switched off. The basic ROM, which retains its data, contains the operating system, BASIC interpreter and little else. The microprocessor distinguishes between the two by means of the addresses or an electronic switching arrangement – how it does this is irrelevant here.

Tapes and Disks

Clearly if we need to keep any data other than that held in ROM we must keep it on tape or disc. For serious use a tape deck is inconveniently slow and prone to trouble. Files are stored on tape by modulating a signal with two frequencies used to denote one and zero respectively. Some business applications require multiple files: it's difficult to swap tapes to get at the files and to find where a required file is on a tape.

Disk Drive

The answer to this is a disk drive. There are at least four disk standards in common use, and various operating systems for use with them. For smaller business machines the most common type of disk is the 5¼in. one, with an operating system known as DOS produced by Microsoft. This is designed to work with an 8088 or similar microprocessor. With home computers the situation is rather different. Many of these have no in-built disk drive, so this item must be purchased separately and may come with its own operating system. An exception to this is the Amstrad range that uses 3in. disks and an operating system known as CP/M – DOS was evolved from this and the two are similar in many respects.

With a disk-based machine the operating system looks after running the programs, the disk and other peripherals. The languages used are not usually contained in ROM but must be loaded from the disk, as indeed must the operating system itself. But hold it – how can we do this since we need an operating system to load a file from the disk?!

The answer is in ROM and is called a bootstrap program – the term "booting up" is derived from this. The bootstrap program starts a process which loads the operating system and prepares it to accept keyboard commands. How this works in detail will be explained after we've covered the way in which files are stored on disk.

Storing Data on Disks

Unlike a tape, which is a serial device, a disk is divided into concentric areas called "tracks". Each track is divided into "sectors", and each sector can be found by its sector and track number. It must be stressed that the pattern is purely a magnetic one: it's laid down when a new disk is "formatted", which must be done before it can be used. This is carried out by one of the operating system commands.

From here on for clarity we'll use DOS as the assumed operating system. The formatting process also reserves several sectors as a "directory" and some more as a "file allocation table" (FAT). The files on the disk have a directory entry which gives the file name, length and starting track/sector. The operating system puts the files on the disk contiguously. If a file increases or decreases in size, or is deleted altogether, DOS reallocates the space as necessary.

So how do we keep track of a file that may be spread all over the disk? The answer to this lies in the FAT. For convenience, the sectors are grouped in units called "clusters". Two sectors per cluster is typical. DOS recognises a cluster by a unique number, and a cluster is the smallest unit that can be allocated to a single file. The directory entry is actually the starting cluster number rather than a track and sector number. The FAT is divided into "cells", each entry corresponding to one cluster on the disk in a fixed order. There are three possibilities for an entry: (1) The number of the next cluster in the file. (2) A unique code that means the cluster is unusable. (3) A unique code that means it's the last cluster of a file. Thus the DOS can pick up the first cluster number from the directory and use the FAT to trace the rest of the file. So unlike a tape any file on a disk can be reached without having to read other files first. And of course a disk system is much faster – after all it was designed for the job, not for reproducing audio!

Incidentally, when a file is erased nothing of the sort actually happens. What does happen is that the directory entry is changed so that the file name doesn't appear, and the FAT clusters are put on an "unused" list. This explains the apparent magic of programs which can recover an "erased" file – as long as the space hasn't been reused.

Next month a closer look at computer languages and reasons for choice.

Still Hazy

Yes, I have to admit that I'm still hazy and finding it very difficult to type this note. There are one or two things I must say however.

First, my thanks to Les Austin (see Letters page) for his help with the Grundig set that gave me so much trouble. You remember the 2210 that blows the 1A fuse I fitted in series with the supply to the line output stage? No, Les, it doesn't make any popping noises before it goes. It just goes. You did say that a lot of people cross over the e.h.t. tripler's diode and earth leads. This had happened to the set and on wiring it correctly I found out why. When wired correctly there was no luminance, only chroma. This was due to the 680Ω resistor R528 in the e.h.t. current sensing circuit having gone almost open-circuit, producing permanent beam limiting. Having put all this right the set is now working and I'm waiting to see whether the fuse still fails. Thanks for putting me on the right track.

Thanks also to the other kind chap who called in at the shop to give me a replacement for the small choke (L508) which is wired in series with the line scan thyristor's gate. He told me that when faulty it causes trouble due to the thyristor firing early. I fitted the choke but the fuse still blew. Thanks anyway.

Whoops – the fuse has gone again. Sorry Les: one day I'll find out what's doing it. Fancy the tripler being incorrectly connected and making so little difference.

Now what's all this about and why am I so hazy? Well, you see, at present the heart hasn't the heart to pump sufficient blood to my brain while I'm standing up or sitting down, only when I'm lying down, and I can't do that all day, can I? So I have to take some tablets, but only two per day as they are rather powerful. They work for about an hour, then I sink back into partial oblivion – still able to repair sets, but unable to remember much about them. So, as you can imagine, I'm getting myself into some fine old scraps.

Les Lawry-Johns.

ment used in the 3A chassis. It's effect is not to everyone's liking however — it's probably unnecessary with system I signals — and if it's used with a VCR that has full HQ circuitry you get a double dose of overshoot. So it's a handset option.

The on-screen display is stable in the absence of an off-air signal, unlike the usual ragged lettering when the background consists of snow. This is due to sync pulses being provided by the teletext sync generator when there's no signal input.

Back in the Groove

Les Lawry-Johns

Yes, we're back in action. Well, nearly. At any rate it's better than living in a cloud all the time.

The Fidelity ZX3000

Now what was it I promised to tell you in the December issue? Oh yes, it was about the Fidelity portable (ZX3000 chassis) that wouldn't start up. It was daft really, and quite simple. I'd been checking the tracks in the chopper circuit from below and had found them to be in order. After several days I checked again, this time from above, i.e. the component side. Two tracks were found to be open-circuit. Stupid, isn't it? And all that time wasted.

Tripler Trouble

A Decca set fitted with the 80 series chassis led me a real dance. I wasn't thinking properly, but managed to discover that the tripler was faulty. Now I could see that it was a single-ended one, and instead of using a universal tripler and reading the instructions I thought I'd save time and fit a Philips G8 tripler. So I clipped off the leads and fitted it quite neatly into the space provided, noting that the e.h.t. lead wasn't quite long enough to reach when the chassis was lowered.

The result was a dark picture, and I found that there was little voltage at the tube's first anodes. A check around the first anode supply network revealed an open-circuit resistor. Time to look at the circuit diagram. It was one of the two resistors connected in series across the first anode potentiometer network. So they shouldn't have prevented the first anodes being supplied if they were faulty. In fact they were both faulty, so I disconnected them and tried again.

This time there was no picture at all. I called the set some nasty names and checked the voltages at the first anodes again. Now the readings were negative. So I hunted around for the first anode supply rectifier diode. There wasn't one, and it began to dawn on me that the new tripler wasn't the right one. This showed me what I didn't know about triplers. I thought that if they didn't have a negative diode lead they were all the same. The Philips tripler was removed, and I then selected a universal type and read the leaflet. Join the diode and earth leads together it said (as for the CVC32). With this fitted I had a nice clear picture and plenty of first anode voltage. I kicked myself for trying to be economic – and more than a little woozy.

G11 on a Hazy Day

Yesterday afternoon I was getting really hazy. It was approaching closing time, so I didn't take another tablet (those tablets to strengthen the heart action and get blood up to the brain – cries of "why doesn't he stand on his head?"). A couple of chaps arrived with this enormous Philips G11, still on its legs. They put it on the bench and I asked what I was supposed to do with it.

"There's no picture and no sound."

I thought I had an h.t. problem, but on switching the set on the tube's heaters lit up and the e.h.t. started hissing away like mad. Having cleared up the hissing I checked the loudspeaker and got a dead short reading, but on checking the audio output transistors I could hear the speaker responding. I checked the RGB output transistors and found that the base and emitter voltages were very low, with the collector voltages rather high. This explained the no picture condition. Why the loss of sound as well?

I made voltage checks and found lots of places where they were very low. I checked the line output panel but the voltages here were correct. By now my mind was completely bunged up. I had to express my regrets and wrap it up. The set was then carted off. After they'd gone I realised that the set was a remote control model, and that the fault must have been in the separate power unit which I hadn't checked. Silly me, but what do you do if you can't think?

The next day I found that the meter had a burnt out resistor in it. This explained the short-circuit reading I got when I checked the loudspeaker. With a new resistor fitted the meter read low-value resistances perfectly. If the owner of the set is reading this, as I suspect he might be, I do apologise. Just check that remote control power supply, will you? The one under the tube, left of centre.

A Glance from Tessa

It was late in the evening. We decided to have a drink before retiring. I looked at the sherry bottle. It contained about three measures, so we dediced to kill it off. After pouring one for myself and one for Honey Bunch I noticed Tess, who was sitting nearby, and was shocked by her appearance. She stared at me in a manner I'd not seen before. Not once did she blink or look away. She just stared. I knew what this meant. I'd to do something she wanted me to do. I drew H.B.'s attention to her.

"Oh, she wants your sherry."

