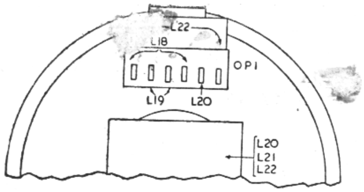
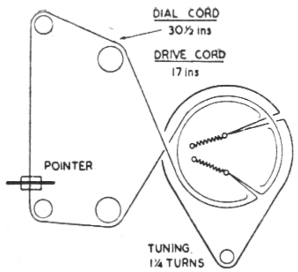
FERRANTI 148

Continued





Right: The cord drive with gang fully meshed

AERIAL signal is switched by S1 to aerial coupling coils L2 (SW), L4 (MW), L6 (LW). L1, C1 is an IF filter and R1 a static drain. The grid coils L3 (SW), L5 (MW), L7 (LW), trimmed by T1, T2, T3, C3 respectively, are switched by S2 to aerial tuning capacitor VC1 and to triode-hexode frequency-changer V1. AVC and a standing bias decoupled by R12, C2 are fed through the tuned coils on all wavebands.

Oscillator is connected in a tuned grid, shunt fed circuit. The grid coils L10 (SW), L12 (MW), L14 (LW), trimmed by T4, T5, T6, C12 respectively and padded by C10, C11, C13, are switched by S3 to oscillator tuning capacitor VC2 and coupled by C9 to oscillator grid of V1. Automatic bias is developed on C9 with R4 as leak.

Anode reaction voltages, obtained inductively from the series connected coils L11 (SW), L13 (MW), L15 (LW), are fed through C8 to oscillator anode of which R3 is the load. R7 is a series limiter. On SW range S4 connects LW padder C13 across L13, L15.

IF amplifier operates at a frequency of 465kc/s. Secondary L9, C7 of IFT1 feeds signal and AVC voltages together with a standing bias decoupled by R12, C2 to IF amplifier V2. Cathode and suppressor grid are connected down to chassis. Screen voltage is obtained from R2 decoupled by C14. Primary L16, C15 of IFT2 is in the anode circuit, the HT for which is decoupled by R21, C29.

Signal rectifier. Secondary L17, C16 of IFT2 feeds signal to one of diodes of V3. R9 is the diode load and R8, C18, C19 form an IF filter.

AVC. C17 feeds signal at anode V2 to second diode of V3. R13 its load resistor is returned to chassis through R19 thus providing a standing bias for grids of V1, V2. This bias together with cathode bias developed across R11 gives AVC line delay voltage.

AF amplifier. Rectified signal is fed by C20 to S5, which in its three radio positions, switches signal through to volume control R10 and thence to grid of triode section of V3.

Pickup. Sockets are fitted for connection of a crystal or high-impedance magnetic pickup. When wavechange switch is placed in Gram position the pickup is switched by S5 through the volume control R10. With crystal pickups it may be necessary to incorporate a correcting filter. A typical filter could consist of a 100K and 250K resistor in series across the pickup leads, the output being taken from across the 250K resistor.

Output stage. C25 feeds signal to beam-tetrode output valve V4. R15 is its grid resistor and with C23 gives variable top-cut tone control. C22 is an RF filter.

Cathode bias is provided by R16 decoupled by C24. Primary L18 of output matching transformer OP1 is in the anode circuit with R17 as an anode stopper. R18, C26 give fixed degree of tone control. Secondary L19 of OP1 feeds signal to an 8in. energised speaker L21.

L20 is a hum-bucking coil. Sockets are fitted on L19 for connection of a low-impedance PM extension speaker. Plug-socket switch S7 enables the internal speaker L21 to be silenced.

HT is provided by a full-wave indirectly heated rectifier V5. Choke-capacity smoothing is given by L22, the field coil of the speaker, together with C27, C28.

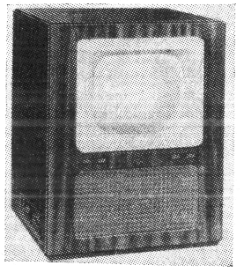
RF filtering is by C4, whilst HT feed to V1, V3 and screen V2 is decoupled by R5, C5. Anode V2 is separately decoupled by R21, C29. Reservoir C28 should be rated to handle 100mA ripple.

Negative side of HT is returned to chassis through R19. The voltage developed across R19 is used as AVC delay bias.

TRIMMING INSTRUCTIONS

Apply signal as stated below	Tune receiver to	Trim in order stated for maximum output
(1) Connect a suitable output meter, in series with .1 mF capacitor across primary L18 of OP1.		
(2) 465kc/s to g1 of V1 via .1 capacitor	LW with gang at max. cap.	Cores L8, L9, L16 L17
(3) 465kc/s to AE sockets via dummy aerial	MW with gang at max. cap.	Core L1 for minimum.
(4) With gang fully meshed check that dial pointer coincides with calibration lines at bottom of SW and LW scales.		
(5) 1.5mc/s to AE sockets via dummy aerial	200 metres	T5 and check at 190 metres.
(6) 1.401mc/s as above	214 metres	T2.
(7) 600kc/s as above	500 metres	Core L12, L5. Repeat 5, 6 and 7
(8) 300kc/s as above	1000 metres	T6
(9) 266kc/s as above	1128 metres	T3
(10) 167kc/s as above	1800 metres	Core L14, L7. Repeat 8, 9 and 10
(11) 1.149kc/s as above	1370 metres	Reduce output by altering positions of high RF potential leads of L6, L7.
(12) 18mc/s as above	16.67 metres	T4 for second peak from max. cap. position.
(13) 15mc/s as above	20 metres	T1
(14) 6.67mc/s as above	45 metres	Adjust tracking leads from L10, to switch and from L3 to switch. Repeat 12, 13, and 14

