about half an inch of Soot's left ear in my hand.

Glad grabbed Soot as he shot through the kitchen and her scream rent the afternoon air.

"Ahhhh, Ahhhh, look at his bleeding ear. You've cut the end off."

I stood struck dumb for a moment, desperately searching for words.

"Er, well, you have to clip their ears Glad. Otherwise they dangle in the dirt and pick up all sorts of things: a vet told me."

Glad glared at me in disbelief. "You're supposed to clip the fur, not the ear, you bloody fool. Poor old Soot's going to look lop sided now until his fur grows."

"Sorry Glad, sorry Soot." And with the score at one TV set repaired and one dog with a clipped ear (neither chargeable) we beat a hasty retreat. Anybody want their dog groomed?

# Frustrating Follies

*Les Lawry-Johns*

SOME very funny things have been happening around here lately. Take the other morning for instance. In came this fellow, well turned out and apparently friendly.

"Fark you" he said, and held out his hand.

Not wishing to return such offensiveness, I took his hand and merely said "Good morning."

## **Peacock Tale – Start**

"I have a Peacock" he confided. "It's got a bit missing. I know what it is but it gets red hot when I put it in and I wondered if you have a bigger one that won't get so hot."

Now I'm very easily confused. Most people get muddled when under stress. I start off muddled and when the stress starts I just go to pieces. My only salvation then is pure habit. So I reached for the job pad and started the routine.

"Could I have the name please?"

"I've already told you" he said impatiently. "Farqueue." He spelt it out, to my relief.

"What type of set are we on about?"

"A Finlux Peacock of course."

The penny began to drop, and the panic subsided.

"What value did you put in that got so hot?"

"I don't know much about these things, but my friend told me that I needed a 47 $\Omega$  wirewound resistor and I got a 17W one but it got red hot. So I thought if you could let me have say a 30W one it would do the job."

This sounded reasonable enough, so I managed to find a 47 $\Omega$  dropper of adequate wattage and off he went, leaving me to tackle an Ultra 6816 (1590 chassis) portable which had the complaint "not working".

## **A White Ultra**

Lifting off the shell, a meter applied to the regulator body (l.t. rail) showed about 7V, varying slightly. This proved a couple of things: the l.t. fuse was intact, and the current being drawn was not enough to blow it – provided it was of the correct rating. To check the latter point it has to be removed, due to its awkward position. So out came the fuse. It was correct at 2.5A. The next step was to check just what the current being drawn was. If it was low, the regulator itself could be faulty, if it was higher than normal the regulator was probably o.k. but was being overloaded. It was high, at about 2A, and varying. The 10 $\Omega$  resistor in parallel with the regulator transistor (on the front left) was also getting hot. On switching on and moving the volume control however some slight audio noise could be heard, so it was unlikely that the fault would be in this area.

Attention was therefore directed to the line output stage, where our old adversary the AU113 line output transistor was getting quite warm. This meant that it was unlikely to be at fault, since there are no half measures with this: if it shorts, it blows the fuse with none of your 2.5A niceties.

Since it was warm it was being driven by the line oscillator and driver. There was an overload on the line output stage therefore, and the first step was to unload whatever could be unloaded.

We didn't actually have to get that far. A finger on the 95V supply rectifier W14 was hastily withdrawn. The fact that the diode was hot meant that it was either shorted or had a short across it, probably its reservoir capacitor C111. Whichever it was disconnecting the diode at one end would remove the overload, so off it came.

There was an immediate response. The sound hissed into life, frightening the dog out of his life, the tube heater lit up, and we smiled. For a moment that is. There was a funny crackling noise, and we were back to square one. Voltage low, no hiss, tube heater out. Oh dear. Check this, that and the other to no avail. Precisely the same symptoms as before, except that there was no overheated diode to blame. Scan coils? Unhook the scan-correction capacitor C108 to check this possibility. No difference. With all else unloaded, only the line output transformer was left. What will Mrs. Carp say? Ring Mrs. Carp.

"Hello Mrs. Carp. Your little white portable needs a transformer and a couple of bits: it'll cost a bob or two."

"Never mind, it's all I've got so you do it and I'll be in at the end of the week."

"Righto Mrs. Carp, bye."

So in went the transformer and a diode. Check the regulator and solder up the bar of the tuner unit (it was practically off at one end). That was that.

## **Peacock Tale – Resumed**

Enter Mr. Farqueue.

"It's no good, that thing you gave me. It still gets hot and the set doesn't work properly with it. Will you have a look at it?"