"The drunken bitch."

"No she's not."

So I poured my sherry into a saucer for her. She immediately stopped staring and lapped it up – before I'd a chance to finish pouring out the remainder for myself. More staring. Why didn't she stare at H.B.? I knew I wasn't going to have that sherry and it's funny, when you know you're not going to have something, how you want it far more. I've never been particularly fond of sherry, but at that moment I really wanted that last drop.

I poured most of it into Tessa's saucer, then quickly knocked back the remainder. No more staring – but she did give a few hiccups before going to bed. She snored all night, leaving the guard duty to Zeb. Typical woman . . .

CASE Structure

These control structures are mandatory for any computer language. There's another very useful one that's missing in BASIC. This is the CASE structure. Consider a program with a menu of choices from which the user has to chose a number or letter. With BASIC we would probably carry out an IF test on all the possible choices, or adopt some equally complicated method. The CASE structure eliminates this problem. Here's an example, in language C:

```
switch (choice)
{    case 1: command; break;
     case 2: another command; break
     case 3: yet another; break
}
```

Much neater, isn't it? This particular section of code carries out different commands on the value of a variable "choice". The word "break" is a part of language C to prevent execution of more than one command at this point.

Threaded Interpretive Languages

Before closing this time we must mention another class of languages altogether. BASIC, C etc. are all procedural languages, i.e. the interpreter or compiler reads a list of instructions sequentially or in a sequence determined by a control structure. This other class of languages is called threaded interpretive – the best known example is FORTH. With these the language consists of a number of named routines known as words. You don't really write a program, but instead define new words in terms of existing ones, ending with a single word that executes the program. An application written in FORTH is really an extension of FORTH rather than something separate. We'll have more to say about FORTH next month, when we come to consider the suitability of these various languages for different applications.

More Troubles

Les Lawry-Johns

Well here we are again, tapping all the wrong keys and making a mess of everything. How the editor puts up with it I just don't know. Poor old Stan from SEME is also on the rocks. He can't do much driving, so we have to phone our orders in and make sure he gets the credit. One way or another we all seem to be up against it. Perhaps we're being tested. Like I was when this chap brought in a fairly new 14in. Fidelity portable, a CTV140 I think.

The Fidelity Portable

It didn't want to work at all, and I didn't suspect the line output transformer as I would have done with the earlier ZX2000 chassis. When I had switched it off however I checked between the line output stage feed resistor and chassis. The reading was 20Ω. Probably the BY127 efficiency diode in parallel with the line output transistor (BU508A). I peered inside and failed to see it. Someone had taken it out and fitted it underneath, as I discovered when I withdrew the panel. On closer inspection I found that it was fitted the wrong way round. So I removed it and checked again. The low reading was still present. I was about to bawl at the line output transformer when I thought I'd better check the transistor first. It was the BU508A that was causing the trouble, so I apologised to the transformer and fitted a nice new transistor and put the diode in the right way round.

When I switched the set on again I was rewarded with a nice, clear picture. On fitting the rear cover I saw a label attached. Rapid Repairs. Oh well, that explained it all. These Rapid Repairs people have been going around lately causing havoc. Not Rapid Repairs, actually, but you know who I mean – don't you?

Before I Forget

Time to thank those of you who've written in to wish me a rapid recovery from the brain shut-down that's been troubling me of late. I'd like to thank in particular Ken Muir of Maidstone. He suggested that a book called "Service with a Smile", illustrated by Giles and containing some of my articles, ought to be published. Articles other than the Red Baron one. What was wrong with the Red Baron? Thanks to E.V. Hurran for the tip about vitamin E. Must try this. In reply to David Botto of Bournemouth, thanks, I've stopped taking the tablets – they seemed to make my head spin round instead of being hazy. Also John Wakely of SW19 – sorry I took so long to acknowledge your letter.

Mr. Cole's ITT

Mr. Cole came in moaning his head off about his old ITT CVC5 I'd repaired before Christmas.

"It's gorn again. Now don't get me wrong, I'm not moaning, but it shouldn't have gone again so quickly, should it?"

"It depends on what's wrong with it."

"There's no sound. Here's the bill you gave me."

I looked at the bill. It said "replace the boost capacitor, 0·47μF 1kV, and test".

"That's got nothing to do with the sound" I said.

"Course it has. You did the set, didn't you? And it shouldn't have gone again so quickly."

So I told him to leave it with me to check over. I suspected the PCL86 audio valve but it turned out to be the loudspeaker. A new one put everything right and the sound was crisp and clear. I wrote on the bottom of the previous bill "fit new loudspeaker, previous one has given 15 years' service, £5".

When he came back he had a big smile on his face. I showed him his speaker and the bill and his smile faded.

"I'm not paying you any more money and that's that."

"O.k. Leave the set here and I'll sell it to get my money back."

"Not likely" he said as he tried to lift the set up. He couldn't, since I'd brought it in. "Help me get it to the car" he panted.

"Not likely" I said. "Pay your fiver or clear off."

So he paid his fiver and I picked up the set and put it in the car. If I'd known I'd have made it a tenner.

Boozy Tessa

Tessa now has three saucers of sherry a night. Zeb won't drink but there's no doubt that Tessa's a drunkard. H.B. is on the wagon and says Tessa takes after her dad (you know who). All I have is a few scotches, only a few . . .

So, if you object to or cannot afford to pay for a TV licence your options are: (a) buy a playback only VCR and hire tapes; (b) live in a house that's more than fifty yards from the road; (c) live in a high-rise block where almost everyone else has a licence; (d) construct a t.r.f. receiver (at u.h.f.!); (e) give up viewing!

A Different Life

Les Lawry-Johns

I made this astounding discovery the other night. H.B. often claims to see things that I don't, and has often said that an old chap prowls around in the cellar where the living quarters were years ago. I dismissed this as imagination until our next door neighbour Irene told me that an old chap kept coming into their downstairs living quarters. She described him exactly as H.B. had done and told me she'd asked her husband Vic to put up a wooden screen to stop him coming through the wall that separates our shops. If a wall won't stop him, why should a fence? . . . H.B. also says she often sees an old girl in our lounge, constantly rocking to and fro in a rocking chair. I've not seen her either.

Last Sunday evening we were sitting looking at TV with the electric fire on. Tessa was sitting in front of it. She suddenly leapt to her feet and started to bark at the fire.

"She's daft" I said.

"No, she's barking at Trog" said H.B.

You may remember our black female cat Trog who was run over ten years ago – we now have Spock, who pokes her nose into everything.

"Trog's been dead for ten years" I pointed out.

"Yes but she was sitting by the fire until Tessa frightened her away."

I must say that I don't get this. Women and female dogs see things that we don't. Zeb didn't see anything either. I'm not stupid: it's just that females are different I suppose. I thought maybe it's my empty head, which has been funny for some time but is now improving thanks to the vitamin E Mr. Hurran recommended. It takes time though, and I'm still not working properly.

The Philips K35

Take for example the 26in. Philips K35 that came in yesterday. For a while it nearly turned me barmy – when you tuned it in it would go slightly off tune and spoil the picture. When you tune it in you have to open the front flap, which disconnects the a.f.c., so I discounted a.f.c. trouble. I eventually found that the switch was faulty and realigned the a.f.c. coil cores (U157 and U158). The picture then tuned in correctly. Alignment isn't easy as the tuner is too near the a.f.c. coils.

At last we had all channels right and I was satisfied. Terry came to collect it and his wife phoned today to say that although TV reception was o.k. they couldn't get the set to accept the video channel. Oh dear, what a tangled web we weave.

A Ferguson TX9

I was also driven up the wall by a TX9 – one of the ones with a thyristor power supply (PC1040 main panel). It had a good picture except for two well-spaced horizontal lines that revolved slowly. I bridged the electrolytics in the field timebase chip's supply then fitted a new TDA1170 chip. The result of this was a constantly revolving picture, so I looked for the field hold preset. There isn't one. Of course, it should be a TDA1170S which works with close-tolerance components in the field oscillator department. With the correct chip fitted we were back to a good picture with slowly rotating horizontal white lines.

I then turned to the power supply and checked the electrolytics in this section of the set. They all proclaimed their innocence. At this point the test electrolytic came adrift and shorted to a point lower down. There was a flash and the 1·6AT mains fuse failed. I stuck in another which blew straight away at switch on. After much testing I found that the crowbar trip thyristor CSR2 was short-circuit. So I left this out while I continued to make tests.

The fuse now held and the picture, with the lines, returned as before. I found that the only way I could get rid of the lines was to shunt the power supply efficiency diode D77 with a 470μF, 250V electrolytic. This left slight dotted lines that were difficult to see. I was aware that I'd missed something, but for the life of me I couldn't find the real cause of the fault.

I fitted a new crowbar thyristor and wrapped the job up with the extra 470μF electrolytic securely fitted inside the cabinet. This made me feel guilty, but there haven't been any complaints.

Another TX9

I'd just got rid of the TX9 when another one arrived, this time with a cracked panel that needed many leads fitted to restore normal working. This was done quite quickly. The owner collected it and was grateful to see the really good picture it displayed. It came back in a matter of hours with a very grainy picture.

