Servicing TELEVISION Receivers

No. 148 - THORN 900 CHASSIS

by L. Lawry-Johns

RECEIVERS using this chassis include the Ferguson Models 3623-3627 plus some variations, the HMV 2620-2624, Marconiphone 4611 and 4612 and Ultra Models 6625-6629. Some models have radio facilities which necessitate additional switching and circuitry and one of three basic types of v.h.f. tuner may be encountered, one of which is a push-button type (TV only).

The main feature of this design is its one-piece "cool" chassis. There are no mains dropping resistors, the valve heaters being fed from the 150V tapping on a small autotransformer on the left-hand side as viewed from the rear. Also featured is a heat-operated cut-out, referred to as a fusible resistor. This is basically a 14Ω wire-wound resistor in series with the h.t. line. When excessive current is passed by this resistor the solder joining two wires melts allowing them to spring apart. This opens the h.t. line and stops the receiver working from the h.t. point of view until the fault is found and the wires again joined with a soldering iron (not by wrapping fuse wire round them). A 1·5A fuse is also fitted in the mains supply from the on/off switch to the auto-transformer.

Some models use a flywheel sync unit which is a small assembly on the right side using an EF80 valve and a couple of diodes in one envelope (W401 and W402, type FSY11A), with the preset line hold control R413 prominently mounted.

SERVICING

It is rarely necessary to remove the chassis completely for normal servicing. There is a chassis fixing nut on either side at the bottom. The top is pivoted in slots which allows the chassis to be raised and swung out. In addition the cabinet can be turned on its side allowing complete access to the printed panel except for the tracks which run under the frame. This is a useful facility as it means that the flexible cable(s) which operate the system switch can be left undisturbed. It is of course necessary to lift the chassis up out of the top slots completely and disconnect the bonding strips when the tube has to be replaced; an operation which has been found necessary quite early in the life of a number of these sets. In most models it is possible to remove the cover of the v.h.f. tuner unit without removing the tuner. This enables the turret contacts to be cleaned with the minimum of trouble. Some models use twin-panel tubes, some use implosion-proof tubes whilst others have a moulded Diakon implosion guard. These generally do not require attention but there are some which employ a window at the front and where this is found a bottom member can be removed to facilitate cleaning when necessary. Those using a moulded Diakon implosion guard and those with the stretched p.v.c. skin guard may be cleaned with a soft damp cloth and perhaps a little soap only. On no account use any abrasive cleaner. Many variations of tube fixing will be found but examination will show what comes out with the tube and what stays in.

Some common troubles: Heater line faults

One fairly common fault in the heater line which can be nasty if it continues over any period of time is excessive heater current resulting in all the valves and the tube heater being overrun. If the valve heaters appear to glow brighter than normal either put a meter in series with the heater chain which should show 300mA or a little under,

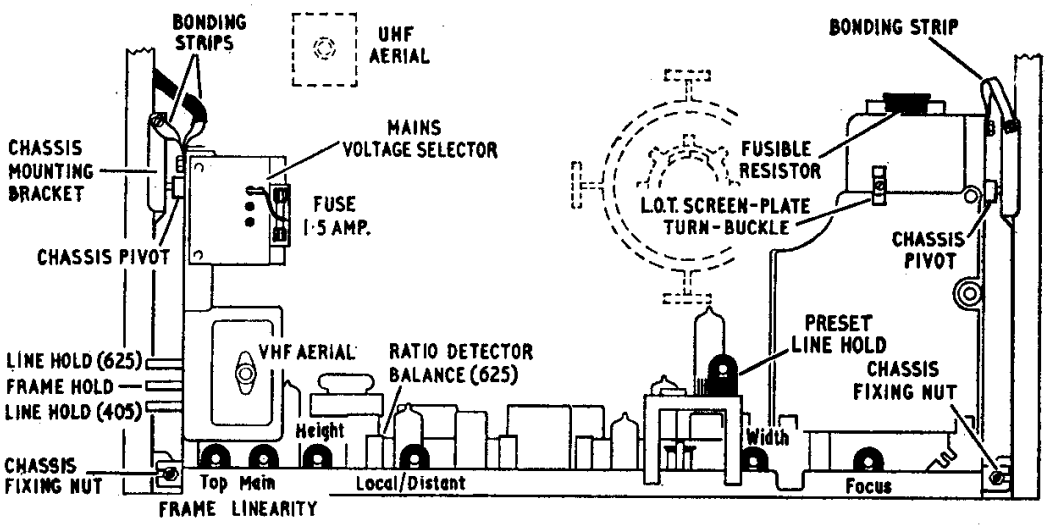

Fig. 1: Preset adjustments. Flywheel unit with preset line hold on fringe models only.

