Caught by a Körting . . .

Les Lawry-Johns

I WAS standing behind the counter wondering why I had sold all those coaxial plugs for 18p when they cost me 19p (I don't study invoices half enough: after all, it's all I can do to keep you lot amused) when this fellow came in.

He said he had a Baird colour set and that a resistor had burnt out and his picture had gone a funny colour and could he have another one. He handed me a charred offering. "That's the thing".

"If you don't mind", I said with icy calm. "I've lost my crystal ball".

"Oh" he said with a disarming smile. "You mean you can't read the value. Don't worry, there were two more of them so I took one out so you can match it up". He showed me a shiny 1·5kΩ 1W resistor. "Ah", I said with something of a snarl in my voice, "what happens if the new one burns out too?" Voice rising "and pray why shouldn't it".

His smile made me ashamed of this outburst. "I thought you'd say that. That's why I put the set in the back of the van. I'll go and get it".

He returned in a trice, carrying the set far too easily for it to have been an old Baird one – but it didn't look much like a Thorn set either.

"It's German", he said. "Nice, isn't it? It's a Korting actually". "Kurting", I said loftily. "Don't you know nothing?"

So, saying he'd call back in an hour, he went – not telling me where the resistors had come from. Well, I looked over every panel and subpanel which could affect the colour rendering, mainly around the BF179C colour-difference output transistors which, on a 51763, are on a plug in subpanel, but no sign.

To cut it short, I eventually found where they lived. On the tube base panel, and on the component side which is the side away from you of course. There was one 1·5kΩ resistor in series with one cathode (see Fig. 1) with the other two missing. The position of the blue 1·5kΩ series resistor was scorched, so we put back the red one and checked around the blue circuitry. Nothing wrong cold. Switch on and see the effect. Weird it was. With the brightness down, a dull blue raster remained. With the controls at the normal settings and an aerial connected, lovely lots of red and green. Nothing wrong around the blue cathode, no shorts, no excess voltages, nothing to burn out a 1·5kΩ resistor.

So we put in another one. Lovely. Turn off the colour, turn down the brightness and set the first anode controls for a nice grey scale, set the drives, perfect.

Ponder. The resistor burnt out. Obviously an excess voltage across it. Where do it come from, where do it go? Spark gap shorted? No. Tube shorting? Again no.

H.T. short? The resistor wouldn't have suffered from this unless the spark gap was short-circuit. But it wasn't, while the BD115 was quite cheerful. Oh dear. But wait, here comes the bloke back again.

"Done is it?" he beamed. "Well done. I knew you'd do it".

"Well, er, you see, in fact it's not quite that easy".

"Rubbish, you're just being modest, the picture's perfect".

Regaining some of our normal arrogance we pointed out that the picture might well be perfect now but at any time the beast could well rise from the depths again, gobble up the poor old resistor and submerge to lie in wait for the next victim. But he could take his set if that's what he wanted....

Well, to stop indulging in all this imaginary chit-chat, back he came a few days later to ask if he could buy two 1·5kΩ resistors as the same one had burnt out again. He hasn't yet brought the set back, preferring to replace the resistor rather than (he says) to have a new tube fitted because he is convinced that there is an intermittent short in the tube....

Körting Again?

The model we have been going on about (51763 series) has proved quite a reliable set really apart from the odd valve and diode failure, but the first generation one (8455 series) was a different kettle of fish. It had its share of shorted diodes and faulty transistors etc. but the one big failure was in the transformers. It had a line output and an e.h.t. transformer and both gave a lot of trouble until they were modified. I think they were of Philips design but I could be wrong. Insulation breakdown was the trouble and the snag was that the customer didn't take kindly to forking out for a new transformer one month only to have the other cook up a month or two later. Not cheap items either.

These sets had two colour controls on the front. The left-hand one was the normal saturation control, the other the hue or drive adjustment. They had sliders, with the optimum point in the centre. It's quite common for the hue control to develop poor contact, with the result that at one moment everyone looks healthy but at the next they look decidedly seasick.

The tuner units were also a bit complicated, being designed for u.h.f. and v.h.f. reception. It's often necessary to attend to the switch contacts in these and to knock off the v.h.f. side while you're at it. One of the advantages of doing this is that a fairly heavy spring can be left off and this takes quite a lot of strain out of the unit and the button selection.

Finlandia

Lovely music that. Old Syble something or the other (I

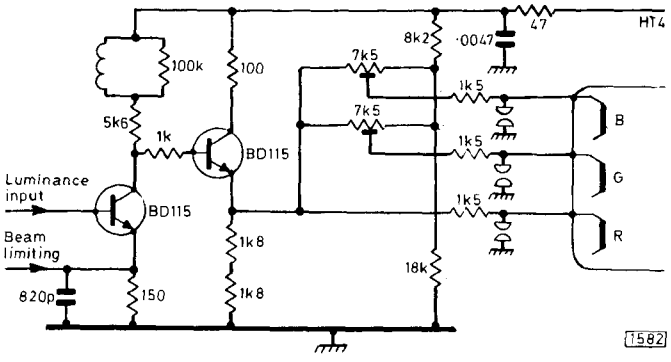

Fig. 1: The luminance output stage, Körting 51763 chassis. In many sets the 7·5kΩ drive potentiometers are omitted.

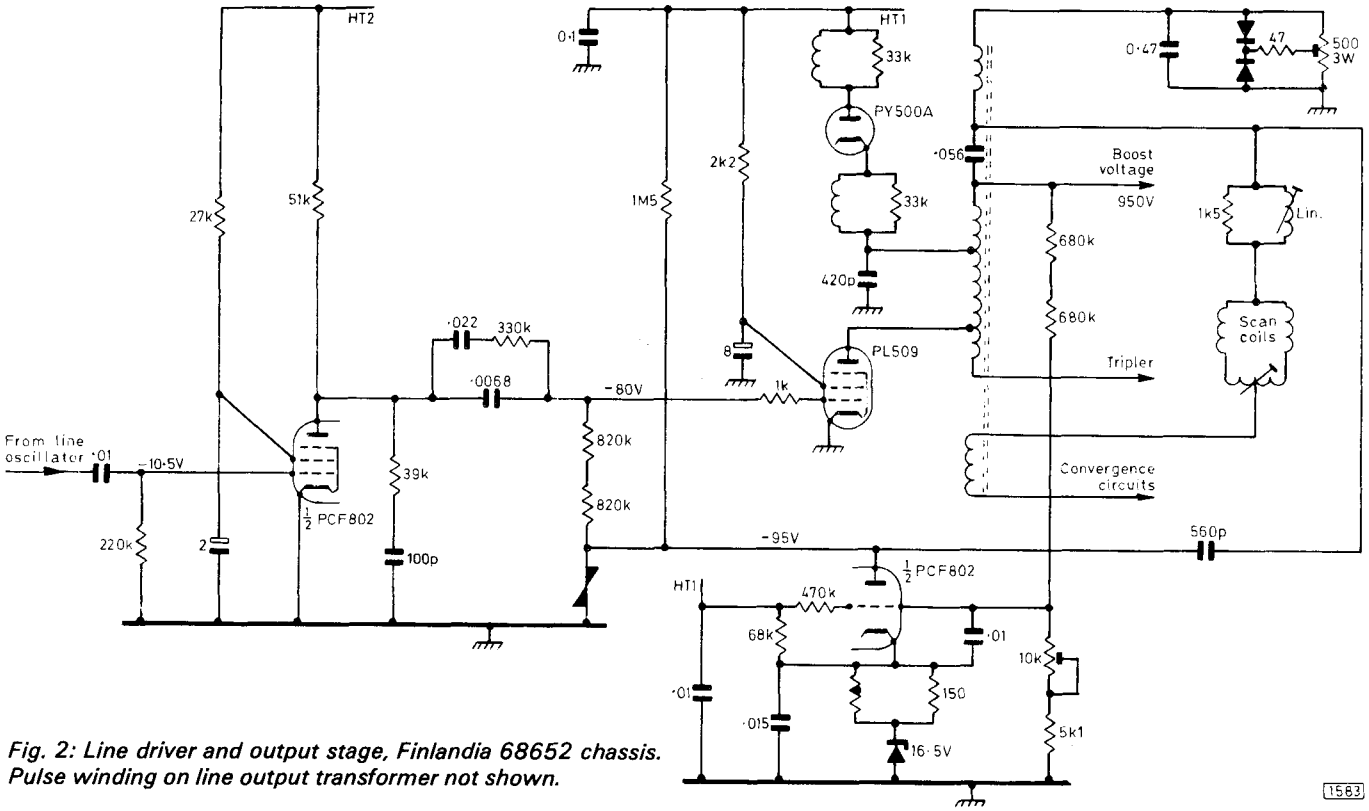

Fig. 2: Line driver and output stage, Finlandia 68652 chassis. Pulse winding on line output transformer not shown.

know my music mate, so don't start getting uppity about it). Anyway quite a few of these nice sets (68652 series) have graced our bench so perhaps a few words about them might not come amiss.

Most of them come along via the ex-rental market, from Granada. So they have a few years over their heads, and are of hybrid design with only three valves.

The PCF802 is not the line oscillator, so watch that one. The pentode section acts as a driver for the PL509 line output valve while the triode section acts as a stabiliser, with of course the PY500 as the efficiency diode (see Fig. 2). The line oscillator is transistorised, with a pretty complicated circuit which with the line sync filter etc. adds up to quite a few components to think about. Not much seems to go wrong here however, so another load is lifted from our excessive burden of funny fings to fink about. The small electrolytics and the 2·2MΩ discriminator load resistors should receive attention first when things do start happening to the line hold. The 2·2MΩ resistors (RB96 and RB97) are connected to either end of the line symmetry (discriminator balance) control PB7.

Probably the most common fault on these sets concerns the RGB output transistors, which are of the BD115 type. They can short or become open-circuit or be damaged by sparking between tracks, this again being quite a common thing. They drive the c.r.t. grids incidentally, with the c.r.t. cathodes being linked together and used for flyback blanking and beam limiting.

Trouble spots will also be found in the supply lines. There are four separate diodes in the h.t. bridge and a block type diode bridge for the l.t. supply. One of the separate diodes may short and blow one or both of the 2·5A supply fuses, or may pop off the surge limiter RB189 (4·7Ω, 9W) which can also fail when CB102 (0·1μF) across the bridge goes short-circuit.

In short, there is very little to worry about. It's one of those sets where you don't have to spend hours studying the circuitry in order to trace a fault, and I must confess that I have little detailed knowledge of the design because it's never been necessary to delve too deep in order to keep the customers happy. Perhaps it's something to do with all those funny baths they keep on having up in Lapland.

Some of our set designers could do with a few. Someone comes up with a circuit which saves a couple of bob and then it has to be surrounded by gadgets to protect the thing from the effects of it going berserk. It's in the nature of things that these gadgets are in themselves so inherently unreliable that the protectors need protecting (bung in another thick film overvolts unit Joe).

What was wrong with a separate stabilised power supply feeding various parts that could be separately isolated in order to put things right in the least possible time? Do the setmakers pay us to put their products right when they go wrong almost as soon as they've been installed? One or two allow a small percentage, but this amounts to only about one service call. Better by far to build sets with reliable components and to have them in a design which doesn't require a genius to understand – because most of us service people are not geniuses and aren't even particularly bright (I speak for myself, so no abuse please).

In short, what I am saying is that some designs should have been left deep in the heart of Texas. By all means use the latest short neck, quick heating, in-line gun tubes, but for heaven's sake use them in a proved and relatively simple circuit so that morons like me don't have to sit in the toilet half the night trying to understand which bit does what and why all over again every few months. End of plea.

Back Comes the Körting

Since starting these jottings the bloke with the Körting has returned and, yes, it turned out to be an intermittent heater-cathode short in the blue gun. But a new tube wasn't necessary: we simply removed the earth connections from the tube's heater supply, which is provided by a secondary winding on the mains transformer, and ran an extra lead to the c.r.t. base panel. Fortunately the winding has a very low capacitance, so there's no loss of picture detail at all.

When You Meet a Stranger . . .

Les Lawry-Johns

DEALING with colour sets you've either sold or serviced regularly is one thing. Dealing with a colour set you've not seen before is a different kettle of fish altogether and requires a different approach – particularly if it's getting on a bit. You might say it's much the same thing as buying a second-hand colour set, which is true except for the economic factor. It's one thing to buy a used set and go through it from stem to stern to restore it, with loving kindness, to its original condition – if nothing else in order to obtain a good deal of job satisfaction from doing this. When one is presented with a strange set purely as a quick servicing job however, probably with a ceiling price of a few pounds, a different problem emerges. It's one which has given us pause for thought on many occasions, and no doubt will, or has, you.

