SERVICE CASEBOOK

EKCO T114

INTERMITTENT frame collapse. Frame would be collapsed and normal for long periods. CRO showed no frame oscillation in 6K25 (frame oscillator). Anode volts were found to be low, being 30 instead of 75. When frame scan returned, voltage rose to normal.

Anode load resistor was changed, as was coupling capacitor to frame output valve (SP41). Charging capacitor (.5mF) was checked but found to be OK, as were all the relevant components in this stage.

The fault had reached the baffling stage, so drastic treatment was called for. The valves were waggled about in their holders, and it was found that when the SP41 was moved the frame was sometimes affected. The base of this valve was checked and found to be clean.

On closer inspection it was found that when the lead to the grid of the SP41 was moved in a certain way, the frame collapsed. The top cap was cleaned and the screened lead was suspected as the rubber was perished. It was tested for shorts and found to have an intermittent short inside it. Replacing with co-axial feeder cured the trouble. —G. A. PEARSON, Sheffield.

ULTRA 72, 73, 84

WE have found the most common fault on these sets to be in the line output and EHT stages. About half the EHT faults have been found to be due to the screen dropper resistor to the line output valve going O/C.

The horizontal hold control has so much effect on the line frequency, that the EHT will disappear on some sets, when the control is advanced to its limit.

One set came in with slow line oscillation, the fault appearing as a double picture in the horizontal direction. The EHT then went off, so the line oscillator was checked for volts.

The anode potential of this valve (6L1) was 140 volts instead of 60. This was traced to a faulty .001mf coupling capacitor to the output valve.

Replacing this component restored EHT and cleared the line frequency fault.—G. A. PEARSON, Sheffield.

ULTRA 12IN. TV CONSOLE

WE found that the only thing visible on the screen was a thin vertical line which was wavering about from side to side. Obviously the line timebase or output stage was at fault and, also obviously, EHT was not generated from line fly-back.

A glance round the back showed EHT to be mains-transformer produced and, after a little while, the faintest wisp of smoke appeared. Noting that the SP61 transitron line oscillator was running rather hotter than normal, we pulled it out of the holder in case it had an internal electrode short. As soon as we removed the valve the smoke disappeared but, on substituting another SP61, the smoke reappeared.

Nothing for it but to remove the chassis; it was found that the component causing the smoke was a half-watt resistor in the cathode lead of the SP61. Tests revealed this valve was getting about 200V on a grid that should not be getting any—cause, a completely S/C picofarad condenser wired across the valveholder.—G. R. W., Liverpool.

FERGUSON 968T

CLIENT reported no volume and sound on Vision. Set was checked over thoroughly. Heater-cathode short was found in rectifier; this was cleared and set was then re-aligned.

When it was turned on its base again it performed OK for a time, then—sound on vision, and no volume! The set was upended and realigned—the same again happened.

A close examination of L 6, 7, 18, 19, 20, 21 (April 1950, Chart) revealed that the coils of wire were not stuck to the coil formers and could slide up and down as much as ¼in. They were fixed, re-checked and the set is now OK.—J. SIMMONS, Southend-on-Sea.

PHILIPS 681A

CASES of distortion are a common feature of these models and can usually be traced to one of the ½W resistors in the potential divider of the AF amplifier (EAF42) screen grid, or the screen feed of same.—K. U., Rowlands Hill.

REGENTONE U353

DEAD on all wavebands. Slight live response from FC grid. FC oscillating, shown by negative kick of meter at osc. grid.

Found that putting meter lead on AVC feed resistor to FC grid brought up weak signals. Tried a test Condenser (.1mF) in same position. Reproduction came up. Traced along AVC line to the culprit—the AVC decoupling condenser, common to FC and IF Valves. Replacing cured the trouble. —K. U.

REGENTONE A121

A CASE of hum, together with intermittent motor boating, I managed to locate in FC stage. Eventually, I tracked the cause to the screen decoupling condenser (.1mF) which had gone low.—K. U.

BUSH DC MODEL

PERFORMANCE was OK on LW SW and MW locals. Rest of MW band was poor until an earth lead was connected, then performance came right up to normal.

After a while I came to the seat of the trouble. An O/C condenser decoupling the screen of the FC valve.—K. U.