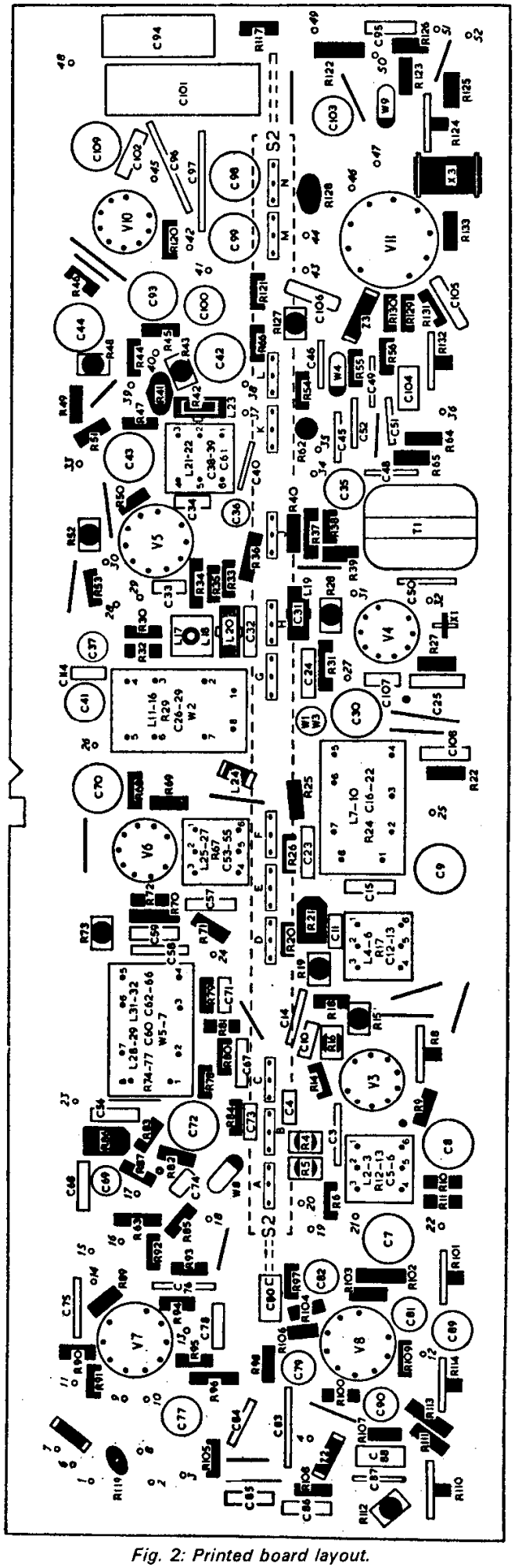

Fig. 2: Printed board layout.

or check the voltage at autotransformer T5 150V tap (or tag 7 on the panel). The voltage should not exceed 150V at normal running. If the voltage is higher with the mains tapping set correctly change the transformer. This develops shorted turns and causes overrunning. This fault can cause premature valve and tube failure.

Another nasty one is when the heater track which runs from the PCL85 (V8) to the thermistor X3 along the rear edge of the panel shorts to frame. This immediately blows the PCL85 as well as the fuse (or instead of it) and at first leaves the repairer a little mystified. One is accustomed to finding the thermistor the first item in the heater chain or at least the efficiency diode (PY801) but in this circuit the supply from the transformer is to the PCL85 heater and then along to the thermistor. If the track cannot be cleared easily, part it at the two ends and connect a lead from the PCL85 to the thermistor.

Loss of vision signals

Another common one, not so awkward, is that R28 (5kΩ) changes value. This is the h.t. supply resistor to the vision i.f. amplifier V4 PCF808 (pentode section). When it goes high it causes loss of vision signals or leaves them extremely weak. If a replacement overheats change V4 which sometimes develops an internal short.

Intermittent loss of sound

If the picture is normal but the sound is intermittent particularly with movement of the board or i.f. transformers but the circuit is functioning from the detector onward, suspect V6 EF184 and check it. Quite often however we have found the fault in one of the sound i.f. transformers. If close inspection fails to reveal a dry joint which can be remade, a new transformer is necessary.

Improper switching

Incorrect operation of the flexible cable which operates the system switch can cause several, some strange, effects. These effects vary according to which contacts make or fail to break. Failure to switch to 625 with the 405 picture enormously enlarged is one effect. The remedy is to more efficiently clamp the cable so that the outer sheath does not move. Modified clamps can be obtained from the makers or a metal skin can be inserted to tighten the grip.

Autotransformer

The vibration caused by T5 working loose can be very annoying. If tightening the clamp screw does not help matters some packing may be introduced and the transformer tightened down on it.

The line output stage

Two types of line output transformer may be found fitted, the conventional type with an EY86 e.h.t. rectifier or a "jelly-pot" type with an e.h.t. rectifier consisting of a tray containing three pencil-type selenium rectifiers. The latter (tray) can be detached from the main unit quickly for replacement and the obnoxious smell given off by a faulty selenium rectifier is usually a sure pointer to the source of the cause of a no picture condition.

