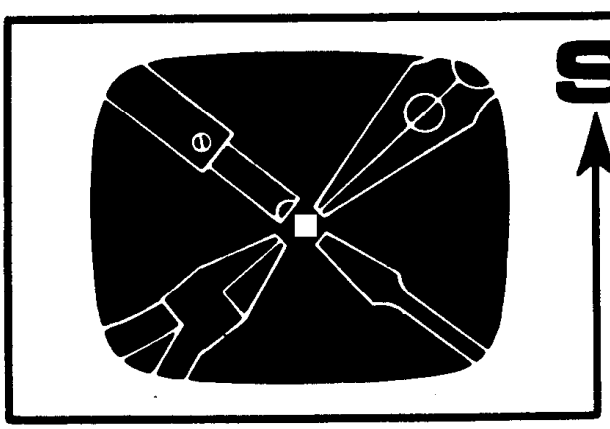


SERVICING television receivers

L. LAWRY-JOHNS

BRC 1580 CHASSIS

THE **Ferguson** 3805 and **Marconiphone** 4805 are mains-operated portables using the hybrid (i.e. with valves and transistors) BRC 1580 chassis. This distinguishes them from the later 1590 series which although of similar appearance uses an all-transistor circuit suitable for mains or battery operation. The 1580 chassis is designed for use on u.h.f. only and has a four push-button tuner (type T20) similar to that used in later versions of the 1400 series. Two transistors are used in the tuner and nine on the main panel with five valves. Whilst the supply for the video amplifier and sync separator transistors is derived from the 180V HT2 line the rest of the transistors depend for their supply upon the field output valve cathode circuit.

The cabinet shell is secured by two screws at the rear and two underneath. It is essential when replacing this shell to locate the rear control spindles in line with the holes and to feed the mains lead through so that no loop is left inside.

Power Supply Circuitry

The mains input passes via the on/off switch to fuse F1 which is rated at 1.6A. If this fuse is found to have failed examine its appearance to see whether it has gently melted or blown violently. If it has come to a violent end a complete short probably exists and an ohmmeter should be used to check this before replacing the fuse. If the meter shows no direct short suspect the mains filter capacitor C87 (0.1μF 300V a.c. working) as this loves to play games. Snip one end and try again with a new fuse.

If a direct short is recorded again check this capacitor by disconnecting one lead. If the short is still present check the h.t. rectifier W9 (BY127) and its shunt capacitor C88 (C84 is less likely to give trouble but you never know). A direct short is unlikely to be elsewhere except in C99 (the reservoir electrolytic) and this doesn't happen very often. All other h.t. circuits have series resistors which will show on the meter.

There is no dropper or series diode in the heater circuit. Instead a capacitor of 4.23μF (C85) is used in series with the valve heaters to produce a wattless voltage drop. In the unlikely event of this capacitor developing a fault it must be replaced by the exact type.

The d.c. output from W9 through the surge limiter R127 charges C99 to something like 295V which is then smoothed by the various resistor-capacitor combinations to give the HT1, HT2, HT3 etc. supplies. Faulty smoothing will cause the usual symptoms of curved edges with rising and falling field linearity variations and perhaps a degree of hum on the sound.

The smoothing resistors are mainly on the rear left side and like most wire-wounds have a habit of becoming open-circuit as a result of internal failure. We can thus be presented with one part of the set suddenly refusing to work through lack of h.t. It is a peculiar fact that so far most cases of field collapse in sets serviced by the writer have been due to the h.t. supply resistor R135 being open-circuit and not to a faulty PCL805. R135 is of course the 1.4kΩ smoothing resistor for the HT4 supply. It is mounted horizontally on the left side but there is no reason why an upstanding resistor should not be fitted provided it is of adequate wattage and has sufficient clearance.

Field Timebase

Having said that we must hasten to add that if there is only a white line across the screen denoting field collapse the supply resistor will not be at fault if there is still sound. To clarify this it can be seen from the circuit that the main transistor supply is derived from the cathode circuit of the PCL805: thus if there is a fault which stops emission in the pentode section or no supply to pins 6 or 7 the transistors will be rendered inoperative and there can be no sound or vision signals.

In the majority of cases a faulty PCL805 causes total field collapse due to a fault in the triode section, leaving the output pentode section working from an emission point of view and thus maintaining the supply to the transistors. If there is sound therefore the supply resistor must be in order and a white line across the screen will denote a fault either in the PCL805 itself, the supply to the triode from the boost line (where the 1μF smoothing capacitor C71 is the main culprit), an open-circuit height control or some other oscillator component.