EKCO TS105, TRC124



Eighteen-valve, London frequency, television receiver with a three-valve superhet radio unit giving choice of four preset stations. TS105 is a table model with a 9in. CRT, and model TRC124 is a console type with a 12in. tube. Suitable for 200 to 250V 40—60c/s. Made by E. K. Cole, Ltd., Southend-on-Sea.

THE television receiver employs a TRF circuit with permeability tuned coils and incorporates vision interference limiter and sound noise suppression circuits. EHT is obtained from line flyback pulses.

The radio receiver is a superhet with one stage of IF amplification at 455kc/s. Its output is fed *via* the common television-radio sound volume control to the output amplifier on the television chassis. The radio channel provides four preset tuned programmes—three on the MW band and one on LW band—selected by means of a switch.

Mains consumption at 225V input is .75A on television and .2A on radio.

Aerial input is designed for a 75 ohm co-axial feeder. The signal is fed through isolating capacitors C1, C2 and coupled by L3, L4 to first RF amplifier V1. L1 is an RF choke, and L2, C4 form an IF filter across the input to the radio receiver.

Vision channel consists of RF amplifiers V1, V2, V3, signal rectifier and interference limiter V4, and video amplifier V5. Bandpass coupling is used between V1, V2, V3, and V4A. To provide a wide bandwidth covering both sound and vision frequencies, the coupling transformers of V1 and V2 are damped by resistors R7, R8 and R10, R11.

Gain of V1 is controlled by R4, the **Contrast** control in the cathode circuit. R4 varies the bias applied to control grid and suppressor grid of V1 in a way that maintains reasonably constant the input capacity and resistance of the valve, and hence preserves the input response curve.

Sound signal rejection is given by L19 in the grid circuit of first sound RF amplifier V10. Rectified signal developed at cathode V5A is DC coupled through peaking chokes L11, L12 to grid of video amplifier V5. Negative going picture signal produced in anode circuit of V5 is DC coupled to cathode of CRT. R24 limits the DC potential between cathode and heater of CRT to prevent flash-over.

Interference limiter. Diode V4B is connected between CRT cathode and chassis and is normally held cut-off by charge on C14 which is equal to peak-white. When a high frequency negative going interference pulse appears at anode V5, then, because of the comparatively long time constant of R16, C14, the cathode of V4B is driven heavily negative and the diode conducts and short circuits the interference pulse.

When S1 is closed R15 is shunted across R16. The resultant time constant of R16, C14 is therefore reduced and the charge on C14 is also reduced. Thus V4B conducts just before peak-white amplitude is reached and the effectiveness of the limiter is increased, but at the expense of a general overall loss of peak-white.

Sound Channel. The sound signal of 41.5mc/s is amplified together with the vision signal by V1 and V2, and is fed by C9 to L19 tuned to 41.5mc/s and coupled by L20 to grid of first sound RF amplifier V10. A preset gain control R42, which varies the bias to grid and suppressor of V10, is provided to enable the television sound output to be adjusted to suit the setting of the manual radio-television volume control R89.

Output of V10 is bandpass transformer coupled by L21, L22 to second sound RF amplifier V11, which in turn is bandpass coupled by L23, L24 to signal rectifier V12A. The rectified signal which appears across R53 is coupled by C35 to cathode of series noise suppressor diode V12B, and thence fed by C36, R50 back to g1 of V11 for AF amplification.

Cathode of V11 is decoupled by C29 at RF and by C32 at AF. Amplified signal is taken from screen of V11 and fed by R47 through C72 to S4, which in its TV position passes the signal on to volume control R89. From R89 it is fed by C38 through R55 to pentode sound amplifier valve V13, the output of which is fed into a 6½in. PM speaker. C40, R61 provides negative feedback, and R62, C41 fixed tone correction.

Noise suppression. Anode of diode V12B is connected to HT through R56, R54 and is normally in a state of conduction. The time constant of R56, C39 is such that the charge on C39 follows that of the audio signal which is fed to the cathode of V12B by C35. When a high frequency interference pulse is passed by C35 the diode is cut off due to the cathode being driven positive (the anode potential cannot change so quickly because of the longer time constant of R56, C39).

Sync. separator. Signal at anode of video amplifier V5 is fed by R22, C17 to sync. separator V14. The positive sync. pulses drive V14 into grid current, which produces a steady negative bias across R64 sufficient to place the negative video signal beyond cut-off. Hence only the positive sync. pulses are amplified by V14 and appear in its anode circuit. Screen and anode potentials of V14 are reduced by R65 decoupled by C43 to shorten its grid base to ensure sync. separation on weak signals. Frame sync. pulses are fed by C47, R25 to control grid of frame scan oscillator V7.