"I'm not paying out any more on the thing" grunted the owner.

So I checked it over and came to the conclusion that the tuner was at fault. As the owner didn't want to pay for a new one I pulled off the side screen and the picture came up as good as new. It remained like this for some considerable time, then the owner came and carted the set away again.

It's a fact that removal of one side or the other will often restore normal reception and save replacement of the tuner – except in areas of high signal strength of course.

This left me a bit fed up with early TX9s. The TX10 seems to be a lot better – except for the focus control of course. Mind you they can be naughty at times, and I'll probably be eating these words within a week or two.

The ITT CVC1120

Phil tells me that I must mention the ITT CVC1120 that came in last Saturday. My memory of this is very hazy and in fact I left it to Phil to tackle. The trouble was that the 1A fuse in the power supply kept blowing. Because the owner was an attractive young lady with large, er . . . eyes, Phil was eager to please her. To cut a long story short, he traced the trouble to the 10μF filter capacitor C701 which was short-circuit. Well done Phil. I won't tell Sara about the young lady with the . . . eyes.

That's all for now. See you next month.

the guide and introduce as small a mismatch as possible in doing so. Fig. 19 shows a common form of matched load. It consists of a short length of waveguide with one end closed off with an end plate: a wedge shaped piece of lossy material – usually resin loaded with iron dust – is slid into the guide. The principle is as follows. Microwave energy entering the wedge produces eddy currents within it, due to the iron content. These eddy currents dissipate the microwave energy in the form of heat. The wedge shape is used because the material introduces a discontinuity into the guide: to minimise reflections the discontinuity must be introduced gradually.

The length of the wedge should produce a reduction factor of 100, i.e. an attenuation of −20dB, as the energy passes through it. After passing through the wedge the attenuated energy is reflected by the end plate. It then passes back into the wedge where it will experience a further attenuation of −20dB. Thus the reflected signal emerging from the wedge should be 1/10,000th (−40dB) of the original level.

Waveguide Attenuators

Attenuators are used to reduce the power level in a system. This may for example be necessary to protect a delicate instrument when taking measurements where the transmitted power is relatively high.

Fig. 20 shows a common form of attenuator. Attenuation is produced by the tapered resistive strip which is inserted into the guide parallel with the narrow dimension. Microwave energy sets up currents in the strip (commonly referred to as a vane), the energy being dissipated as heat. The E field, which the vane obstructs, varies from zero at either sidewall to a maximum at the centre of the broad dimension. Maximum attenuation is thus obtained with the vane in the centre of the guide. The attenuation can be varied by adjusting the position of the vane.

The vane is tapered so that the disturbance it introduces in the guide is gradual, thereby keeping reflections from the vane to a minimum. The micrometer provides precise adjustment and enables the device to be calibrated in decibels accurately.

Practical Devices

Note that the waveguide devices described in this article have been shown in the diagrams in their simplest form. In practice flanges would be included to allow connection between components and the main guide.

Thanks a Million

Les Lawry-Johns

What a lovely lot of readers we do have. There's no doubt about it. For example Cliff Mitchell from Bexleyheath popped in last week and presented me with a bottle of Teacher's. A lovely man who remembered that H.B. doesn't like this brand in her coffee so that I'd have to drink the whole bottle neat. I toasted Cliff several times that evening. Cheers!

As he departed Keith and Alex from Portsmouth popped in. They were on their way to Sendz at Southend to pick up several bits and pieces and presented me with a couple of Thorn triplers. Thanks, lads, they'll come in very handy: I've had to ease up on my ordering recently so as not to upset my bank manager – since I've not been able to think too clearly of late I've not been able to make much money. Keith and Alex also sorted out the battery board of a Philips 10CX1120 that had been puzzling me. Although I had the circuit it didn't show what voltages to expect and I had been too stupid to expect a 110V output from the board. Thanks the pair of you – call in again and rescue me anytime!

The Tandberg

This chap came in and asked me to look at his TV set. I asked him the make. Tandberg he said. I thought it would be of Scandinavian origin, but it had "Made in Scotland" on the back. I removed this and peered at the unfamiliar inside.

He said the picture was distorted. When I switched the set on there was hum on the sound and a severely curved picture, so I accused the main reservoir electrolytic of being open-circuit. I didn't have one with the right pins, so I checked the voltage and fitted a 470μF, 300V electrolytic inside the cabinet, taped to the cableform that runs under the tube. The resulting picture was lovely and the sound was clear of hum. I charged a tenner and he went away well pleased.

He came back next day and the new capacitor was a right old mess. I fitted another one and decided to leave the set on test for a while. After an hour I switched it off and left it for ten minutes. Upon switching on again there was a gurgling noise and the new capacitor had once again failed.

To cut a long story short, the switch-mode power supply was not switching on. Without a load the voltage produced by the mains bridge rectifier was excessive, so the reservoir capacitor failed. It transpired that the h.t. preset control was intermittently faulty. A new one, along with a new electrolytic (higher voltage this time, just in case) put things right. The set was tested for a further couple of days before the customer collected it and paid another five pounds.

An ITT CVC9

A friend from the Medway towns brought in an ITT CVC9. He said he didn't have any valves for it so could I fix the set for him? The PY500 boost diode was getting very hot but the PL509 line output valve wasn't. I straight away checked the boost reservoir capacitor, but it was innocent. I checked the PY500 which was also innocent. So was the PL509. When I disconnected the tripler from the line output transformer the PY500 didn't overheat and the sound came on. I stared at the tripler: it shouldn't have caused the PY500 to overheat. Just then I noticed that the beam limiter resistor was cooked. There must have been a leak in the tripler.

Anyway, a new tripler and resistor restored normal operation and a beautiful picture was displayed. The set was a 22in. model. I've never had to replace the tube in one of these in my life. It's a pity that later models didn't have the same tube life span.

More Tripler Trouble

How about that Grundig 2210 that had me by the short and curlies (remember? – last November!). It kept blowing the fuse I'd added in the supply to the line output stage, sometimes after an hour or so, sometimes after a whole

day. The cause of the trouble turned out to be the new tripler that had been fitted a short time earlier.

How did we find out? Well, you'll remember that the set had been given to us. Phil took it home with him and his parents' Grundig needed a new tripler. So he fitted the one from the 2210. It worked fine for a while, then the cut-out started to trip every now and again. Oh well, as long as we know. Thanks Les Austin (Letters, January) for all your advice on these sets. Sorry it took so long. Some of those resistors had been the wrong value.

Resurrecting a Dead Siemens

Colin Boggis

I was recently given a 22in. Siemens Model FF306 with remote control. The problem was that the thick-film focus and first anode supply unit had flashed over, rendering the entire line output transformer, of which it's a part, useless. The spares agent for these sets is Mastercare, and an enquiry produced the information that replacement line output transformers cost around £60. This explains why I was given the set – with labour, the repair bill would have been around £100. That's a bit steep for a four year old set, even allowing for the fact that it was otherwise in almost new condition.

I decided to see whether it would be posible to resurrect the set for a lot less money. The line output stage circuitry (see Fig. 1) is standard, so I thought that it might be possible to use a Ferguson TX10 focus assembly along with a separate potentiometer for the first anode supply – provided the faulty parts could be safely isolated from the existing line output transformer.

Modifications

Adopting a "go for broke" approach, I simply cut off the top part of the focus assembly (see Fig. 2), using a hacksaw as carefully as I could manage. Having done this I covered the exposed wire ends with epoxy glue to provide insulation.

I then wired in the TX10 focus unit and a first anode potentiometer (see circuit shown in Fig. 3) and crossed my fingers as I switched the set on. It sprang into life, with a healthy crackle as the e.h.t. came up, and after setting the first anode voltage, the grey-scale and focus I was rewarded with a perfect picture.

To check the safety of the epoxy resin insulation I gingerly prodded around the glue with an earthed probe, trying to provoke a response. None came, so I appeared to have won. The modification cost about £10, a saving on parts of some £50.

After soak testing for a week or so the set developed a "flutter" when switched on from cold. This was traced to a faulty BR303 thyristor in the power control circuitry.

It's six months since I sold the set and there's been no comeback. A lot of TV sets use a similar line output transformer assembly and in suitable cases this TX10 approach might well be worth trying.

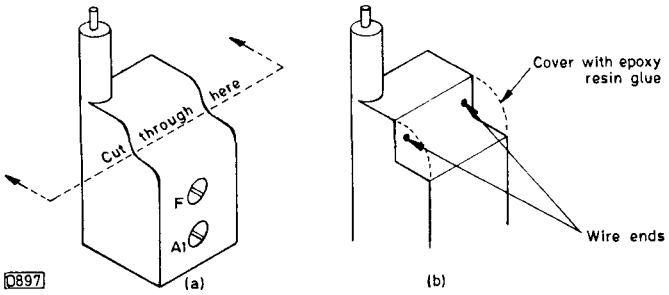

Fig. 2: Where to cut through the focus/A1 section of the line output transformer (a), application of epoxy resin insulation (b).

