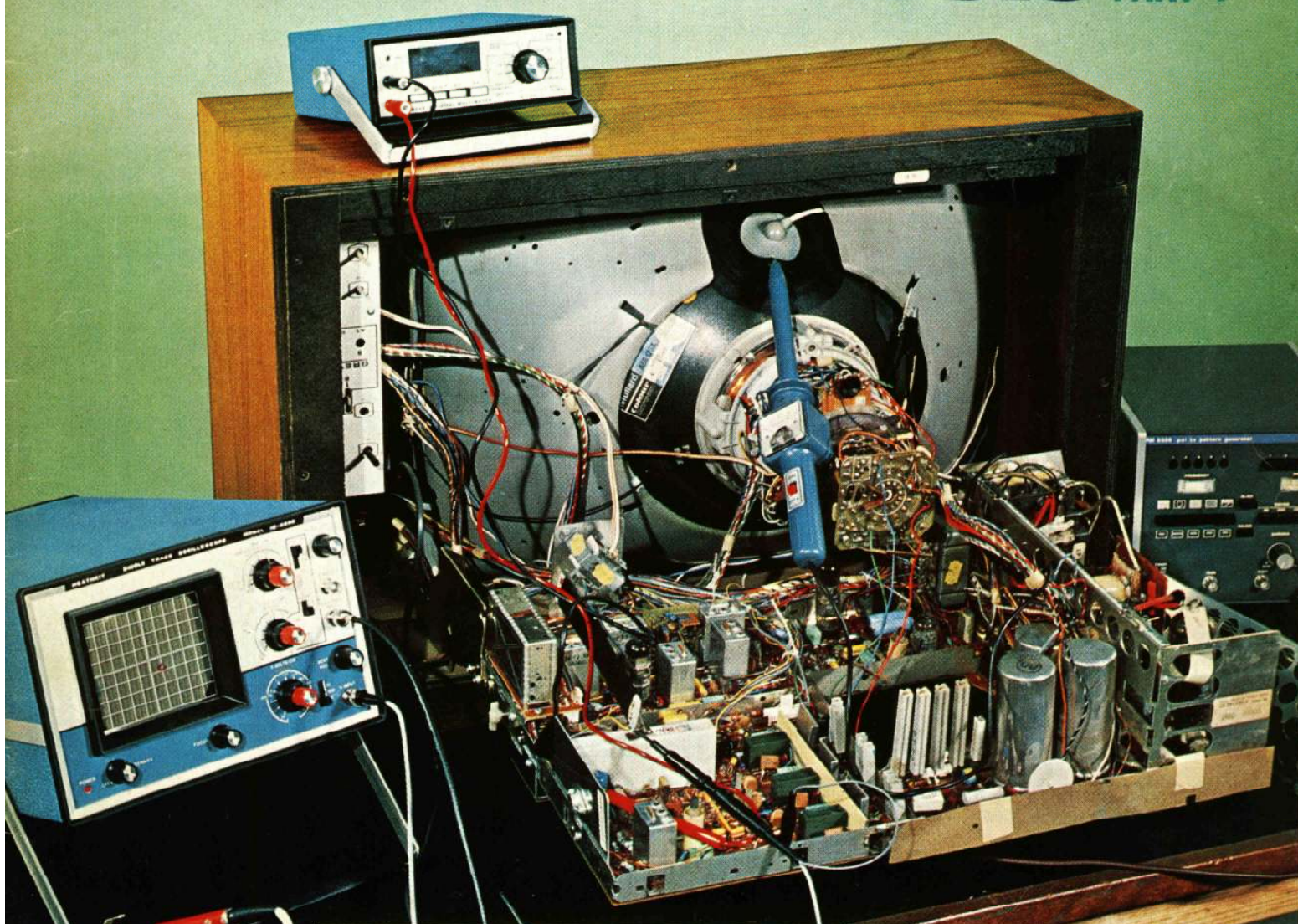# Television

NOVEMBER 1975

40p

servicing

The ITT CVC 5/7/8/9 COLOUR CHASSIS PART 1

also: SYNCHRONOUS DETECTION; SERVICE NOTEBOOK; BUSH TV300 FAULT GUIDE; AC THEORY (NEW SERIES)

Servicing the ITT CVC5, CVC5/8, CVC7, CVC8, CVC9 Chassis

PART 1   E. TRUNDLE

IN preparing an article of this sort it is very easy to give the impression that the chassis described is unreliable or troublesome. It should be made clear at the outset however that the ITT CVC5-CVC9 series chassis compare favourably with similar UK and European designs on the score of reliability, and it is the opinion of the author that the basic chassis is the best design yet to appear from a British manufacturer. The performance leaves little to be desired, and a well set up 20in specimen is capable of producing a picture as good as many higher-priced receivers. After several years of servicing these chassis however I have come across certain stock faults: these will be described together with one or two unusual failures.

With the odd notable exception, the majority of common failings have been eliminated by the makers in later production. One example of this is the problems experienced in the early days with polystyrene capacitors. These did not like the solder-bath operation and often became open-circuit, with harassing results for the service engineer. Later versions use different types of capacitor which have eliminated the problem.

Construction

The receiver is built on four main printed-circuit boards, which are not intended to be "swappable". The boards are mounted vertically on a steel framework which can be swung downwards to a horizontal or intermediate position for servicing. The design is hybrid, employing five valves in the timebases and sound stages. The varicap tuner is controlled from a bank of seven push-buttons – six touch-buttons in the case of the CVC7 chassis (Model FT100).

Tuning

The varactor tuner is mounted on its own printed-circuit panel, bolted to the main chassis. In early CVC5 chassis a large zener diode, type LZ36B (D11), is mounted near the tuner to stabilise the tuning voltage. Any tuning drift beyond the range of the a.f.c. action should direct attention to this component. The later TAA550 i.c. stabiliser is less prone to thermal drift but can also be responsible for wandering tuning. Note that the same replacements must be used, i.e. you can't replace an LZ36B with a TAA550 (equivalents ZTK33 or SN76550-2) or vice versa. Transistor T6 can also cause tuning drift.

The switch/potentiometer bank used mainly in the CVC5 chassis – recognizable by a separate tuning dial for each button – seems to have a limited life. Many have had to be replaced in sets between two and four years old. The

symptoms here can be misleading as, due to the high circuit impedance, one faulty track can upset the operation of the other buttons. Symptoms are sudden and large changes in tuning, and possibly intermittent flashing on the picture. Cleaning rarely works, but the manufacturers operate an exchange scheme on these units.

Sudden tuning changes can also be due to a faulty tuner, along with the more common tuner disorders such as noise. Repair of these units is not recommended, and an exchange scheme is again available. In the case of intermittent tuner problems it is worth checking socket A via which the tuner is connected to the main panel. Sometimes the socket pins are crimped over the wire's insulation. The cure is obvious.

Touch Tuning (CVC7 Chassis)

It is in the tuner area that the "Feathertouch 100" (CVC7 chassis) differs from the standard chassis. A fairly complex touch-switching circuit is incorporated. Random tuning drift without the illuminated station indicator changing state has been traced on several occasions to a leak in one of the hold-off diodes D1111-D1116. Inability to select one or more channels results from poor contact of the "fingers" which carry the trigger signal from the touch-button: the printed-circuit board should be pushed hard up to the touch-button panel before tightening the retaining screws. If the selector doggedly remains on channel 1, check that the 22MΩ resistor R177, on the print side of the board, is not adrift.