Line sync. pulses sharpened by L28 are fed by C46 to suppressor of line scan oscillator V15.

Continued overleaf

Frame scan oscillator uses a thyratron V7. Scan voltage is developed on C19. R28 adjusts the cathode bias of V7 and gives **Frame Hold** control.

Frame amplifier. Oscillator output is fed by C20 to picture **Height** control R31 and thence through R33 to pentode amplifier V8. FT1 in the anode circuit feeds scanning waveform to frame deflector coils L17, L18 on the neck of CRT. Variable negative feedback from anode to grid of V8 by R35, R34, C22 gives adjustment of **Linearity.** To further improve linearity additional negative feedback is introduced by returning cathode of V8 to chassis through secondary L16 of FT1.

R37 damps out line oscillation in L17, L18 due to mutual inductance.

Line scan oscillator is pentode V15 connected in a combined Miller integrator and transitron circuit. The scan voltage is developed across cathode load R68. Variation of the positive bias applied to the grid gives **Line Hold** control.

Line amplifier. Oscillator output is fed by C49, R75 to beam-tetrode amplifier V16. Amplified waveform is transformer coupled by LT1 through C53 to line deflector coils L32, L33 on the neck of the CRT. Variable inductance L31 damped by R78, C52, which is in series with deflector coils, gives control of picture **Width.**

Efficiency diode. V18 serves to damp out fly-back oscillations set up across secondary L30 of LT1. The rectified voltage is developed across R77, C50, so that cathode V16 is made approximately 25 volts negative to chassis, thus increasing the anode voltage.

EHT of approximately 7kV for anode of CRT is obtained by rectifying the surge voltages developed across the over-wound primary L29 of LT1 by means of half-wave rectifier V17. Heater current for V17 is provided by a separate secondary L36 on mains input transformer MT1.

HT is provided by two half-wave rectifiers V9 and V21, which, although independently fed, are smoothed by a single choke-capacity smoothing circuit L34, C54, C55. On television both V9 and V21 outputs are required, but when radio only is in operation, then V9 heater and anode supplies are switched off by S5.

HT feed to television and radio circuits, with the exception of anode and screen supply of V13 and anode V5, is switched by S6. As V13 is in use on TV and radio, its HT lead is connected direct to smoothing circuit. V5 anode supply is maintained so as to provide a cathode bias for the CRT to prevent a burn spot forming when the selector switch is turned from TV to radio. Reservoir smoothing capacitor C55 should be rated to handle 500mA of ripple current.

Heaters of V1 to V12, V14 to V16 and V18 obtain their current from the various secondary windings L37 to L41 provided on MT1. V13 is connected in series with radio circuit valves V19, V20, V21, which obtain their current from the mains through tapped dropper resistor R81.

Mains input to receiver is fitted with two 1.5A fuses and provided with a double-pole ON/OFF switch S7 which is ganged to volume control R89. Primary L42 of MT1 and mains dropper R81 are tapped for 200-210, 220-230, 240-250V inputs.

CRT is either a 9in. or 12in. triode with permanent magnet focusing. **Brightness** is controlled by variation of grid bias by R21.

RADIO RECEIVER

Radio receiver consists of a triode-hexode frequency-changer V19 and a combined IF amplifier and signal rectifier V20. The rectified output from diode of V20 is switched by S4 to volume control R89 and thence fed to sound output valve V13.

Aerial. The outer screening of TV co-axial cable is used as the radio aerial. Signal is fed through choke L1 and C57 to S2, which switches into circuit the permeability tuned aerial coils L43 to L59. The tuned coils are coupled by C58 to frequency-changer V19. AVC is applied via R82.

Oscillator is connected in a Collpitts circuit with permeability tuned loading coils L47 to L50 switched into circuit by S3.