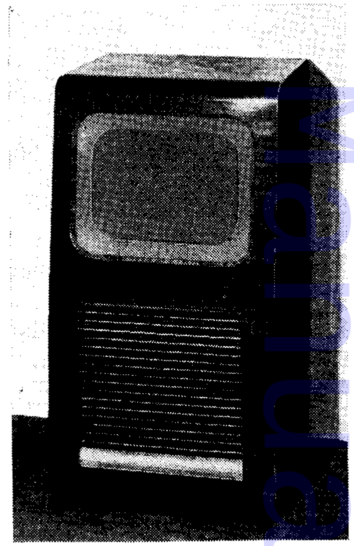
SYMPTOMS OF NOISY VOLUME CONTROL

I HAVE had two cases of noisy volume control which turned out to have nothing to do with the volume control.

First one was in a GEC gram. Complaint of distortion at high volume. Volume control appeared to scratch when turned. After fruitless changing of volume control I found the trouble; a dead short in the DDT cathode decoupling condenser.—K. U.

Second case, a Bush model, had the same scratchy symptoms, together with low HT. This time the shorted decoupler was in the output cathode circuit.—K. U.

FERGUSON 989T



Nineteen-valve, five-channel television receiver with 16in. flat-screen metal-coned CRT with neutral tinted filter, giving a 13¼in. by 10in. picture and incorporating push-pull sound output. Walnut veneered console or oak period style cabinet with panelled doors. For 200-250V DC or AC 50c/s. Manufactured by Ferguson Radio Corporation Ltd, Great Cambridge Road, Enfield, Middlesex.

THE receiver is a superhet operating on lower sideband of vision carrier. Aerial input panel incorporates an attenuator; aerial, RF and oscillator circuits are tuneable to any of the five BBC channels. Vision interference and sound noise suppression circuits are adjustable by three-position plug at rear of chassis.

Mains consumption is 120-150W.

Aerial input is for use with 80ohm coaxial. Aerial signal can be fed direct or through an attenuator R1 R2 R3 to primary L1 of aerial input transformer RFT1. Filter circuit L19 T2, which is tuneable from approximately 70-100mc/s, is fitted to trap interference signals. Outer screen of coaxial and earthy side of aerial input circuit are DC isolated from receiver chassis by C1.

RF amplifier. Aerial signal is coupled by secondary L2 of RFT1 to grid of RF amplifier V1, the gain of which is controlled, with that of first vision IF amplifier V3, by R8 the **Contrast** control in their common cathode return to chassis. Amplified signal is developed across L3.

Frequency-changer is V2 operated as combined oscillator and mixer. Oscillatory tuned circuit L4 C7 C8 T9 is connected between screen and grid through C10, the screen or oscillator anode voltage being obtained through R7 from anode of RF amplifier V1. Automatic bias for oscillator grid is developed on C10 with R9 as leak. RF signals at anode V1 are fed through R7 C6 and mixed with oscillator signal to produce in V2 anode circuit a sound IF of 19.5mc/s across L7 C12 and a vision IF of 16mc/s across L5 damped by R10.

Vision channel consists of two IF amplifiers V3 V4, signal rectifier W1, video output amplifier V5 and interference suppressor V6A.

Bandpass transformer coupling is employed between anode of V2 and first vision IF amplifier V3, and between V3 V4 and vision signal rectifier W1. Wide bandwidth is maintained by damping resistors R10 R11 R13 R14 and R19.

L8 C13, tuned to 14.5mc/s in grid of V3, is an adjacent-channel rejector circuit, whilst sound-on-vision rejection at 19.5mc/s is given by L7 C12 in anode V2 and by L11 C16 in anode V3.

The video signal is developed across R21 in grid of video amplifier V5, the anode of which is connected through correcting choke L23, damped by R24, to cathode of CRT.

Interference limiter is diode V6A shunted by R25 R26 R27 and connected with its anode direct down to chassis and its cathode, through C22, to junction of video correcting chokes L21 L22 in anode of V5. Potential set up on C22 is equal to peak-white signal and is just sufficient to hold V6A cut-off. When a high frequency negative-going interference pulse is passed by C22, cathode V6A is driven negative to anode and the diode conducts to short the pulse to chassis. Choice of three values of shunt load by S1, which forms one section of **Interference Limiter** control, enables degree of limiting to be adjusted.

Sound channel consists of two IF amplifiers V10 V11, signal rectifier W2, noise suppressor V6B, AF amplifier V12A, phase-reverser V13A and push-pull output amplifiers V12B V13B.