Electrolytics

Whilst the large smoothing capacitors are of normal reliability the same cannot be said of the smaller types. We have mentioned C71 which often causes field collapse but this is not the only troublesome one. The field output stage decoupler C80 (160μF) can become open-circuit at the drop of a hat thus causing severe loss of height—more pro-

nounced at the bottom. The 64μF video coupler (C32) may suddenly decide to withdraw its labour thus causing a nice blank raster with no picture information or at the most a very weak picture with little or no sync, the sound continuing merrily with no alteration since the sound and a.g.c. drive are taken off from the video driver stage VT5. Fortunately C80 and C32 nearly always become open-circuit so it is a matter of moments to shunt another capacitor across the suspect to prove the point, the exact capacitance not being very important for the purposes of a quick test though the polarity must of course be observed.

Line Timebase

The line timebase is quite nice and (speaking for myself) doesn't give much trouble. It consists of a flywheel sync discriminator (W3, W4 etc.) with reference pulses fed back via the integrating resistor R45 from winding B–C on the line output transformer, a valve multivibrator (V1, ECC82), line output valve (PL81A) and efficiency diode (PY801) working the line output transformer with its various services including a two-stick e.h.t. tray which provides the 10.5kV required by the tube.

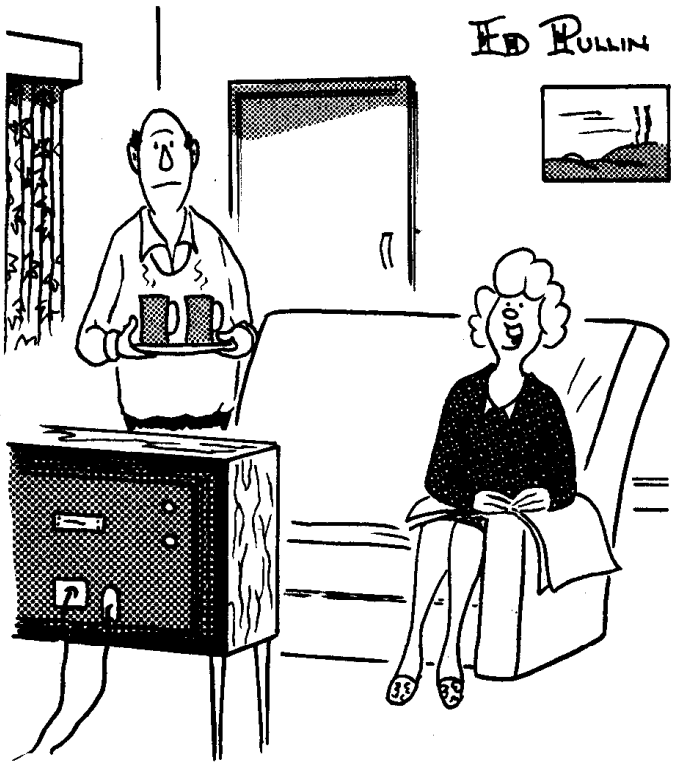
As well as providing a reference pulse for the flywheel line sync discriminator, winding B–C on the transformer also does two other jobs: it provides line blanking pulses for the c.r.t. grid via R125, and via C55 reduced-amplitude (due to the potential divider R131, R132 and R133) pulses to gate the a.g.c. amplifier VT8.

The width circuit is the conventional BRC type with a 100pF high-voltage ceramic capacitor (C92) feeding flyback pulses to a v.d.r. (Z2) to produce a bias which is backed off by the width control. This circuit can be the source of several fault conditions. The most obvious and damaging is when C92 shorts. This cooks up the v.d.r. (Z2) and can damage the panel. The v.d.r. can survive a severe overload but should replacement be necessary a type E298ZZ/05 should be used. If the panel has suffered, a certain amount of cutting away may have to be done and the new capacitor mounted in a raised position (which is no bad thing). No fault symptoms need be given for this type of disaster of course but other defects in the circuit can produce symptoms which may puzzle the less hardened.

The symptoms in one instance can be described as corrugated verticals and in another as a wasp-waisted picture (or raster). Perhaps the more clinically minded would term the latter effect as hour glass or egg timer (I don't care, the middle comes in anyway). These symptoms denote a high resistance in the grid circuit of the line output valve and the search need only be directed to R139 (2.2MΩ) and R141 (1.8MΩ). The former will produce the wasp waist, the latter the corrugated effect. Check these items and the width control and you should be home and dry, except perhaps for a crack in the panel.

When a margin appears down the left side with a white line down the edge don't try to remove it with the width control or by valve replacement, just replace the S-correction capacitor C90 (0.1μF) which will be found to have shorted.

Lack of width is usually due to either the PL81A or the PY801 getting tired but the width control itself and its series resistor R143 should not be above suspicion. If the PL81A is at fault and is a fairly recent replacement check the ECC82 and C96 either of which can be guilty of delivering insufficient line drive.



"You missed the bit where she stepped stark naked out of the bath."