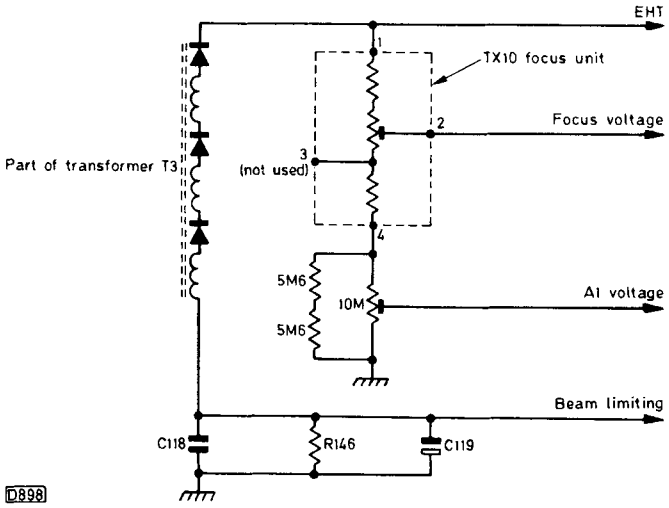

Fig. 3: Modified circuit using the focus unit used in the Ferguson TX10 chassis.

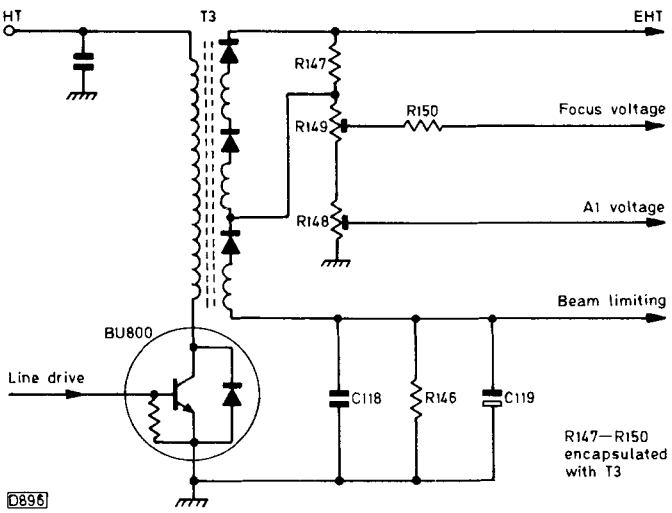

Fig. 1: Original e.h.t., focus and first anode supply circuitry used in the Siemens Model FF306.

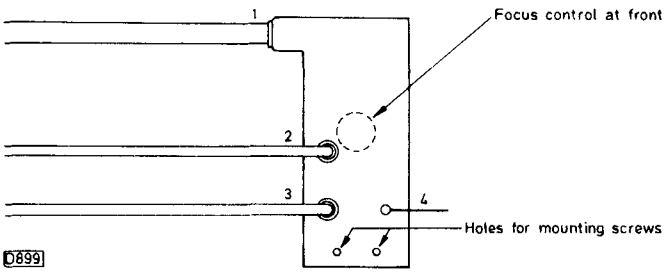

Fig. 4: Connections to the TX10 focus module (rear view).

What's up Doc?

Les Lawry-Johns

You may remember the articles "What's up Doc?" parts one and two that I wrote some while back. They related to an examination (painful) I had to have and a prostate operation to help remove a swelling on my right-hand side. I still have the swelling, but at least I know that it's nothing to worry about. What has been worrying me is this heart trouble I've mentioned from time to time recently. My doctor made an appointment for me to see a heart specialist about my muzzy head, which doesn't allow me to think straight – or to write straight either.

It took some time for the date of my appointment to come round. I went along to the hospital on March 30th and after a while I was weighed and measured. Then I went in to see the specialist. He asked me what the trouble was and I told him I couldn't think straight because my doctor thought my heart wouldn't pump enough blood up to my brain.

"How long has this been going on?" he asked.

"Since last October" I replied. "I seem to be muzzy most of the time."

So he asked me some questions to see whether my brain was working.

"Who's after Neil Kinnock's job?"

"Tony Benn."

"Who's helping him?"

"Some left-winger. I forget the name."

"How many children has the Queen got?"

"Four, I think."

"Name them."

"There's Charles and Ann and the one in the Fleet Air Arm, my old mob, that's Andrew. And one who wants to be on the stage, er, I forget his name."

"Edward."

That's all he asked. I think. Then he gave me a brief check over and some chits of paper to go and have tests. As I made my way down the corridor I kept seeing people I knew I should have known, but I couldn't think of their names. One of them told me to pop into the X-ray room first and give them my name and one of the chits, then to go to the blood test department to get that over with, after which I'd be first in line for the X-rays. It nearly worked out like that.

I told them in the blood department that they'd find it was largely whisky, and that raised a laugh. But I think I'll get a ticking off from the specialist when I see him again. It's just that I don't like the idea of swallowing a lot of rat poison to keep my blood thin. Well, that's my story anyway.

The girl in the X-ray room told me to undress, upper part only. After the X-rays I dressed and was then called back and told to get undressed again as the machine hadn't seen enough.

The tablets I was given to take are very small white ones. It says on the bottle take half a tablet twice a day. The job is cutting each one in two. Oh well, all in the cause of science I suppose. Back to work.

This Skantic set had a Luxor chassis inside and I spent quite a long time trying to find out why it wouldn't start. Eventually I gave up. When its owner came back I explained that I wasn't thinking too clearly and couldn't do it. I put it on the bench to show him. Switched it on and a beautiful picture appeared, with good sound. I told him to take it away as I wasn't feeling up to it all.

But if there's one set that doesn't worry me it's a G11. Until this one came along. I'd resoldered all the joints, fitted a new line output transistor, and had the set on test. After a while the picture faded. The sound faded too. Attention to the video panel restored a good picture, but the sound remained low. As it was a remote control version I first tested the audio section on the lower left side – this responded well to tests – then turned my attention to the extreme left side remote control panel. After a lot of seeking I replaced the resistor that feeds the volume control. This restored normal sound, and the set was collected shortly afterwards. It came back next day with the complaint "no sound". I switched it on and received full sound. Oh well . . .

Philips KT3 Drill

Some of our usual stock faults are changing slightly, though they still come in often enough. Take the Philips KT3 chassis. It was common for the tripler to cause audible tripping. We now more often get complete shut down. If the h.t. is present at both ends of the 4·7Ω surge limiting resistor in the power supply, don't waste time – disconnect the line output transistor (remove the connecting screws to its collector). If this restores some signs of life, disconnect the tripler's input lead and replace the line output transistor. If the line output stage now works, bring the tripler's disconnected lead back near to it (beware of the high voltage). If the result is tripping, replace the tripler and write out the bill.

Remember the drill. If the set is tripping, disconnect the tripler. If this was the cause of the fault the tripping will stop and the tube's heaters will light up. If the set is dead, check the 4·7Ω resistor on the power board then, if necessary, disconnect the line output transistor (I didn't say the BU208A, because alternatives are sometimes fitted). It's also wise to disconnect the tripler to prevent the new transistor going up the creek. It may not do so, but it's sensible to protect it in this way.

Is This a Record?

Something that I might claim to put in the book of records has just happened. A car drew up outside and the driver left its engine running as he carried in an old Decca Bradford. He left the door open as well.

"I'd like you to look at this and tell me how much it would cost to repair it."

"If you'd like to leave it, I'll look it over and tell you this afternoon."

"Could you look at it now?"

So I looked, having removed the rear cover. I switched it on and the tube's heaters glowed but the valves didn't light up. I thought I'd start at the beginning, so I switched off and removed the PY500 boost diode, whose heater comes first in the heater chain. The top cap came off and there was a hole in the glass. A check on the heater confirmed that it was open-circuit.

I fitted a new PY500 and switched on again, keeping my eyes on the heaters, ready to switch off in a hurry. The heaters all glowed but there was no sign of life at the PY500's top cap. So I turned the set on its side and carefully slid the chassis out. The 500mA fuse in the supply to the PY500 was open–circuit. I fitted another and turned the set upright. When the set had been switched on again and the valves had warmed up, life returned to the line

output stage. Connecting an aerial produced a picture. The tube was in good order and the sound was clear.

"How much?" he asked.

"Twelve quid" I replied.

"O.k., I'll have it done."

"It is done."

"Make out the bill then."

So I made him out a bill. He paid up and carted the set out – after I'd replaced the rear cover. He put it back in the car, closed the door (at last), jumped in the driver's side and drove off.

I ask you. Draw up, leave the engine running, leave the door open and have the set repaired before closing the door again. Can I claim a record – for being a fool?

Practical Computer Programming

Part 5

Mike Phelan

It's time we considered the steps involved in designing, producing and testing a typical computer application. As an example we've selected a repair history database covering customers' equipment. We want to be able to store data on the types of faults dealt with, actual repairs carried out, parts fitted, charges made and so on.

Before deciding to go ahead it's worth considering whether the use of a computer to do the job is appropriate. If the use of a computer entails extra cost, time spent or any other debit aspect, it may be better to do the job manually. If, on the other hand, a computer is available, the volume of work is such that keeping paper records is not really feasible, or you wish to be able to extract much more information than could readily be done with a manual paper system, then the use of a computer is worth consideration. A direct comparison is usually difficult, because the computer system will end up giving you more than the manual one it might replace. Another point, though an obvious one, is that the amount of detail required in any output, whether on a screen or a printout, must at some stage be keyed in.