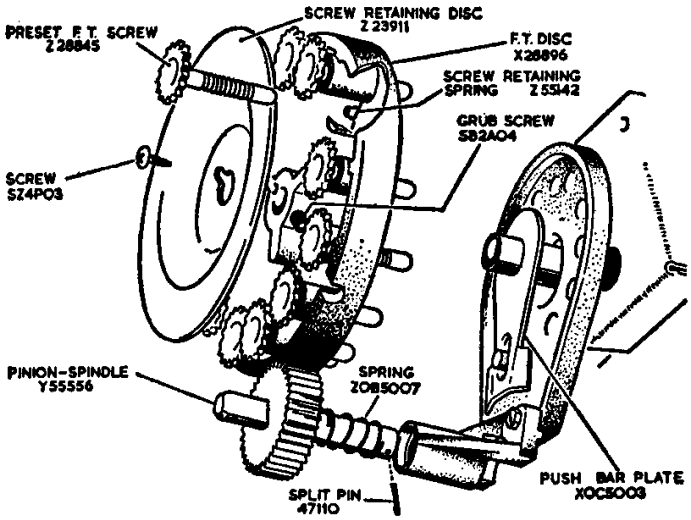

Fig. 3: Preset fine tuning mechanism.

The PL500 is a frequent source of trouble causing the conditions of no picture, lack of width and varying picture size. It also has the irritating habit of developing an intermittent short which damages R128 (2·2kΩ) its screen feed resistor.

The PY801 should not escape attention when the line output stage is found inoperative. We use as many PY801 and PY800 valves as we do PL500 (PL504) and PL36, the latter not being used in these sets of course.

An inoperative line output stage will often be restored to partial working by removing the PY801 top cap. This of course should stop the circuit functioning completely but if C101 (0·22μF) is shorted an h.t. path is provided and some sort of working will result when the PY801 is rendered inoperative by removing its top cap.

The line output stage can of course be rendered inoperative by several faults, including a defective line output transformer and lack of line drive from V4B line oscillator. The maker's remarks upon the line output transformer are as follows: Access to the line output transformer assembly is facilitated by removal of the screening plate which is secured by a turn-buckle. The transformer assembly is secured by two nuts or screws which are accessible without removing the chassis. In some receivers a jelly-pot transformer and selenium-type e.h.t. rectifiers are fitted. Extreme care should be exercised when removing or resoldering the connecting leads to the transformer tags. Use a small, low-consumption iron, and do not bear down on the tags heavily or apply the bit for longer than is necessary to produce sound joints. The e.h.t. rectifier assembly is a plug-in unit. If one of the clip-in rectifiers becomes faulty all three should be replaced; before removal carefully note polarity. Important: shorting the e.h.t. supply or drawing arcs with a screwdriver (earthed) during servicing will damage the selenium rectifiers.

Line hold

Standard version: If difficulty is experienced locking the picture horizontally check the PCF808 (V4) and the line hold control itself (405 R58 250kΩ; 625 R60 100kΩ). If the controls are at one end of their travel check R62 620kΩ.

Flywheel sync version: R62 is not fitted. The control bias is determined by the operating conditions of V401 (EF80). Thus R413 becomes a preset line hold. In the event of poor or absent line sync check the EF80, W401/W402 (FSY11A) and the capacitor C407 (0·5μF) which often becomes leaky.

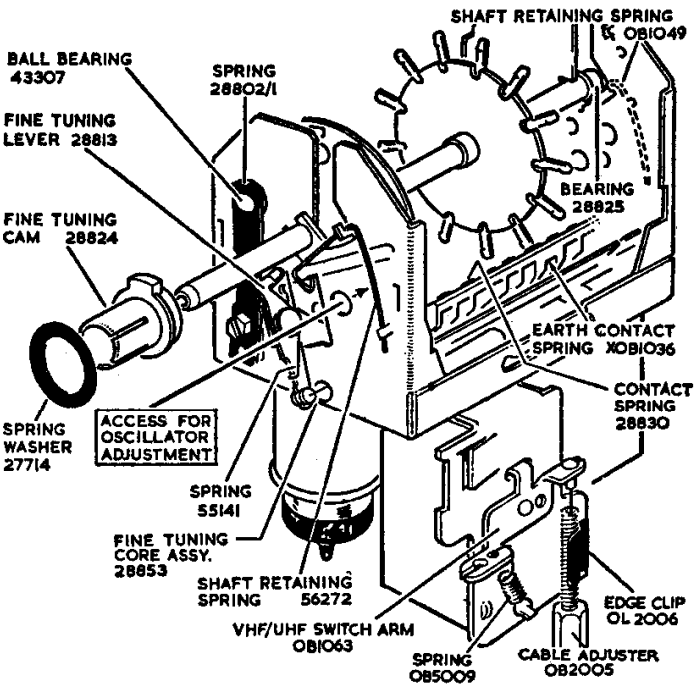

Fig. 4: Rotary tuner with fine manual tuning

The field time base

The heart of the field timebase is the PCL85. Most of the troubles which beset the timebase can be cleared by replacement of the valve (V8). The symptoms may vary from complete loss of scan, resulting in a solitary white line across the centre of the screen, to loss of hold or irregular scanning.

Faced with a single white line condition the average engineer would carry out the following routine. Replace the PCL85. If the condition is unaltered, take the voltage readings at pins 1, 6, 7 and 8. The next action would depend upon these readings. The pin 1 voltage should be about 75V. If absent check at height control. If this is about 230V check C100 for shorts. If however the voltage is well up at the boost line end of the control and low at the pin 1 end of R102, suspect the PCL85 of non-oscillation. Check C79-C80-C81-C82-C83, and compare other voltages. For example pin 6 should be about 190V. If very low check T3 primary (300Ω) assuming the pin 7 voltage is correct at about 200V. If again this is absent check R119 which may be open-circuit and C91 for shorts. The pin 8 voltage is also very important. Its proper reading is 17V. If it is much over this check C82 which could be leaky (this would explain also the low voltage at pin 1) and also check the bias resistor R112 (360Ω).