There are two viewpoints to consider. The set owner or customer – if you're not the owner – whose primary considerations are to get the set back into working order as quickly as possible and at the least possible cost. And yours, if you're the repairer, whose primary considerations are to get the set working properly as quickly as possible with no come backs and hopefully to show a small profit on the deal. Unfortunately, meeting all these considerations is only rarely possible, so some compromise has to be reached. In reaching this compromise one has to consider a couple more points.

If you succeed in pleasing the customer you will almost certainly meet the set again. Therefore the initial repair should be carried out bearing in mind that it is going to be your baby from now on. But do you want this particular baby?

If you do it may be as well to suffer some initial loss of time and money so that you can service it efficiently and profitably at a later date and obtain a regular customer with probably their word of mouth recommendation to their friends and relatives . . . which may or may not be a good thing.

It's absolutely astounding what some people will look at in the name of colour television and what they consider an acceptable picture. They'll continue to look at a frightful jumble of images on the screen, and only cease to do so when the thing fails completely.

So when it's presented to you the owner has the viewpoint that "the picture valve has gone" or "a wire has come off", and you have the problem of what to do and what to leave undone.

A Case in Point

This was brought home to us most forcibly only the other day. We were asked to call to see a Bush Model CTV182S. The complaint was that the picture had failed, leaving the sound normal. Now this could be due to almost anything, so bearing in mind the fact that we hadn't seen this particular set before and that time was limited we packed our bags with care, leaving out only the kitchen sink. Pondering for a moment, we put the kitchen sink in just in case and started off.

On the way we also pondered upon another aspect. Here we were, driving an expensive vehicle loaded with expensive gear to enable us to deal with almost any contingency, all of which had to be paid for in advance and with a great deal of thought from an ordering point of view, so as to satisfy someone who would probably say to another someone "They don't half know how to charge nowadays, they want four quid just to set foot over the doorstep".

Dismissing these dismal thoughts, we set foot over the appropriate doorstep and confronted the Bush colour set. It wasn't a burning Bush by the way, and it wasn't up a mountain either. Switching on confirmed that the sound was in order. But there was no sign of e.h.t. (no friendly rustle when the set was switched on). A quick check revealed that most supplies were in order – 200V at the h.t. fuse, with most of the l.t. lines intact. There was no 20V supply to the scan drive panel however, due to the 6·8Ω feed resistor 8R2 being open-circuit – quite a common one this, with no contributory cause.

Replacing 8R2 restored a picture. But what a picture. Lacking an inch either side, colours anything but right, convergence a mile out. "Oh that's lovely dear", said the lady of the house. "That, madam, is not strictly true", we said bitterly. "The colours may be lovely but they're not where or what they should be."

This was to put it mildly, but we had no desire to spend an hour or more doing things we hadn't been asked to to. So we tweeked up the convergence and left the reds pink and the blues mauve. Cowardly? No, just prudent.

Sets Brought In

Similar sorts of things occur regularly with sets brought into the shop. The proud owner will loudly proclaim that his set has never given a spot of bother and that only now has a fuse or something gone. When you have painstakingly put together the upper right side power supply panel (GEC 2028 series) in order to get the set working you may find a dull, poorly defined picture of a pinky green hue when it should be black and white, changing to mauve as the brightness is advanced. Any attempt to set up the grey scale is doomed to failure from the outset and tuning in a colour transmission is a laugh.

"That picture was perfect before it went off", maintains the owner. "Well it wants a new tube for a start, and then a lot of work done on it after that", you confide. "No, I'll take it as it is: it suits me and the missus."

The Basic Problem

So there it is. This is what you may well come across when you meet a stranger. Better the devil you know. . . .

Having accepted this truism, the basic problem remains.

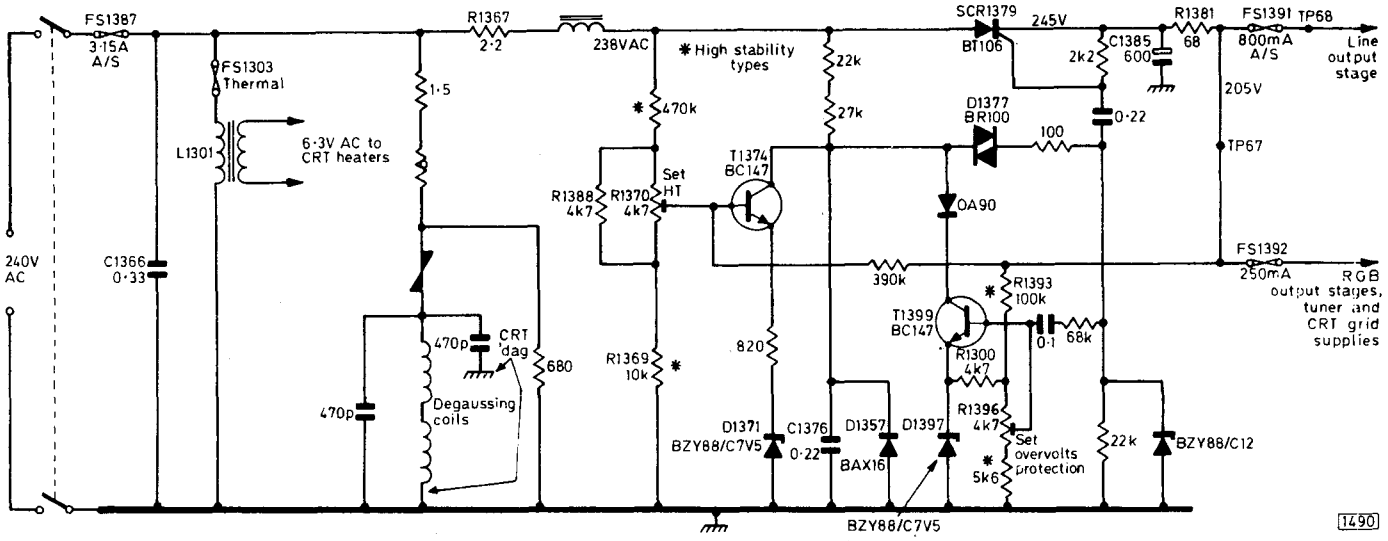

Fig. 1: Power supply circuit, recent version. There have been several modifications during production.

If the cards are stacked against you but you don't want to throw your hand in, take another close look at the cards you have.

In the first place, the customer probably doesn't expect perfection and, in spite of all the work which should be done, he probably wouldn't appreciate it because money is usually (not always) the paramount consideration.

In the second place, you may have one or two good cards, not the least of which is experience. You've probably met the type of set before, and have a pretty good idea of what the stock faults are. This is probably your ace in the hole. If the set wants a lot of faults put right it's almost certainly old enough for the stock faults to be tabulated in your mind – or if you have time you could look up the relevant write up on the particular model in a past issue of *Television*.

Some Examples

We haven't had many articles on the Philips G8 chassis, so let's imagine that one comes in, or you go out to it, the complaint being that it's not working at all – this is the most common complaint.

Your first action should be to remove the back cover and the lower left side plug, and lift the paper cover to expose the mains fuse (3·15A anti-surge). If this is clean and intact the trouble is probably due to an open-circuit dropper (front left) which has two sections, R1367 and R1381 (see Fig. 1). The lower section is wound with heavy wire and has a value of 2·2Ω. This is the surge limiter and it doesn't often fail. If it's in order the supply to the thyristor (SCR1379), which may be a BT106 or an alternative, is intact and a pretty high d.c. will be found at the cathode (reservoir capacitor C1385 charged, so look out because it packs a powerful wallop which has nowhere to go if the next assumption is correct). In all probability there will be no such voltage at the two rear edge fuses, and if this is so the 68Ω upper dropper section is open-circuit. This is an extremely common fault. Your first action must be to discharge the reservoir capacitor in compliance with the rules of the society for the prevention of cruelty to service engineers. A fully charged 600μF electrolytic is a fearsome weapon which must be treated with respect. Discharge it with any convenient wirewound resistor, having first switched the set off of course.

With these things done you can afford the luxury of examining the dropper. It will probably have a distinct mark on it to show where the fracture is. Incidentally, this is often the cause of intermittent operation, where the set sometimes works for hours at a time and at others it appears to be as

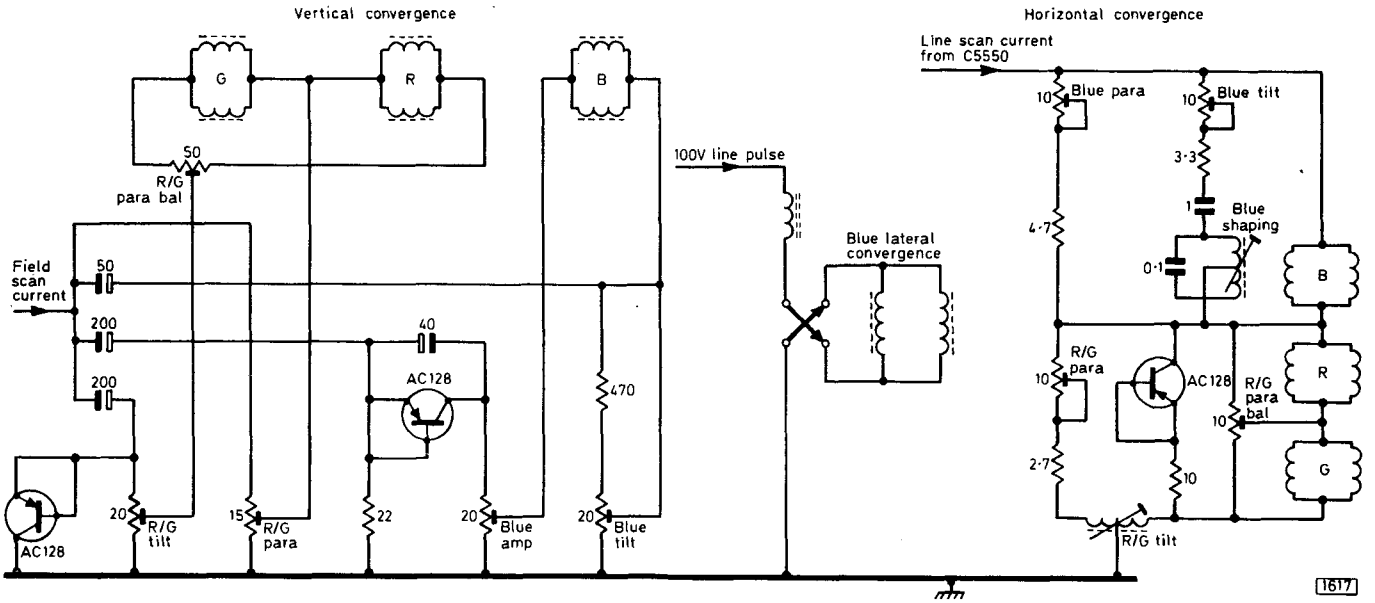

Fig. 2: The convergence circuits. There have been several modifications during production.

dead as a bottle of light ale with a leaky top. Sometimes you may be lucky enough to see a pretty little bright spark at the point of fracture.

Anyway, either you have the correct replacement at hand or as a temporary expedient you can disconnect the section and fit two 33Ω RS dropper sections in series. These are the thick ones with a rating of 0·7A, so they are well within specification. We say these items because they are the ones most likely to be in the spares kit, also because they do the job well.

Now: having restored the supply, your next action must be to ensure that it is correct. The voltage at the two fuses on the rear edge of the upper left panel should be 205V – no more. If it is set (by R1370) too low, all sorts of funny things can show up. Not only lack of width, as you would expect, but also some pretty weird effects too numerous to describe and varying with individual sets.

Having made sure that the voltage is right you are permitted to look at the picture. If you are lucky it may need only a few fine touches to produce a good black and white picture with the colour off, and if this is so the chances are that when the colour is turned up everything will be fine. If this is a stranger however it is equally on the cards that at least part of the convergence procedure will have to be carried out in order to achieve acceptable results. We mention convergence in particular because this is the thing that's most often found to be way out yet not mentioned by the customer. In all probability only a few tweeks on the right controls may be needed, but there are times when no amount of adjustment will produce an acceptable picture.

In such cases you can save a lot of time and patience by checking a few items on the convergence panel. There are three AC128 transistors and four small electrolytics on this particular panel (see Fig. 2). Disconnect each and check it with an ohmmeter. Very roughly you could say that the suspects are the ones nearest the controls which will not come into line. It can save a lot of time if you check the lot plus the controls themselves however – this can be done quite quickly. Faulty electrolytics on the convergence panel are more common than one may think, possibly because they are often ignored.