So we got the Peacock on the operating table. The item in question was on the left side, or rather there was a space for it with two leads dangling nearby with clips on. There was already a dropper or large wirewound next to the empty space, and this was marked 47 $\Omega$ .

"I took out the one you gave me, as it was obviously wrong."

"It was your idea that it was 47 $\Omega$ , not mine" I protested stoutly.

"Well, what the dickens should it be?"

"I'll have to look it up." So saying I rummaged through my service sheets and wished I'd left them in the right order. There they were. Three separate sheets. Check on the layout diagram. The resistor in question was given as R111. Check the value of R111. On the power supply list this was shown as 390 $\Omega$ ! I whipped the sheet under Mr. Farqueue's nose.

"Look. 390 bloody ohms. Not 47, 390. Would you believe it?" Privately I was thinking to myself what funny things these Peacocks are. Who was I to argue?

Rake out a 390 $\Omega$  wirewound. Fix clips and switch on. Funny noise and the resistor smoked, but the Peacock didn't really respond. Apart from the noise, not much else happened, though the resistor was obviously uncomfortable.

Switch off and see what the circuit had to say about R111. Across the degaussing coils? Were the coils open-circuit? In any case the current should have fallen away quickly. And why didn't the set work without it? Panic set in and reason went out of the window.

Look more carefully I told myself. Recheck and be methodical, like wot you always tell other people to be. Check the degaussing circuit. The 390 $\Omega$  resistor is there on the board on the left side. If it's there, it can't be somewhere

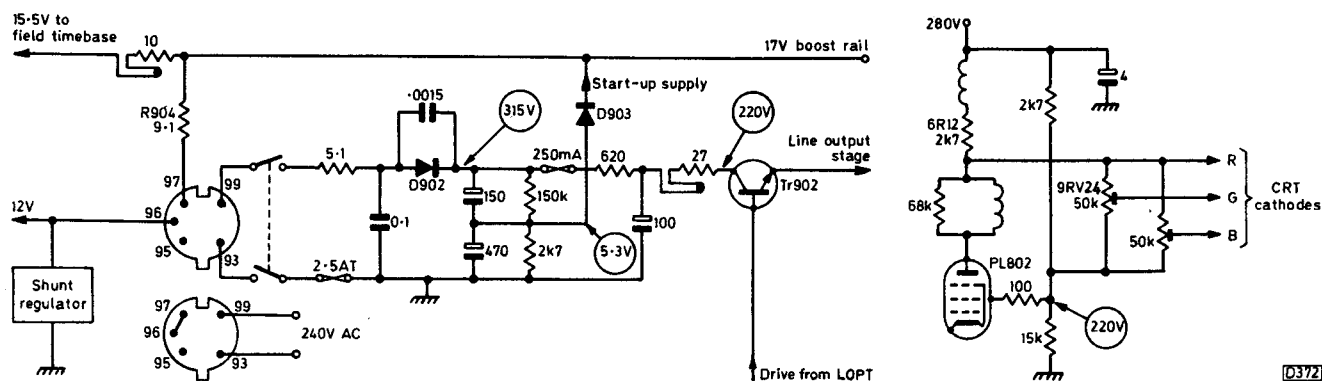


Fig. 1 (left): Since all the stages in the Indesit T12LGB monochrome portable are powered from supplies obtained from the line output stage, a start-up system is required. At switch on diode D903 feeds a reduced (5.3V) voltage to the boost rail to get the line oscillator, which is powered from the stabilised 12V rail, to start. Once the line output stage comes into operation, the 17V boost supply is developed and D903 switches off. With no link between connections 96/97 to the mains plug, the line oscillator can't start. Hence no results.

Fig. 2 (right): Luminance drive to the c.r.t. cathodes, Bush CTV25/CTV162 series. An intermittent heater-cathode short in the green gun led to the demise of 9RV24, leaving the green cathode without drive.

else, can it?

So we have two items marked R111 on the sheets. One is obviously right. So what should the other one be? Check the power supply layout shown against the circuit, and check the values. The large  $47\Omega$  wirewound is shown as R115. Its listed value is  $1k\Omega$ ! Is there a  $47\Omega$  resistor on the list? Yes, R104. Ah.

If that's marked wrong, what else? The one item not in the set is R102,  $4.7\Omega$ . It's also not shown on the layout.

It's a good bet therefore that if R115 is actually R104, R111 should really be marked R102. Proceeding on this tack, we fitted a large  $4.7\Omega$  resistor and checked the flyleads back, just to be sure. Yes, a bullseye! Connect up and switch on.