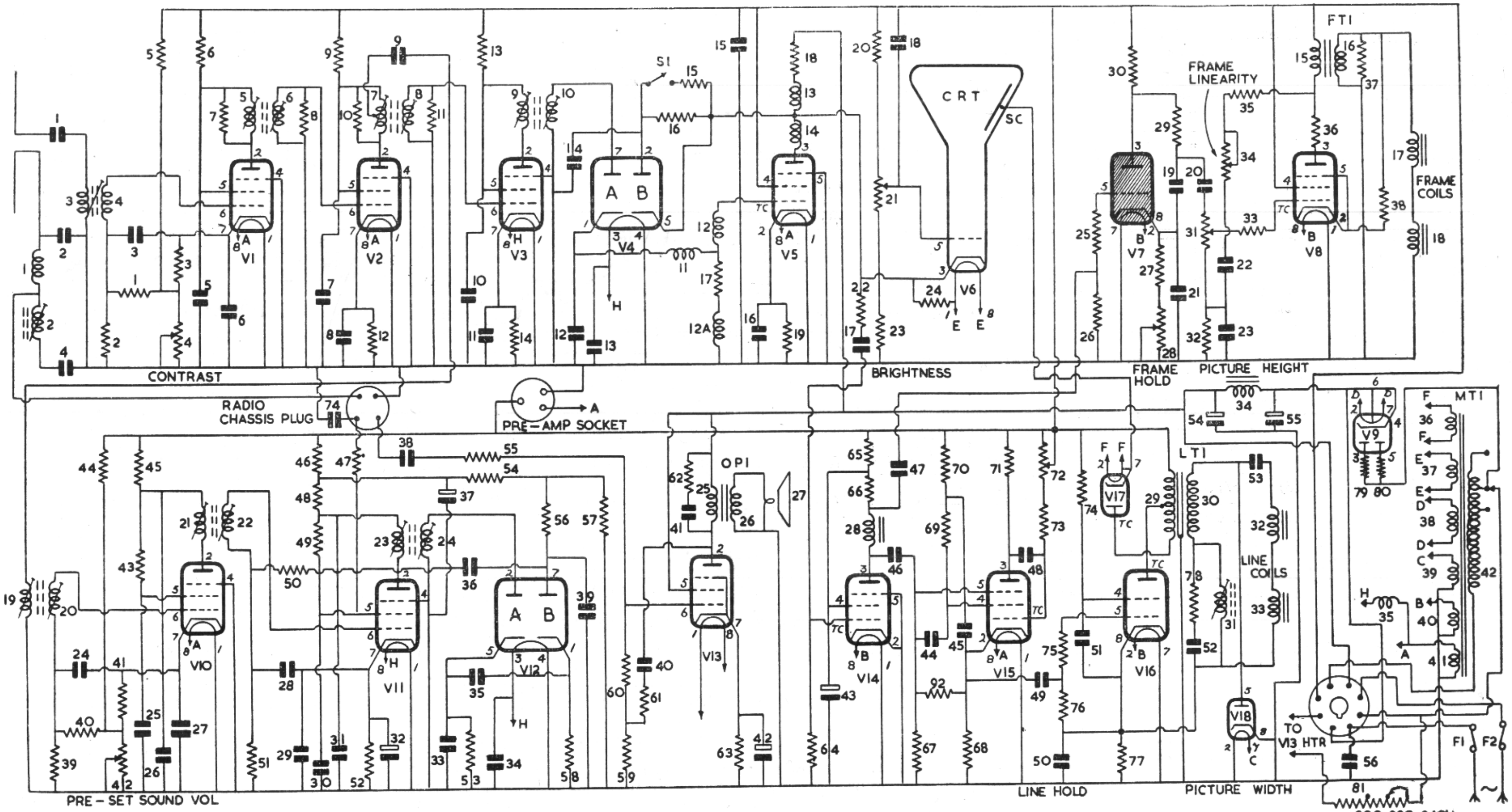
IF amplifier IFT1 in the hexode anode of V1 feeds the IF signal of 455kc/s and AVC voltage to IF amplifier V20.

Signal rectifier. IFT2 feeds signal to single diode of V20, of which R87, R88 form the diode load. Rectified signal is switched by S4 to volume control R89 and thence fed through to grid of pentode sound output valve V13.

AVC. The DC component of rectified signal is tapped off from junction of R87, R88 decoupled by C71 and fed to grids of V19, V20.

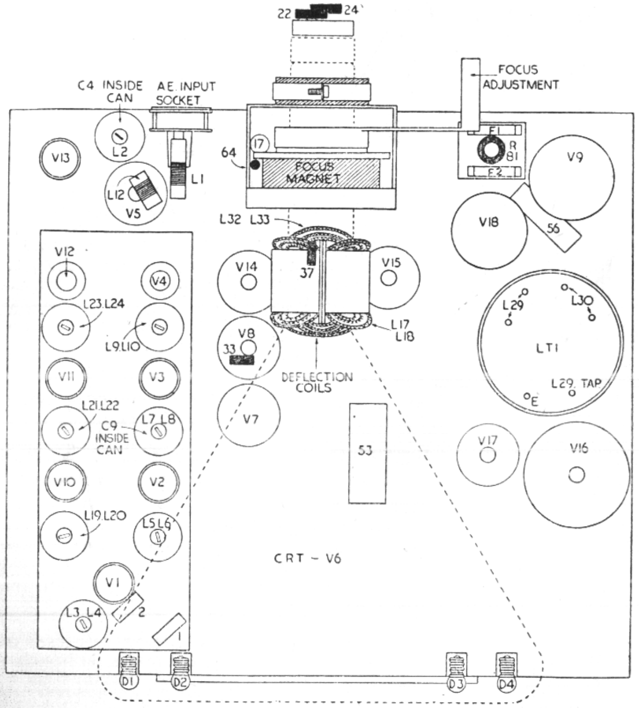
HT is provided by a half-wave rectifier V21, the output of which is fed to common TV and radio