Blown Fuse

Now let's go back to that 3·15A input fuse (FS1387). Say it's not clean. Say it's a nasty black colour. Here you take a different course. First check the other fuses to make sure that some joker has not put a heavier fuse in a position where it is clearly marked, say, 800mA. Remember that you haven't seen this set before, so you can't take chances. If they are all correct, the cause of the blow out is almost certainly a shorted thyristor or a shorted mains filter capacitor (C1366). Check the thyristor first. If it's at fault there will probably be a short from its anode (body on a BT106) to its cathode (the longer prong). If the thyristor is in order and there are no other obvious shorts it is reasonable to suspect the large blue and white or plain blue filter capacitor which is wired on the reverse side of the input fuse panel.

Worn Tube

Having restored the set to an operating condition, what might we find this time? Remember the set was in working order before it failed altogether, therefore the sound is most probably in order and some sort of picture must be on the screen – and in this instance we'll consider that the set may be of any make.

We have already mentioned some of the effects of a worn tube. Wrong colours which can be put right at one setting of the brilliance control but change due to the differing emissions of the three guns. In addition, one or two colours may spread out as the brilliance control is advanced, making good convergence an impossible task. Even worse, one colour may be present at only the lowest brilliance setting, not responding as the control is advanced even though the tube base voltages may be spot on.

To clarify this, let's say that at normal brightness the picture consists of only two basic colours, say red and blue to make magenta, or purple as the majority of people describe it, green being absent. Turning down the brightness may restore a faint vestige of green, and turning the red and blue first anode supply switches off may leave a green background with faint flyback lines which cannot be controlled by adjusting the brightness. If you've checked the tube base voltages, the answer can be only an open-circuit electrode in the tube.

Back to the G8

Returning to the G8 chassis, let's assume that the complaint is one of no picture and no sound but the tube heaters are glowing. This means the input fuse is intact. The fuses on the power unit may all be intact, but it may well be that the 800mA fuse (FS5557) on the right side line scan panel has blown.

In this case we must proceed with caution. Disconnect whatever can be done without. The first and most obvious choice is the tripler, which needs only to be pulled off the nipple on the line output transformer. Indeed you may hit the bullseye first time. The tripler is often the cause of the fuse on the line scan panel failing, but often it isn't. It's worthwhile checking the two line output transistors (see Fig. 3) on a meter in the usual way (for collector to emitter shorts etc.) Also make a quick check on the diodes and their attendant electrolytics.

One would normally do these things of course but one item which is often overlooked is the pincushion correction transductor (T4485). This is on the right side of the lower right side timebase unit, and appears to be a small transformer with three separate windings. It could well look a little poorly, with little bubbles of discoloration on one or more of its windings. If there is doubt, merely pulling out the red plug H – from the line scan unit to the timebase panel – will prove the point as the set may then function quite well without the transductor being in circuit. This happens not nearly so often as say defective line output transistors, a defective tripler and the like, but it's worth bearing in mind. So removing plug H is an essential part of the "clearing the decks operation" when checking for shorts which have blown the fuse on the line scan unit.

Another defect which may be obvious after the original complaint has been cleared is lack of width. Be careful with this one, because it can hang round your neck like a stone. You've already checked the supply voltage as part of the initial operation (haven't you?). Therefore your trouble is almost certainly on the line scan unit, although the line oscillator components are on the lower right timebase panel. If you have a spare line scan unit it is only a matter of plugging this in to prove the point, and this action will almost certainly restore full width and leave you with the problem: what to do, what to do?

It is a fairly easy job to replace the line output transistors, and whether these are BU105, BU204 or BU205 types we

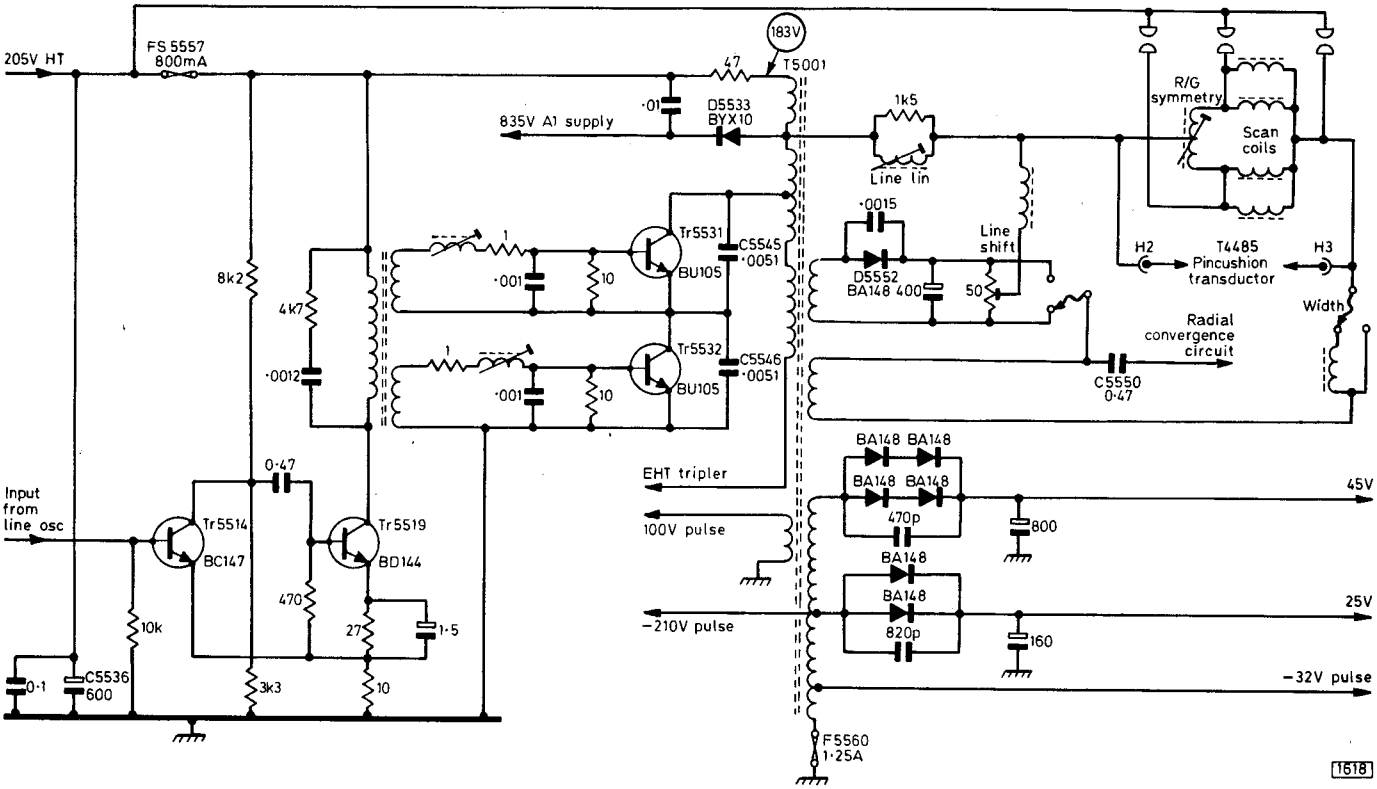

Fig. 3: The trigger amplifier (Tr5514), driver (Tr5519) and line output stages. The beam limiter circuit is also mounted on the line scan panel but is not shown here. There have been several production modifications.

keep 2SC643A types in stock since they replace all these and a few others and so are very handy transistors to have around. But it's quite likely that the transistors are not at fault. You can check the capacitors, and the trigger amplifier and driver transistors, but by this time it will be sinking in that the culprit is that thing on the rear end with all the windings on it. Yes, just one shorted turn is all you need to cause the transistors to pass excessive current and dampen things down a bit. Now tell the customer how much that nice simple job is going to cost.

Colour Drop-out

One of the habits of the G8 is for the colour to disappear suddenly after several hours of faultless performance. This can be very irritating and time consuming since it won't happen (probably) when the back cover is off. It can be due to a lot of things, and we don't propose to list them here. What we do propose is that you hare off out and get yourself one of those small hand-held hairdryers with a narrow nozzle on the end to concentrate the heat on to one particular area. With this in one hand and your aerosol freezer in the other, heat up the area of can 008 which is next to the CAQ370 crystal, to the left of the luminance delay line (see circuit, Fig. 4). If this causes the colour to drop out just check the setting of the core of 008: half a turn may restore the colour no matter how much heat and freezing is applied. You may need a new crystal or maybe any number of other things, but it's worth checking the core first to save an awful lot of time and frustration.

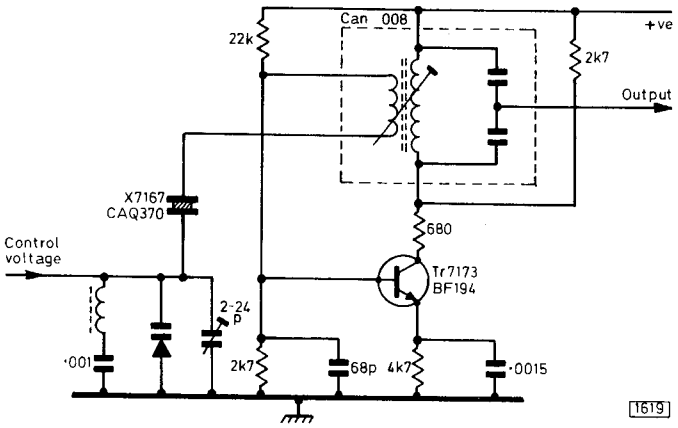

Fig. 4: Decoder reference oscillator circuit.

It Didn't Do That Before!

Talking about frustration, say you've been called in to do a job and this has involved swinging up the chassis and lowering the side supports to prop it into the service position. You've done the job you were asked to do, so you lower the chassis down and switch on with a satisfied smirk on your face. Maybe the picture does come on in glorious colour, but the sound which was perfect before isn't there any more. "The sound was all right before you came" says the lady of the house, and so it was. The point is that all too often a potential sound fault has existed ever since the set was new, but it just needed you swinging up the chassis to show it up.

It may be only a loose fitting sound output plug and socket (follow speaker leads to the front end), but it could well be a joint which was never soldered properly in the first place. A prime source is the intercarrier sound i.c. which in the earlier models was of the round variety (TAA570). Time after time we have found one leg improperly soldered, just lurking there waiting for you to be the one to disturb it.

Mind you, things like this can happen all over the place and needn't concern the sound. If it's difficult to trace, a little judicious tapping around will often reveal the source of the dry-joint or whatever and temporarily restore what was missing, be it a primary colour, line hold or what have you.

This is the sort of thing that can happen when you have dealings with a stranger. So be warned!

In Puffed a Couple of Chaps . . .

Les Lawry-Johns

WE had a couple of Japanese portables in recently, both with cracked tubes. What a pricey job this is. One is well advised to check the current price of these tubes, plus the VAT, plus the carriage, etc. before giving an estimate. Anyway, we had just about wrapped these up and were wondering why these Far Eastern jobs have such heavy mains leads – one of them could have easily run a washing machine, the other tied up the QE2 – when a van pulled up outside.

In puffed a couple of chaps carrying a large Ultra colour set. We chatted about this and that and it transpired that the trouble with the set was "a poor picture with lines shooting across it." Having arranged a convenient time to collect it, the owner and his son in law departed, leaving us with what appeared to be a straight-forward job. Unfortunately, having got the set on the bench we found that one or two other things appeared to be wrong. To be quite candid about it, and with the benefit of hindsight, practically every nightmare that can afflict a Thorn 3000 chassis was present on this one. So sharpen your pencils and take a few notes. Who knows, the same (not all we hope!) may happen to you!

No Raster

With the set up on the bench there was neither picture nor raster, but there was a funny arcing noise every now and again from the beam limiter board. On trying to take a voltage measurement across R907 (see Fig. 1) we found that it was loose. This is one of the key test points on the chassis as it shows the current taken by the line output stage: the voltage across the 1·5Ω resistor should be 1·3V if all is well. If the reading is higher, either the timebase is taking too much current or the resistor has risen in value. You may say that a low-value wirewound resistor does not change value. But it can, and has on more than one occasion to cause loss of brightness. This time however it was loose and the solder had decomposed.