Reduced scan

If the bottom is compressed check C89, the PCL85, C88 and R114. If the loss is even top and bottom check the PCL85 and C82 for slight leakage.

TO BE CONTINUED

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continued

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Returning to the complete loss of scan, it may be found that all the voltages are in order. In this event check the continuity of the field deflection coils and note the effect of shorting across the thermistor X2 (deflection assembly).

Vertical Hold

If difficulty is experienced in locking the picture check R99 and if this is at one end R98 and C80. If the sync pulses are weak and there is evidence of line pulling check C35 in the video circuit, the PFL200 valve, C41 and C44. C35 is in the cathode circuit of the video amplifier, C41 is the screen decoupler and C44 is the screen decoupler of the sync separator section of the PFL200. Further checks should include C43 (0·1μF) and the PFL200 resistors.

Video Stage

Having mentioned the PFL200 as having an influence upon the sync pulses we would hasten to point out that it has many other influences. One of the most common of these is the tendency of the valve to run into grid current when its bias conditions are altered; as when switched to 625. This causes the picture to become much lighter until very little picture is left at all and the 625-standard sound is also affected. Hum on BBC-2 sound, although the picture may not appear to be affected, can be caused by a faulty PFL200. In situations where BBC-2 is not received or not required these early warning symptoms are not given and the first intimation that something is wrong may be the appearance of hum bars and poor sync on the 405-standard picture only. This condition could vary from light shading to very light and dark bars across the screen.

Loss of signals

If the raster is normal but there are no sound or vision signals check the V3 EF183 and stage, feed resistors, tuner unit supplies and valves. If

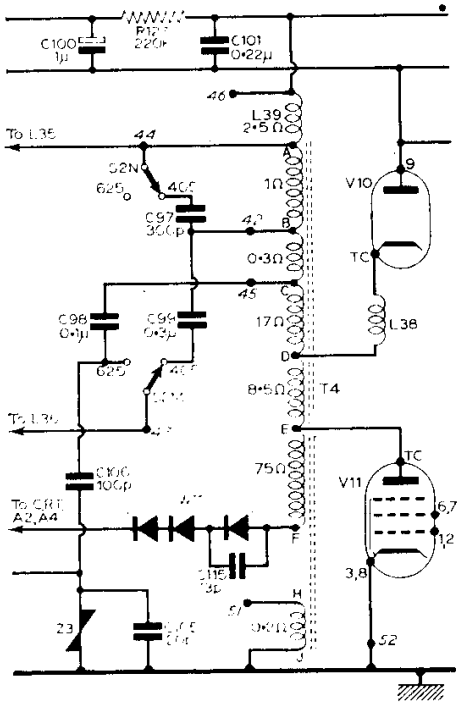


Fig. 5: Modifications to the line output stage when a jelly-pot transformer and selenium e.h.t. rectifier are used. R66 is 620kΩ with jelly-pot transformer.

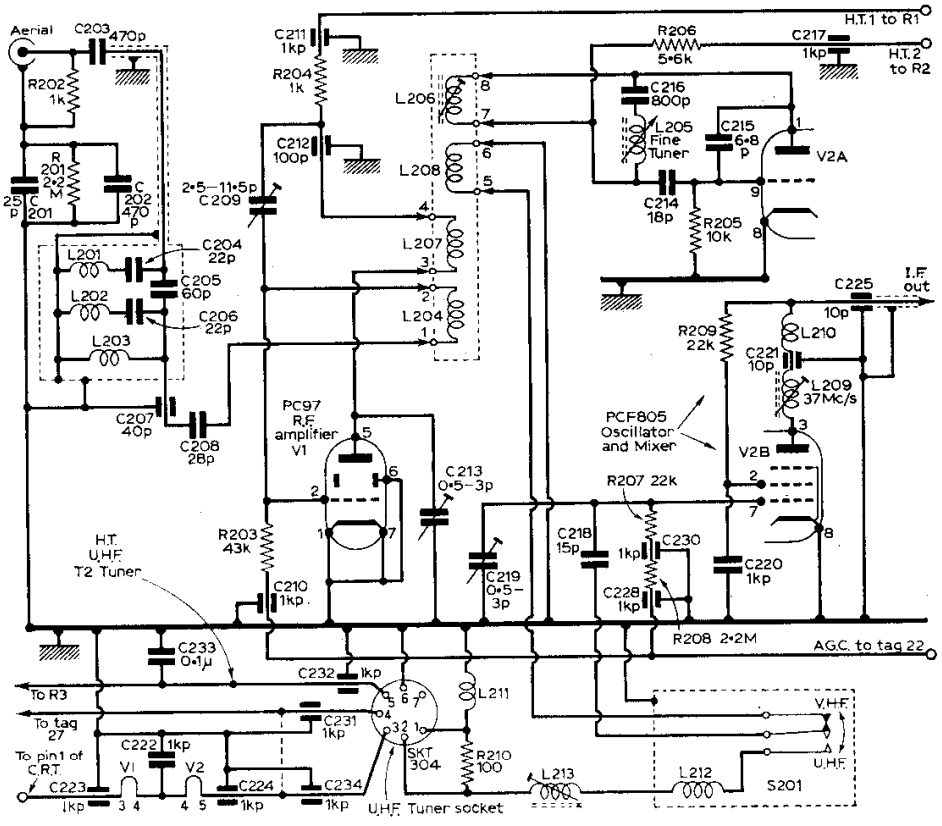


Fig. 6: Type MT10 rotary v.h.f. tuner circuit.