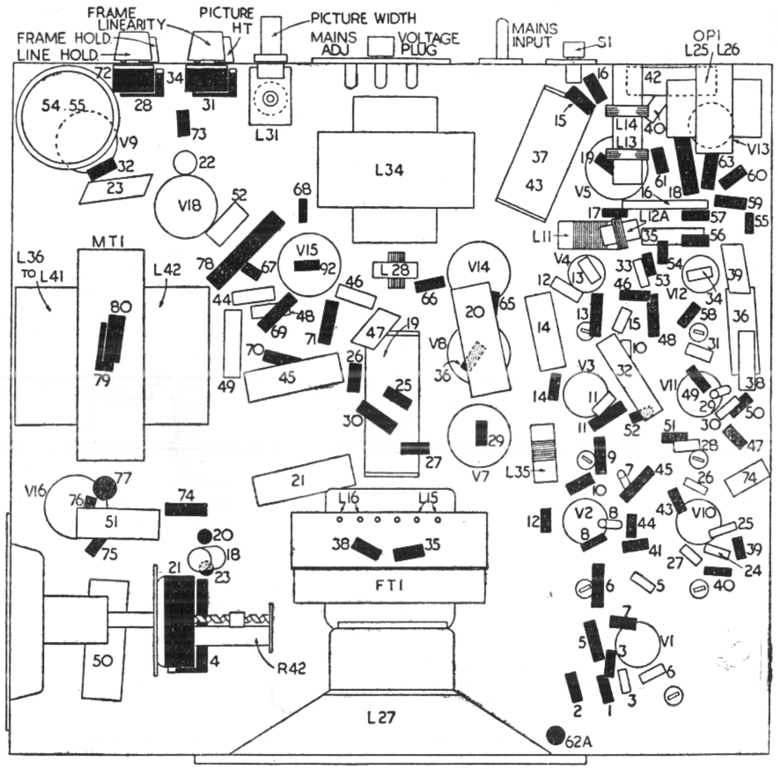
Continued on page 14

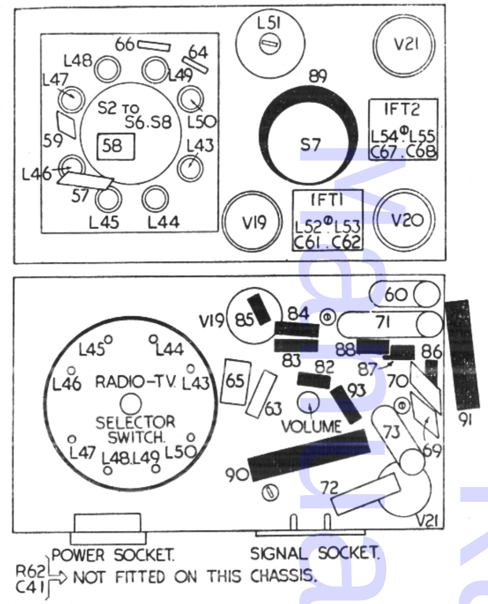


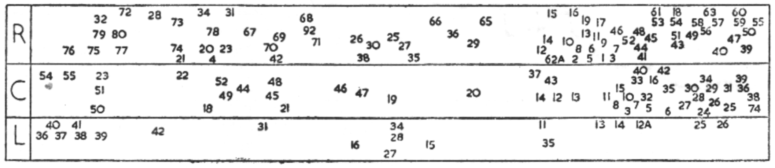
CAPACITORS

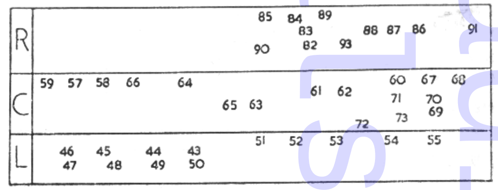
C	Capacity	Type
1	500pF	Mica
2	500pf	Mica
3	.011	Tub. Ceramic
4	150pF	Silver Mica
5	.001	Tub. Ceramic
6	.001	Tub. Ceramic
7	.001	Tub. Ceramic
8	.001	Tub. Ceramic
9	15pf	Tub. Ceramic
10	.001	Tub. Ceramic
11	.001	Tub. Ceramic
12	6pF	Tub. Ceramic
13	.001	Tub. Ceramic
14	.1	Tubular 350V
15	.001	Tub. Ceramic
16	.0015	Silver Mica
17	.1	Tubular 350V
18	.01	Tubular 350V
19	.5	Tubular 500V
20	.1	Tubular 350V
21	.1	Tubular 350V
22	.01	Tubular 500V
23	3600pF	Silver Mica
24	.001	Tub. Ceramic
25	.001	Tub. Ceramic
26	.001	Tub. Ceramic
27	.001	Tub. Ceramic
28	30pF	Tub. Ceramic
29	.001	Tub. Ceramic
30	.001	Tub. Ceramic
31	.001	Tub. Ceramic
32	20	Electrolytic 12V
33	30pF	Tub. Ceramic
34	.001	Tub. Ceramic
35	.02	Tubular 350V
36	.05	Tubular 350V
37	8	Electrolytic 275V
38	.02	Tubular 350V
39	500pF	Silver Mica
40	.001	Tubular 350V
41	.04	Tubular 350V
42	50	Electrolytic 12V
43	4	Electrolytic 275V
44	100pF	Mica
45	.1	Tubular 350V
46	6pF	Tub. Ceramic
47	500pF	Silver Mica
48	100pF	Mica
49	.01	Tubular 350V
50	25	Electrolytic 50V
51	.1	Tubular 350V