We soon made this good and confidently switched on. Nothing doing, no voltage here at all. We then checked that the supply was in order, on the power board – about 60V at F603 – and followed the supply along to the collector of the line output transistor. Upon looking at the underside of the transistor however we found some hideous blobs of solder on the base and emitter pins, and touching these with a screwdriver brought the e.h.t. crackling up. Switching off we also noticed some drops of solder on the decoder board, which is underneath. So we dutifully cleaned off the transistor pins, made good the soldering, and cleaned up all (we thought) the little bits of solder on the board.

The Tearing Lines Appear

Now on switching the set on the e.h.t. and raster appeared but on plugging in an aerial there was only a very poor monochrome picture (in a nice shade of yellow) with severe interference in the form of tearing lines. This was what the man had said of course: the rest must have resulted from vibration during handling showing up the dry-joints.

So we next turned our attention to the left side i.f. panel. Now you cannot quarrel with the layout of this panel. The transistors are clearly marked and are easily found, along with all associated components. A pleasure to work on.

We were not certain of the nature of the fault, and decided therefore to short out the input signal and see if there would be any sign left of the disturbance. Connecting an 0·01μF capacitor from the base of the first i.f. transistor VT101 (see Fig. 2) to either its emitter or to chassis would, we thought, knock out the signal. It didn't, but resulted in a lovely clear picture, free of interference. Oh dear. Taking off the capacitor brought back the interference and the poor picture. For the want of something better to do we then used it to short the collector to chassis. Lovely picture!

We then concluded that we were up against an a.g.c. fault or an open-circuit decoupler in the supply line. Checking the latter didn't help much but bridging C179 seemed to help – bridging it with an electrolytic that is, not with the 0·01μF capacitor, twit. Moving down the chassis, we next bridged C134 and this cleared the condition. Now when the base of VT101 was bridged with the 0·01μF capacitor the

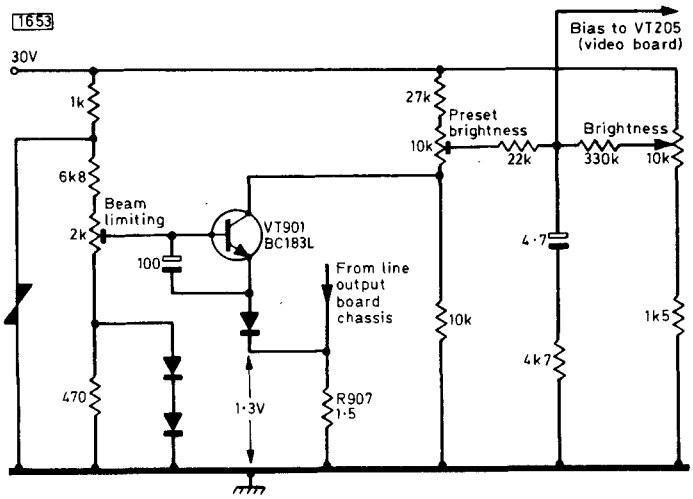

Fig. 1: The beam limiter circuit, Thorn 3000/3500 chasis.

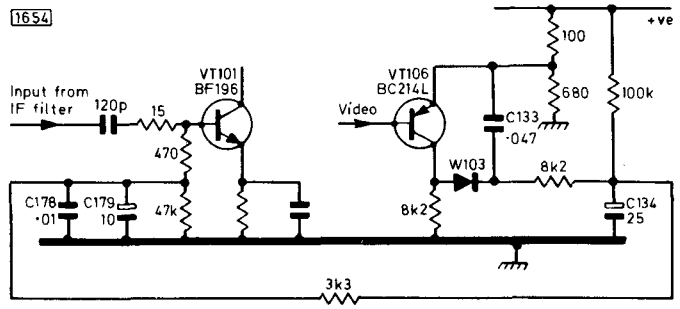

Fig. 2: The first controlled i.f. stage VT101 and the a.g.c. detector/amplifier transistor VT106. C134 was omitted in later production chassis.

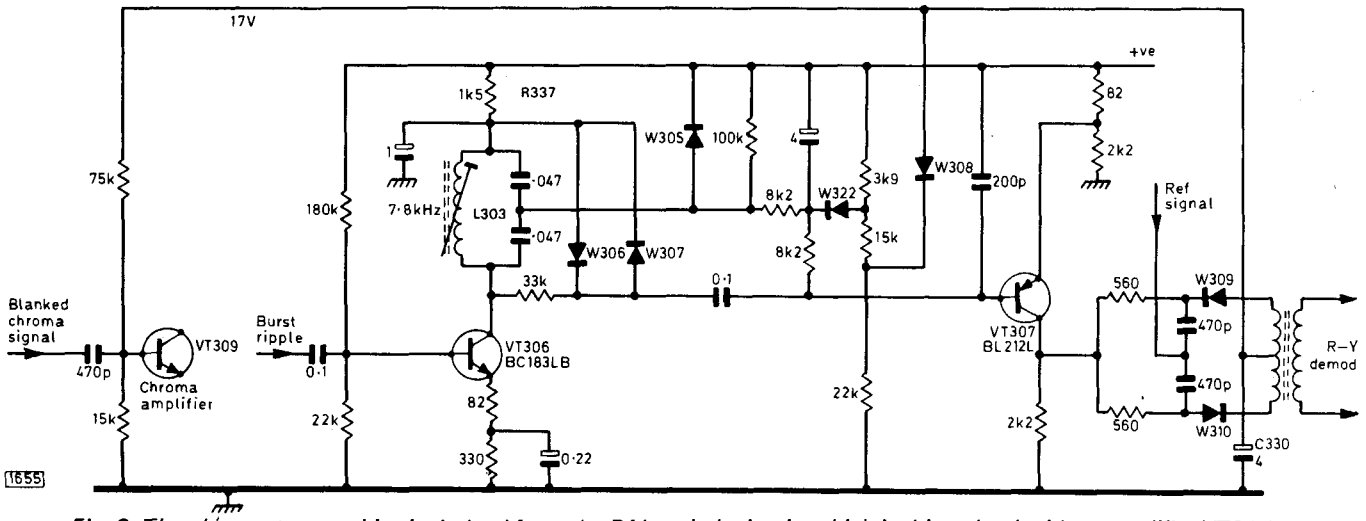

Fig. 3: The chroma turn-on bias is derived from the PAL switch circuit, which is driven by the ident amplifier VT306.

signal disappeared as it should have done in the first place (oh the complexity of it all).

Getting the Colour Back

We now had a clear picture in what should have been black and white with no trace of colour. Taking the opportunity, we set up the gray scale with the first anode potentiometers and the drive controls until the monochrome picture looked respectable, and then turned our attention to the decoder board. Most voltages were, well, not too far out, but there was a complete absence of turn-on voltage at the base of the chroma amplifier VT309 (Fig. 3). Ah ha, we said. Nipping smartly over to the PAL switch driver/chroma bias generator transistor VT307 we found no voltage at its emitter. The network of diodes connected in its base circuit caused us to have a momentary mental blackout, so we broke off for a cup of coffee.

Refreshed, we returned to the fray and found that there was now no voltage at the collector of the ident amplifier VT306, whereas this voltage had been about right earlier. A niggling doubt crept in. If the collector voltage had been there earlier, the chances were that the turn-on voltage for the chroma amplifier had also been there. If so, why had there been no colour? Dismissing these dismal thoughts, we investigated the supply to VT306. R337 had its 30V at one end but there was a dead short to chassis at the other. Looking at the circuit showed this to be unlikely from a component point of view, so we took the plastic cover off L303 and there was a thin sliver of solder which had somehow got under the cover during the manhandling process, having laid dormant and harmless for many moons after having dropped down from the previously mentioned clumsy soldering of the line output transistor. Being under cover, it had escaped our eagle eye. With the short removed however there was still no colour and the voltages, although much nearer, were still not right.

It was obvious that the trouble was now leading us back to the burst detector, and much time was spent checking and rechecking as the colour burst came in all right but petered out at the emitter of the burst detector driver VT302. Just at that moment my good friend Ray came on the scene. We poured out our troubles. "Can't say I've had much trouble with decoder boards on this chassis", said Ray helpfully. He suggested that since the detector coil L301 didn't tune there may be some solder under that one too. We shook our head. Couldn't get in there.

I went to see if the coffee pot was still going, and left Ray playing. A shout of triumph brought me hurrying helter skelter. Ray had taken the cover off L301 and there it was: a spot of green on one of the wires, which parted when touched. Again disturbed by the manhandling? Red faced and ashamed, I muttered that I had been about to investigate the condition of L301 when he came in but that nevertheless he was a fine fellow and a valued friend.

Having reset L301 after repairing it, glorious colour was displayed. "OK now?" Ray asked irritatingly. "I'll just borrow an indoor aerial and be on my way".

The Picture and Sound Vanish

When the smirking idiot had gone, we subjected the set to a simulated manhandling process – just in case. The picture and sound vanished. No chopper output, no 30V line, all fuses intact. Wearily we returned to the fray. We spent some time looking for dry-joints etc. The 30V stabiliser transistor VT601 was OK (Fig. 4), with voltage at its collector. But there was nothing at its base to turn it on. Check C609, but this normally causes ragged verticals when defective, and it wasn't shorted. Check the zener W605. No shorts. Come back Ray, you're not an idiot, I don't mind if you do smirk.

Wait a minute though, have another look at the supply to VT601. Not quite right is it? Check C607. Open-circuit. Replace. All's well. I'm rather glad he didn't come back.

We delivered the set ourselves, and very carefully too.

Effects of Age

As these 3000 and 3500 chassis begin to feel their age,

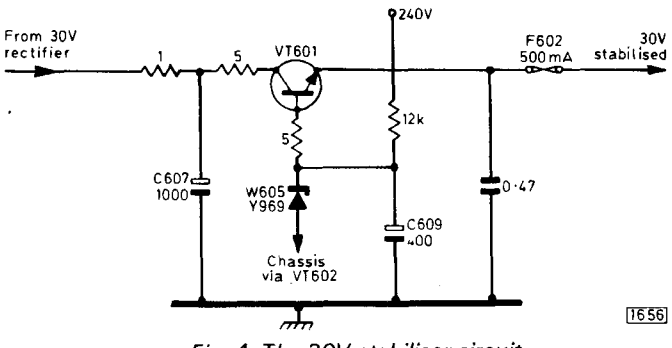

Fig. 4: The 30V stabiliser circuit.

the previous well known list of stock faults apply a little less and one now encounters the effects of heat over an extended period, corroding contacts etc. – as indeed we mentioned in the case of R907 on the beam limiter board. It's also worth while having a look at the timebase board, which is revealed in part when the beam limiter board is lifted. Particularly in older models, there is often quite a bit of corrosion around L502 and R528, whether W507 is fitted or not – these components are in the power supply feed to the line driver and output stages. A clean up job here can save trouble later.

Similar remarks apply to the power supply board, where the wirewound resistors are now tending to part company with the print – and it must be admitted that it's not easy to work on the underside of this panel. Our experience shows that the items likely to require replacement on the power supply panel are the chopper transistor itself (VT604) – remember to check its insulating washer, which can be punctured, and clear away any corrosion – the wirewound resistors (check all for continuity), the electrolytic capacitors (particularly C607), the 30V zener W605, and transistors VT601 (30V stabiliser) and VT605 (chopper driver). Smaller components likely to escape attention but which we've found troublesome include C631 (0·01μF) in the driver's collector circuit and C622 (0·022μF) and W618 in the feedback amplifier circuit.

Whilst line output stage failure due to faulty line output transistor(s) or the tripler is pretty obvious and easily checked (for example by merely pulling off the tripler lead from the transformer) there are other and more obscure line timebase troubles. For example, intermittent loss of line hold is often due to the small electrolytics C506 and C511 playing about. The two can be replaced in moments and there is no point in holding a conference about whether they are faulty or not or which. Oh yes, when soldering the line output transistor(s) make sure that no solder falls on the decoder panel . . .

The convergence panel has been subjected to considerable alteration as far as the layout is concerned, but the same basic comments apply. A little scorching here and there, shorted diodes or electrolytics, defective potentiometers and of course our old friends the first anode switches which tend to leak, thereby robbing the relevant c.r.t. first anode of its voltage and resulting in the absence of that colour (usually green, remember . . . ?).

We have said that the sudden drop out of a certain colour is often due to low first anode voltage on the c.r.t. gun concerned. The trouble is quite often that one colour comes up far too bright however, so that all that can be seen is an almost blank screen of that colour, making it difficult to see picture information contributed by the other two colours. A quick check at the tube cathodes will often reveal that although there may be about 160V on two of them there is precious little at all on the other. This immediately throws suspicion on the collector load resistor of the output transistor concerned. Earlier models used separate wirewound resistors (R250, R264 and R277). Later versions use a pack with four lead-out wires, enabling the unit to be stood off the panel. It appears that this thick-film unit is not as reliable as was at first hoped, and we fit separate resistors as required.