This raises the question the amount of data to be held. A database system reads the information from tape or disk and holds some or all of it in memory. Is there enough room for this? Maybe we shall have to sacrifice some of the data – or not store it for ten years! Generally it's not necessary to keep data for too long, but in the present example it would be nice to record the history of a set during its lifetime – whatever that may be.

System Specification

Assuming we've decided that a computer system is appropriate, we can go ahead with its design. You may be surprised that we've not so far mentioned anything about the choice between an off-the-shelf package or dedicated software, and in the latter case which computer language to use. We will not be going into this for some time yet. At this stage, the truth is that it doesn't matter. These questions will be taken up at the end of the design stage.

In this context, design is what is called a "system specification" as opposed to a program specification. The system specification covers things like which items of data are to be stored, how the system must appear to the user and what comes out of it in what format. After doing this we can decide on which package or language to use, taking into account the budget, expertise available and the possible limitations of a particular language.

Now down to it. We start at the back end. What do we want out of the system? Fairly typical things on the list would be: (1) a complete service history of any set; (2) turnover in a given period; (3) the progress of a particular job (in a large or medium business); (4) parts used; (5) call rates per annum for a given make/model. Items (1) and (3) could be available on-screen only, items (2) and (5) printed, while (4) might need to be interfaced with some form of stock control should the system be expanded. In our example, we'll leave out (4).

Design Procedure

The next stage is to design on paper the five types of report required, detailing each item of data and whether it is to be entered directly or calculated from other data. Following this we list all the data items that need to be stored on disk, excluding those that can be calculated on the spot (call rate percentages and so on). We also need to specify the type of data (numerical or character) and its width, i.e. how many digits per item.

A first attempt might look like this:

1	Name	16
2	Address line 1	24
3	Address line 2	24
4	Address line 3	24
5	Address line 4	24
6	Postcode	9
7	Telephone number	12
8	Make	10
9	Model	10
10	Repair description	50
11	Net cost	10
12	Price charged	10

which amounts to a space requirement of 223 digits (bytes) per record. We now have a database consisting of one record per repair job, which is the level of detail we need. The record has twelve "fields".

Suppose that we have 200 customers, each with a rather troublesome video, TV set and radio receiver, and that each of these items generates five service calls a year. Over a complete year we would have $200 \times 3 \times 5$ records of 223 bytes each, which would take up 653K bytes of disk space! As this is beyond the limits of most disk systems in our range, we must clearly cut down somewhere.

It will help if we can reduce the size of some of the fields in each record. Each item needs only sufficient information to make it unique. This is an important point. For example, we don't actually need 9 digits for the postcode since it's not necessary to store the space between the two parts, so 8 will do. Likewise a phone number requires only 10 digits, or we might decide to omit this item – there's an excellent database called the telephone directory. We will normally need to phone the customer only while a repair is in progress. The job will have some sort of ticket attached to it, and we can write the phone number on this when given. Other savings can be made on things like the make and model – using the

that it wasn't packed in the usual polystyrene mouldings but in expanded foam. There were also the remains of two permalloy assemblies. When we fitted the tube we found that it was difficult to set up. With the purity set correctly convergence was impossible. I noticed that it would set up better if the degaussing coils were disconnected. Current was obviously flowing through the coils – with the coils out of circuit a scope showed 80V peak-to-peak pulses at line rate. Not having a set with which to make comparisons, we rang Sony technical (SES) to find out whether or not this was normal. They couldn't advise on this. Nor could they say whether it's normal to have blue and green shading from the corners rather than the sides during purity adjustment, something we've not had before. After one or two more fruitless questions we were advised to stick on as many disc magnets as might be required to mask any defects, as that's what they do. Does this illustrate Mr. McCormick's point?

We haven't had the best of service from SES. On the very rare occasions when we seek information it's usually a case of "too old, before our time" or "too new, no faults known". Panasonic on the other hand have been known to telex Japan for obscure information on industrial products. They can provide voltages and waveforms that are not on our service sheets, and will always ring back if necessary.

Sony's policy on service manuals is another strange one. Only top dealers get automatic mail shots whereas all their dealers used to get these. The administrative work of having to send individual manuals invoiced f.o.c. and the phone calls must surely cost more than sending ten or twelve together for each dealer on the lorry.

Nick Beer,
Bideford, N. Devon.

Outlook Cloudy

Les Lawry-Johns

A customer brought in an ITT set fitted with the CVC30 chassis and full remote control. He complained of no sound or picture, and remarked vaguely about random channel changing after the set had warmed up. I studied the chassis and decided to replace the left-side i.f. panel. Doing this made no difference at all, so I looked at the circuit diagram and saw that I'd marked R28 (820Ω) with a star. The trouble was that I couldn't find it.

At this point a young friend of mine by the name of Surinder Lakha came in to ask me something. He looked at the set on the bench and asked what was wrong. I told him — basically no sound or vision with the timebases working. "I've had that trouble" he said. "It's the resistor down the bottom." He pointed to the lower left side. I looked there and found R28 looking back at me. Quick as a flash it was out and was replaced with two resistors, of 300Ω and 520Ω, in series. I thought they would last longer. The picture and sound then came on and stayed. Thanks a lot Surinder — call in again any time!

If I'd marked it with a star, how come I didn't know where it lived? The clouds are still a bit thick. The set's owner came and collected it. Next day he was back again to tell me I needed sorting out and that he was just the one to do it. I hadn't dealt with his tuning troubles you see. I had a word with Geoff (Moon Lane) about the problem and he referred me to his friend in Welling, an ITT expert. The advice I was given was to replace the SAA1124 chip in the remote control unit. I did this when the set was brought back. It went off again and I've heard no more — I'm still waiting to have my head bashed in . . .

More Confusion

Just to show you how daft I am, the other day I collected a T20 which suffered from intermittently poor focus. I fitted three focus units before I realised that it was a T20 and that the tube base socket was therefore at fault. I keep these in stock and one was fitted in no time, giving perfect focus that didn't vary.

How loony can I get? Now the psoriasis is coming back, affecting my hands, nose and ears. Once I become the Ugly Man my mind should clear despite what the medical profession tell me. I went back to the specialist the other day. He told me to go back to my doctor and continue with the pills. He hadn't been able to find much wrong with me. Perhaps I'm just going barmy — or getting old.

The Ferguson TX9

A colour portable fitted with the Ferguson TX9 chassis came in yesterday and had me by the short and curlies for a little while. Field collapse usually means that the TDA1170S field timebase chip has failed. This time however the field scan was about two inches high, which gave me a moment's hesitation. Having checked the supply I changed the TDA1170S, but I needn't have bothered as the results were just the same. I next checked the height control and found that there was no voltage here at all. R268 (1·5MΩ) which is in series with it was open-circuit. The old adage still holds good: check that the voltages are right before you do anything else.

The Philips G9

A 26in. Roberts set fitted with the Philips G9 chassis came in the other day, with several troubles. They all seemed to clear when I replaced the lower right side timebase panel. Off it went and back it came next day, for field collapse after the set had been on for a time. This surprised me as I'd replaced the timebase panel. The cause of the trouble turned out to be a poor contact at the top of the left side convergence panel — a run round with the soldering iron cleared it permanently. But it had still needed the timebase panel.

Hey What's This?

What's this I hear? Someone was looking through a 1957 issue of *Practical Television,* as we then were, and came across my article of the Etronic Models ECV1523 and ECV1527. He asks whether the Les Lawry-Johns of today is the L. Lawry-Johns of those days and suggests it's maybe a pen name that several people have used. Not so! I wrote about those sets then just the same as I'm writing this now — well, nearly the same. It seems that the reader who enquired is about to retire. That doesn't mean I've got to, though it might not seem a bad idea. I must give it some thought.

July is a month of birthdays. Surinder, whom I mentioned earlier, has his on the first while Honey Bunch's is on the fourth. Independence Day, yes indeed. Happy birthday love.

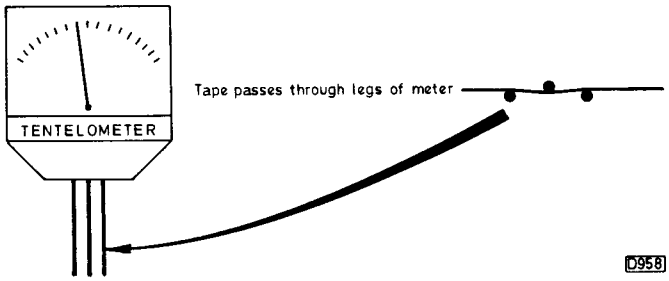

Fig. 2: The Panasonic Tentelometer and its use.

I hope I've said enough to stress the importance of back tension, and that you'll accordingly check this point. The price of a meter or a cassette meter will soon be recouped, especially if you care for a number of rental machines.