On one memorable occasion an FT100/CVC7 came in for repair with the complaint that it favoured button 2. Regardless of the programme selected, sooner or later the set would switch itself over to channel 2, and no amount of button-touching would make it budge. This is commonly due to surface leakage on the button-panel. The usual resort of cleaning the panel face thoroughly with methylated spirit had no effect on the fault however. After much fruitless investigation and soul-searching, the touch-panel was removed from the assembly and checked with a Megger. This revealed the mind-boggling fact that the plastic was conducting! A new touch-panel put matters to rights, but a permanent scar was left on this engineer's credibility.

Note that both the neutral and live sides of the mains are present on the top and back edge of this board – so care is required.

The IF Strip

The i.f. strip is a compact printed-circuit unit mounted vertically on the main board. Many inductors are printed
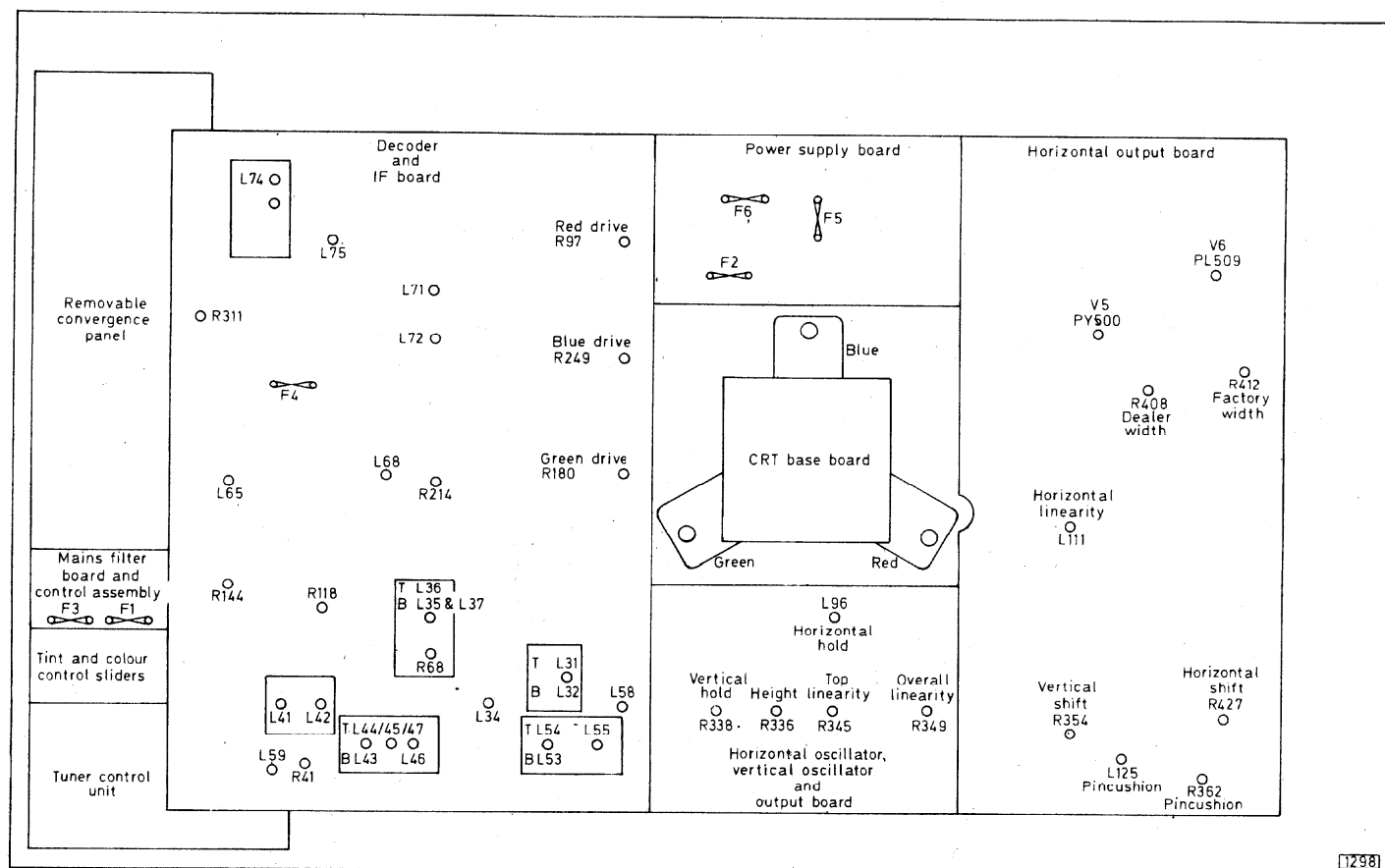
Fig. 1 : Rear view of the CVC5 chassis.

Decoder and IF board

L74
L75
L71
L72
L68
L65
R144
R118
R311
F4
L36 / B L35 & L37
R68
L41 L42
T L44/45/47 / B L43 L46
L59 R41
L34
T L31 / B L32 L58
T L54 L55 / B L53

Red drive R97
Blue drive R249
Green drive R180
R214

Removable convergence panel

Mains filter board and control assembly F3 F1

Tint and colour control sliders

Tuner control unit

Power supply board
F6 F5
F2
Blue
CRT base board
Green Red

Horizontal output board
V6 PL509
V5 PY500
R408 Dealer width
R412 Factory width
Horizontal linearity L111
Vertical shift R354
Horizontal shift R427
L125 Pincushion
R362 Pincushion

L96 Horizontal hold

Vertical hold R338
Height R336
Top linearity R345
Overall linearity R349

Horizontal oscillator, vertical oscillator and output board

1298

and not adjustable. The flatpack transistors used for T13-T17 can give rise to many strange symptoms. Intermittent faults in these can usually be located with, the aid of a freezer aerosol and gentle heat from a hair-dryer. More reliable substitutes are BF197 for T13 and T17 and BF196 for T15 and T16. Poor print joints in this area usually occur at the junction points of the conductors on the i.f. board with those on the main panel. The printed conductor from R118 to T14 base seems prone to hair-line cracks, causing grainy pictures unaffected by the setting of the tuner a.g.c. control R118. We have found that a piece of 5A fuse wire bypassing the board joint and printed track in this area is the best solution.

Access to the print side of the i.f. panel is poor, but the entire i.f. unit can be replaced at reasonable cost. (Eliminate the a.g.c. department first however — details later.) When replacing this board, RS Components' desoldering braid has been found more effective than the use of the solder-pump type of tool. T13 is more often the cause of low i.f. gain than the other transistors.

Sound Faults

The sound i.f. amplifiers are T8 and T9. Sound i.f. troubles are occasionally due to T8 failing, but in the majority of cases the problem lies in the sound detector can — D14/15, T9 and the 6·8μF capacitor C68 being the most common causes of faults here. Later models use an i.c. in the sound can: this has proved most reliable provided L35 is correctly tuned.

The early discrete type detector assembly is no longer available. If this type has to be replaced by the i.c. version (part No. 32-517) the drill is to remove T8 and resistors R60 (4·7kΩ), R61 (39kΩ), capacitor C61 (0·001μF) and the sound discriminator assembly. Fit a wire link from T8 collector hole on the board to the centre tap on L34 which

is the coil end of the capacitor C61 previously removed. The new assembly can then be fitted in place of the old can.