O.K. sound. O.K. vision, R102 normally hot only. Mr. Farquhar departed with his Peacock, having witnessed a triumph of mind over wrongly marked service sheets. Trader service sheet, 3154/T411. Horizontal chassis layout. Change R115 to R104, R111 to R102.

## An Orange Indesit

An orange Indesit. No not colour, just one of those little T12LGBs. We've had our share of these in for repair, as most have I suppose. Usually they're not a lot of trouble, neither would this one have been if . . .

Chap by the name of Beaton brought it in with just the message that "it doesn't go."

When its turn came we plugged it in. Sure enough, nothing. Off came the shell and we checked the supply from the socket up to the on-off switch. Everything in order so far. The fuses were intact and our tiny mind started saying "pump circuit, start-up supply to the line oscillator," and funny things like that.

We had full h.t. at the collector of the pump transistor TR902 (see Fig. 1), but this was not switching on. We had very nearly 300V in fact, instead of about 220V. Reaching for the circuit and looking at the line output and power circuit, we missed what was right under our nose and continued the search, moving on to the start-up supply diode D903. This should have 5.3V at its anode, but the reading was only 2.5V. We then started to panic. Check here, there and almost everywhere. Everything read right, transistors, electrolytics – nothing escaped examination. At last my spirit broke.

I turned the convergence mirror and looked at my

ravaged face, careworn and despair written on every line. I let out a despairing cry and buried my head in my hands.

At this, my little honey bee came on the scene.

"Now what" she asked. "What's all the noise about?"

"I'm finished, that's what. I'm going to do away with myself and end all this suffering."

"You said that last week" she said sympathetically. "I saw the insurance man, but you didn't do anything."

"Well I'm going to, you'll see. You'll miss me. At the going down of the sun and in the morning, you'll remember me. You'll be sorry when I've gone to New Zealand and walked into the water at some lonely beach, never to be seen again."

"New Zealand? Why all that way when the river's only a few hundred yards off."

"The water's cold, that's why."

"What's it all about. Can't you find out what's wrong with that little set?"

"No I can't, and I've checked everything."

"Probably the plug. Anyway I've got a lot of things to do."

So off she went. The selfishness of women never ceases to appal me. Warily I turned back to the horror.

Glancing down at the circuit again, I saw some funny drawings of the mains input and battery input plugs. As well as the actual mains input connections, there's also a link on the mains plug connecting pins 97 and 96 to feed the 12V shunt regulator. On reversing the small input panel, and with the plug in but not connected to the mains, we found that there was no continuity between the two pins. Slapping a shorting link between them and applying the mains brought on full sound and a raster.

All that suffering for nothing. I should have tried it on battery first. Removing the link and examining the moulded mains input plug (socket) showed that it had been tampered with, so that the connectors on the link side could not make proper contact. When will I learn?

## And a Mauve Bush

Some years ago we had sold a Bush CTV162 (a 19in. development of the CTV25). It came in the other day with the complaint that the picture had gone mauve.

As far as we could see (not very far), it was simply a matter of finding out where the green had gone. The best place to start is at the tube base, to see if the green first anode is low or the grid-cathode voltages too close

compared to the red and blue guns. The first anode of the green gun was about the same voltage as the red and blue first anodes, so we checked the green cathode. This seemed much the same as the other two cathodes, but there was a sudden surge of green illumination when the meter touched the pin.

Noting this fact we checked the three grids, which were all 100V give or take a volt or two. So we went back to the green cathode and checked again. The meter swung up to the 200V mark (approximately) and the screen glowed green. When the meter was applied to the red or blue cathode there was no increase of either colour, which was queer since all three voltages are obtained from the PL802's anode, the blue and green via two presets (see Fig. 2). Presets, that's it.

Sure enough the green preset 9RV24 read open-circuit, and in fact was found to be burned out. Must have been a nasty flashover, we stupidly thought. To see what would happen we fitted a new preset and set it up. This resulted in fully adjustable green, and after a bit of fiddling a well nigh

perfect grey scale. Turning up the colour presented a very creditable picture indeed.

Nothing untoward happened for quite some time, and we were beginning to think that our fears were groundless when there was a sharp metallic click and off went the picture. Scrambling for the meter was rendered unnecessary because the green preset smoked up and the PL802's anode resistor 6R12 became red hot. Heater-cathode short in the green gun.