Sound signal of 19.5mc/s, developed across L7 C12 in anode of V2, is fed by C32, together with AVC voltages decoupled by R43 C35, to grid of first sound IF amplifier V10. Single-peak transformer coupling is employed between V10 V11 and signal rectifier W2.

Audio signal is developed across R45 and fed by C39 through noise limiter V6B and thence fed by C42 to **Volume** control R48 in grid of AF amplifier V12A. Amplified signal at anode is fed by C45 to grid of one push-pull amplifier V12B, and in addition an attenuated signal derived from potential divider R50 R51 between anodes V12A V13A is fed by C47 to grid V13A. Opposite-phase signal at anode V13A is thence coupled by C46 to other push-pull amplifier V13B.

Output is transformer fed by OP1 to an 8in. PM speaker L38. Fixed tone correction is provided by R59 C49 and C50.

AVC. The DC component of the rectified signal is decoupled by R43 C35 and applied to grid of first sound IF amplifier V10 as AVC voltage.

Noise suppressor. Anode of diode V6B is positively biased from HT line through R46 and conducts to set up a potential across R47 C40 C41, the time constant of which is such that the potential across it follows that of the audio signal fed through C39 to anode V6B. When a high-frequency interference pulse appears, anode V6B is driven negative to its cathode, the potential of which is maintained by the comparatively long time constant. The diode is cut-off for duration of interference pulse.

Time constant of V6B cathode circuit can be adjusted by S4 to give three degrees of limiting. Sound and vision limiter adjusters S4, S1 are ganged to a common **Interference Limiter** control.

Sync separator. Signal at junction of L21 L22 in anode video amplifier V5 is fed through R60 C51 to grid of sync separator V14A. Positive sync pulses cause grid current and bias set up across R61 is sufficient to place video portion of waveform below cut-off; thus only sync pulses appear at anode. Line sync pulses are developed across R64 and fed through C53 and anti-parasitic choke L27 to grid of line oscillator and amplifier V8. Frame sync pulses are differentiated from line sync pulses by action of V14B in conjunction with V15.

Grid V14B is positively biased from HT line through R66 and hence the valve conducts heavily with consequent low anode voltage. Anode V14B is directly connected to grid V15 and as cathode bias of this latter valve, obtained from potential divider R67 R68, is more positive than the voltage applied to its grid, it is normally cut-off. Negative sync pulses, fed by C54 to grid V14B, cause its anode voltage to rise positively. Time constant of R65 C55 is such that the potential on C55 becomes more positive than cathode voltage V15, thus allowing V15 to conduct, only when the long-duration frame sync pulses are on grid V14B.

Frame sync pulses are developed across R69 and fed by C59 to pentode screen (g2) of frame scan oscillator V16.

Frame scan oscillator. Triode V16A is cross-coupled by C57 C58 with screen and grid of pentode V16B in a multivibrator circuit, the oscillation frequency being determined by time constants of R72 C58 and R74 R75 C57. Adjustment of the latter network by R75 gives **Vertical Hold.** Frame scan voltage is developed on C61 in anode V16B. Variation of HT to anode V16B by R76 gives **Picture Height** control.

Frame amplifier. Scan voltage on C61 is fed by C62 through stopper R82 to grid of pentode frame amplifier V17. Amplified scanning waveform at anode is transformer coupled by FT1 to frame deflector coils L41 L42. Centre tap of coils is connected through R36 to HT line. Variation of cathode bias voltage by R71 gives control of **Frame Linearity** whilst R81 R80 C63 C64 provides negative feedback waveform correction.

Line scan voltage is generated by a self-oscillating pentode output amplifier V8. Valve is driven into oscillation by positive grid feedback, through C25 R32 R31 from secondary L31 of line output transformer LT1. Adjustment of feedback network by R32 gives **Horizontal Hold.**

Output waveform is coupled by secondary L31 through linearity coil L25, damped by R37 C31, and DC isolating capacitor C30 to line deflector coils L34 L35. **Line Linearity** is controlled by variation of inductance of series coil L25 by means of a position-adjustable permanent magnet placed in close proximity to the coil.