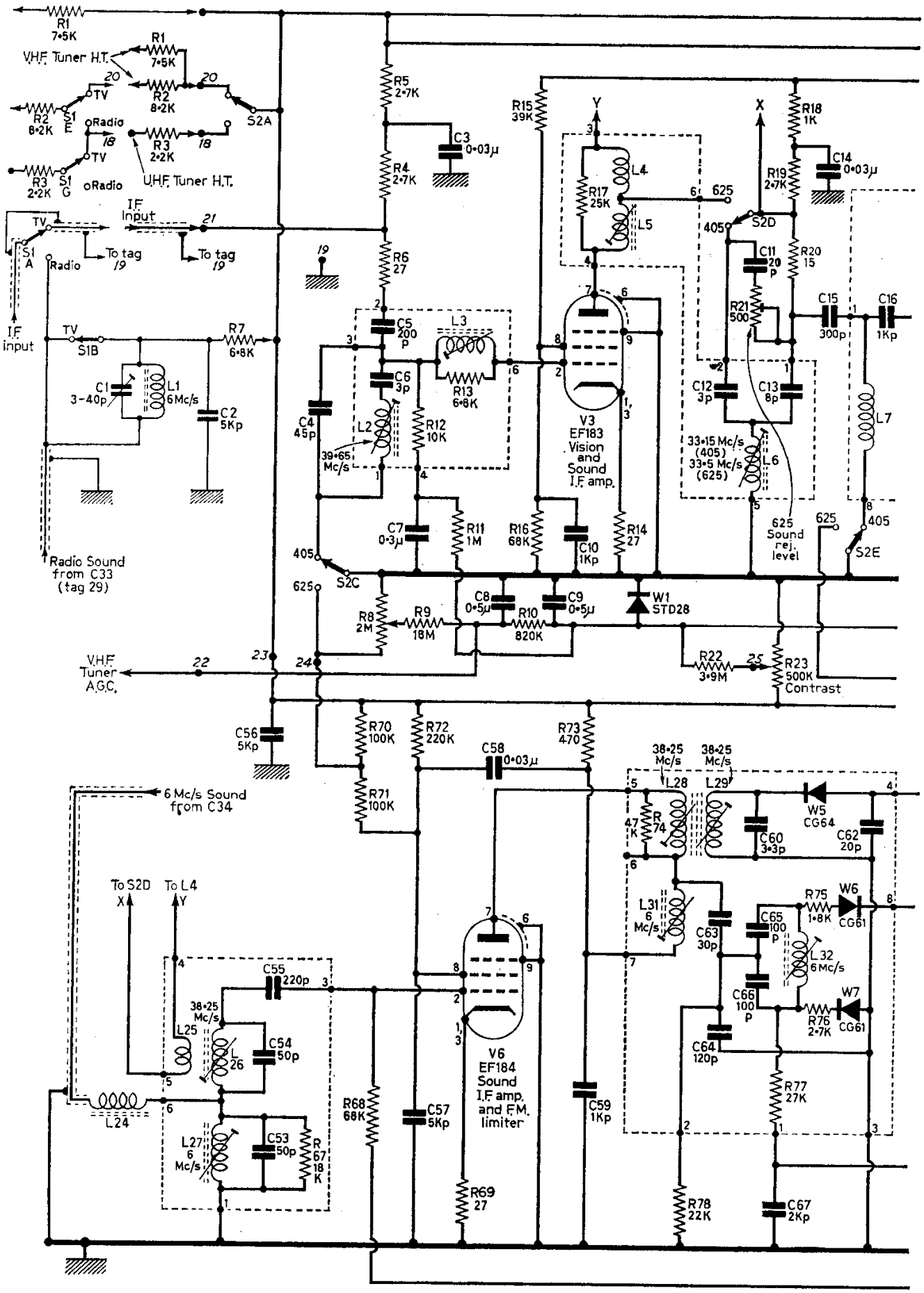