The Blaze

Les Lawry-Johns

A red Consul drew up outside. Its driver came in to collect his set which, on investigation, had turned out to be not worth repairing. He carried the set out, put it in the car, closed the boot and got in behind the driving wheel. His wife and two children were with him. I heard him trying to start the car, but it didn't want to know. Next thing I knew they were all coming into the shop. "Call the fire brigade, my car's on fire!"

So I dialled 999. When I got through to the fire people I told them there was a car on fire outside my shop and they promised to be there in a moment. As I turned from the the phone I saw Phil, who comes in on Saturdays, struggling with the shop fire extinguisher. I took it from him, whipped out the wire and went out to the car. Flames were coming from under the bonnet. So I bashed the top of the extinguisher and directed the spout up near a front wheel. The extinguisher gushed out a white cloud, and at that moment the car's starter started up. After a few more moments the white cloud stopped gushing and the flames were out – there was still a lot of somke, but the fire was dying down. H.B. shouted at me to get away from the car – she was leaning out of an upstairs window and thought it was about to blow up. It wasn't.

Just then the fire brigade arrived, along with a police car. The firemen lifted the car's bonnet and looked at the mess inside. It was a mess. I recognised the policemen as he got out of his car. It was Bill Bevan, whose wife is expecting. He took the car driver's name and address, and the number of the car. He suggested that when I got the bill for refuelling the extinguisher I should send it to the car's owner who would present it to his insurance company. When I got the estimate it was for eighty pounds plus VAT. I wrote to the address Bill gave me, but haven't had a reply. Oh well! And what did the local rag say next week? "Fire brigade puts out car fire." Thanks a million!

The Fidelity ZX2000 Chassis

I've serviced hundreds of Fidelity TV sets. In the earlier ZX2000 chassis failure of the line output transformer is the usual cause of R901 in the supply to the line output stage being burnt out. Normally you replace the transformer with the later type from the ZX3000 chassis, fitting the adaptor base, remove the focus and first anode controls as these are built into the new transformer, replace the resistor and everything works fine.

The last one I did this to came back a few days later. This time I found that the chopper transistor and the chopper circuit efficiency diode D24 (RGP15J) had failed. I must confess that the diagnosis and repair were not as straightforward as this account suggests – my muddled head is going to get me into some trouble soon.

How's This for Service?

Phil dropped in during the week to see if I had an SN76532N for an ITT VC300 monochrome portable he was repairing. I looked here, there and everywhere but couldn't find one. He left and enquired around the town but didn't have any luck. Someone told him that Gosling Electronics would have one, but they are in south London, some twenty miles away.

Not to be deterred, Phil jumped into his car and sped off there – after checking by phone to ensure that they had one. He found the shop, but the chip was in the outside engineer's van. Gosling drew a diagram to show where his calls were and Phil once more set off on the chase. First here, then there and eventually, would you believe it, Phil caught up with him. The engineer had the chip and let Phil have it (too cheaply I thought). When Phil got back and fitted the SN76532N sync was restored. You think you go to a lot of trouble to please your customers!

Two Old Dears

These old dears brought their white Ferguson 3848 (1690 chassis) along in a black dustbin bag. As I got it out they told me there was no sound or vision. While they nattered away I whiped the back off, releasing the aerial etc. panel for easier access. When I switched the set on there was slight sound and the tube's heater was dim. On removing the e.h.t. cap the set showed more life.

I switched the set off and clipped the e.h.t. lead. The right sort of e.h.t. diode wasn't in stock – the only one I could find was the little white Thorn 8000 chassis type. I screwed this on to the line output transformer's screen, then connected the line output transformer to it – after removing the new unit's stud and carefully insulating the connection. When the e.h.t. cap was connected to the tube the set sprang to life, with a good picture and full sound. I know I should have replaced the complete overwinding, but it wasn't necessary. Meanwhile the ladies were still nattering away as I replaced the cabinet etc. I heard one of them say "makes you wonder what it's all for".

"Don't you know?" I asked.

"No I don't" one of them replied.

So I explained to them what life is all about.

"When you're young you get a partner, then a child whom you bring up as best you can. When it has repeated the process it's time for you to go to make room for the newcomer. That's all there is to it, whether you like it or not. No point in belly aching about it."

They looked at me as though I was mad.

"I don't think much of that view of life – when will the set be ready?"

"It's ready right now and the charge is ten quid."

They paid up and departed, still thinking they were important, as we tend to do. When will we learn? From the red salmon for example, which dies after spawning. But why do some spirits survive – like the soldiers under the local fort. They keep on appearing, though their boss General Gordon never does. . .

Haunted

Les Lawry-Johns

I seem to be haunted by Fidelity colour portables of late. If not of the ZX2000 series, then the later ZX3000 version. One that stopped me in my tracks for a while came in the other day. It was a CTV14S, fitted with the ZX3000 chassis. Its trouble was no green. Checks on the tube base panel revealed that the voltages in the green output stage were way out. It took some time to find that the 100kΩ bias resistor R214 was open-circuit. Fitting a replacement restored the green and my flagging spirits. The equivalent resistors in the red and blue channels are R224 and R204 respectively. So the moral is, if one colour goes check the relevant bias resistor on the tube base panel before you consider changing the TDA3562A colour decoder chip with its 28 pins.

The Philips KT3 chassis is also getting to be all too predictable. Quite apart from the 4·7Ω surge limiting resistor on the power supply panel and the tripler, which sometimes kills the line output transistor, it's now common to find that the tube is faulty. Sometimes you find that for some while only one colour appears, the other two finally coming on after a struggle. In this event I usually short out one of the heater chokes on the tube base to liven up the heaters so that the lazy colours are not so long in coming through. This seems to satisfy most people. But not Mrs. Grouser.

"I want the proper picture when I switch on. I don't see why you can't do it."

"I can for about eighty pounds Mrs. Grouser."

"What? I'm not paying that sort of money on this old set."

"Well you'll have to get a new one then."

"I will too. Snippers down the road have some nice ones. Quite cheap too."

"O.K. Mrs. Grouser. Just see if they're prepared to repair it if anything goes wrong."

So out she went, hoping to get something for nothing as they all do. Or nearly all.

Pete's 9600

Shortly afterwards this chap struggled in with an Ultra set fitted with the Thorn 9600 chassis. I vaguely recognised him but couldn't put a name to him. H.B. came into the shop from the kitchen. "Hullo Pete" she said. "Hullo love" said Pete.

I whipped the back off. The 2·5A mains fuse on the left-hand side had blown and a meter check showed that the chopper transistor on the right-hand side was short-circuit. I also noticed that the brown lead to plug 511 on the chopper power supply panel had been disconnected from the plug and soldered directly to the panel. "Some rough work has been done on this set" I commented.

Pete looked at me but didn't say anything.

"Pick it up later on?" I asked.

So he left, saying he'd be back before we closed.

When he'd gone H.B. asked me why I didn't recognise him as we'd sold him the set some years ago and had always looked after it. This meant that I'd done the rough work. Oh dear.

Still in a muddle, I prepared to replace the chopper transistor, stupidly unsoldering the base and emitter contacts, one of which broke off. When I removed the two screws that hold the transistor I was able to pull it out of its holder. So in fact I'd messed up the holder. This took some time to repair, but at last it was done and a new chopper transistor was fitted. I checked the circuit carefully but couldn't find anything else amiss. So I plugged the thing in and switched on. There was a flash from the right-hand side panel and the new transistor was dead. What had killed it? Closer examination showed that plug 511 had a poor neutral lead connection in addition to the previously attended to live lead connection. So the plug came out altogether and the neutral lead was soldered to the panel as the live one had been. If I'd done this years ago when the live lead gave trouble I wouldn't have had to fit another chopper transistor. Very rough work indeed, and all my own fault. Sorry, very sorry.

Another Blunder

A few years ago I sold a Philips CTX-E colour portable to a lady who phoned the other day to say that it had gone wrong. I nipped over and picked it up, not having time to do it on the spot. Back in the shop I plugged the set in and switched it on. Nothing happened. So I slid the chassis out and found that there was a full 300V at the chopper transistor's collector and nothing at its emitter. I searched everywhere and after an hour or so I gave up.

Later on I had another go and this time I looked at the front. The standby light was on. When I pressed the selector button I heard the set start up. All that mucking about over nothing. How stupid can I get? With an aerial connected the sound boomed out but there was nothing on the screen. A bell rang in the back of my mind. When I turned up the first anode control there was a white line across the screen. So I checked the voltages around the TDA3651 field output chip. The supply was present but there were no other voltages. I unsoldered the pins and removed it on its heatsink. It was marked TDA3653. Oh well. As I couldn't find one of these I ended up fitting a TDA3652, which worked just as well. I now had a very bright picture, so I had to turn the first anode control down again. Ten minutes later the set's owner turned up to collect it. She'd got her boss to run her up. What next?

The Next Disaster

The next disaster was a Thorn 9000 I'd sold some years ago. Its owner had mucked about with the fuses. Having got these right I checked the diode (W702) in series with the syclops transistor — on the transistor's surround — and found that it was short-circuit. So I replaced it and checked the syclops transistor itself and the 47Ω resistor connected between its base and emitter. This was well down in value, so I removed it — the test was made with one end disconnected — and fitted another. I then switched the set on. All I could hear was a soft tripping noise. I disconnected this, that and the other (the tripler etc.) but the tripping continued. So I put the set on one side and got on with some less mysterious jobs.