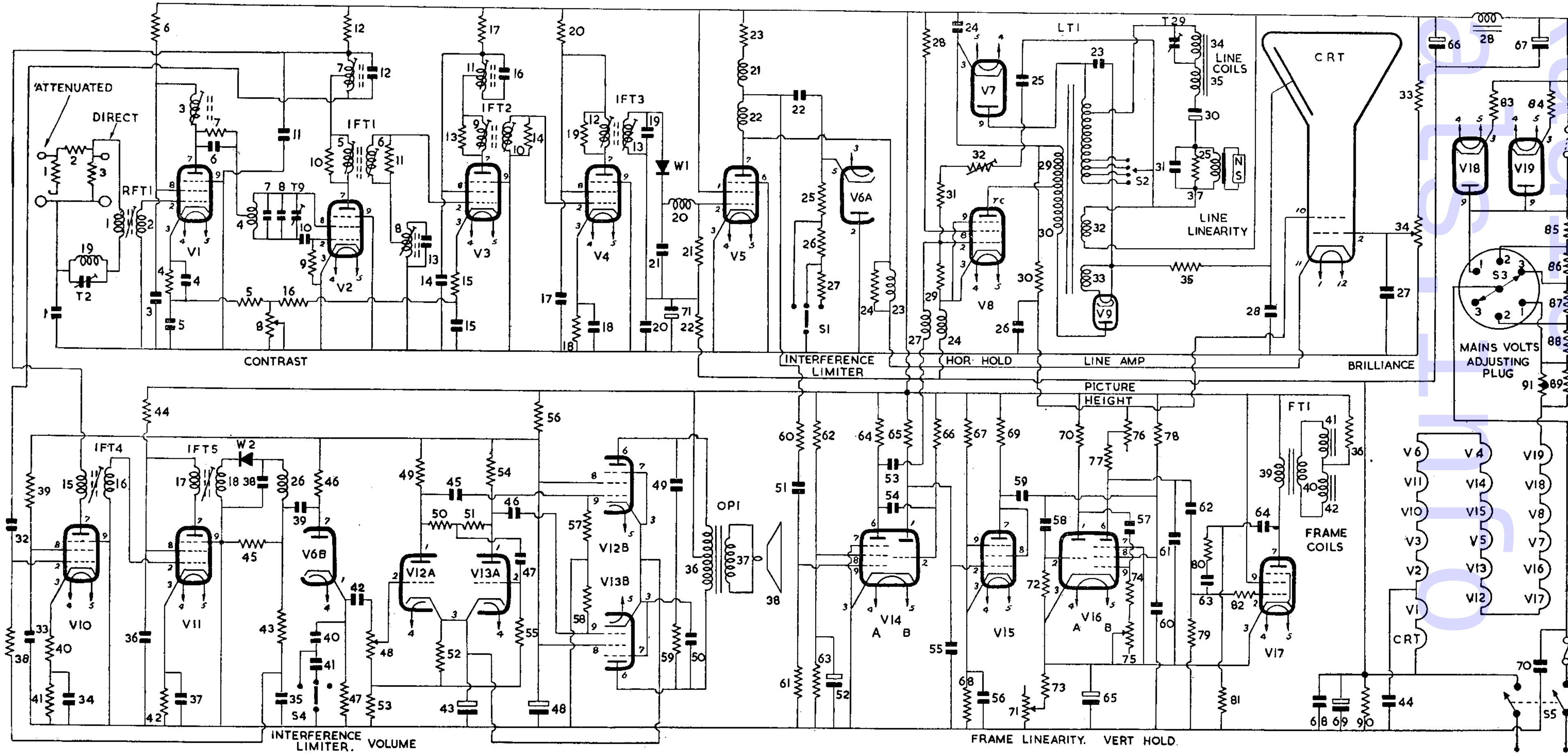
Negative bias for grid of V8 is obtained by returning grid resistor R29 through anti-parasitic choke L24 to bias network R90 C68 C69 in negative HT return lead to chassis. **Line Amplitude** is adjusted by plug S2 which connects deflector coil to tappings on output secondary L31 of LT1.