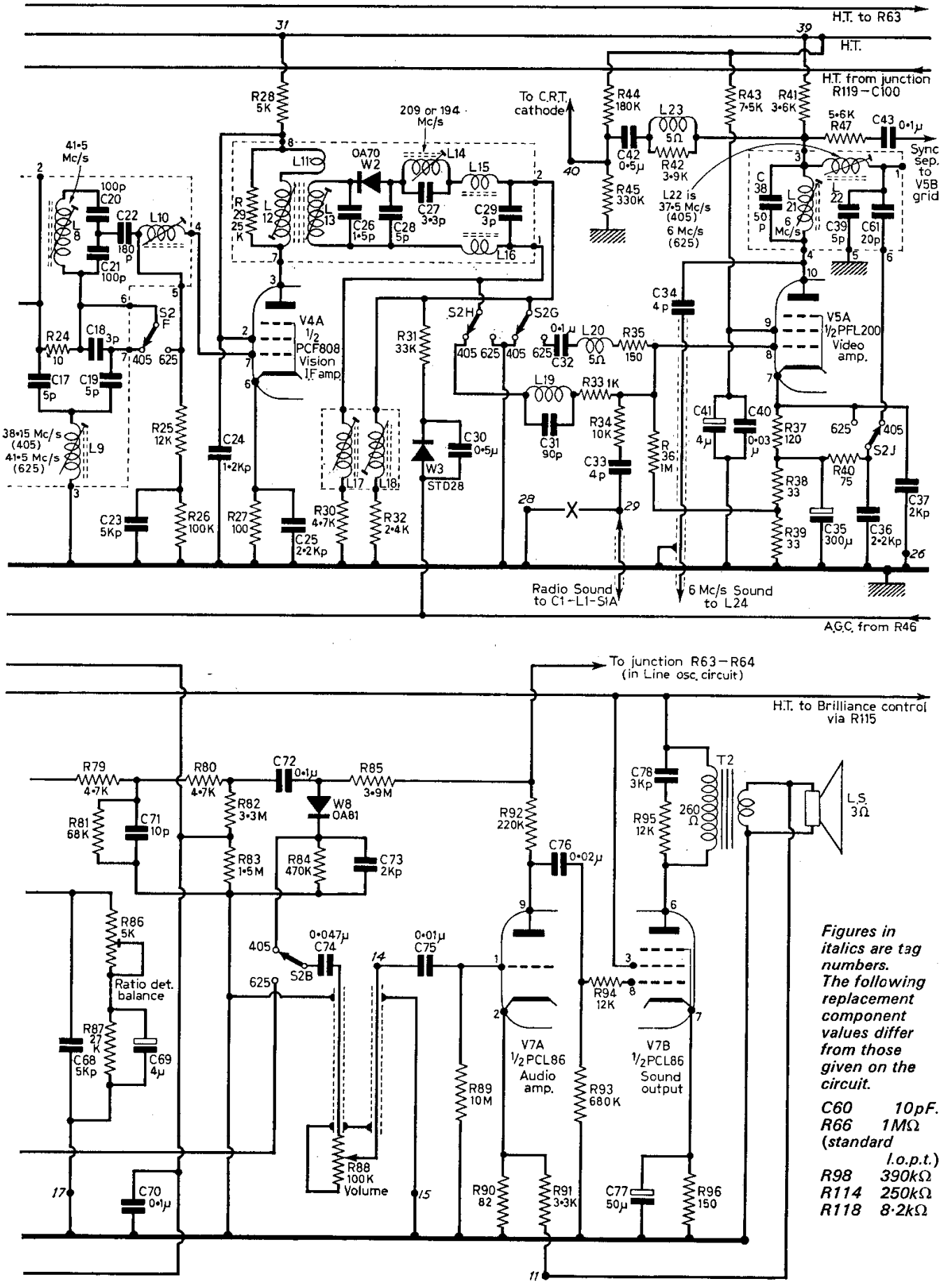