Intermittent Colour Drop Out

This is not a servicing article on the 3000 chassis however, so we had better not carry on too much about these sets. We have a 9000 series set which suffers from intermittent colour drop out. The slightest vibration restores colour (you've only got to blow on the cabinet and the colour comes back) and you can't make it go off no matter what. All plugs, sockets, leads and soldered connections have been checked, probed and prodded. No result. The colour stays for hours after intensive searching and then drops out. Can you hear me Ray? Rayyyy . . .

A Simple Soldering-Iron Stand

Malcolm Burrell

ACCIDENTS with hot soldering irons can be annoying at the least and both expensive and embarrassing at the most! In the home workshop, on the kitchen table or in the field some form of stand is desirable. The one shown here is just as efficient as many commercial models and was devised and built in half an hour.

It consists of a length of tubing, for example $\frac{7}{8}$in. aerial mast, hammered flat at one end which then has two holes drilled in it so that the tubing can be mounted on a stout block of wood or screwed directly on to the bench. All sorts of variations are possible. A double unit to accommodate both a standard and a small low-wattage iron can be constructed for example, while a length of tubing mounted in the tool box provides a convenient stand which will protect other tools – and customers' carpets!

A hardboard cheek can be mounted on the lid of the tool box so that a long lead can be stored on the outside, giving more space for tools and essential spares inside. If the electrical installations in your area are not too diverse, fit a plug to the lead: a useful arrangement is a two-pin 5A plug with a 13A type razor adaptor.

If your soldering iron's bit is not of the fixed type it's a useful habit to give it a twist every time you plug the iron in: this ensures that the fixing does not seize and facilitates replacement of defective bits without having to scrap the element as well. ■

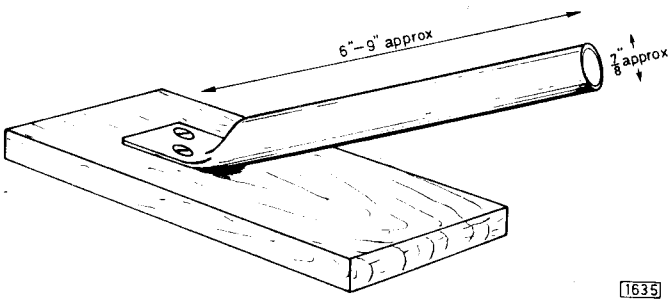

Fig. 1: The soldering-iron stand.

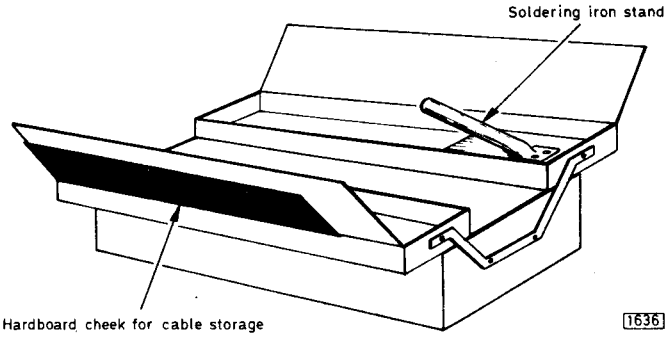

Fig. 2: Metal tool box adaptations.

A Day in the Life of . . .

Les Lawry-Johns

07.30 Open eyes. Think about coming day. Close eyes.

07.45 Open eyes. See cat sitting by bed waiting to be fed. Get up. Kick cat and visit bathroom. Dress and proceed downstairs preceded by cat. Say good morning to dog. Pick up morning paper and final rates demand plus a letter from the editor asking if we would like him to send us a new ribbon for our typewriter because he can't understand half of what we write and the half he can understand doesn't make sense anyway so would we like a typist as well?

07.50 Feed cat. Put on kettle and take dog for walk across road on yonder green. Throw sticks for dog. Find sticks for dog. Say good morning to passers by. Wish we had put on wellies as feet are soaking wet.

08.00 Return for breakfast. Say good morning to most beautiful girl in the world (who will read this). Read paper, at the same time listening to most beautiful girl talking about something or other. Go to toilet: read final rates demand.

08.45 Open for business. First job, fit regunned tube in 24in. monochrome Philips set. Correction. Try to fit tube, but cannot undo nuts holding old tube. Box spanner wrong size. Succeed with pliers, injuring hand. Complain to most beautiful girl who says "You should have let me do it".

09.00 Test Philips set. Goes into lines after five minutes. Change ECC82 line oscillator valve to cure.

09.05 Sell razor adaptor to man from Australia who says that things seem upside down here.

09.10 Try to ring Mullard Limited about colour tube worn out after three years by woman who leaves set on from early morning till late at night for company (tube insured for four years). Fail to get Mullard Limited. Phone out of order. Go next door to ring 151 and speak to nice engineer.

09.15 Two ladies carry in colour set, GEC Model C2111. Complaint: blows 3·15A mains fuse once per week but present trouble is no sound this time after replacing 3·15A fuse. Male member of family arrives and fills in gaps in story. Brother-in-law has serviced set up to present but never found reason for 3·15A fuse failing. Brother-in-law has gone to New Zealand, leaving good supply of fuses. Picture apparently pulsates prior to fuse failing.

Investigation reveals that the 24V line 60Ω wirewound resistor R603 (see Fig. 1) by the side of the line output stage has sprung open, thus removing the supply to the audio amplifier i.c. No shorts, no reason. Solder up resistor. Switch on. E.H.T. rustles up. Sound o.k., but no picture. Brilliance has been turned down! Turn up, picture o.k.

Now stop and think for a moment. If R603 springs open, it is overloaded. What by? The audio i.c.? Unlikely. When they go they go (they don't come back). The 24V zener? Well yes but. What else? The picture pulsates. What does that mean? Varying in size and brightness, i.e. the h.t. supply is fluctuating. What else? The 3·15A supply fuse fails regularly, apparently without cause. Add this lot up. There is a sudden rise in voltage which normally blows the fuse and can open the 24V supply because the zener is trying to cope with the sudden rise in voltage. Who's to blame? What's his name? Thyristor. That's it, the BT106. Take out the centre supply panel, remove the BT106 and fit another. No more trouble to date.

10.00 Involved tussle with a Hitachi car radio which in the first place had only required a loudspeaker but has now burnt out the tracks to the output transformer secondary and the output transformer secondary winding to boot. Make up and fit a suitable transformer with revised secondary output to speaker, and advise customer to recheck wiring in 24V lorry supply so that the 12V used for the radio comes from the battery nearest earth and not the 12V to 24V one as one side of the speaker connects to radio earth which may not be the vehicle earth and the speaker may be running to earth and this is not good. Sort that out.

10.30 Dog takes duster from under counter and wants to play. Avo falls to floor, exit dog. Female half says we shouldn't take our nasty temper out on the dog just because the sets won't go right. Beautiful girl no longer beautiful. From now on just she. She's made a cup of coffee. Not a bad girl really.

10.40 Bush Model CTV194. Big flash from power panel on switching on. 8TH2 (mains input thermistor) doesn't look good. Fit new one. Switch on. No flash but no results as there is no l.t. supply. Output from bridge o.k., but is not present at filter resistors at top of panel. Remove panel (again) and trace crack across track coming up from bridge. Repair and try again. O.K. except for hum bar. Tighten screws securing panel, no hum bar.

Sudden bright spark from right side panel, smoke from transductor 6T3 (see Fig. 2). Fit new transductor. Picture now only a couple of inches high, with bright line top and bottom. Check this, that and the other, only to find eventually that there was a dead spot on 6RV4 which is just above the transductor. A slight touch restored normal scan.

11.05 Spend some time showing on paper how to provide two coaxial outlets from one aerial to gentleman who could not or would not understand whilst his two unruly children tear place to pieces chasing cat and dog.

11.30 Gentleman leaves, taking reluctant offspring, having purchased one coaxial plug.

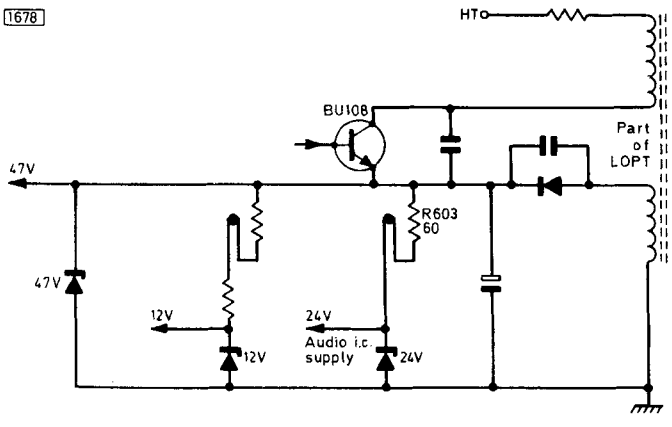

Fig. 1: What kept blowing the mains fuse, and made R603 go open-circuit? GEC Model C2111.

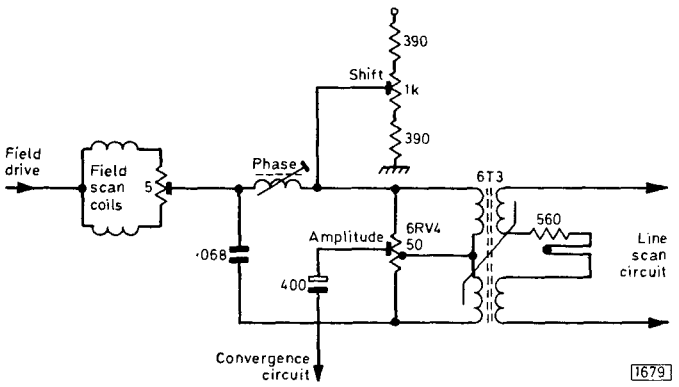

Fig. 2: Bush Model CTV194. The transductor 6T3 went up in smoke, then 6RV4 caused nasty things.

11.35 GPO engineer calls to check phone. Fault on external line. Climbs up pole to fix. Phone Mullard Limited.

11.40 Dismantle car radio. Replace fairy light used as dial lamp. Check output and find driver transformer open-circuit. Fit new driver transformer, using half a reel of desoldering braid as there doesn't seem to be a shortage of solder in Hong Kong. Assemble radio and test. Assorted whistles on medium wave, normal for this type of set.

12.00 Dismantle Ferguson 3816 portable. L.T. fuse blown. Check all circuits, no shorts. Fit new fuse and switch on. L.T. voltage 15V instead of 11·5V. Tube lights up like light bulb. Check regulator transistors VT21 and VT22 and all associated components. No fault. Set regulator to produce 5V at base of feedback transistor VT22. L.T. line now normal, with tube heater nice and dull. Surprise: picture is good black and white, no sign of strain. Question. Good picture at correct voltage means that the incorrect voltage could not have been present very long. Why the sudden rise with no apparent cause? Decide to put the set on soak test and keep an eye on the glow of the tube heater.

13.00 She shouts out "come and get lunch". Lunch only interrupted three times by phone making up for lost time.

14.00 Nice chap brings in old Bush (second set) v.h.f. only model. Find faulty PY800 in no time but on test reception is terrible. Spend much time checking tuner, valves, voltages etc. She says it might be aerial trouble. Send her away. Find v.h.f. aerial has not been plugged in to wall socket for some time. Lovely pictures on old set now that I have traced trouble.

15.00 Nip out to attend to outside calls. First an Ekco colour set (Pye 691 chassis) with no picture. Short from PY500 to chassis. Partially slide out right side unit and remove side cover of line output transformer. Snip lead of 0·47μF boost capacitor to prove it shorted, which it is. Could have been 100kΩ feed resistor to first anode controls damaged (down to zero) by shorted 0·1μF decoupler, but not this time. Replace boost capacitor and reassemble side panel. Switch on but no h.t. supply. H.T. surge limiting resistor at top of panel open-circuit, with thermistor looking a bit dicky. Replace both. PY500 none the worse for wear. Grey scale not nice. Set up and wrap up job.

15.30 Call to see set we had lately serviced, fitting new line output transformer and tube. Complaint, hum with a kinked picture – Bush Model TV161. Nasty hum, curved verticals. Check main electrolytic, earth tag (lower one with braiding) loose on rivet. Nip with wire cutters to improve contact instead of bashing with chisel (no chisel). No charge.