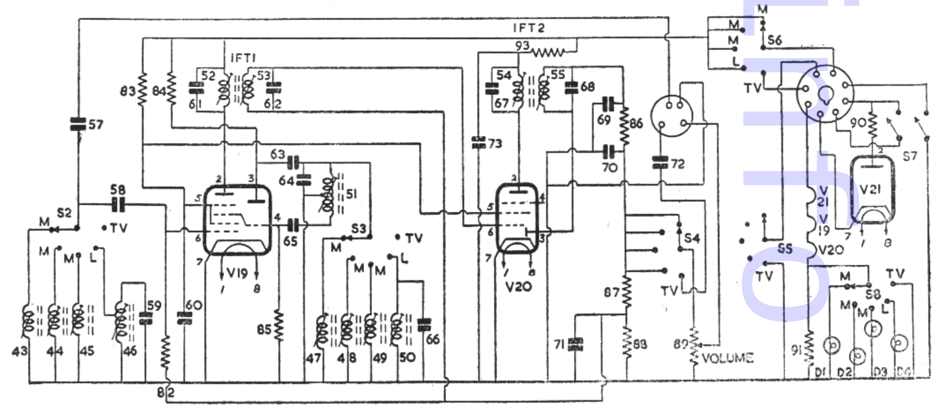
C	
52	.01 Tubular 350V
53	.5 Tubular 350V
54	100 Electrolytic 280V
55	50 Electrolytic 350V
56	.1 Tubular 1000V
57	82pF Silver Mica
58	100pF Silver Mica
59	175pF Silver Mica
60	.1 Tubular 350V
51	56pF Silver Mica
52	56pF Silver Mica
53	500pF Silver Mica
64	270pF Silver Mica
65	200pF Mica
66	250pF Silver Mica
67	100pF Silver Mica
68	100pF Silver Mica
69	200pF Silver Mica
70	200pF Silver Mica
71	.02 Tubular 350V
72	.02 Tubular 350V
73	.1 Tubular 350V
74	.007 Tubular 350V

RESISTORS

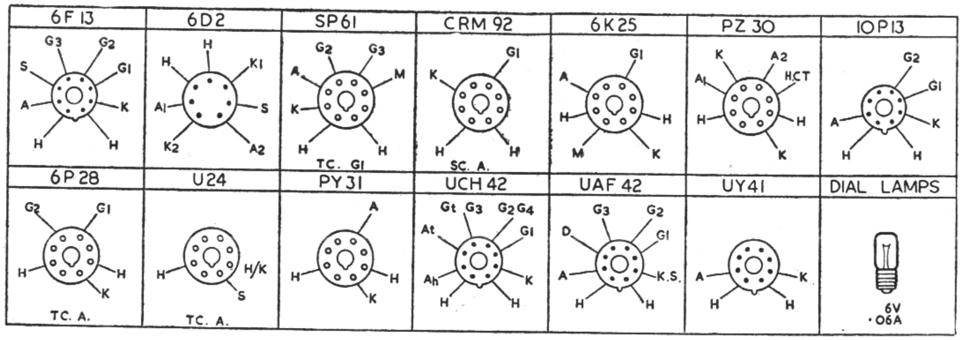
R	Ohms	Watts
1	3.9K	¼
2	100K	¼
3	150	¼
4	10K	WW potr.
5	120K	½
6	4.7K	¼
7	4.7K	¼
8	6.8K	¼
9	4.7K	½
10	4.7K	¼
11	6.8K	¼
12	150	¼
13	4.7K	½
14	150	¼
15	1M	¼
16	4.7M	¼
17	3.9K	¼
18	6.8K	1W
19	330	¼
20	82K	¼
21	100K	Potr.
22	10K	½
23	100K	¼
24	100K	¼
25	5.6K	¼
26	39K	¼
27	2.2K	¼
28	3K	Potr.
29	100	¼
30	100K	½
31	1M	Potr.
32	330K	¼
33	10K	¼
34	500K	Potr.
35	330K	¼
36	47	¼
37	470	¼
38	330	¼
39	100K	¼
40	3.3K	¼
41	150	¼
42	10K Special WW potr.	
43	1K	¼
44	220K	¼
45	4.7K	½
46	1.5K	¼
47	22K	¼
48	4.7K	¼
49	1K	¼
50	100K	¼
51	33K	¼
52	150	¼
53	68K	¼
54	470K	¼
55	68K	¼
56	2.2M	¼
57	180K	¼
58	1M	¼
59	47K	¼
60	820K	¼
61	330K	¼
62	5.6K	¼
62A	15	1W
63	390	½
64	470K	¼
65	470K	¼
66	1.2K	¼
67	1M	¼
68	8.2K	¼
69	10K	½
70	33K	¼
71	10K	½
72	2M	Potr.
73	2.2M	¼
74	1.8K	½
75	330	¼
76	680K	¼
77	2.2K	2W
78	680	1W
79	50 WW	5W
80	50 WW	5W
81	1,356 tapped 150+150 WW Mains Dropper	
82	1M	¼
83	22K	½
84	22K	½
85	47K	¼
86	47K	¼
87	3.3M	¼
88	1M	¼
89	500KPotr.with DPST switch	
90	160	2W
91	100	2W
92	220K	¼
93	10K	½