Fig. 7: Circuit of the receiver sections, Thorn 900 chassis.

both standards are out of action the PC97 on the v.h.f. tuner (rotary) is not likely to be at fault. The PCF805 could well be however as this also functions as an i.f. amplifier for the u.h.f. signals.



Points marked X are connected on TV only versions, open-circuit on radio-TV versions.

Figures in italics are tag numbers. The following replacement component values differ from those given on the circuit.

C60	*10pF.*
R66	*1MΩ (standard l.o.p.t.)*
R98	*390kΩ*
R114	*250kΩ*
R118	*8·2kΩ*

Note that the push-button tuner unit (v.h.f.) uses a PCC89 and PCF801. If the supplies are present and the valves are not at fault check the 22kΩ screen feed resistor to pin 2 of the PCF805 as

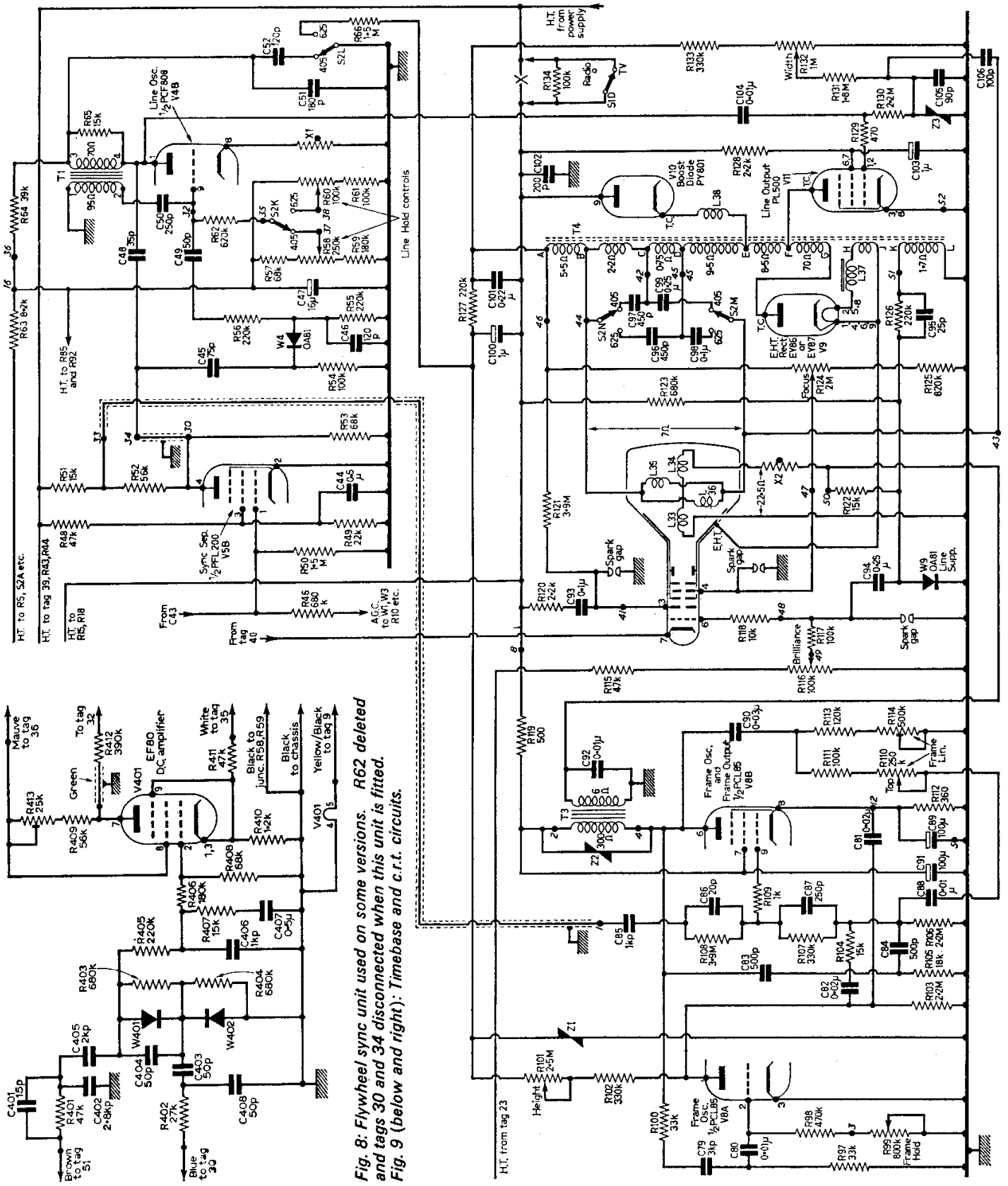


Fig. 8: Flywheel sync unit used on some versions. R62 deleted and tags 30 and 34 disconnected when this unit is fitted.
Fig. 9 (below and right): Timebase and c.r.t. circuits.

this can go high, and make sure the system switch is working.

If the BBC-2 signals are still in order it means that the fault is confined to the oscillator or r.f. sections of the v.h.f. tuner. Check the PC97 (or PCC89) and the PCF805 (or PCF801) and the 5·6kΩ oscillator load resistor R206 (or R263 12kΩ and R264 2·2kΩ on the push-button tuner). Make sure the coil biscuits are in position and have not been tampered with and of course check the aerial input, socket, plug, coaxial leads and ends inside and outside the set.

Inability to select channels reliably

This means that although signals are received they vary on operating the channel selector and necessitate constant operation of the fine tuner. This normally affects only the small turret-type of