It is also essential to check the position of the closed-loop sleeve on the tube neck. Some previous attention to the deflection coils may have resulted in the sleeve being moved too far into the coils. There should be about 5mm. between the coils clamp and the plastic moulding on the sleeve (if it hasn't been pulled off).

In cases of no picture and no e.h.t. remove the top cap of the PY801 and try again. If e.h.t. appears (albeit low) replace the boost reservoir capacitor C95. If there is no change check the valves and line drive etc. If the PL81A is overheating suspect the ECC82 or lack of h.t. at HT2. The latter condition can result from R30 or R31 being at fault, possibly caused by a short in C36. Check the ECC82 voltages at pins 1 and 6, the line drive at the PL81A control grid and take it from there (whatever is missing, low or high). C51 can go short-circuit, opening fusible resistor R126. If the PL81A is not hot check its screen feed resistor R137 (2.2kΩ) which may well be open-circuit if cool or shorted to chassis by C94 if overheated. If all these points are in order —valves, components, drive etc.—and there is still no e.h.t. the suspect must be the line output transformer but first make sure that R144 and R145 which are in series with C103 across the e.h.t. overwinding are not overheating due to C103 shorting. These components form an anti-ring damping circuit and can be disconnected for test purposes.

CONTINUED NEXT MONTH—Circuit Over Page

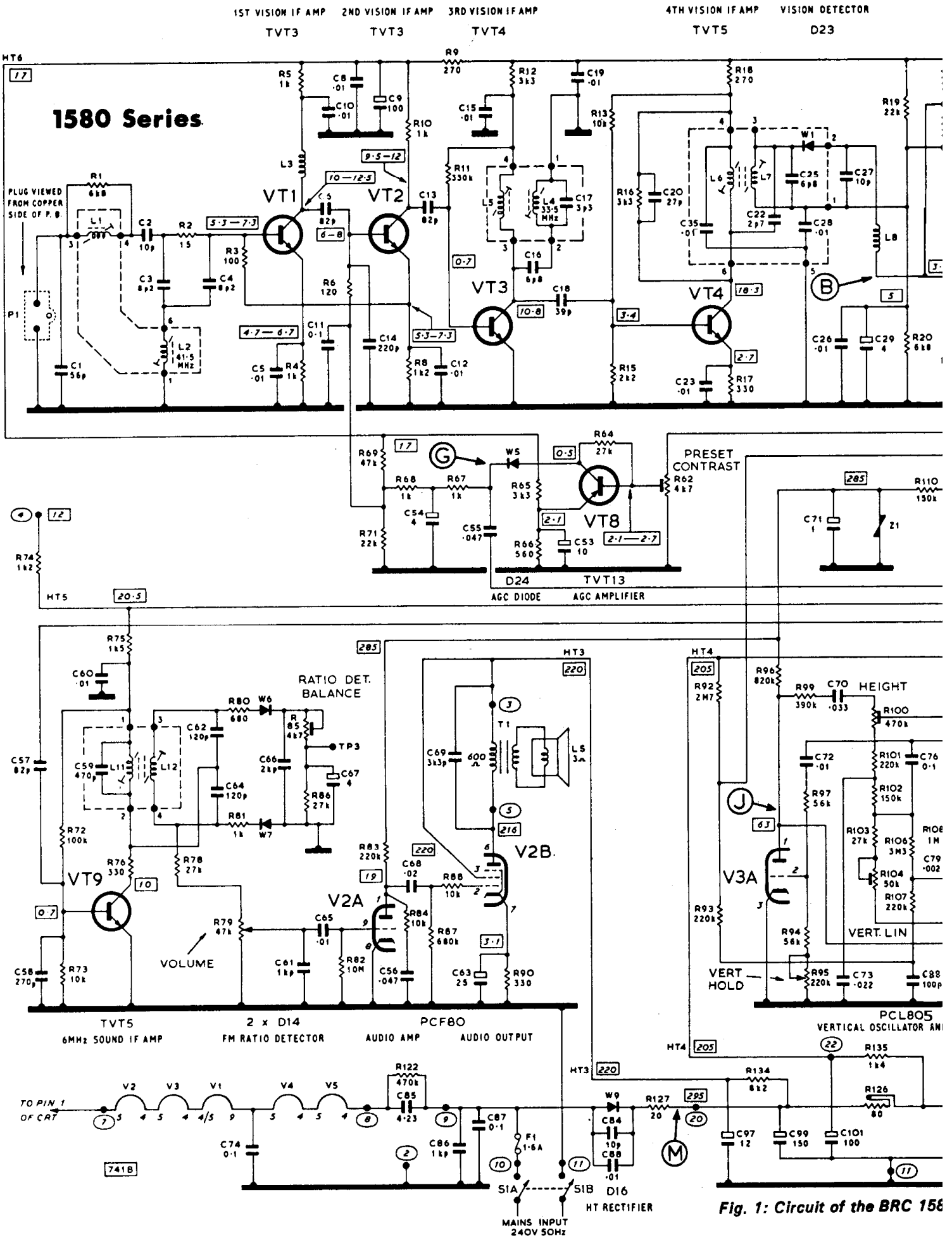
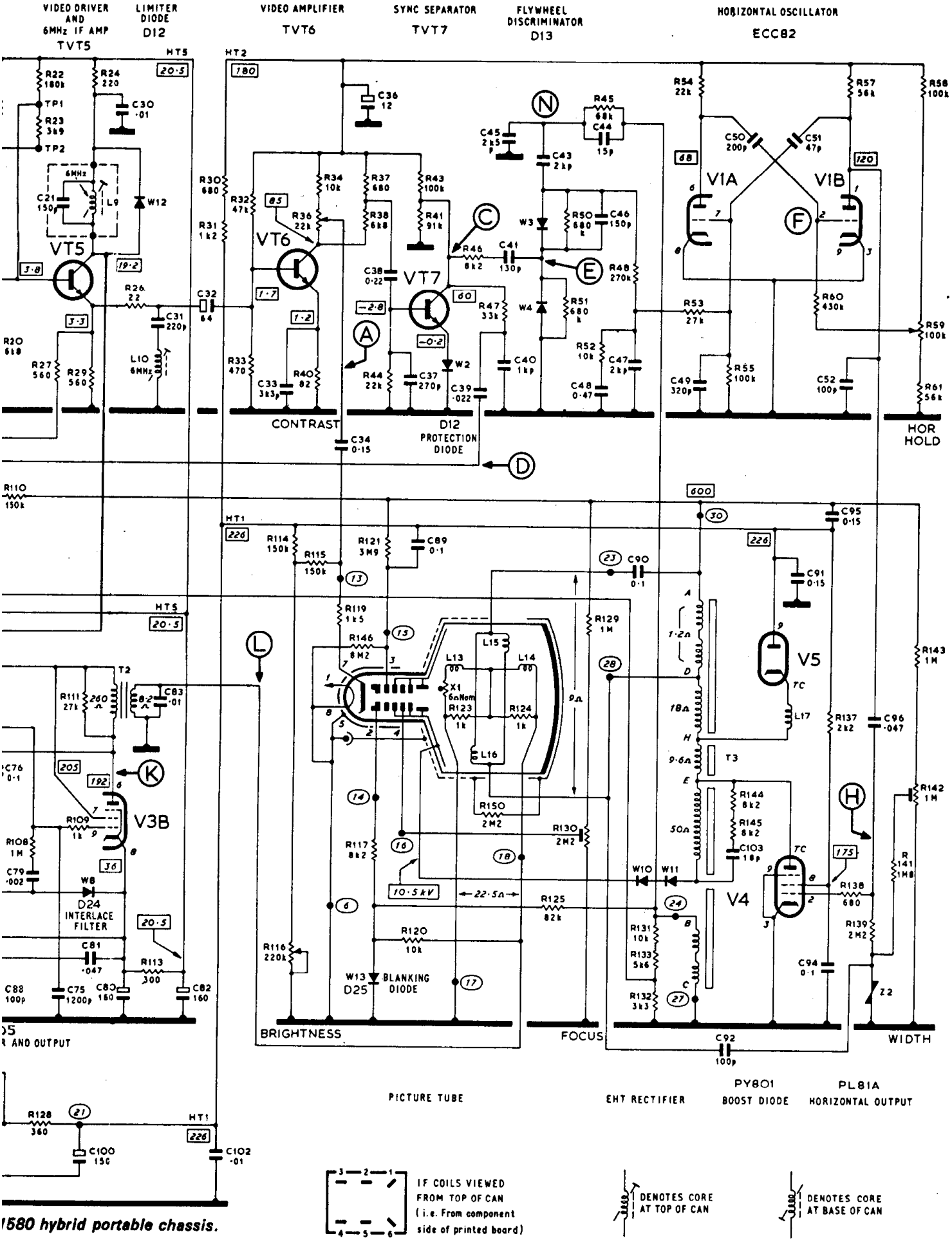
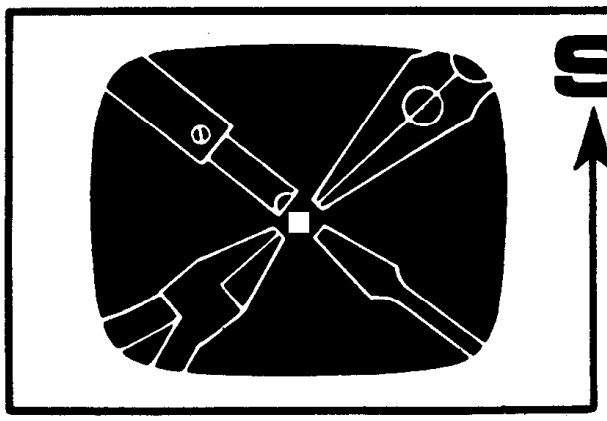


Fig. 1: Circuit of the BRC 156



1580 hybrid portable chassis.