Having polished these off I returned to the 9000, this time on its side, and found that there was a short across one of the rectifiers (W706) supplied by the syclops transformer. It wasn't a dead short, so I made another check on the other side of the 5Ω surge limiting resistor R712 and this time found a dead short due to the reservoir capacitor C715 (22μF). This was removed and the set was tried again. It started up nicely, so I switched off and fitted a replacement electrolytic. The set behaved itself and sat there as good as gold, waiting to be collected.

On checking through the books and looking up devices as I encountered them I came across a couple of absentees, but these were specific manufacturers' types that don't have equivalents. I was pleasantly surprised by some of the things there are included, in particular a large number of numerical only types and the various prefixes used for zener diodes – ZPY and RD for example. Some devices used in Salora equipment caught my eye – RGP10, RGP15 and S2000a are all there. This is bound to help those who have to tackle all types of repair for their living. For example, if one of the multitude of cheap portables comes in with a duff regulator that takes you just ten minutes to diagnose you may then take forever trying to find a replacement that you can guarantee. Or say you have an i.f. fault and it must be in one of two chips but you don't know which one houses the audio detector and you've never come across either device before.

When these books are updated no device is ever left out, no matter how old it is. So you can buy these two new books and give your pile of existing ones to a field engineer or your apprentice. In my opinion they quite obviously represent phenomenal value. In the short time we've had them they've saved us a great deal of time. They are available as a pair for a mere £17·85 trade (no VAT with publications!) from Willow Vale Electronics (head office 11 Arkwright Road, Reading, Berks. RG2 0LU) under order code 21-004B.

The Temptation of Tiny Tim

Les Lawry-Johns

Tiny Tim was having a rest after doing nothing for the best part of the morning. The door opened and in walked delicious Dora. What a face, what a figure. And what a cheek . . . her lips parted as though to give Tim a kiss.

"Would you be kind enough to bring my set in for me? It's a bit heavy for me to carry."

Tim popped out to her car and picked up the Thorn 8800. He carried it into the shop and put it on the counter.

"Can I watch you do it?" asked Dora.

As Tim's wife was out, gassing to everyone up the farm (King's Farm, about a mile up the road), he didn't mind at all. He whipped the back off and plugged the set in, switched on and nothing happened. Next he checked the plug and mains lead, read it through to the on/off switch, then realised he'd fallen for it again. The cut-out button at the back. He pressed it and the set started up. The sound was o.k. and after a short period the picture appeared. It was blurred, so he tried to adjust the focus knob. It was at maximum and turning it back only made things worse.

Tim remembered the time when he'd changed the e.h.t. unit and the focus control several times without improving things and Keith and Alex had popped in on their way back to Portsmouth. Keith had offered to do the job for him there and then. He'd removed the earth lead from the bottom of the focus unit and switched on. There had been an almighty crack from the tube, with flashes everywhere. Keith had then switched off and reconnected the earth lead. On the next attempt the picture appeared in full focus and Keith and Alex had then made their way back to Pompey, having taught Tim another lesson.

Tim thought of trying this again, just to frighten Dora out of her life, but decided against it. He slid the chassis out – with the set switched off – and loosened the e.h.t. unit. After shorting the e.h.t. lead to chassis he disconnected the leads. He walked round, brushing Dora's behind on the way, and selected a new unit from the shelf.

"This will cost you twenty quid" he told her.

"We can talk about that later" Dora said.

So Tim fitted the new unit and switched on. He could now turn the focus control quite a way back and the picture looked good.

"Aren't you clever!" said Dora.

"At most things" Tim said modestly.

He wrapped the set up and carried it out to Dora's car, then went back for his twenty quid.

Dora was leaning against the counter in a suggestive way. "Open to negotiation?" she asked.

Now Tim fancied Dora but, well, maybe it was the weather . . . He's an odd bloke but there are plenty like him. Dora looked annoyed. She opened her purse just as Tinker Bell returned, having cut short her shopping (jawing). Tim took Dora's notes and, as she left the shop, put them in the till.

An Awkward K30

Tim had a Philips K30 that was driving him mad. He'd sold the set some years back to a lady whose husband had been a friend of his and had died two years ago. When she'd phoned to tell him about the set he'd promised to call round that afternoon. He'd gone without a care in the world, taking with him all (he thought) the things he might need.

When he tried the set there was sound but no raster. He replaced the two upper left-hand boards. No difference. He turned up the first anode controls and obtained a blank raster that was locked solid until the aerial was disconnected. So he took the set back to the shop and spent hours trying to find out why the first three transistors on the RGB output board were not turning on. All the supplies to the board were present.

After suffering for a long time he thought he'd let someone else suffer. He took the set along to Moon Lane and handed it to Geoff and Eddy. They laughed when he asked for their help. Two days later he called in to find out whether they'd solved the mystery. They hadn't and the set sat there on the bench, looking at them with the same blank raster. Tim said he was sorry to have given them such a trial. They didn't laugh this time and carried the set down the stairs for Tim and put it in his car. Said they were glad to see the back of it.

Tim settled down to find the source of the trouble but became more and more baffled. The cause of the problem seemed to be lack of bias for the first three transistors on the RGB panel. They are pnp emitter-followers with their collectors returned to chassis and their emitters supplied from the 13V LT3 rail. After a lengthy search Tim found an invisible break in an earth circuit, roughly midway across the main panel near the focus control. Three electrolytics (including the LT3 reservoir) and a resistor are returned to earth at this point. Tim was left very puzzled as the other open-circuit electrolytics and the resistor, which is in the first anode network, should have had other effects. Maybe the break was "made" as far as some of them were concerned.

Hi!

Les Lawry-Johns

Greetings not only from me but also from Rick Kinslow of the Medway Towns. He wants to be remembered to all his friends who used to work so well together at Southern Rentals (Hove and Brighton) in the old days.

Problem Fidelitys

I'd like to thank David Botto for his article on the Fidelity ZX3000 chassis in the September 1986 issue. As you know, I've been a bit muddled for some time now. When I was trying to fix this CTV22R with the ZX3000 chassis I couldn't concentrate properly at all – the set just kept blowing the h.t. fuse and the BU426A chopper transistor as soon as I switched it on.

I thought I'd checked just about everything – I'd changed all the obvious components. Then, in the end, I took time off to go through my back issues. At last I came to David's article, where he drew particular attention to R91 (270kΩ) which is connected to pin 4 of the TDA4600 chopper control chip. I'd run the meter over this item, but I hadn't disconnected one end. When I did I found that it was open-circuit. A new one was fitted as quick as a flash, along with a new BU508A (I'd run out of BU426As).

With a new fuse in place I switched on again, averting my eyes – the flash when the fuse had blown previously had not been very pleasant. This time there was no flash. The set started up and a nice picture appeared. Years ago I would have remembered reading about that, but lately I've been re-reading some of my own articles and wondered just how I wrote them. I seem to have forgotten so much except what occurred forty or fifty years ago, and that's not much good to me now. At least I don't think it is.

Shortly after the above incident a Fidelity CTV14R (ZX2000 chassis) came in. It wouldn't start up. It was also in a bit of a mess, and someone had fitted a pair of resistors in series to take the place of R801 (18kΩ). This resistor, with the 12V zener diode ZD5, provides a stabilised supply for the emitter of the chopper driver transistor and the TDA2581 chopper control chip. It wasn't until I'd fitted a proper wirewound resistor in place of the two series resistors that the set started up and worked properly. This despite the fact that the "faulty" resistors seemed to measure right and ran quite warm. Oh well . . .

The Fry Up

Eddie Fry came in with his set. His wife is French so we call him French Fry. A bit naughty perhaps but it seemed reasonable to us (HB and me). His ITT CVC5 had been going well but had then just given up. He said the picture had come in from the sides, jumped back out again, then the set had gone off. He also said he'd be back later.

So I whipped off the rear cover and checked all the usual things – the fuse in the h.t. supply to the line output stage, the boost capacitor, etc. Then I noticed that one end of the line output valve's screen grid feed resistor R421 (2·7kΩ) was free. I soldered it up and switched on. The h.t. came up all right but there was no life from the line output stage after several minutes' warm up. A voltage check revealed that there was no voltage at the line output valve's screen grid: so the resistor I'd soldered up was open-circuit after

all. This aroused my suspicions, and I accused the PL509 of having an internal short. The excess current passing through the resistor must have melted the solder just before the resistor itself had given up. When the resistor was removed there was a black mark on its side. A nice new 2·7kΩ resistor and a new PL509 restored normal operation and a very good picture – I never stop to marvel at the goodness of the tubes fitted in these sets, after all the years of service they've given. The 22 and 26in. tubes seem to last for ever.

Why no sound? Well, if you remember your ITT hybrids, the sound output stage is muted until the line timebase gets going.

The Thorn 8000

This one came in about an hour ago. Its owner, Mr. Cheapskate, said he was willing to pay up to a fiver on it. So I told him to take it away. He laughed and said he was only joking.