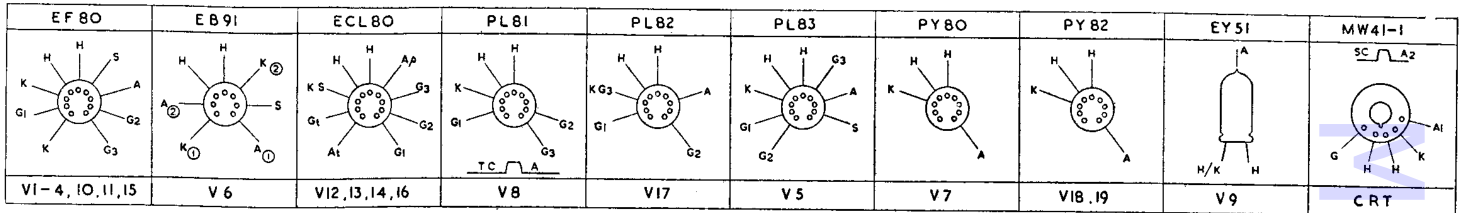
Efficiency diode. Additional drive for line output valve V8 is provided by diode V7 which rectifies high surge voltage set up on secondary L31 when V8 is cut-off at end of each line.

Voltage stored on C24 is smoothed by R30 C26 and fed to second anode of CRT, and to anode of second frame scan multivibrator valve V16B.

EHT of approximately 13.5kV for final anode of CRT is provided by V9 which rectifies the high surge voltage on primary L29 and overwind L30 of LT1 when V8 is cut-off. Approximately 2kV of the 13.5kV is obtained by connecting earthy side of EHT reservoir smoothing capacitor C23 to end of overwind of secondary L31. EHT is smoothed by R35 C23 C28.

HT is provided by two indirectly-heated halfwave rectifiers V18 V19 connected in parallel and fed from the input mains direct on 200-210V or through droppers R85 and R86 on 220-230V and 240-250V supplies respectively. R83 R84 are cathode surge limiters. Choke-capacity smoothing is provided by L28 C66 C67. Reservoir smoothing capacitor C67 should be rated to handle 600 mA





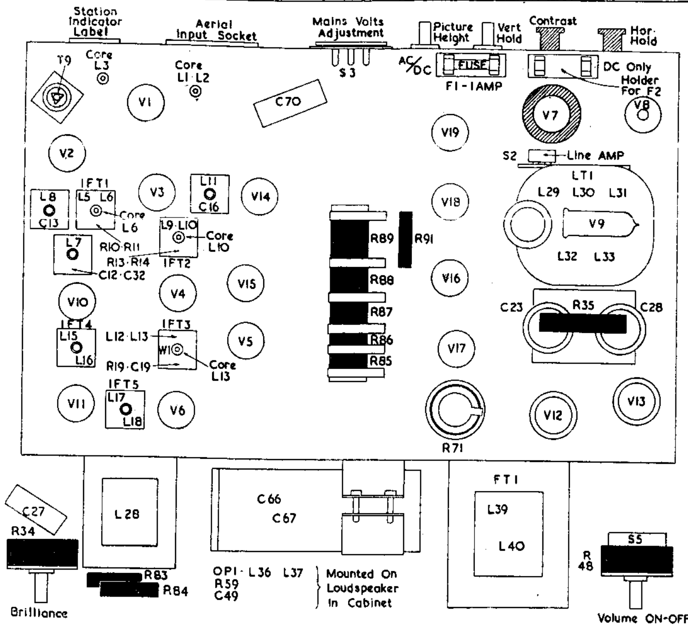
VOLTAGE READINGS

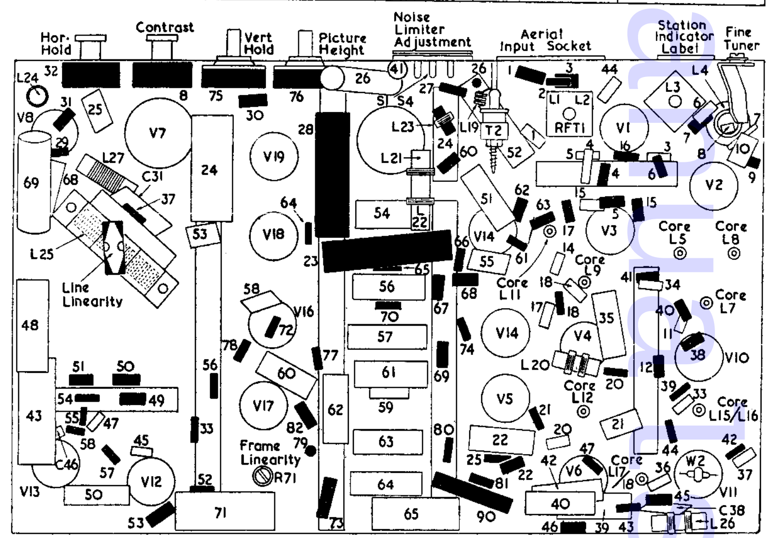
V	Type	A	G_2	K
1	EF80	178–192*	178–192	2.2–4.9
2	EF80	184	113	—
3	EF80	178–192*	178–192	2.2–4.9
4	EF80	178	178	2.2
5	PL83	148	192	—
6 A	EB91	—	—	—
6 B		—	—	—
7	PY30	—	—	457
8	PL81	—	111	— 4.2
9	EY51	—	—	14.5kV
10	EF80	182	168	1.9
11	EF80	177	177	2.2
12 A	ECL80	54	—	6.5
12 B		185	171	
13 A	ECL80	54	—	6.5
13 B		185	171	
14 A	ECL80	109	16	0
14 B		2.6	—	
15	EF80	170	170	32.5
16 A	ECL80	45**	—	11.15
16 B		33	165	
17	PL82	176	190	13
18	PY82	—	—	203
19	PY82	—	—	
CRT	MW41-1	14.5kV	457	148