SERVICING television receivers

L. LAWRY-JOHNS

BRC 1580 CHASSIS—cont.

EHT Tray

The clip-on e.h.t. tray gives little trouble in receivers with low e.h.t. but in the event of one stick becoming defective (symptoms, poor focus and ballooning coupled with lines across the screen when the brilliance is advanced) both should be replaced as a complete tray.

AGC Circuit

Part of the video signal at VT5 emitter is passed to VT8 base via the preset contrast control. VT8 only conducts during the line flyback period when it is switched on by a negative-going pulse of about 30V fed from the line output transformer via C55 and W5. This ensures that VT8 conducts only during the sync pulse part of the video signal, C55 then charging to a level determined by the size of the negative-going sync pulse at VT8 base (the size of the sync pulse depends of course on signal strength and the setting of the preset contrast control). When VT8 is switched off (at the end of the flyback) the positive charge on C55 is fed via a smoothing network to VT2 base. This forward bias *increases* the conduction of VT2 and thus VT1 (since the base of the latter is returned to the emitter of VT2) and the resulting voltage drop at the collectors causes a reduction of gain.

Forward AGC Action

Some may wonder why the control voltage is not negative-going so as to drive the transistors towards cut off—as is done with controlled valves. The answer is that the gain reduction is smoother as the control voltage is increased from the point of maximum gain which is obtained with approximately 6V at VT2 base. Control through decreasing the voltage would cause a more drastic reduction of gain and this is not what is required (what is wanted is a controlled reduction not a switch-like action).

The purpose of W5 is to prevent the a.g.c. transistor being affected by the positive control voltage across C55 (otherwise its collector-base junction would conduct).

Video Channel

The vision detector (W1) output is fed to a buffer stage (VT5) which also acts as an amplifier for the 6MHz sound signals (with prelimiting by W12). The video signals are taken from the emitter (as is the a.g.c. drive) and are capacitively coupled by C32 to the video amplifier VT6, C31 and L10 forming an acceptor filter for the 6MHz component which must be made to feel unwanted in the video stage. We have already mentioned the habit of C32 suddenly becoming open-circuit so we will not labour this point further.

The video amplifier itself (VT6) works hard, being operated from the h.t. line with a nominal voltage of 85V at its collector rising to produce the positive tube drive (towards cut-off at the cathode on the sync pulses) as its base is swung negative by the picture information and sync pulses. This swing at the collector is tapped off by R36 which gives high-level contrast control, the sync pulses being divided by R37-R38 and passed to VT7 which functions as the sync separator with a protection diode (W2) in its emitter lead. A suitable replacement for VT6 is a BF178 and for VT7 a BC117.

Sound Faults

In order to reduce the heat in the cabinet as much as possible a low-dissipation sound output stage is employed drawing only some 10mA or so. With a loudspeaker of the size used the quality isn't too bad until the speech coil starts to rub (as it tends to do after a period) or the PCF80 output valve starts to draw grid current. The difference in the distortion is apparent to the experienced ear but is difficult to describe. If in doubt check the voltages at pins 7 and 1: pin 7 should show about 3V with respect to chassis and pin 1 about 20V. If the pin 7 voltage is higher than say 3.5V either the valve is faulty, R90 is the wrong value or C68 is leaky: if there is a positive voltage at pin 2 suspect the valve or C68. If the pin 1 voltage is low check the value of R83 which should be about 220kΩ. If the resistor is in order check C65 for leakage. If the pin 1 voltage is high, check R82 which can go high-resistance and thus bias off the triode section. If these voltages are correct and the distortion is more obvious at low volume levels suspect the loudspeaker.

Distortion at All Levels

Distortion at all volume levels is more likely to be due to a fault in the ratio detector stage (check W6, W7, R85 setting and C67) or in the alignment of L11-L12.