The audio output stage is conventional and reliable. If the cathode resistor R82 is burnt, replace the PCL86 which will usually have developed internal leakage. Where R82 is provided with brass stand-off sleeves, dry-joints to the printed board can occur. The sleeve is invariably soldered but often the resistor leg is not, leading to intermittent crackles and distortion. Replacement of C78 (50μF) is wise in these circumstances. Mysterious absence of sound can be due to a faulty "silent warm-up" circuit. The voltage which brings the audio channel into operation once the line output stage has warmed up comes via R413 and R409 from the boost rail.

Mains hum on sound, most noticeable at low to medium volume levels, is due to a hum loop being set up in the screened lead to the audio amplifier. Ensure that the earthy end of the volume control is connected only to the leads' braiding and not to the metalwork of the control panel. It sometimes happens on CVC8 series chassis that the braid is badly crimped at pin 6 on socket P on the main printed-circuit board. The effect is sudden bursts of full volume, regardless of the control setting. A blob of solder on the braid/socket connection will prevent this.

Occasionally the symptom of distorted sound at low volume crops up. As with most equipment, an off-centre speech-coil in the loudspeaker is the usual cause of this.

AGC Faults

Absence of signals should — assuming the power supplies are correct — lead to a check of the voltage across C114. A negative voltage here greater than about −1·1V (with signal) indicates a.g.c. problems, T41 often being the culprit. The slightest leak in the gating pulse diode D45 will
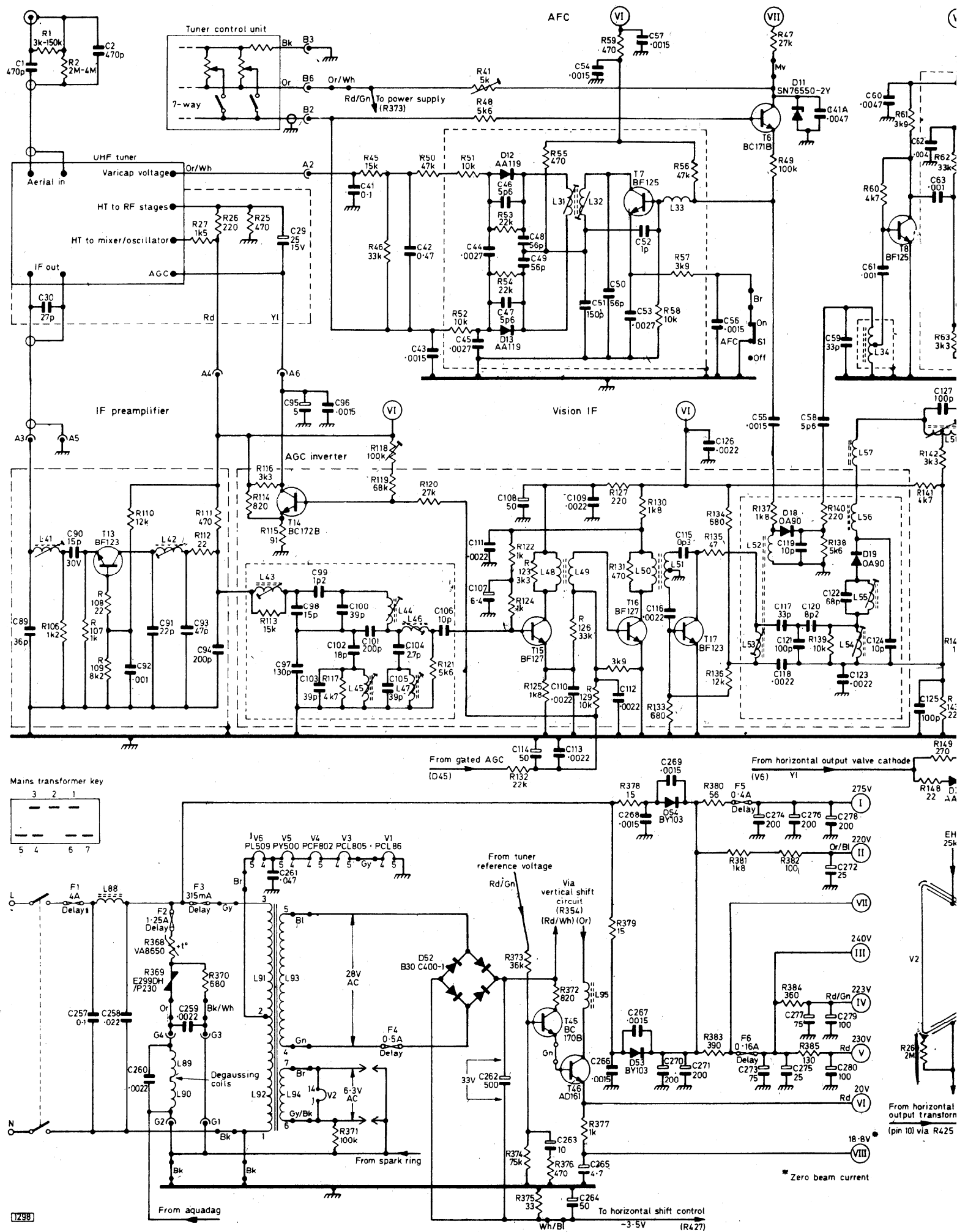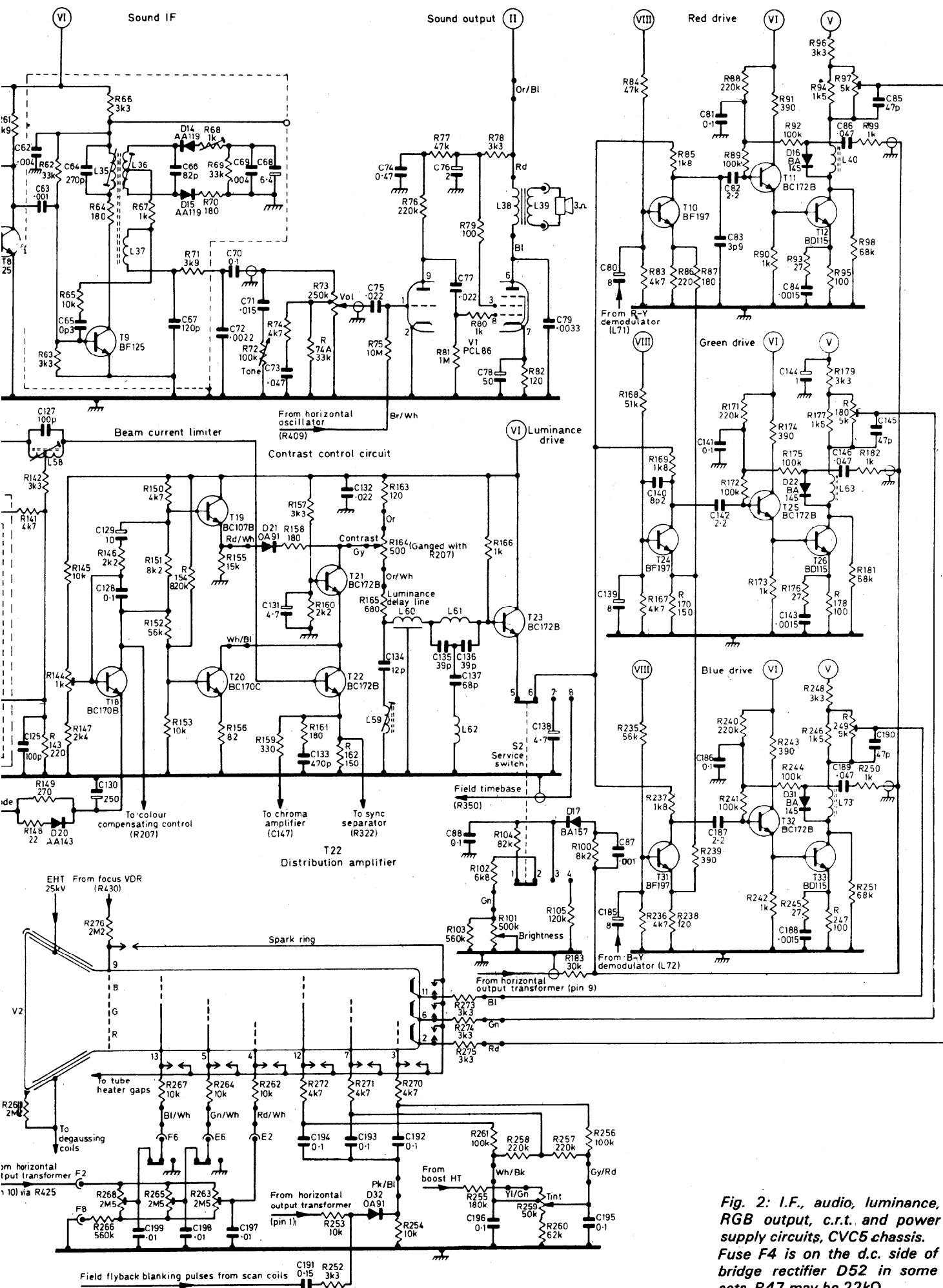
Fig. 2: I.F., audio, luminance, RGB output, c.r.t. and power supply circuits, CVC5 chassis. Fuse F4 is on the d.c. side of bridge rectifier D52 in some sets. R47 may be 22kΩ.