INDUCTORS

L	Ohms
1	1
2	17.5
3–10	very low
11	.5
12	.5
12A	4
13	5
14	5
15	1,100
16	1
17, 18	14
19–24	very low
25	500
26	.3
27	2.5
28	44
29	300
30	3.5
31	6
32, 33	9.6
34	75
35–41	very low
42	29.5 total
43	5
44	6
45	9.5
46	31
47	2.5
48	3
49	2
50	3.5
51	14
52	32
53	32
54	15
55	15



Circuit of the four-station push-button radio receiver which forms part of the Ekco TS105.



smoothing circuit L34, C54, C55. V21 is in operation on both TV and radio channels.

Heaters of V19, V20, V21 are connected in series with the heater of sound output valve V13 and obtain their current from the mains through dropper R81. The preset station indicator lamps are switched by S8 across load resistor R91 in the chassis side of heater chain.

ALIGNMENT INSTRUCTIONS

Requirements : a signal generator capable of producing modulated signals accurately on 46.5 and 41.5mc/s ; a 0—20mA DC meter or a 0—10V 20,000 ohms-per-volt DC voltmeter (or valve voltmeter) ; an AF output meter ; a 560-ohm carbon resistor.

First insulate the CRT anode and clip to prevent possibility of shock when aligning. Remove the upper (primary) cores of L5—6, L7—8, L9—10, L21—22, L23—24. Connect milliammeter between R18 and HT, or the voltmeter across R17, L12A.

Apply signal to aerial socket.

Note : In each case tune to the first peak obtained when screwing in the core.

Vision

(*a*) Connect 560 ohms across L9. Inject 46.5mc/s and adjust L10 for maximum.

Connect damping across L10. Insert primary core and adjust L9 for maximum. Remove damping.

(*b*) Inject 41.5mc/s and increase signal to show a slight reading on meter. Adjust L19 core for *minimum*.

(*c*) Re-tune L7, L8 as in (*a*).
(*d*) Re-tune L5, L6 as in (*a*).
(*e*) Inject 46.5mc/s and adjust L3, L4 core for maximum.

Sound

(*a*) Connect the AF meter across the speaker.
(*b*) Inject 41.5mc/s. Adjust L24 core for maximum. Insert L23 core, then adjust for maximum.
(*c*) Re-tune L21, L22 as in (*b*).
(*d*) Adjust L20 core for maximum at 41.4mc/s.

Radio

Connect output meter as for TV sound. Switch to position 2. Inject 455kc/s *via* a 0.1 mF to the control grid of V19. Adjust the IF cores in the following order for maximum output ; 2nd IFT upper and lower, then 1st IFT upper and lower.

Connect input to co-axial braiding, then adjust L2 core or *minimum*.

Station Setting. Switch to position giving coverage of the required signal. Inject the required frequency to the braiding ; then adjust the appropriate oscillator core to resonance ; then the grid core for maximum. Insert the correct station name into the indicator panel.

The core of the master oscillator coil L51 should not normally be disturbed, but in cases of necessity switch to position 1, unscrew L50 core for minimum inductance, inject 300kc/s, then adjust L51 core for maximum.

Re-adjust L50 and L46 cores to required frequency.

VOLTAGE AND CURRENT DATA (TV)

Valve	Anode		Screen		Cathode
	Volts	M.A.	Volts	M.A.	Volts
1 6F13 ...	195	9.5	195	3	1.9
2 6F13 ...	195	9.5	195	3	1.9
3 6F13 ...	195	9.5	195	3	1.9
4 6D2 ...	—	—	—	—	—
5 SP61 ...	185	5.3	242	2	2.4
6 CRM92	7000	—	—	—	185
7 6K25 ...	—	—	—	—	—
8 SP61 ...	235	7.3	242	2	3
9 PZ30 ...	225	—	—	—	—
10 6F13 ...	195	9.5	195	3	1.8
11 6F13 ...	185	9.5	185	2.5	1.8
12 6D2 ...	—	—	—	—	—
13 10P13 ...	225	26	242	7	13
14 SP61 ...	—	0.4	—	0.1	—
15 SP61 ...	190	—	142	—	30
16 6P28 ...	—	72	210	18	—.27
17 U24 ...	7000	—	—	—	7000
18 PY31 ...	—	—	—	—	—

CRM121 data as for CRM92.
Variation V1 cathode volts by R4=1.9V to 44V
,, V10 ,, ,, by R42=1.8V to 40V
,, CRT grid ,, ,, by R21=110V to 20V
Smoothed HT output 242V 185mA.

Conditions : Contrast and Volume at maximum. Other controls set for normal operation. No signal input.