Tuner Unit

Quite a bit has been written on the subject of the tuner unit employed in this and other BRC chassis such as the 1500 series. It is difficult for us to advise readers whether to service the units themselves or return them to the nearest maker's depot. It all depends upon the aptitude of the

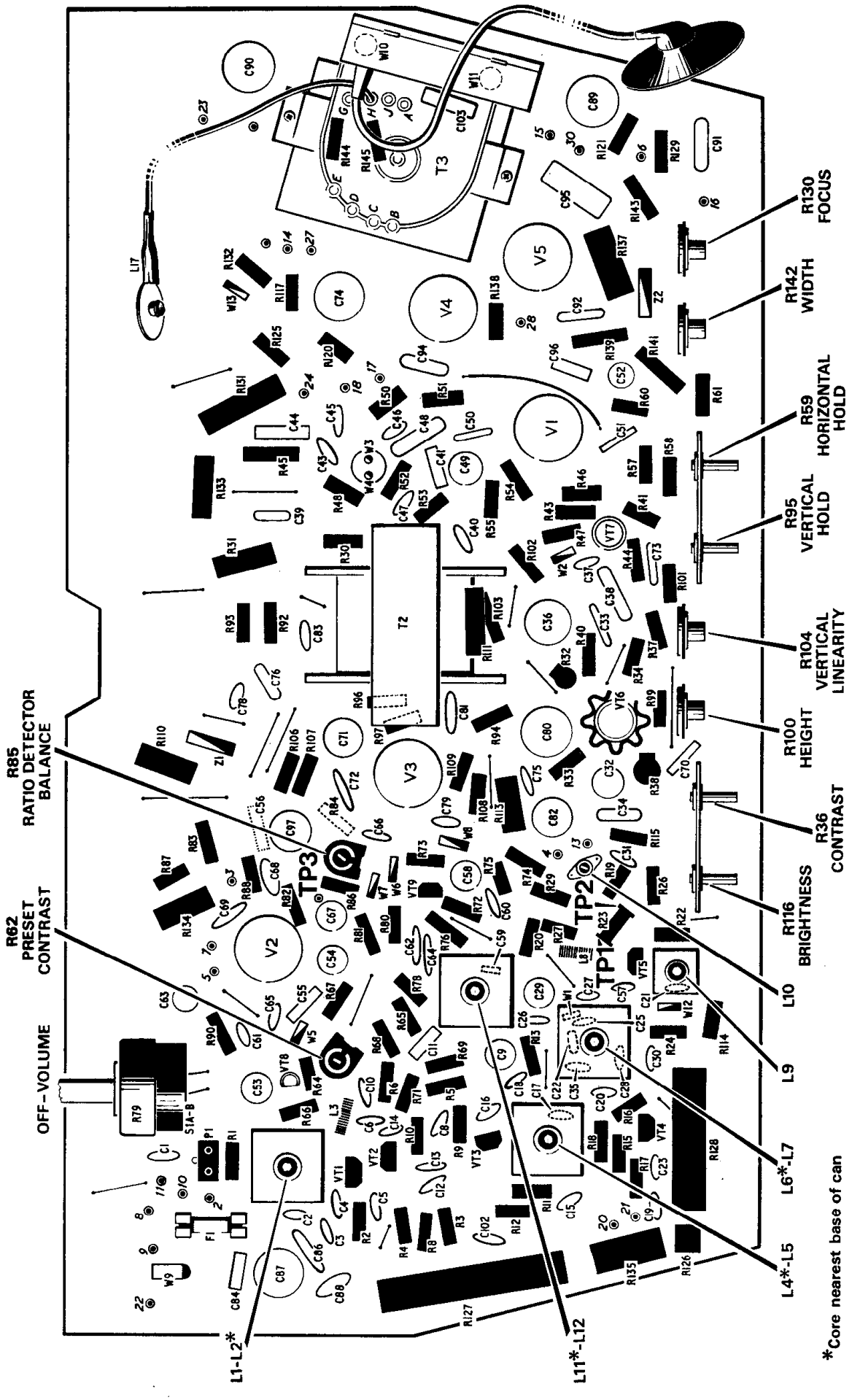


Fig. 2: Component layout on the main chassis assembly.

Suitable semiconductor replacements: VT1 BF196; VT2 BF196; VT3 BF194; VT4 BF197; VT5 BF197; VT6 BF178; VT7 BC117; VT8 BC157; VT9 BF197; W1 OA91; W2 OA90; W3/4 U147I0/1; W5 1S44; W6 AA119; W7 AA119; W8 1S44; W9 BY127; W12 OA90; W13 BA148.