"He's come to deal with sets fitted with Thorn's Syclops circuit."

upset the a.g.c. operation. The only sure check is substitution. Another possibility to bear in mind is C235 going open-circuit. One or two cases where the signals have disappeared after the set has warmed up have been traced to T41 being leaky. C114 being leaky when hot can cause darkening on the left-hand side of the screen.

Contrast/Brightness Variations

Variation in the contrast level can be due to D45 having a high forward resistance. A common complaint, varying contrast/brightness level, is generally due to a dry-joint at R423 in the line output valve cathode circuit. This is easily missed as the stand-off sleeves are well soldered but the resistor legs may not be making contact. Careful probing will often prove the point.

Loss of Luminance Signal

Complete or intermittent loss of luminance signal, with sound and chrominance intact, is commonly due to poor soldering on the luminance delay line where the fine coil wire is terminated. Like most of the coils in this receiver, the line is wound with "solder-through" enamelled wire which is recognizable by its bright red colour. Plenty of heat and solder is required to tin the lead.

Excess Contrast plus Psychedelic Colour

Faults in C131 (4·7μF tantalum) lead to over-contrasted pictures with bizarre psychedelic colour effects. This symptom often occurs when the set has warmed up, and can culminate in complete loss of luminance and chrominance. A squirt of freezer on C131 will confirm the diagnosis. This fault can occur only in the CVC5 and CVC7: the CVC8 and CVC9 chassis have a different circuit altogether at this point.

Chrominance Channel

T27 and T28 are the chrominance amplifiers, the a.c.c. voltage being applied to T27 base. C151 smooths this feed, being one of several small tantalum capacitors dotted around the chrominance amplifier area: all of these are prone to trouble which is often temperature-dependent. This leads to intermittent colour drop-out or desaturation. In the case of decouplers such as C153 and C155 or the smoothing capacitor C162 the quickest check is with an

oscilloscope: an open-circuit capacitor will be found to have a chrominance signal across it. Intermittent colour drop-out can also be due to C156 or C158 where these are polystyrene capacitors. Low saturation can be due to a leak in C265 in the power supply circuit (CVC5, CVC7 chassis), see later.

Saturation control is effected by a novel bridge arrangement around L67, the centre-tap of which is earthed, the inductor thus forming two arms of a bridge. When the capacitances of D23/D24 and C160 are equal the bridge is balanced and C161 receives no chrominance signal. As the saturation control is advanced, the varicap diodes D23 and D24 become progressively less back-biased: the resulting increase in their capacitance unbalances the bridge thus passing a controlled amount of chrominance signal to C161. The trimmer C160 is normally set for zero colour at minimum setting of the saturation control. Sudden lapses of the picture into reversed (complimentary) colours is often traceable to a faulty or mis-set trimmer. The delay-line driver stage around T29 gives little trouble apart from the tantalum capacitors C162 and C165. In early versions C161 was a polystyrene type, and suffered from intermittent open-circuit.

Reference Chain

Turning now to the reference chain, the burst gate stage (T34) is quite reliable apart from C200 (0·001μF) which is rather fragile and can go open-circuit for mechanical reasons, thus removing the colour. If the burst filter can assembly has to be replaced be sure to specify the chassis type when ordering since the polarity of D34 and D35 is reversed between the CVC5/7 and CVC8/9 chassis. The wrong can causes the reference oscillator to lock 180° out of phase, resulting in complementary colours and demented service engineers!

T38 has two functions, that of d.c. amplifier of the control voltage applied to the varicap diodes D42 and D43 and also subcarrier oscillator. It must be replaced by the specified type, i.e. BC172C or BC109. The error potential source in the burst filter circuit is of high impedance, and the smallest amount of leakage in the associated components can play havoc. It is our practice to replace C208 (6·8μF) and the 1·5V zener D36 in cases of wandering oscillator frequency. The crystal itself can also cause this, often obligingly drifting about under the influence of gentle heat or freezer. The oscillator capacitors C228 and C231 and amplifier tuning capacitor C232 were of the notorious polystyrene (see-through) type on early versions, resulting in intermittent shutdown of the oscillator and thus no colour. Another cause of reference oscillator shut-down or incorrect frequency is imbalance between the phase detector diodes D34 and D35. Replacement of any components in the burst filter or crystal oscillator circuits should be followed by realignment of the a.p.c. loop as detailed in the manual.

Ident and Bistable Circuits

In the absence of colour, the killer may be over-ridden by linking the 20V rail to the top of C162 via a 12kΩ resistor. If this results in locked but not necessarily correct colours the chances are that the ident stage (T35) output is low. The ident tuning is critical for correct killer operation, a peak-to-peak voltage of at least 12V being necessary at T35 collector. If retuning L75 for maximum voltage at D37

cathode restores normal operation, C215 (0·015μF) should be suspected. Again, a high-gain transistor is called for in this (T35) position, a BC172C or BC109 being the only suitable replacements.

The bistable circuit operates only when a colour signal is present. D37 then rectifies the ident signal, producing a positive voltage across C218 to prevent the negative-going pulses fed into the circuit via R310 and C223 passing through D38 to the base of T36 — the line-by-line triggering pulses are positive-going and are fed to the bases of T36 and T37 via C222 and C226 respectively. On monochrome the negative-going pulses switch T36 off and its high collector voltage is applied via R301 to T37 base so that it is held conducting. The purpose of this arrangement is to provide the colour-killer action. On colour, when the bistable is active, the square waveform at T37 collector is smoothed by R205/C162 and used to bias T29 on. Thus failure of the bistable to switch, due say to one of the transistors, or if C162 is defective there will be no colour.