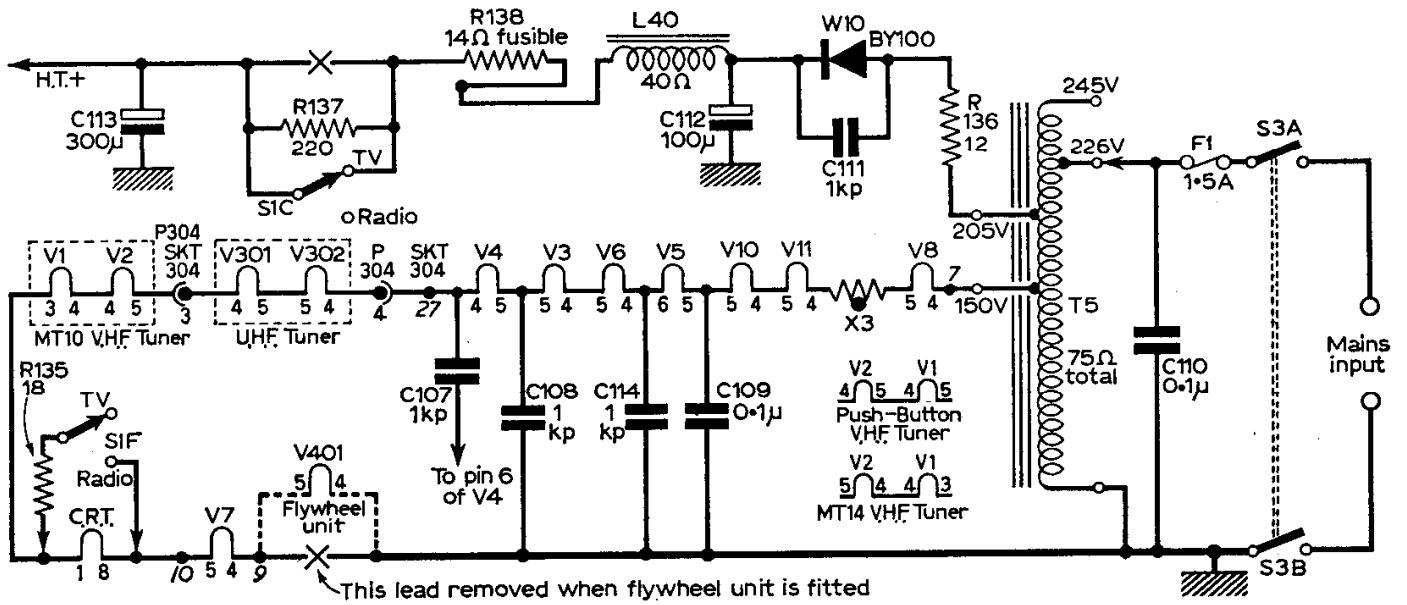


Fig. 10: H.T. supply and heater chain circuits.

Valve		Anode volts		Screen volts		Cathode volts	
		405	625	405	625	405	625
V3	EF183	194	191	52	51·5	—	—
V4A	PCF808	146	144	150	146	2	2
V4B	PCF808	158	135	—	—	—	—
V5A	PFL200	158	112	203	175	4·5	4·4
V5B	PFL200	70	40	65	61	—	—
V6	EF184	227	222	62	31	—	—
V7A	PCL86	102	98	—	—	—	—
V7B	PCL86	221	215	230	225	5·5	5·5
V8A	PCL85	76	74	—	—	—	—
V8B	PCL85	109	184	205	198	17	17
V10	PY801	231	224	—	—	—	—
V11	PL500	—	—	210	201	—	—

tuner. Observation will show a drum of sprockets on the front of the tuner. The fine tuner rotates the sprocket to the preset position and this operates on the push-bar which determines the position of the fine tuner core. If the drum is loose on the main spindle the correct sprocket will not engage for each switch position. The drum is secured by a grub screw and an access slot is provided. Use a small Allan key for tightening once the drum has been correctly located on the spindle. Then retune the fine tuner finally upon reassembly.

This should not be confused with poor switch contacts which will respond to cleaning in the usual way. A fractured fine tuner core could however give very similar symptoms.

Loss of gain on BBC-2

If the v.h.f. signals are good but the u.h.f. reception has deteriorated it will probably be found that the PC88 on the u.h.f. tuner is in need of replacement. The PC86 could be at fault but this usually causes drift due to frequency change as the emission falls. Check the tuner for dry joints without disturbing the wiring if the valves are not at fault.

Voltage and current data

Total h.t. current 325mA (405), 355mA (625). Voltage on main h.t. line (junction R138/C113) 231V (405), 224V (625). Voltage at junction W10/L40 250V (405), 245V (625). E.H.T. 16·5kV. Boost voltage (junction R127/C101) 609V (405), 690V (625). H.T. to u.h.f. tuner (valve) 165V. V.H.F. tuner h.t. at R1 136V (405), 0V (625); at R2 143V (405), 0V (625).

Brief fault-finding guide

Receiver not functioning: Check mains to 1·5A fuse. If absent check mains supply and on-off switch. If the fuse has failed check for shorts and observe behaviour when receiver is switched on with a new fuse fitted. If valve heaters do not light up evenly, i.e. some are very bright,

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check for heater-cathode shorts and heater-to-adjoining tracks shorting. If fuse fails immediately check C110, C111, W10, C112.

If h.t. fusible resistor wires are parted switch off, allow to cool and join wires with a soldering iron. Switch on and note how long it takes to again overheat. If it fails almost immediately check for shorts at supply points along panel, i.e. feed to i.f. stages, to video stage, to tuner, etc. If the heating is delayed until the line timebase starts to work check PL500 and PY801.

Note: if wrap-round tags have to be undone to isolate the fault it is recommended by the makers that the wires be soldered to the tags when remaking the connections.

No picture, no raster, sound in order: Switch to 405 and listen for line timebase whistle. If low or unusual, check with EY86 (if fitted) top cap off. If now normal change EY86. If still absent or unusual check PL500, screen feed resistor, PY801 and PCF808. If jelly-pot transformer and e.h.t. tray is fitted release this and note difference. If e.h.t. is normal check tube base voltages at pins 3, 6 and 7.

Raster and sound in order, no picture signal: Check V4 and V5 with associated circuitry.

Picture in order but no sound: Check V6 and V7 and associated circuitry.

Ferguson Model 3629: This 11 in. model is fitted with a special version of the 900 chassis. R136 is replaced with two 15Ω 10W resistors in series to reduce the h.t. voltage 10%. CME1101 tube, 13·5kV e.h.t.