Look at circuit. The tube heater was not alone on the 6.3V winding, so we couldn't play tricks with it. We had an RS heater isolating transformer on the shelf however, so this was pressed into service – screwed on the centre woodwork under the tube. Connecting the primary of this to the mains 5A fuseholder and chassis, with the secondary to the tube to replace the original heater leads, resulted in normal results once the preset had again been replaced and the PL802's load resistor checked. We added a 100kΩ resistor from the green cathode to the heater to remove any potential stress however, and it's been as right as ninepence ever since.

# Series Voltage Stabilisers

*S. W. Amos, C. Eng., B.Sc., M.I.E.E.*

ONE of the disadvantages of transistors when used in analogue equipment is that their performance varies with the supply voltage – users of battery-driven transistor receivers are well aware of this. For consistent performance the supply voltage must be constant, and it's normal practice in television receivers and hi-fi sound equipment to incorporate a voltage stabiliser in the power supply circuits. In portable television receivers designed to operate from car batteries or the mains supply, the stabiliser circuit must be capable of working with an input voltage as low as 12V.

The stabiliser has two distinct functions. First, to maintain a constant output voltage (which can be predetermined) despite variations in input voltage, whether from the mains or batteries. Secondly to maintain a constant output voltage despite variations in the current drawn by the receiver. This latter quality is often termed "good regulation", and is achieved by giving the stabiliser circuit a low output resistance. This also has the advantage of minimising any tendency to instability in the receiver due to the common impedance of the power supply circuit.

Most of the circuits used to give a constant supply voltage are series stabilisers, which can take many forms although using a common principle. A number of these circuits are analysed in this article to demonstrate their advantages and disadvantages. But first it's useful to consider series stabilisers in general, so as to identify the functions which are necessary for their proper operation.

The block diagram shown in Fig. 1 shows the essential features of a series stabiliser. The stabilised supply is derived from an unstabilised supply (e.g. a mains rectifier or a car battery) via a series stabiliser stage which is controlled so that it maintains a constant output voltage. The control signal is derived from a comparator stage which compares a sample of the stabilised voltage output with a constant reference voltage. If the sample of the stabilised voltage is obtained from a potential divider as suggested in Fig. 1, this divider can be adjusted to give a desired value of stabilised voltage. The constant reference voltage can be obtained

from a zener diode which can be fed via a series resistor from the stabilised or the unstabilised supply.

## The Classic Circuit – and Variants

The comparator stage can for example be a single npn transistor (see Fig. 2) with the sample voltage applied to the base and the constant reference voltage applied to the emitter. The zener diode then effectively presents the emitter with a very low impedance, so that the full gain of a common-emitter amplifier is available from the comparator transistor. If there's a sudden increase in the current drawn from the stabilised supply there's a tendency for the output voltage to fall. This causes a fall in the base voltage of the comparator transistor, and its collector voltage therefore rises. This positive voltage step is applied to the base of the stabiliser transistor and, to supply the additional current required, the stabiliser transistor must be made more conductive by this positive step in the control signal. The stabiliser transistor must therefore be an npn type. A second requirement of the stabiliser transistor is that it must not introduce phase inversion: the positive step applied to the base must cause a positive step in stabilised output voltage so as to offset the fall in stabilised voltage assumed initially. An emitter-follower is therefore the obvious choice

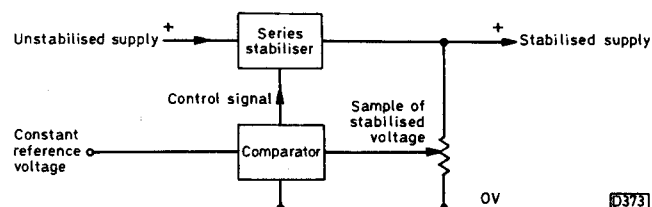


Fig. 1: Basic features of a series stabiliser circuit.

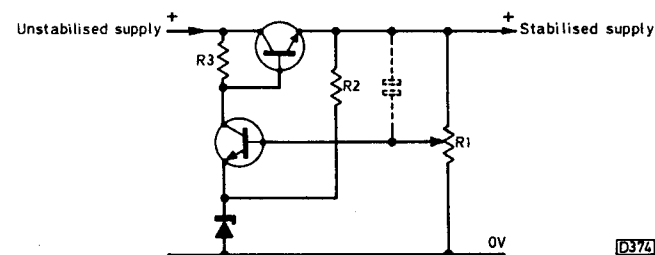


Fig. 2: The "classic" series stabiliser circuit, requiring an npn emitter-follower as the series stabiliser element.