Under certain circumstances, the bistable can operate erratically, showing on a 'scope as "hiccups" during the line period. The effect on the display is dotted red and green vertical lines about half-way across the picture, showing up best at low settings of the brightness and contrast controls. This baffling symptom can be eliminated by replacing C220 and C225 with 68pF ceramic capacitors.

A fault that has cropped up on some receivers of recent vintage is leakage in D40 which couples the ident signal to T37. This upsets the mark-space ratio of the bistable, the effect on the display being a transition from correct to complementary colour of any chroma signal with a V component. The switching characteristic depends on the severity of the leak, so that the "green/red bar" may occur on either side of the screen. Fortunately the diagnosis is simple. The effect can be moved across the screen at will by manipulation of the ident coil L75. The leakage in D40 is not always discernible on an Avo check and substitution is thus recommended.

Colour Confetti on Monochrome

A problem which often crops up in readers queries is colour confetti sometimes seen on monochrome transmissions. The killer circuit can be simply desensitised by interchanging R196 and R197 in the decoder. In persistent cases, reduce R309 (47kΩ) to 22kΩ.

Faint Green and Magenta Striations

Before leaving the decoder, mention should be made of a fault which is present in a few chassis produced around 1972 and seems to defy diagnosis. It takes the form of faint green and magenta vertical bars extending across the full width of the screen and mainly visible on low-key scenes. This is a manifestation of the harmonic ringing of the line output transformer and is due to stray pulse pick-up in the decoder. If you meet this problem, check the phasing of the subcarrier traps L71 and L72 towards the top of the decoder board. The direction of winding should be clockwise when viewed from above. Other contributory causes of this symptom are faults in the 20V line decouplers in the decoder. These are C219 and C152, both 8μF. Finally, ensure that the leads to the convergence box are dressed tight against the degaussing shield, and that the green lead to the base of T46 (AD161) is dressed well away from the r.f. filter choke L95.

CONTINUED NEXT MONTH

PART 2

E. TRUNDLE

RGB Stages

Up to this point the main chassis of the CVC5, CVC7, CVC8 and CVC9 have differed little from each other, but whereas the CVC8 and CVC9 use a pluggable i.c. (type MC1327P) for colour demodulation and matrixing – this is fairly reliable and easily checked by substitution – the CVC5 and CVC7 use discrete component circuitry in this area. The large 2·2µF couplers C82, C142 and C187 which dominate the decoder board are very prone to dry-joints. The solder-blobs often look innocent, but the capacitor lead-out wire may be found oxydised and not making contact. The result is intermittent tinting and loss of a colour-difference component at erratic intervals.

Other problems in the RGB drive stages are usually confined to the demise of the output transistors T12, T26 and T33. Several types have been used in the past in this position – BD115, BD150, E1617 and BF337. We always use BF337s for replacement purposes. On rare occasions one of the driver transistors T11, T25 or T32 may be found faulty.

The BA145 (BY206) clamp diodes D16, D22 and D31 occasionally become leaky, the degree of tinting of the picture depending on the severity of the leak. A surfeit of one primary colour is occasionally due to one of the 100kΩ stabilizing resistors R92, R175 and R244 going high-resistance.

The RGB drive potentiometers R97, R180 and R249 have been known to go open-circuit (cracked track or slider not making contact). After a bout of this trouble some three years ago however we have had very few cases.

Later Models

The RGB drive arrangements in the CVC8 and CVC9 are quite different. We have found that the 560pF mica capacitors C84, C145 and C188 are physically rather fragile. If a lead-out wire breaks away from the body, or the capacitor splits in half (it happens!), the result is impaired bandwidth of the channel concerned, leading to a slight "smearing" effect of that colour. The result resembles a convergence fault at first sight.

Excessive Brightness

Excessive brightness problems on the CVC5 and CVC7 can often be resolved by replacing of R183 (30kΩ). The same symptom accompanied by an increase in height is usually due to D57 (OA91) being open-circuit. This applies to all chassis.

Beam Limiter Faults

Most beam limiter troubles stem from defective soldering of R423, mentioned earlier in connection with varying contrast/brightness level. A mysterious no colour symptom with the decoder functioning normally can be caused by a fault in the beam limiter circuit, the lack of contrast being less obvious than the almost complete lack of colour. The fault can be due to one of several components in the T18 area but is easily traced using a multimeter.

The beam limiter preset control is R144 in the CVC5 and CVC7 chassis, R169 in the CVC8 and CVC9 chassis. The adjustment procedure is as follows. Turn the brightness and contrast controls to minimum and measure the voltage at the cathode (pin 9) of the PL509. In the case of the CVC8/9 it may not be possible to turn off the picture if the mains supply is low: in this case remove the RGB drive connections to the c.r.t. before measuring this voltage, but reconnect them before making the next voltage measurement. With the CVC5/7 turn the contrast control to maximum and the brightness control to mid-travel; with the CVC8/9 chassis turn both controls to maximum. Then adjust the preset until the voltage at PL509 cathode is 0·95V higher than the reading initially obtained.

Power Supplies

The mains filter capacitors commonly go short-circuit, resulting in a shattered 4A fuse. These 600V capacitors (C257 and C258) are best replaced using 1,000V types which are more reliable. Sometimes the leak is not apparent on an ohmmeter test. The other fuse-detonator, a short-circuit h.t. rectifier (D53 or D54), will be obvious on a continuity check. A BY127 is a satisfactory replacement.

In a few early models the multisection electrolytic C271/3/5/6 had the reprehensible habit of developing a hole in its seal. The resulting highly corrosive tears wrought havoc on their long and sorry route to the bottom of the chassis. If you have the misfortune to encounter this state of affairs, the drill is to wash the printed panel thoroughly with methylated spirits, replacing plugs C and D if necessary together with the offending smoothing block.

The l.t. rectifier D52 may be an encapsulated block (type B30C400-1) or a metal device (type CSD11-8XLZ). Neither of these is particularly reliable and if replacement is required the adoption of four separate silicon diodes (type 1N4001) as fitted in production on the CVC8 and CVC9 is recommended. If D52 goes short-circuit F4 blows of course. If D52 is leaky the resulting ripple at 50Hz