15.45 Call at back-to-front house. Rear of house facing road, or rather drive. Open garage with four vehicles. Pick way through garage, Land Rover, Daimler, Cortina and something else to get to back door. Apparently front door never used. Ushered through to large lounge with french windows at end looking out at front of house over garden with large swimming pool looking green and inviting. Sliding doors at side of lounge open to second lounge where family is watching second colour set. Set to be attended is a large Dynatron in Queen Anne housing. Hope it has Pye 697 chassis (familiar), but having removed twenty thousand screws from rear cover find it to be almost new with 725 chassis (modified 731) which has vertical panels and of course is all solid state.

Trouble is wrong colours. Difficult to see exactly what's wrong since grey scale is a mile out. Turn down colour and set up first anode controls on dark background. Grey scale now good, but turning up colour produces only bright red and green. Talk to self. If grey scale is o.k., blue drive must be present at blue amplifier. Check voltages just the same. O.K. This probably means that the drive from the preceding TBA530 matrix i.c. is also o.k., but as it's a plug-in one and we happen to have a spare with us it's a matter of seconds to replace it. No change. This confirms our fear. Blue drive o.k., so trouble must be lack of B—Y somewhere around the demodulator/PAL switch i.c. TBA990Q. Sorry, we don't have one with us (having searched untidy tool box and found little plastic boxes with every other i.c. you can mention). Check effect of red, green and blue level controls. Red sets up red, green sets up green, blue adjusts brightness . . . No circuit with us, and memory rapidly deteriorating to blind panic.

Refit two thousand screws in rear cover whilst chorus from family demands father make tea whilst they watch horse racing. He makes tea as he is not interested in horse racing as he is a bookie. I tell him I will call again when I have learnt a little more about my job and have a TBA990 and have had a look at the circuit. He says don't worry because the picture looks quite nice and they have the other set and he is going out to his villa in Spain anyway and will ring me when they come back. Would I like a cup of tea? I say no, so we have a brandy each before I pick my way out the back of the house to the front and return to shop where several people are waiting to shout at me for not being there when I was wanted.

17.00 Beginning to feel jaded. Check up on 725 circuit and come to conclusion that the TBA990 could well be at fault if only one or two other components can be proved o.k. Search through i.c.s but no sign of wanted one.

Repair Fidelity radio with no a.m., removing dial drum to get at suspect BF194. Replace BF194 and reassemble set so that we can return it to its owner who happens to be the landlord of the pub we are going to visit that evening.

17.30 Call it a day. Tidy up. Wash and brush up. Take dog for walk. Throw sticks for dog. Find sticks for dog. Deliver radio to pub at 18.30.

22.00 Watch News at Ten and notice light areas toward top at each side of tube (new set), due to Teletext off top of screen being reflected back by bulb of tube on to screen. Decide to do something about it later. Go to bed and remember all the things that should have been done before effect of whisky in black coffee taken with supper and News at Ten have effect on top of beer taken earlier with landlord of pub causes drowsey or is it drowsy, or drowsie or something . . .

A Visit to the Cinema

Les Lawry-Johns

WE had barely finished our lunch, which is a hit or miss affair at the best of times, and were about to have a quick game of draughts with the dog (I open the door, he closes it), when this young fellow rushed in.

"Les,", he said. "Number three has packed up".

Now this may not mean very much to you, but it was rather depressing for me.

The young fellow was from the local cinema, and the local cinema (only one where there used to be four within spitting distance) is one of those jobs which have been converted to three – two down, one up. The projectionist lives in the top one, and when he wants to see his screen he looks straight out of his porthole and there it is. When he wants to see what is going on on the other two screens however, he turns round and looks at two television screens which should give him a fair picture of what is going on in the other two, provided the closed-circuit camera is pointing at the screen in the cinema and not at the courting couples on the seats at the rear.

The camera in each is coupled to a monitor TV set marked No. 2 for cinema 2 and No. 3 for cinema 3 (would you believe).

If one of these TV sets fails to perform, the projectionist has little idea about what is going on in that neck of the woods and the only way he can find out is by rushing down about two hundred stairs or phoning down to see if someone can have a quick peek.

You may ask why each section does not have its own projectionist? If they did, he or she would have nothing to do when all is going according to plan, as the whole thing is automated, the film being on one huge reel laying horizontal on a slowly revolving cakestand and operating on the same principle as a cartridge player except that the film has farther to go (to the projector and back). Markers operate the house lights for intervals, and shut the thing down and start it up at the required time, all without attention.

Until something goes wrong that is: and this is where the projectionist up in the main (manual) box needs to see and hear what is going on.

Monitor Modifications

In this particular set up, the TV monitors are two 24in. Pye sets with modified 368 chassis. Modified is to put it mildly. The tuner and i.f. stages have been removed, and a small video preamplifier fitted to the side of the main panel which you will remember is of the swing-down type. A large mains transformer takes up much of the space on the left side, and supplies the h.t., at about 260V, and the heaters. These are still in series, run from a tapping on the transformer. In our opinion, which in the maker's opinion may be silly, the whole issue is overrun. The h.t. is too high, as is the heater current. The snag is that by the time the sets need their first repair the poor old tube has reached the point where a reduction of heater current results in a very dim picture indeed.

In the past we had given No. 2 the full treatment, with a new tube, reduced h.t., a PY88 in place of the PY800 and a thermistor in the heater line. No. 3 had previously received attention but still retained the original h.t. and the original tube. It was this one which was out of action.

Having carried two heavy cases up some two thousand stairs (it's two hundred when someone else does it) we were naturally puffed when we reached the site, and this was the reason, or part of it, why we were depressed when we first received the call. It's one thing to repair a set, it's quite another to have to suffer on the way.

Operating Box or Projection Suite?

Actually, it's quite interesting to visit these more up to date projection suites. We had considerable experience of them many years ago when they were called operating boxes and each projector had a large turntable at the rear of it on which a large record revolved slowly, the pick up working its way from the centre outwards to produce the sound which if the film had not been cut would synchronise with the picture (are you listening Chas E. Miller?) and which became disused when the sound track made its appearance on the side of the film in the form of a variable area or variable density strip which operated a photoelectric cell to produce superior sound (as time went on) and had the added advantage that if the film was cut the sound track went with it and so the sound stayed in sync with the picture . . .

The Defunct No. 3

However, to get back to the defunct No. 3 TV. Investigation revealed a blown fuse, an open-circuit h.t. supply diode, and a cooked up surge limiter resistor. Checking the h.t. line showed no shorts, so we fitted a larger (in size and value, to slightly decrease the h.t.) surge limiter, making it 33Ω, and a BY127, plus the fuse of course. We then switched on.

H.T. o.k., no heaters alight. Checking showed that the PL504 was open-circuit. This is the first heater in the circuit, being followed by the PY800 (PY88 in this case, which we fit here to reduce the heater current as it has a higher heater voltage rating). In view of the demise of the rectifier and surge limiter, not to mention the PL504 heater, we hurled the PY88 out as well, condemning it without a second thought as the cause of the trouble with a heater-cathode short.

Fitting new valves brought things to life, and the heater of the DY802 glowed up nicely. Now all this was done way

up on the shelf where the sets lived, standing on about two square inches of spare space on the rewind bench to save the trouble of lifting the thing down and lifting it back up again, and with the set turned 90 degrees to gain access to the rear. We thus had to stretch our neck to see what was taking place on the screen. The video input was plugged in but not the audio, so until we looked we didn't know what was taking place.

Now I didn't know that cinema 3 showed mainly sex films, so when I stretched on tip toe to see what the picture was like I was unprepared for what was there right in front of my nose.

Well, you could have knocked me off my perch with a feather. There was I, carefully brought up, looking at young naked females doing things I can't describe in this sort of magazine.

Frank, the projectionist, looked impassively at the screen and said "That's nice Les". I said I supposed so but did this sort of thing go on all the time? "Not that", he said, "I'm talking about the picture, it's good. As for what they're getting up to, that's nothing. You should see the one that's on with it. Proper gets on your nerves, all this bum and tit".

Line Sync Lost

At that moment the picture moved sideways and lost line sync. "It didn't last long, did it", Frank said gloomily. Hanging on with one hand, I reached down to my box with the other and clutched a PCL805. A what?!

Well, with this chassis there are two ECC82 valves as the line and field oscillators, the PCL805 functioning as the field output (pentode) and the flywheel line sync phase splitter (triode).Thus when the line won't lock but drifts back and forth with the hold control, the PCL805 is the first suspect. With the new one in the line locked solid and we were back to the bare facts of life and those naughty girls.

Final Checks

Before wrapping the job up, and while still up on our perch, we checked the audio input and the condition of the PCL82. This and its cathode resistor do not appear to have a normal life span, but we had replaced them not so long since and they seemed to be holding up well enough.

We thankfully replaced the rear cover and turned the set so that Frank could see that the carryings on in cinema 3 were up to the normal high standard. We then packed our gear and plodded down the ten thousand stairs, carefully avoiding cinema 3 on the way out. Outside, the advertising broadsheet read: "See the love life of the most beautiful girls in Europe". Oh dear, and not a male in sight. Are we really necessary, apart from repairing sets that is?

There are Other Monitors

One must not run away with the idea that all cinema TV monitors are the same. Oh no. Only a few weeks ago we had one sent in from another town. This was an all metal job, made by Sony. This used valves but the heaters were in parallel, EY88 etc. . . . All good fun, but we haven't plucked up enough courage to tackle the cameras. Any volunteers?

Footnote . . .

We understand that cinema projectionists are in very short supply. A short training period and you could be watching three films at once while being paid for it.

Toil and Trouble...

Les Lawry-Johns

I MUST admit that I am never at my best first thing in the morning. The world then seems to me to be conspiring to cheat me out of my cup of tea and piece of toast, and when the world beats a path to my door before the humours have settled it's greeted with snarls and grunts. After say 9.30 (a.m.) a transformation takes place and I am once again the obliging, polite, helpful fellow that most know well (so they think). In short, before 9.30 I see the world as it is. After 9.30 I see it through rosy coloured glasses and I can then face almost anything. Almost, but there are limits.

Then, puff, it stopped speaking

Take the other morning. Just after nine, as I was busy thrashing the dog for fun, in walked a couple of gentlemen carrying a Bush TV161. Their command of English was not good.

"There is nothing wrong with the television you know", said beardy. "It will take you only a few minutes to put it right."

Non-beardy was equally helpful. "I think it is perhaps a fuse, as it was perfectly all right you understand and then, puff, it stopped speaking." I struggled for a few moments and then managed "Ah yes, there is a lot of it about you know".

Beardy was not distracted. "How much will it cost to replace this fuse?" I thought for a moment. There was an axe under the counter, or I could accidentally let off the fire extinguisher. "Perhaps we had better find out why the fuse failed?" I suggested, having considered the mess that would be caused by either of the above two alternatives. "Would you like to come back later when I have found the reason?"

Non-beardy was stubborn. If it was a fuse, he wanted to see it fitted with no hanky panky. Quick as a flash, my lightning sharp mind added up the possibility of a bit of fun. If the fuse had popped it was probably the mains filter capacitor, a shorted rectifier diode, or perhaps a shorted boost capacitor (returned to chassis in this model). Why not let them see that fuses do not just blow by themselves (except in some makes of colour sets, but that's neither here nor there)? Why not, why not?

In a trice the set was on the bench and the back was off. Beardy's head peered in at one side while non-beardy's head peered in at the other. I removed the shattered fuse from the lower right side. So that I would not get caught in any atomic fall out, I quickly checked with the ohmmeter: mains filter capacitor seemed o.k., but you never know with these, the rectifier diodes were not short-circuit, no h.t. shorts, and 1MΩ from the top cap of the PY88 boost diode to chassis (boost capacitor not shorted). So that it would not fail too easily I put in a 2·5A fuse, plugged the set in and switched on.

Valves started to heat up nicely. Beardy beamed. "The fuse does not fail!" Feeling slightly bemused, I switched the meter to the 300V range and went to check the voltage at the main smoothers on the lower left side. At that moment there was a loud hiss and a jet of vapour shot out of the main smoothing can and hit me dead amidships (clean shirt that morning no longer clean). Pop went the fuse and the two enthralled spectators vanished for a moment.

Beardy reappeared. "What did you do to our television set to make it go bang like this?" he demanded. "What did I do?" I screamed. "Look what your bloody set's done to my shirt." Non-beardy howled with laughter. "Do it again please, just once more." I scowled at him, slackened off the clamp holding the electrolytic, snipped off the tags and pulled it out, holding it with a pair of pliers. "Here it is, it's all yours."