VOLTAGE AND CURRENT DATA (RADIO)

Valve	A node		Screen		Cathode
	Volts	M.A.	Volts	M.A.	Volts
V19 UCH42 OSC. A	223 123	1.94 } 3.0 }	87	2.5	—
V20 UAF42	150	7.5	87	2.4	—
V21 UY41 ...	—	—	—	—	226
V13 IOP13 ...	210	23.4	223	5.3	11.5

CURING INTERMITTENT FAULTS

By G. R. WILDING

A service engineer looked into his records, then wrote this practical article. Other contributions summarising service experience are invited

MOST engineers will agree that the most difficult faults to trace are intermittent ones for, while these may harass the set owner with monotonous regularity, they have a habit of disappearing when looked for by the engineer.

Almost equally annoying too, are those faults of a semi-mechanical nature which can be produced by chassis movement or cabinet knocking. While the way to cure the latter type of fault is diligent component prodding and wire moving, the only way to cure the former is to have the receiver in the workshop for a really prolonged time test, and with its chassis removed so that at the slightest sign of irregularity the engineer can investigate.

From records covering thousands of repairs during the last few years I have made an analysis of the faults that give rise to intermittent operation or distortion.

THREE COMMON CAUSES

Neglecting valves, we find that intermittent operation of local oscillator circuits, dry joints and shorting trimmers are the three commonest causes of intermittent signals, while periodic distorted reproduction is invariably due to a "leaky" coupling condenser or the speaker itself.

Resistors are seldom the cause of irregular operation but we experienced quite a fair amount of trouble with intermittently open-circuit speech coil leads and badly contacting internal speaker switches.

But to revert to bogey number one, intermittent operation of the local oscillator—we find that, especially in some makes, the commonest cause is the picofarad condenser in the grid circuit of the triode oscillator. Other fairly frequent causes of spasmodic oscillation are OC decoupling condensers anywhere in the frequency-changer circuit and badly contacting valveholders.

More than once we have had experience of battery superhets oscillating intermittently due to the wax compound encasing the oscillator coil having absorbed considerable moisture. This dampness is equivalent to a low value resistor paralleled across the coil and unless the set is switched on and off several times quickly—to give it a little "shock excitation"—the load proves too much for the valve.

We put the whole chassis in a very low temperature oven and dry it out for a quarter of an hour.

Intermittent short circuits in trimmers are invariably due to metal dust or specks of solder, or caused by the sharp corners of the metal leaves having been bent down a little when stamped out and through vibration piercing the mica insulation.

Picofarad condensers of the "sprayed-on" type we always replace if we have any suspicion at all, and similarly if any of the frequency-changer's small decoupling condensers are suspected of intermittency, we find it most economic to replace them all.

While on the subject of frequency changers, we must mention the apparent intermittency of some prewar receivers fitted with QAVC circuits which, if wrongly adjusted and when tuned to a variable strength signal, would completely fade in and out as the signal strength varied above or below the sharply defined cut-off point.

The Ekco models AC85, AC86, the Marconi Q286 in particular, and several Pye, Ever Ready and GEC receivers were susceptible to this trouble. These models were all manufactured about the same time when there was a wave of popularity for any type of noise suppressing device.

In practice, when an intermittent set goes "off" in the service workshop, the first thing we do is to test for the tell-tale negative voltage developed across the grid leak of the triode oscillator. If this is absent, the valve cannot be oscillating, but if the voltage is there we have an RF—AF signal generator placed conveniently so that we inject a suitable signal into each stage in turn.

Concerning intermittent distortion, our records show that the output pentode's grid coupling condenser and its bias resistor by-pass condenser are easily the two most common causes of this fault, although volume controls and grid circuit tone controls figure prominently in our analysis.

Distorted speech coil formers, loose speech coil turns and intermittently OC speech coil leads are our three commonest speaker faults, although in one or two cases intermittent "buzzing" noises complained of by customers proved to be due to the outer perimeter of the cone having come uncemented from the speaker frame.

Intermittent humming is comparatively rare, and when experienced is usually found to be due, not to the main electrolytic condensers as might be supposed, but to imperfect contact in the grid circuit of the DDT valve, which causes the grid to be intermittently freed from any chassis return circuit. Valveholders and dry joints are usually the cause of this effect.

Intermittently varying volume is also comparatively rare, and in the few occasions when it was experienced, proved to be of semi-mechanical origin, i.e. bare wires shorting, poor contacts or dirty wavechange switches.

UNRELIABLE WIRES

Screened wire in old sets are apt to be unreliable as also are the $\frac{1}{8}$ watt grid stopper resistors inside the screened top cap connectors of double diode output pentodes. Once or twice too, we have found that the top section of certain valve screens would on the slightest provocation short circuit to chassis the grid top cap of the valve.

Intermittently contacting or poorly soldered pigtails on the reaction condensers in battery TRF receivers were found several times to give rise to objectionable volume fluctuation while damp output transformers and current carrying HF transformers resulted in spasmodic crackling.

Metallised valves protected by screening cans are found now and then to give rise to intermittently varying volume if for any reason the valve's metallising contacts the screening can. Usually these valves are auto-biased by cathode resistor, and when the metallising touches the valve can the valve is left unbiased.