Fig. 3: Circuit diagram of the decoder. An MC1327P i.c. is used for colour demodulation and matrixing in the CVC8 and CVC9 chassis. The circuit changes involved will be shown next month.
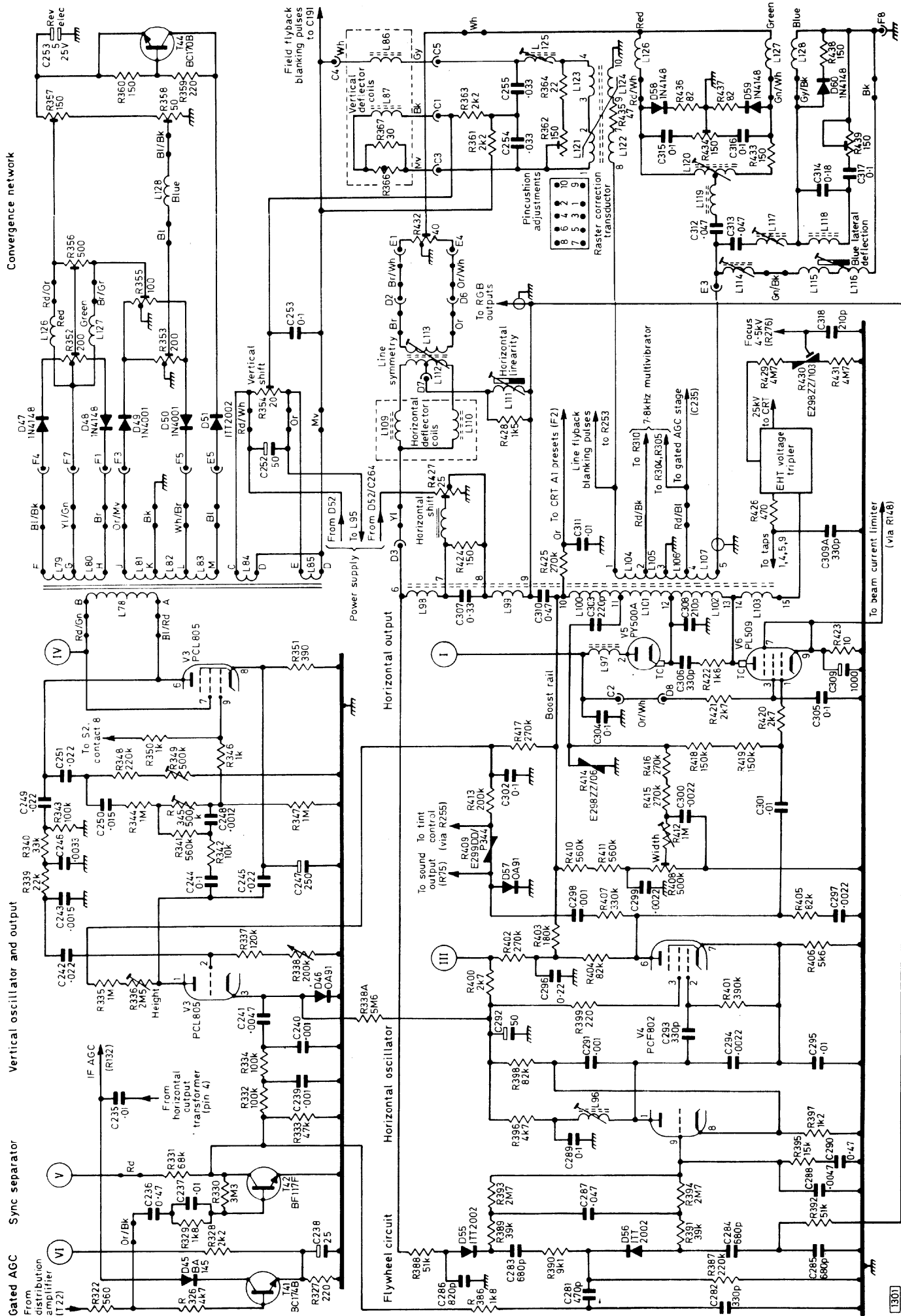
Fig. 4: The timebase and convergence circuits.

produces a single hum-bar on the screen. 100Hz ripple – a double hum-bar – is often caused by a leaky l.t. regulator transistor T46 (AD161). The same effect is sometimes due to a fault in the 10μF tantalum capacitor C263. Again, the symptom can be caused by a leak or low capacitance in the 500μF reservoir capacitor C262, but this is comparatively rare.

The reference for the 20V regulator circuit is derived from the varicap supply stabiliser D11. If this diode develops a fault, hum and voltage variations on the 20V line can result. Long before this stage is reached however the intolerable tuning drift usually calls attention to the diode (or i.c.) D11 anyway.

Lack of saturation can be caused by C265 being leaky since the 18·8V line falls reducing the supply to the colour-difference amplifier stages (this fault applies to the CVC5 and CVC7 only since as previously mentioned the demodulator and following RGB circuitry used in the later chassis differs). If either C262 or C263 is sufficiently leaky the 20V line will fall possibly leading to no sound or vision.

No Sound or Raster

A point that could mislead those who are not used to the type of RGB circuitry used in these chassis is that when the 20V supply is absent – due mainly to D52 going short-circuit and blowing F4, or occasionally to T46 going open-circuit – the symptom will be no sound and no *raster*. This is because the RGB output transistors are left without any base bias, their high collector voltages, d.c. coupled to the c.r.t. cathodes, back-biasing the tube.

The Field Timebase

It is a source of wonder to us that the necessary deflection power for a 90° thick-neck colour tube can be squeezed out of a PCL805. In spite of this, the mortality rate of the device is no greater than in monochrome receivers. A short-circuit in D46 (OA91) will lead to loss of field sync: if the diode goes open-circuit, the field scan collapses: if it is leaky, there will be poor interlace and a tendency to rolling. If the field frequency takes some time to settle down from cold, the valve should be replaced. A faulty cathode decoupler (C247) can cause the usual effects of bottom cramping etc. but has also been known to cause weak field sync without substantially affecting the linearity. This is one to be on guard against.

Field jitter with varying linearity can usually be traced to R344 (1MΩ) in the feedback loop. Less often the same symptom can be caused by leakage in C248 (0·0012μF) or C250 (0·015μF). A dud spot on the height control can cause spasmodic height variation. Intermittent field collapse has been traced to a dry-jointed or open-circuit R340 (33kΩ). C242 occasionally goes open-circuit with the same result.

Insufficient height is usually due to R417 (270kΩ, 2W) going high-resistance; in severe cases the sound is affected via the "silent warm-up" circuit. This component is buried at the bottom of the line timebase board, inside the line output compartment cage. Long pointed pliers and considerable patience are essential when replacement is attempted. Field bounce has also been traced to R417.

An eerie mechanical buzz at field rate sometimes emanates from C253. We replace this with a 400V polyester capacitor from the RS components range.

CONTINUED NEXT MONTH

Servicing the ITT CVC5, CVC5/8, CVC7, CVC8, CVC9 Chassis

PART 3

E. TRUNDLE

No Sync

Loss of both syncs is likely to be caused by the sync separator transistor going short-circuit. This is T42 on the field panel. It is a high-voltage type and must be replaced with a similar type, e.g. BF117F or BF137F. Spasmodic field roll on change of camera etc. can be due to R330 (3·3MΩ); it is more commonly caused by D46 however.

Line Timebase

The line oscillator with its detector and reactance stage can be the source of several faults. If line hold troubles are encountered, earth pin 9 of the PCF802 valve and adjust L96 for vertical floating lines. If the line oscillator does not lock in when the shorting link is removed the trouble is in the phase detector. While the discriminator diodes D55 and D56 can be responsible, the polystyrene capacitors C281-C286 are more often faulty. We usually replace all six when this trouble is encountered. Any unbalance between R388 and R392 (51kΩ) or R393 and R394 (2·7MΩ) causes an assymetrical pull-in range.

If the 400mA fuse F5 on the CVC5/CVC7 chassis or the fusible resistor R380 on CVC8/CVC9 chassis blows erratically and for no apparent reason the cause is often a lazy line oscillator failing to start up. C294 (0·0022μF), C295 (0·01μF) and C291 (0·001μF) were polystyrene types in early chassis and should be replaced on sight! Ceramic capacitors are unsuitable here. Polystyrene or polyester capacitors are sufficiently stable for replacement purposes, but avoid RS components' polystyrene types which are rated at only 125V. The other suspects for a sleepy oscillator are the 330pF ceramic capacitor C293 and the oscillator coil itself, L96. In the latter case, zero voltage at pin 1 of the PCF802 makes the diagnosis easy. Resoldering the fine coil wire to the leadout pins will do the trick. A dry-joint at R400 has also been known to cause the trouble.