Non-beardy took it and dropped it in one go. It was beardy's turn to laugh. "Hot, you know", he confided in me.

"Right", I said. "Now let's get down to it. If you want it done, say so." Anyway, after this it all passed off without further incident and away they went carrying their Bush which now spoke instead of hissed. I removed my shirt to ensure that I had not been permanently injured. "Look", I said to the chief squaw. She wasn't very sympathetic. "I wish I'd have seen it" she giggled. Resplendent in another clean shirt (we've got two, one now a different colour around the navel), we tackled the next job.

Dud rectifiers

This was a Philips G17T320. Many of these are now coming in with a shattered mains input fuse. This tends to direct attention to the mains filter capacitor which has not however been found at fault so far. Instead the fault has in each case been the bridge rectifier, which shorts from the negative end to the a.c. input. The power panel is secured by two screws and is easily removed without loss of the screws or the insulated stand off spacers – well done Philips. With the panel turned, the bridge can be removed quite easily. Note that the replacement should be a BY179. Check the voltage rating of any other type you use and also which end is positive and which is negative. Otherwise fit four BY127 or equivalents. Incidentally, the mains input filter capacitor is clipped to the side wall near this panel and is not near the on/off switch. Since we dealt with this series of receivers in the December 1976 and January 1977 issues we will not add servicing notes here.

Liquid problems

Just as we were wrapping up the Philips, a grey Renault 16 drew up outside, gleaming in the sun. Out hopped Derek, who is a river pilot and a regular customer. He looked decidedly wet on this dry, sunny day.

"Hallo Derek", we greeted him. "Did they make you walk the plank?"

"No" said Derek. "I've just come from the car wash."

"Wouldn't it have been better to take the car in with you?", we asked reasonably.

"Very funny" said Derek savagely. "I was in the car all right but the bloody fool I lent it to over the weekend hadn't shut the sunshine roof properly. Anyway, that heap of rubbish that I bought from you some time ago has gone

wrong. Can I bring it in when I've been home and dried out?"

Assuring him of our utmost co-operation, we watched him climb back into his car and drive off, little knowing that he was to baptised yet again later that evening when a pint of beer placed on a high shelf would be accidentally knocked off smack on to poor Derek's head just as he stood back from the shove ha'penny board to admire his winning effort. Gusts of laughter filled Harold's bar, and some wit shouted "Consider yourself launched, God bless you and all who sail in you". This has little to do with the day's work, however: just thought you might like to know about it.

A nasty surprise

We then turned our attention to an ITT colour set which we had taken to be a CVC8 or something of that ilk. When we removed the rear cover however a cold hand clutched our heart. Not a valve in sight! The moment of truth was at hand. Our first CVC20.

"Help!", I yelled to the chief squaw. "Bring some strong coffee and blow the expense." The chief squaw appeared as though by magic, carrying the required tranquiliser. "What are you carrying on about now?", she asked sympathetically.

"It's this, this set. We haven't had one in before and I haven't done my homework and I'm frightened."

"Never mind, you'll sort it out. Do you think my hair looks all right this way or should I do it like I normally do?"

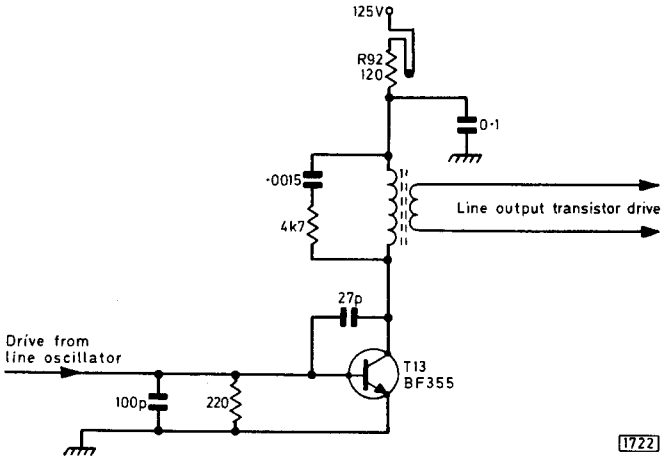

Fig. 1: Line driver stage, ITT CVC20 chassis.

This was it then. Alone and friendless. What about these women though? If they cared half as much about the inside of their heads as they do about the outside they'd all be rated as geniuses. Still they're not so bad really. Some are really quite useful. Back to the CVC20 however.

E. Trundle did a nice write up on the switch-mode power supply used in this receiver in the September issue, and readers not familiar with the circuit could well profit from a study of this.

The set we had on the bench had no e.h.t., although the

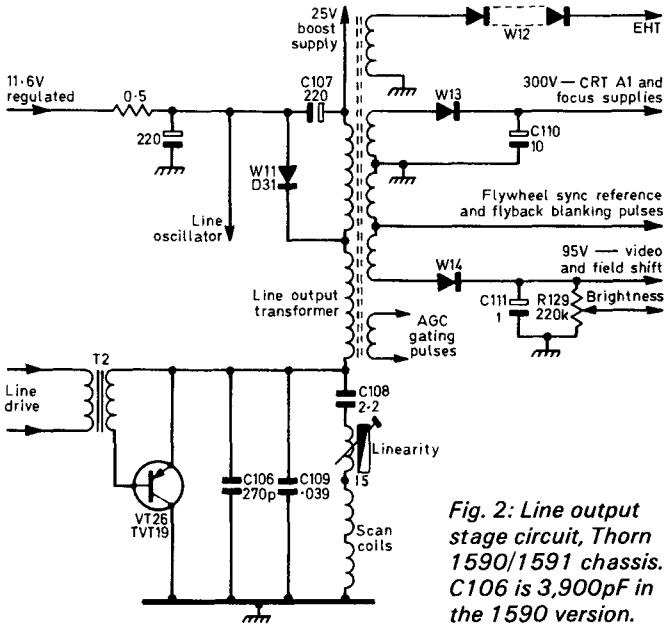

Fig. 2: Line output stage circuit, Thorn 1590/1591 chassis. C106 is 3,900pF in the 1590 version.

supply was present to the line driver and output transistors and there was a continuous note coming from the loudspeaker. This suggested that either the line oscillator was not functioning or the line driver transistor (see Fig. 1) was at fault. Its collector feed resistor R92 was not open-circuit so we took the easy path and noted that there was no voltage drop across it. Cold testing the driver base-to-emitter and base-to-collector did not at first show the correct readings, but then did so on the second attempt. Switching on again produced full e.h.t., full sound and full colour....

Having been fooled by transistors in the past (cold testing often seems to bring them back to conduction), we immediately accused the driver transistor T13 (BF355), of being the culprit and whipped it out before it could say a word. We didn't have a BF355 to hand, so we used our favourite transistor of this type (high-voltage, medium-power npn), which is the BF337, and were rewarded by good results and have had no comeback so far.

No EHT again

The feeling of relief encouraged us to tackle the next job, which we thought was going to be an easy one, without delay. It was an Ultra Model 6816, which uses the 1590 Thorn chassis. The note said "very narrow and dark picture".

With the set on the bench there was no picture or raster at all, with not very much activity around the line output transformer. The supply line was correct at around 11·5V however. Checking for shorts around the rectifier diodes W13 and W14 (see Fig. 2) produced no fruitful results.

With these symptoms either one of those diodes or its smoothing electrolytic (C110 for W13, C111 for W14) is usually found to be at fault. Checking the boost diode W11 and capacitor C107 again produced little cheer. Disconnecting the scan coil coupling capacitor C108 merely produced a faint vertical line down the centre to show that the woeful loss of line output efficiency was still present. The AU113 line output transistor next received the best check of all – replacement – but the fault still persisted.

As the line oscillator was obviously working we were beginning to think in terms of a faulty line output transformer. There were other possibilities still to check however. Disconnecting the e.h.t. rectifier stick W12 produced no better response. We then did what we should have done in the first place and checked the waveform at the base of the AU113. This was quite weird looking. Thus armed we attacked the driver VT25. This is a TIS90 and although it read reasonably on a cold test a replacement restored normal working.

Two drivers in a row! Decidedly back seat types. Still suspicious, we left the set on test but it behaved itself, thus proving that the drivers of today are not what they used to be.

Arcing, and a smell

The next item on the agenda was a large Ultra set fitted with the Thorn 3500 chassis. Arcing noise they said, and a smell. Easy we thought: the tripler. Removing the tripler lead to the e.h.t. transformer should restore normal time-base working and the correct voltage drop across the 1·5Ω monitoring resistor R907 on the beam limiter board. The voltage drop remained at over 3V however instead of 1·3V, and to prove the point the spring cut out sprung. At this the weak BBC-1 sound became loud ITV as the voltages went up with the load going down.

Making a few tests around the line timebase turned out to be fruitless (no the driver wasn't guilty, neither was the line output transistor). Capacitors were checked and all shouted their innocence. Still the suspicion lingered ... arcing and smell. Brave to the last we unhooked the e.h.t. transformer and reconnected R907. It ran cool. Lunchtime.

During lunch a lady rang to say that the wood veneer on the front of her new TV set was buckled and could we let her have another set today as her grandchildren were coming at five o'clock and if they saw the buckle sticking out they would pull it off altogether. We complied with her request and only wish that we could get such prompt attention from the people who supplied us with the set. No such luck, it is still here and is likely to be for some time unless we get a carpenter on the job ourselves. Never mind, it's our problem.

Back to the 3500. We obtained and fitted a new e.h.t. transformer and were then in a quandary. Whether to connect the tripler and see, or to fit another one thus putting up the charge considerably. We decided to approach with caution. With the set on, we advanced the tripler lead towards the nipple of the transformer. The spark was not nice, it was more of a flame. We feared for the new transformer and some of the more responsive transistors. On fitting a new tripler all was well and the only difficult thing left was to write out the bill.

Hari Kari or Marta Hari?

We will not bore you with a description of the rest of the afternoon's activities except to say that they consisted of attending to intermittent faults on stereo units. These nearly caused us to commit Hari Kari (or is it Marta Hari, where you plunge a knife deep into a block of cheese).

Problems with a 1500

It was getting near closing time when an HMV mono set (1500 chassis) came in (all on its own, it just walked in) followed by its owner who had trained it well. He had just acquired it. Would we give it the once over?

Switching on produced a plain raster with no sound. This normally leads one to the i.f. transistors or the a.g.c. circuit of course. The a.g.c. amplifier transistor is VT3, which controls the second i.f. amplifier transistor VT5 which in

turn controls the base of the first i.f. amplifier transistor VT4 (no tuner a.g.c.). Checking voltages showed some funny readings of around 20V on the legs of VT4 and VT5, i.e. both saturated, and incorrect voltage at the base of VT3. VT3 is driven by the a.g.c. detector diode, which is fed from the slider of the preset contrast control in the emitter circuit of the first video transistor VT8. So we went on to VT8, where there was nothing at the emitter and very little at the base. The base bias is filtered by R30/C32 (see Fig. 1, page 40), and checking back we found nothing at the junction of R79/R136. R79 is the left-hand section of the dropper, and should have a value of 317Ω. It was open-circuit, leaving a high voltage at the input to the transistor supply line smoothing resistor R78. Fitting a replacement wirewound resistor restored normal voltages, but still no signals except for some short-wave noise creeping through the sound i.f. Checking through revealed that the fourth i.f. amplifier transistor VT7 was faulty. Replacing it restored sound and vision signals (this transistor often fails when the transistor supply line rises excessively after R79 goes open-circuit), but....

There was a nasty hum bar drifting up the screen, with the picture pulling and rolling. Check transistor supply line electrolytics. C58 proved to be faulty, not surviving the effect of R79 going open-circuit.

Replacing C58 restored near normal conditions, but on adjustment the local/distant tuner gain control R74 fell apart. A new one put us on the road again except for occasional picture roll, which as usual was cured by replacing R44, the upper resistor in the potential divider network feeding the screen grid of the 30FL2 sync separator.

All now seemed well except for an unpleasant smell which however proved not to be issuing from the e.h.t. tray but from the sewerage works across the river. The owner lacked transport, having come in a taxi. Would we phone for a cab? No taxi available at this time of the evening. Wait fifteen minutes. Then run him home, and his set. Reached the pub just in time to see Derek annointed.

Which Valves to Stock?

Peter Duncan

WITH valves no longer being used in current production TV receivers it is becoming increasingly important to decide what to keep in stock. The problems are roughly: which valves are worth laying in for future repairs, which ones aren't worth re-ordering, and which ones will probably never be used and should be stored out of the way?