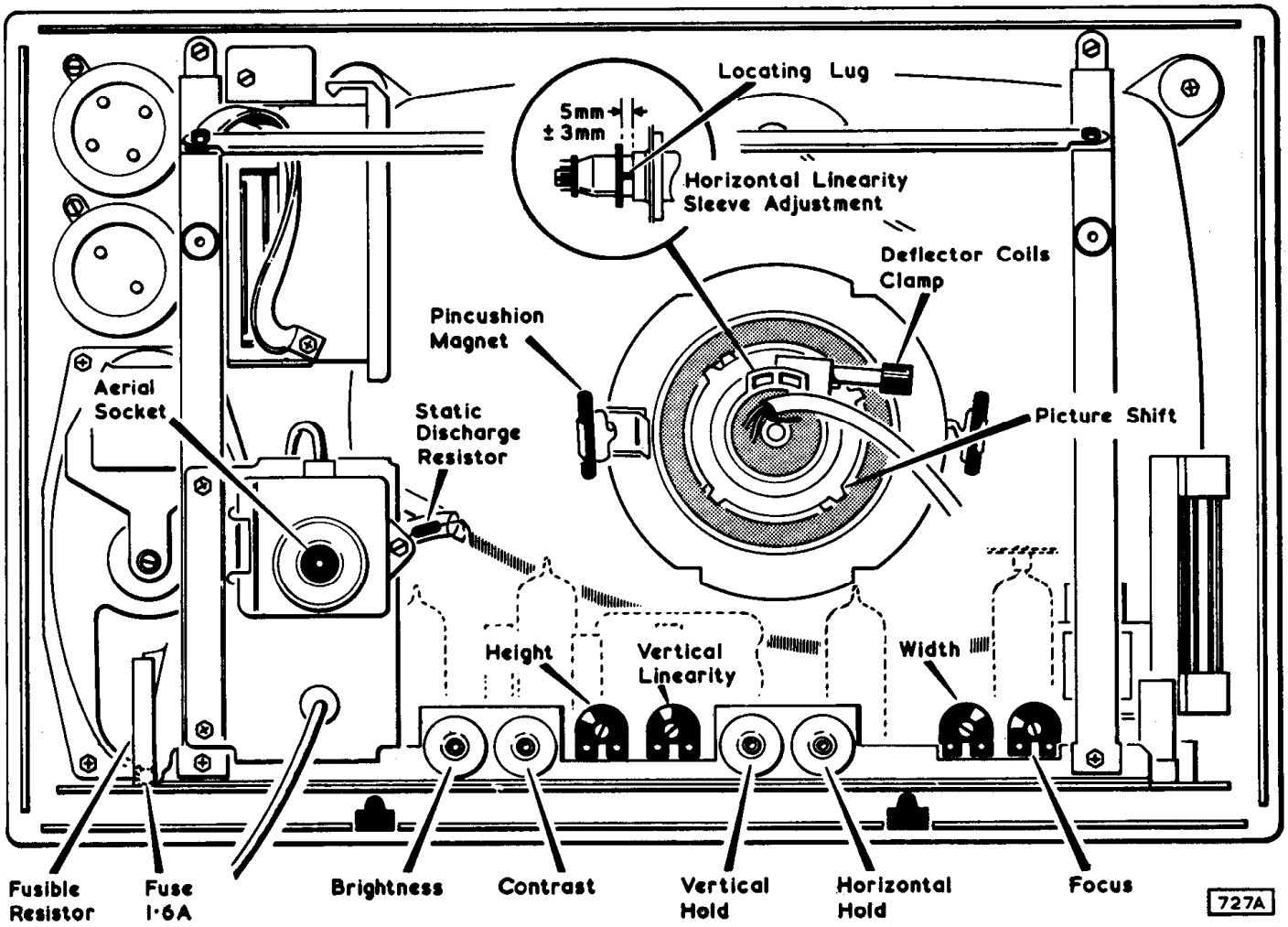


Fig. 3: Rear chassis view showing preset adjustments.

reader. If you don't know exactly what it is all about leave the unit alone and let someone who does know do it. For those who feel quite capable but would like a little guidance we would make the following points.

If the quality of the picture is good but the tuning is inaccurate, the push buttons tending to require frequent resetting, first ensure that the mechanical side is in order. If so it is reasonable to assume that the defect is inside the tuner. The trouble is most likely to be due to surplus grease, which prevents good electrical contact, on the tuning spindle leaf springs. This is not a signal for switch cleaner to be sprayed willy-nilly all over the spindle and tuning vanes: if this is done it will be a considerable time before the tuner will function properly again and the fault will not be removed.

Only the leaf springs require attention. The grease can be removed with a small brush and grease solvent. When the grease has been removed apply switch cleaner lightly to the contact surfaces of the springs. The springs can be removed if desired using a heavy-weight iron or gun—a 15 or 25W iron with a pencil bit is not much use for this job.

Transistor Faults

Low gain, where the picture is very grainy, if not due to a faulty aerial or plug/socket connection is most often due to failure of the first stage transistor in the tuner—type AF239. If the gain is found to be the same or better with the signal applied between the stages it is safe to fit a new transistor. Lack of voltage drop across its 1kΩ emitter resistor is another indication that it is not performing.

The second transistor—type AF139—can well be at fault if one programme can be tuned in but not another (the transistor being reluctant to oscillate at a lower frequency). On more than one occasion we have fitted a new transistor in this position only to find that it is no more willing to oscillate than the one taken out.