The line drive feed to the PL509 follows a long and roundabout route. Lack of drive (often intermittent) is sometimes caused by solder blobs or hairline cracks along the way.

The 210pF tuning capacitor C308 (mounted on the line output transformer subpanel) often becomes short-circuit with some charring. The 400mA fuse (CVC5/7) or 56Ω fusible (CVC8/9) soon puts the PY500 out of its misery. The boost reservoir capacitor C310 (0·47μF, 1kV) sometimes goes short-circuit with identical results.

The line output transformer itself is quite reliable, and the occasional failure is usually obvious from burn-marks on the winding.

A mystifying symptom is a plain distorted raster with vague red and green curved vertical lines. The fault is as difficult to diagnose as the effect is to describe, and is due to R422 being dry-jointed or, more commonly, the four earth tags on the line output transformer being dry-jointed to their subpanel. This lifts one or more of C308, R414 or transformer pin 3, which depend on the transformer frame for an earth-return, off earth. The effect is often intermittent. A similar situation can develop on the earth tags of the steel cage around the line output compartment. Symptoms vary, but a series of loud cracks immediately after switching off is the most usual. A beefy soldering iron is called for here.

Apart from the usual symptoms, a burning R426 (470Ω) is a sure sign of a faulty tripler. Renew the tripler and replace the resistor with a similar (1W composition) type. The 8kV lead from the line output transformer overwinding to the tripler can arc to the cage top due to disintegration of the plastic retaining strap. Shortening the lead is the best remedy.

Focus drift is usually due to the resistors associated with the focus v.d.r. R430 going high-resistance. These are R429 and R431, both 4·7MΩ. If oxide type resistors are used as replacements they will be found more reliable. Constant focus adjustment can lead to a copper deposit building up on the v.d.r. A moments thought will confirm that rotating the v.d.r. to find a different track area will not work. Clean off the deposit with emery cloth. Occasionally, focus tr >ubles are caused by the tripler itself or by R276 (2·2MΩ on the c.r.t. base panel) going high-resistance. This resistor must be mounted clear of the board and not pushed over.
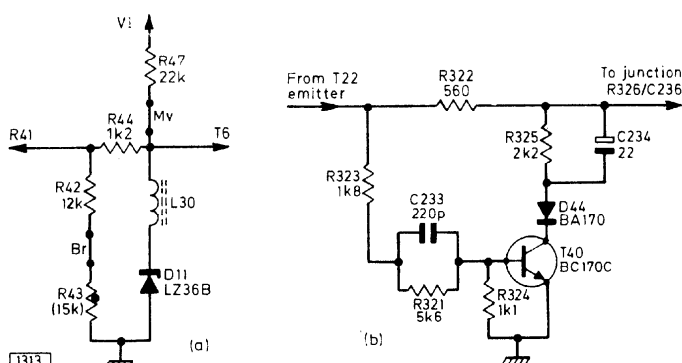
Fig. 5: Early versions of the CVC5 chassis used the tuning voltage stabiliser circuit shown at (a) and the noise gate shown at (b).
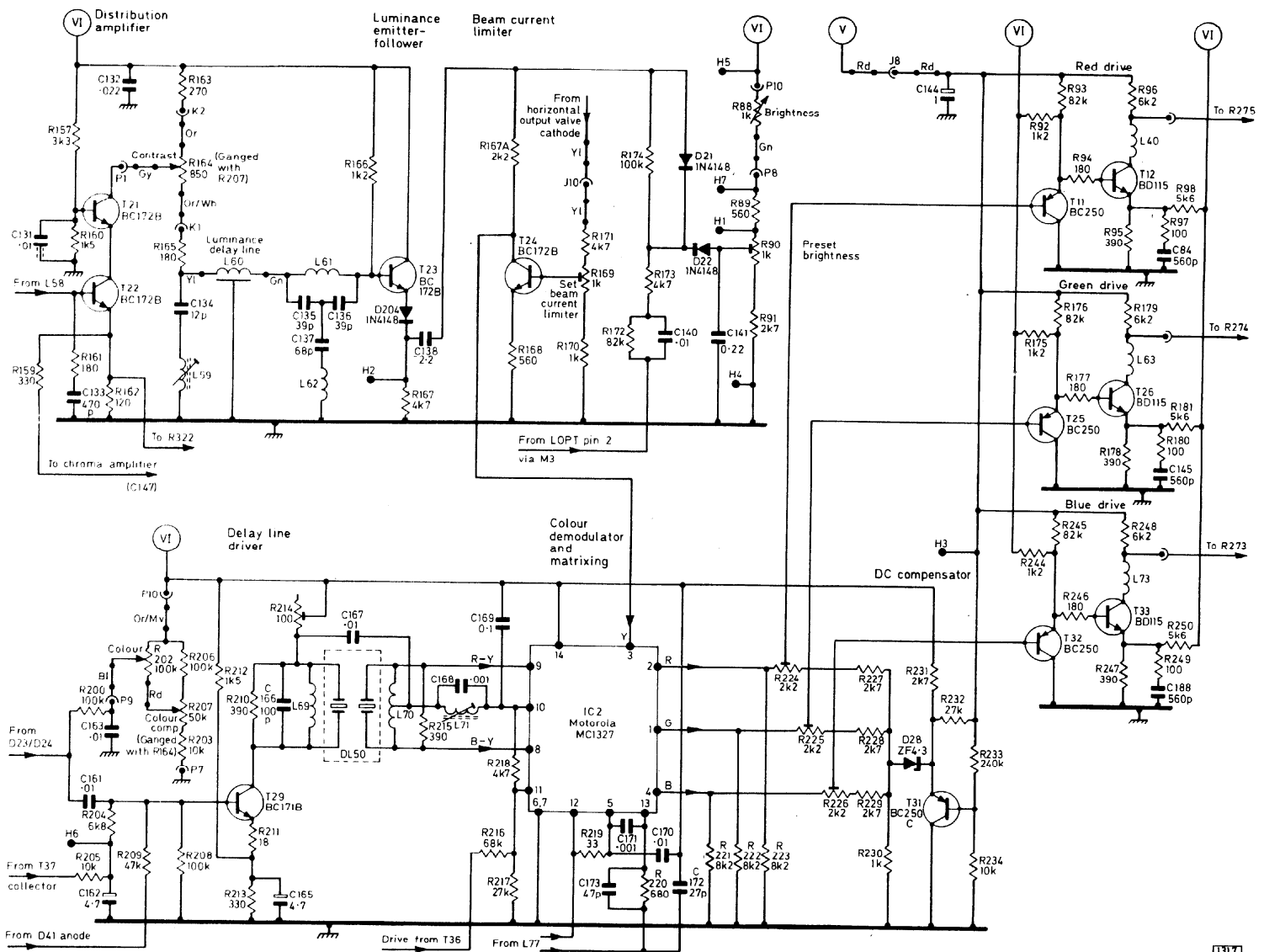
Fig. 6: Modified decoder and RGB circuitry employed when an MC1327P i.c. is used for colour demodulation and matrixing, and PAL switching. The subcarrier amplifier circuit is modified as follows: there is no tap on L77, and the feedback to the detector diodes D34/D35 is from a tap on L76 via C211 with C210 and R286 deleted.