I switched it on and it tripped like mad. With the e.h.t. rectifier unit disconnected from the line output transformer it continued to trip. I lowered the right side (looking from the rear) timebase unit and tried again. This time I saw smoke rising from the 3·3kΩ resistor in series with the rectifier that provides the supply for the c.r.t.'s first anodes. I looked at the associated 0·047μF, 1kV white capacitor (C401). This item has always given up easily. I fitted a replacement and ran the set up again. A perfect picture appeared and Mr. Cheapskate was delighted.

"There you are then" I told him. There's your £5 job. Now take it away before I look at the set properly.

Post Strike

The post strike was still on while this issue was being prepared. I wondered what the editor would do if he received nothing in the post? What he could do is to reprint some of the better of the old pieces, a request that several readers have made. I wonder how it would go down? In the end the editor's inestimable assistant Tessa took this all down over the phone. Why didn't I Fax it? Well these newfangled machines are not all that thick on the ground yet in this neck of the woods.

Blanking Pulse Generator Circuit

John de Rivaz, B.Sc. (Eng.)

Those still using sets fitted with the Rank A823 series chassis will have noticed that over the last few months white lines have appeared at the top of the screen — the effect is particularly noticeable on Channel 4. These lines are caused by additional text services introduced for closed user groups. They benefit the viewer only in as much as the charges made for the new services contribute towards the cost of the broadcasting services.

One possible way of removing these lines would be to modify the field timebase to produce a faster flyback, but this would undoubtedly put strain on components that weren't originally designed to withstand the changed conditions. An alternative approach was therefore tried.

Circuit Description

A simple two-transistor monostable muitivibrator circuit that provides a positive-going pulse of sufficient duration to blank out the unwanted text signals was designed and built. The circuit is shown in Fig. 1. R1 was added to prevent instability, and the value of R2 may need to be selected to obtain a long enough output pulse. You could use an 0-20kΩ potentiometer to set this up. Reduce the value of R3 if the blanking is insufficient.

Since the two transistors operate as switches a collector load resistor for Tr1 didn't seem to be necessary. If the transistor used in this position is slightly leaky however a load resistor connected to the positive side of the supply may be required. Hopefully the value shouldn't need to be less than 100kΩ. A BC384L or similar transistor is suitable in the npn position and a BC212L or similar device can be used in the pnp position.

The circuit was powered from the A823 chassis' 18V rail, which is convenient as this is used by the field timebase. The input pulse for the circuit was tapped from the collector of the upper BD131 transistor in the field output stage (5VT11 on the A803 panel used in earlier versions of the A823 chassis, 5VT9 on the A802A panel used in the A823A and later versions of the chassis).

R3 and the 1N4148 diode should be mounted at the input to the luminance delay line, with a wire running from them to the timebase board. The diode is reverse biased via Tr2's collector load resistor when the blanking pulse is not present. Thus when Tr2 is off the existing luminance circuitry is loaded only by the diode's capacitance, which is negligible. The new circuit can be made using a tagstrip or piece of Veroboard fitted with stiff wires to the 18V supply smoothing electrolytic (5C24 on board A803, 5C36 on board A802A).

To avoid unnecessary disturbance to the picture, the blanking pulse is wide enough to only just remove the unwanted lines. Some of the teletext lines and the pulse and bar test signal remain in their usual positions off the top of the screen. The effect of adding the pulse is to shift the video signal in a positive direction: as the circuit is d.c. coupled at this point this action is sufficient to blank the screen.

Other Sets

Other old sets that suffer from this problem could be modified in a similar way, though the circuit may have to be arranged the other way up to provide negative-going pulses if these are easier to apply to the video circuitry.

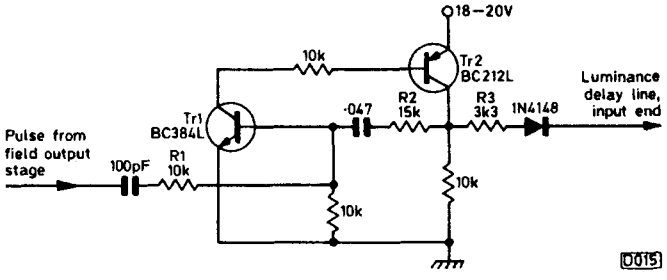

Fig. 1: Pulse generator circuit to provide field flyback blanking pulses in the Rank A823 chassis.

The Butt of Lewis

Les Lawry-Johns

I'd spent an interesting morning repairing three colour sets and a Pye cassette recorder, all for next to nothing because their owners always seem to be able to give me a good reason why they shouldn't be charged and, being the fool that I am, I always seem to see their point of view. Why doesn't my bank manager see mine?

SEME Stan

Just as I finished the last one Stan (from SEME Ltd.) came in to take my order (small). I gave him the list and while he was writing it down I noticed the thing sticking out of his top pocket. It had a little red light on it, and suddenly started to bleep. "Why don't you answer it?" I asked.

"It won't talk to me" Stan said. "I have to phone them."

"Well phone them then and stop that racket" I said crossly.

"O.K." said Stan, "can I use your phone?"

"Of course you can" I replied. "I'll go and make your coffee with no milk and sugar."

So Stan phoned back to base while I plied my way in the kitchen. When I came back Stan looked white and shaken.

"I don't know" said Stan, "I've to go to the Outer Hebrides to placate a bloke called Tim Tiny or something like that. I know it's a familiar name, but I can't recall upsetting anyone that far away."

"I hope the sea is calm for you" was all I could think to say.

So Stan staggered out whilst I sat behind the counter wishing I'd not phoned SEME the previous day, saying I'd been dissatisfied with Stan's service on his last visit to me at the Butt of Lewes. I hope Mr. Bullock will bump into him and calm him down. I know he's up that way but I can't remember where exactly. Sorry Mr. Bullock. Hope Stan makes it across those waters. I wonder why I feel a little guilty?

The GEC 3135

I felt guilty about this little GEC monochrome portable too — Model 3135. When it came in it refused to work at all, but it's a nice little set so I got on with it with the best of intentions.

The fact that it didn't work at all suggested to me that the trouble was in the power supply. I checked everything on the rectifier panel then decided to look up the circuit — in the 1976-77 volume of *Radio and Television Servicing*. With my muddled mind it took me a long time to make sense of it — it's the set with the switch-mode pump circuit, a single transformer being driven by the pump and line output transistors.

I decided to try it out with a battery supply. With 12V d.c. input the sound burst out and I concluded from this that the set would operate with a battery. This was silly, because I hadn't checked whether a picture would appear. I then reverted to mains operation and continued my search, beginning to realise what an idiot I'd been.

There was 250V at the collector of the switch-mode pump transistor TR451, which is adjacent to the switch-mode/line output transformer, but nothing at its base or emitter. A more careful study of the circuit suggested that a fault in the line output side could cause this condition. After a bit of a struggle I checked the line output transistor TR203 and found that it was short-circuit. At this point I decided to give the customer an estimate and wrapped up the job until I'd got his O.K. to proceed. When he came back he declined and took the set away. Another waste of time. Only mine so it doesn't matter.

The Decca Portable

Shortly afterwards a young chap carried in a Decca colour portable. He said it had just arrived and was brand new but couldn't be tuned in.

I plugged it in and fitted the aerial plug. One front button selected the channels: the next two to it were for tuning up or down and the right side single button was for memory store. I selected channel 1 and pressed the lower search button. The screen lit up with a mass of grain and faint (TVS) channels drifted through. London BBC-2 appeared and I pressed the button once more in case the set lingered. Down we subsequently went and Channel 4 appeared, only to vanish as the set continued on its way down. BBC-1 appeared next, and I pressed the memory button to keep it on switch position 1. I then selected position 2 and repeated the previous procedure, pressing the memory button when BBC-2 appeared. This business was repeated for ITV and Channel 4. The young man was amazed.

"How did you do that? I'd tried for hours."

"You were probably going up instead of down" I suggested.

So having paid me a pound for the job he packed up the set and whilst doing so mentioned that it had arrived by parcel post that morning, having been ordered from a club. This explained why he hadn't be able to call for help from the suppliers.

Return of the Intrepid Duo

Shortly after this a large, expensive car drew up outside (like I used to drive but can't afford to now). Out got Beardy and non-Beardy. "Oh my Gawd" I groaned.

They brought in a 22in. Amstrad of the type that has been haunting me lately.

"Will you just have a quick look at this?" said Beardy.

I stared at it hard.

"No, don't look at it. Find out what's wrong with it while we wait."

So I took the back off and freed the chassis, pulled it out and turned the whole thing up to get access to the chopper transistor etc. The latter was short-circuit, as was the line output transistor. Making allowances for finding the cause of the trouble and the resoldering etc. that would be required I told them that it would cost about forty quid.

Beardy's hair stood on end. "You are joking with us. Forty pounds to repair a TV set?"

"Yes. It was forty pence last time I think but this one will be forty pounds — or maybe more. If you're not happy you can take it and see whether you can get it done cheaper elsewhere. Only don't bring it back here."

So off they went, having found that Uncle Les isn't as daft as they'd thought he was.