Before suspecting any transistor however always make sure the supply line is up to specification—12V at the tuner and 20.5V at HT5. Low voltage could indicate a fault in the field timebase, in a supply resistor, or leakage through a smoothing or decoupling capacitor.

Hum Bars

If the picture is heavily shaded together with loss of field hold suspect C82 and shunt a test electrolytic from the 20.5V line to chassis. The test capacitor should have a capacitance of over 100μF and a rating of 25V or more.

Modifications

C11 may be 0.047μF; C365 in the tuner unit may not be fitted; R102 may be 120kΩ; R111 15kΩ and R355 in the tuner 2.7kΩ (or 2k7 if you like it put that way).

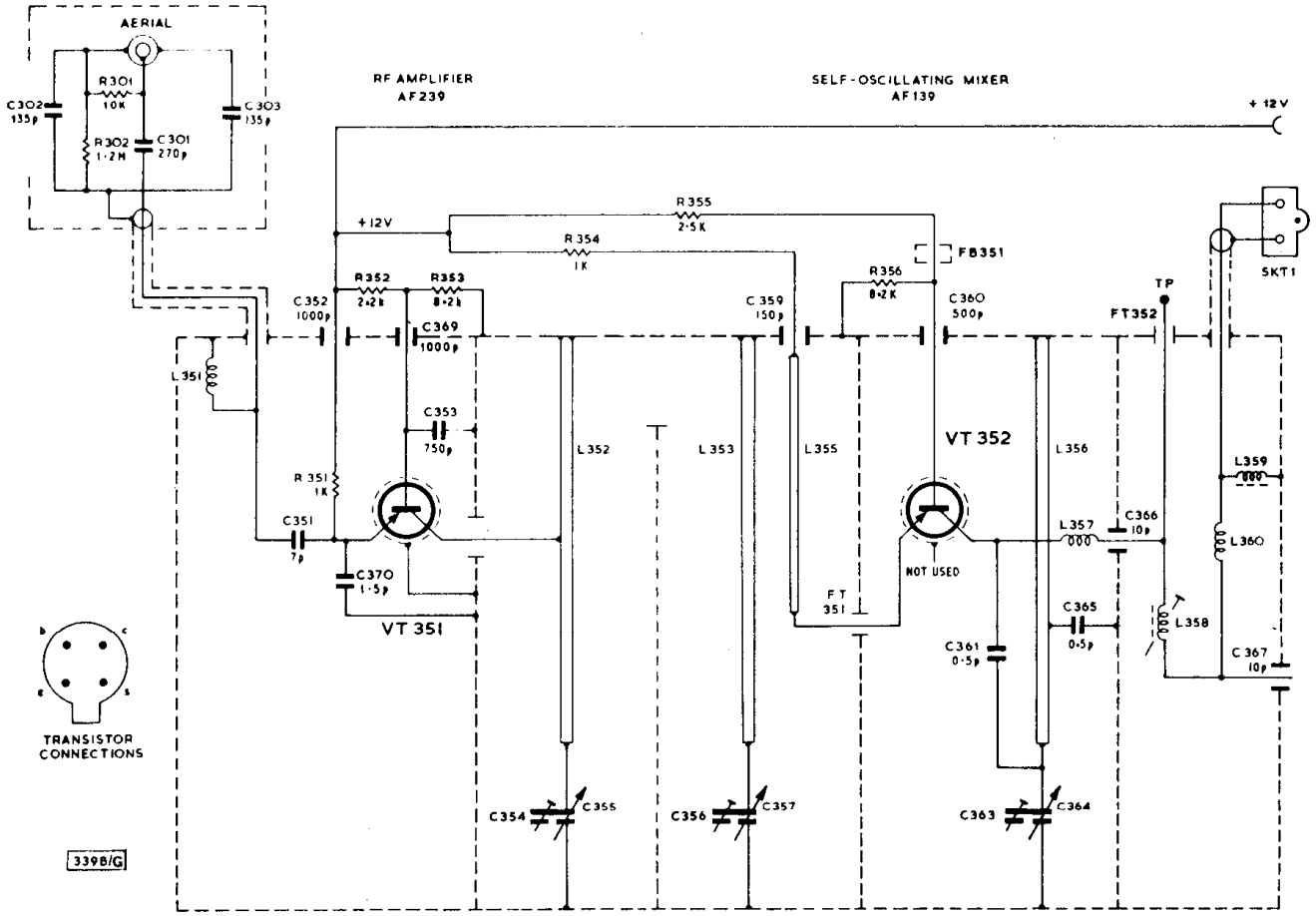


Fig. 4: Tuner type T20 used in the BRC 1580 chassis.