Fig. 7: Power supply and degaussing circuit used in the CVC8 chassis. In the CVC9 chassis F3 is replaced by a thermal cut-out and a pair of BY133 h.t. rectifiers may be used as in earlier sets with two BY103 h.t. rectifiers.

Fig. 8: (a) Intercarrier sound i.c. circuit used in later production. (b) Later a.f. coupling circuit.

Fig. 9: Connections to Plessey deflection coils.

Fig. 10: Connections to Plessey convergence coils.

L117 having too little range, can be caused by C313.

Other troubles in this area are usually confined to hairline cracks on the c.r.t. first anode preset potentiometers (R263, R265 and R268, all 2·5MΩ). This leads to grey-scale drift.

Purity Faults

Purity troubles due to a faulty degaussing circuit are extremely rare though not unknown. If R368 is defective the fact will be revealed by its appearance. More often R370 gets severely damaged, the symptom being pretty patterns which move slowly up or down the display.

The CVC9 Chassis

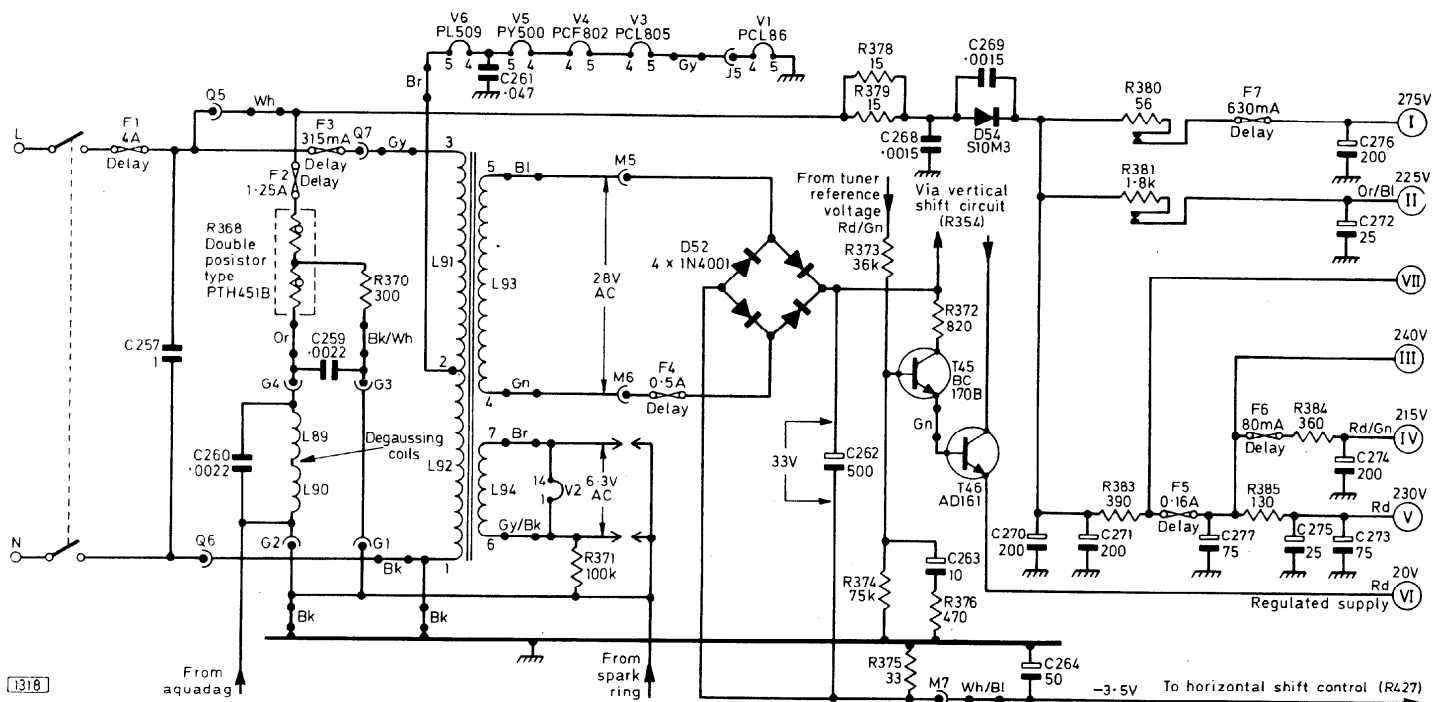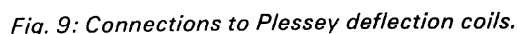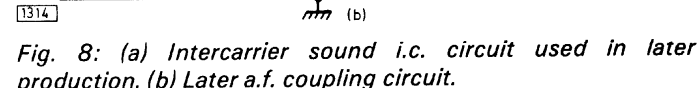At the time of writing, the CVC9 chassis has been introduced only recently. It is a development of the CVC8 incorporating modifications to meet BEAB requirements and also to allow greater flexibility in the choice of tuner control units. The touch-tuned version contains no less than ten fuses, which must be a record.

From the servicing viewpoint, replacement of any BEAB specified component must be made with an ITT-approved part, and these components must be fitted in the same way as the originals.

Apart from a sprinkling of fusible resistors, most of the circuit changes concern the circuitry around the tuner. The 32V stabiliser i.c. is fed via a lower value resistor than on earlier chassis (R47 is 18kΩ), and the resulting high bleed current is excessive for a TAA550 i.c. The ZTK33B (ITT) and SN76550-2Y (Texas) are suitable.

Two variants of the CVC9 will be encountered. The touch-tuned version has five illuminated touch-buttons in a spring-out drawer. Two i.c.s are used in the selector circuits, which are altogether less complex than the earlier (CVC7) arrangement. The tuner assembly for use with this arrangement is not interchangeable with the rest of the CVC5-CVC8 series, having a different component layout on the printed tuner mounting board.

The second type uses a conventional tuning bank (square buttons, as on the CVC8). The wiring of the control unit is different from the CVC8 however, and the units are not directly interchangeable.

A further point to note is that the new breed of Mullard varicap tuners have higher resistance trimming potentiometers. To date we have had no problems when fitting the earlier type of varicap tuner unit to the CVC9.

The line linearity coil damping resistor R428 is a generously rated wire-wound component and vertical striations on the left of the display due to its failure are much less common than on other makes of receiver. Other possible causes of this fault are C305 or the network R422, C306.

R424 has been known to become open-circuit causing great discomfort to the scan-correction capacitor C307. More commonly it becomes dry-jointed after prolonged use, leading to arcing and line jitter. A bad burn hole in the printed circuit board can result. The best course is to remove the charred section of the board altogether and fit a paxolin patch — it is hoped to enlarge on this method of board repair in a later article. Note that both R424 and R422 must be mounted clear of the board — a gap of 10mm is recommended.

Convergence Board Faults

Faults on the convergence board are rare. If red-green convergence down the vertical centre line cannot be achieved with the appropriate controls one of the diodes D47-D50 inclusive is usually responsible. If double encapsulated types are found, D47 and D48 may be replaced with two 1N4148 diodes and D49, D50 with two 1N4001 diodes. Difficulty with blue convergence, with

Conclusion

In conclusion it should be pointed out that the foregoing is the distillation of over five years spent servicing many hundreds of these receivers. Unless you are very unlucky, the average specimen will contain very few faults. The chassis is very accessible in the main, and fault diagnosis relatively easy. ∎