The last two UK setmakers to produce hybrid colour chassis were Decca and ITT. The valves used in their final hybrid chassis are as follows: PCF802, PL509, PY500A, PCL86, PCL82, PCL805, PL508, PCF80. A set of these costs around £7·68 (based on the prices quoted by Bentley Acoustics in their August 1977 advertisement) and this represents the minimum stock required to be able to offer an efficient colour repair service. It seems to us that the future of any valve as a profitable spare is in some doubt if it's not one of these.

With the exception of Thorn, all UK setmakers started off by producing hybrid colour receivers. The additional valves required in order to be able to cater for these earlier colour chassis are as follows: PL504, ECC82, EF184, EF183, EF80, DY86/87, PCF805, PC97, PCL84, PL802, PFL200, GY501, PCF200, ECC81, PCC85, PCC88, EY51, PD500, EB91. Some of these are to be found in only the earlier, dual-standard chassis. The important ones are the PCL84, PL802 and ECC82. The Philips G6 chassis is still regularly encountered however and had a rather unusual valve line up. To be able to deal with these sets you'll need to have the following in stock: EF183, EF184, EF80, PFL200, PCC85, PCF200, ECC81, EY51, GY501 and PD500 – in addition to some of those listed in the second paragraph.

Service enthusiasts who worry when they cannot do an immediate repair to an old set requiring a replacement valve not in stock should relax: the RETRA code of practice allows up to fifteen working days for a repair, and valves can be obtained by return post from advertisers in *Television*. When ordering a valve specially for an old set it's wise to order a couple since new valves can unfortunately also be faulty. The cost of repairs carried out on old sets should allow for the fact that you may be left with valves that are unlikely to be used.

There is a belief that foreign sets are constructed with infinite care to stringent, all-transistor quality specifications and are thus absolutely reliable. Not so! Foreign sets do fail, and when you take the back off you may be surprised to find a host of good old unreliable valves. Depending on which makes you may handle, the following is a list of some of the valves you may require – we're not repeating the types so far listed.

Bang and Olufsen: 12HG7, PL84, EAA91 (an EB91 will do however), ECL84, PY88.
Telefunken: ECH84, PL519.
Saba: PL519, PL95, PC92.
Sanyo: 3BS2A.
Kuba Porta-Colour (also known as the Granada Colourette): PC900, PY83, 1AD2.
Teleton: 3AT2, 6GH8A, 8FQ7, 10GK6, 17DW4A, 17JZ8A, 21LU8, 31JS6A, 40KD6.

The odd balls are mainly in early Japanese sets, due to the American influence. Note that the PL519 is an up-rated version of the PL509 and may be stocked in its place. Unless specialising in the repair of foreign sets it's best to regard these valves as "special order" types and quote five-fifteen days for repairs.

When it comes to monochrome sets the situation is more difficult, due to the greater variety of valves that have been used in them. To appreciate this it's only necessary to think of the Thorn 1400 and 1500 chassis which used such valves as the 6F28 and 30FL2. Stocking up to be able to deal with an extensive range of monochrome sets can be expensive, though many of the valves used will already be in stock for use in colour sets. The following are the main valves required, in addition to those listed in paragraphs two and three, to be able to deal with most of the valved and hybrid monochrome sets produced since 1970: PY88, PY801, DY802, PL36, PL81A, 6F28, 30FL2, 30FL14, 30PL1, 30PL14, ECL80 and, if you deal with Grundig sets, the PL95 and PCH200. ■

It won't take you a minute . . .

Les Lawry-Johns

THERE are days when everything goes with a swing: there are others when you are on a roundabout which keeps bringing you back to where you started from. Not only do you get nowhere, but the damned thing starts going backwards and you end up hate filled, bitter and frustrated. Much like that ladybird I was watching the other day walking round and round the top of an empty bowl, not realising that it kept coming back to where it started. But then ladybirds can fly off and escape from that type of torture. For me there was no escape when that Hitachi monochrome portable arrived for its three day stay which I thought was going to be a couple of hours at the outside. You could call it a mother-in-law, and it behaved in much the same way.

A Good Start

It (the day) had started off quite well really: three colour sets polished off in minutes each. The first, an Ultra with a 3500 chassis, simply needed a red button cut-out because it had cut out and wouldn't come back. Twist, twist (the tabs), unsolder two leads, plonk the new one in and that was that.

The second was a Decca with the Bradford chassis. Poor focus, width o.k., check the resistors associated with the focus unit (two 4·7MΩ resistors, one from the tripler to the focus unit, the other from the unit to chassis) and find one high. Snip snip and Bob's your auntie.

The third was an ITT CVC5 with no sound (PCL86) and an initially rolling picture (PCL805). It doesn't happen very often like that but there they were, three in a row and I was smiling. Then in walked Stan.

The Hitachi Portable Arrives

"Just have a look at this portable will you, you did it a couple of years ago and it took only a few minutes, probably the same thing again. I'm going to have a haircut – collect it on the way back". Before I could think of a cutting remark he had gone, leaving his Hitachi P32 monochrome portable for me to wave my magic wand over.

Although there were several other things to be attended to I thought I'd try to oblige. Screw either side and two underneath, pull off the side contrast and brightness knobs and lift off the cabinet shell. Plug in aerial and switch on. Still tuned in as sound came on full strength, but no picture. E.H.T. o.k. Tube base voltages: first anode pin 7 o.k., grid pin 5 near enough right, cathode pin 2 high at 100V (should be about 54V).

Well that looks easy enough: video output transistor not drawing any current. Where is it? There, with a heatsink on it: check collector, 100V; base 2·5V; emitter 2V. Switch off and cold check the transistor. Reads right and as the base should be at 4·2V check back through the contrast control to the emitter of the video emitter-follower. Voltage low here too, and the base low at about 2V (should be 4·95V). Where does it get its bias from? Check bias network, having removed the screening covers (soldered on in several places) to get at the print. These and other components seemed to be blameless.

Some time had gone by and back came Stan. "Done it?" he enquired cheerfully. "No", I growled. "If you think it's that easy, do the bloody thing yourself".

Only the Sound's Slipped Out

"Don't be like that", said Stan. "It's only that the sound slipped out".

"Slipped out, slipped out", I croaked. "I suppose the picture slips in when the sound slips out?".

"Yes, that's right. The knob's probably loose", said Stan helpfully. This was too much for me. Putting the set back upright, I asked him to give me a demonstration. He turned the tuner knob slightly and the sound slipped out and some sort of picture slipped in. I clutched at a straw.

"You haven't just come back from a wine tasting trip to Germany have you, and had this thing seen to out there?"

Stan looked at me as if I'd gone loony.

"I don't drink wine if that's anything to go by, and I haven't been to Germany or Timbuktu, and if I had I wouldn't have taken this with me, so what are you on about".

"Never mind, I only thought . . . Oh well", I floundered.

I returned to the tuner. Tuned in correctly, there was no illumination on the screen at all. Detuned, the screen lit up and the sound naturally slid off. The possibilities were endless and my mind went numb. "Better leave it with me Stan, there's nothing easy about this one".

Stan departed, mystified that such a small thing could take so long to put right. He said he'd call in when he finished work on Monday evening, leaving us the weekend. When he had gone there were several other sets to see to before we could get back to the mystery. When we did get back to it however we didn't get very far.

The AGC Circuit

It was now obvious that when a full-strength signal was tuned in there was insufficient output from the detector to drive the video emitter-follower. Without an aerial at all, the set behaved itself and a grainy picture could be tuned in with almost normal sound. This naturally directed attention to the a.g.c. line, which was checked through bit by bit as the circuit (see Fig. 1) is not all that easy to follow from the manual. The two transistors appeared to be in order on a cold test, the capacitors had capacity, and the resistors were right. With the set on again, everything was in order! Therefore all the testing had been in vain, since the fault was not present. After some time however the picture started fluttering and back we were to square one. After some more fruitless checking we put it down until the next day.

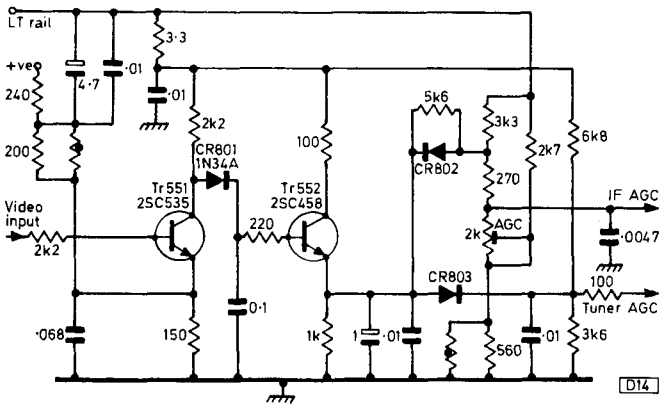

Fig. 1: A.G.C. circuit, Hitachi monochrome portable Model P32.

The next morning we started again. So did the set. Fine for a few minutes, and then the overloading started. Without turning off, we returned to the testing. Still the low detector output, so we worked back along the i.f. strip.

The a.g.c. applied to the first two i.f. stages seemed very small and varied little as the aerial was withdrawn. There was a good swing at the base of TR551, but not at the base of TR552. This directed attention to both transistors and CR801. The latter checked out o.k., and bearing in mind the fact that we had already had some hanky panky with the fault coming and going we replaced both transistors with BC107 types (for convenience) and were rewarded with a steady, unblinking picture with normal sound.

Many hours had been spent tracing this simple fault but there had been several interruptions to distract us. When Stan returned his comment was "I knew it wouldn't be very much. Fancy it taking you all that time to do it". Our reply was unprintable.

A Very Grainy Picture

Hardly had we sorted this one out when a Pye 180 arrived. Picture very grainy indeed, suggesting a poor aerial socket, or perhaps a defective tuner. This solid-state Pye monochrome set uses the same i.f. selectivity/gain module as the CT200 and the Philips 570 series. It's been a constant source of trouble, due to defective soldering to the capacitors and coils in the unit. We disregarded the tuner etc. therefore and without further ado set about removing the i.f. module. Using a solder sucker or desoldering braid, this can be done in a matter of minutes, so we soon had the suspect stripped out of its can.

There are several possible trouble spots with this unit, as we have mentioned before in previous issues. We always go straight to the components on the print, which are soldered on both sides. Lifting the small capacitors a fraction with the solder melted ensures that the legs get the solder and not the cement. This is normally all that is required, and once again this seemed so as a normal picture appeared when the unit was replaced. After twenty minutes however the same symptoms returned and the whole process had to be repeated, this time with lasting success.

A Rigonda Starlet

Then followed a long, involved tussle with a Rigonda Starlet 603. We do not normally handle these, but this set belonged to a close relative so with bad grace we got down to it. The complaint was that it would function for a time and then intermittently go off as though switched off.

As the owner was a first class poacher (not really, he does get permission from the farmer), I suggested that a nice fresh rabbit would come in handy, skinned and dressed of course. He readily agreed but complained that the rabbiting was not so good of late because his wife had been petting one of his ferrets. The result was that as soon as it was released at the rabbit hole instead of going down it would roll over on its back to have its belly tickled. This is not at all the idea, so until he could break the habit the catch would be reduced. I found this hard to believe because every ferret I've ever met seemed to have had but one desire, to bite my fingers off. Since these were very young ferrets however I presumed that they would develop their more ferocious habits later. Ah yes, the Rigonda.

Now these are made up in slabs which can be separately detached – top, bottom and sides. Since the power pack is at the bottom we removed the four screws and then the bottom slab. This gave us partial access, at least enough to confirm that although the supply voltages were reaching the base and emitter of the regulator transistor its collector was shutting down with monotonous regularity. At first sight the regulator looked very much like an AD149 or similar, except that it had three legs in the same configuration as the more common smaller drivers etc. Never to be accused of wasting an opportunity, we stuck a 10Ω dropper section between the emitter and the collector to bring it more into line with what we are used to. The thing then worked and regulated correctly. Remove the resistor and it reverted to its hysterical behaviour. Check the transistor and it read o.k. Replace the resistor and the thing worked for an hour with the resistor taking only a small amount of current.

I suppose the resistor kept the emitter voltage just that little bit over the base voltage so that the transistor continued to conduct, but the appearance of the control panel persuaded us not to argue with the other three control transistors over the matter. In our tattered nervous condition we did not feel inclined to delve deeper, so we replaced the power slab and called it a day, rabbit or no rabbit.

If it comes back I'll fit an AD149 and see if that cures the condition, but so far everyone appears to be happy.