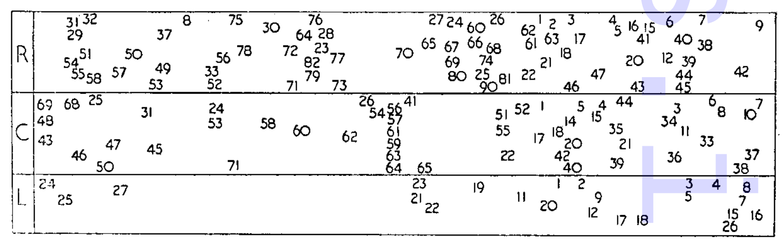
*R8 max.–min. **R71 min.–max.

Total HT current = 285mA

Mains current = .84A







RESISTORS

R	Ohms	Watts
1	82	¼
2	1K	⅛
3	82	¼
4	47	¼
5	150	¼
6	1K	¼
7	22K	¼
8	5K	WW Potr.
9	150K	¼
10	12K	⅛
11	12K	⅛
12	470	¼
13	22K	⅛
14	22K	⅛
15	47	¼
16	150	¼
17	1K	½
18	180	¼
19	12K	⅛
20	1K	¼
21	5.6K	¼
22	6.8K	¼
23	3K	3
24	5.6K	¼
25	470K	¼
26	11.5M	¼
27	1.5M	¼
28	3K	3
29	2.2M	¼
30	22K	½
31	68K	¼
32	250K	Potr.
33	100K	¼
34	500K	Potr.
35	1.5M	2
36	2.2K	¼
37	910	¼
38	68K	¼
39	1K	¼
40	47	¼

R	Ohms	Watt
41	150	¼
42	180	¼
43	220K	¼
44	1K	¼
45	47K	¼
46	3.3M	¼
47	1M	¼
48	500K	Potr. with DP Switch
49	220K	¼
50	750K	¼
51	1M	¼
52	100	¼
53	100	¼
54	220K	¼
55	470K	¼
56	2.2K	¼
57	680K	¼
58	680K	¼
59	15K	¼
60	12K	¼
61	2.2M	¼
62	150K	¼
63	15K	¼
64	100K	¼
65	750K	¼
66	330K	¼
67	68K	¼
68	15K	¼
69	22K	¼
70	100K	¼
71	500	Potr.
72	560K	¼
73	220	½
74	470K	¼
75	1M	Potr.
76	1M	Potr.
77	470K	¼
78	22K	¼
79	1M	¼
80	27K	¼
81	180K	¼
82	12K	¼

R	Ohms	Watts
83	40	WW3
84	40	WW3
85	20	Tapped Mains Dropper
86	20	Tapped Mains Dropper
87	60	Tapped Mains Dropper
88	60	Tapped Mains Dropper
89	350	Tapped Mains Dropper
90	35	1
91	CZ1A Brimistor	

CAPACITORS

C	Capacity	Type
1	.001	Tubular 300V-AC
2	No Component	
3	.001	Tubular Ceramic
4	15pF	Silver Mica
5	.001	Tubular Ceramic
6	.001	Tubular 350V
7	10pF	Silver Mica
8	5pF ±0.5pF	Ceramic
9	No Component	
10	30pF	Silver Mica
11	3000pF	Tubular 350V
12	70pF	Silver Mica
13	100pF	Silver Mica
14	3000pF	Tubular 350V
15	3000pF	Tubular 350V
16	70pF	Silver Mica

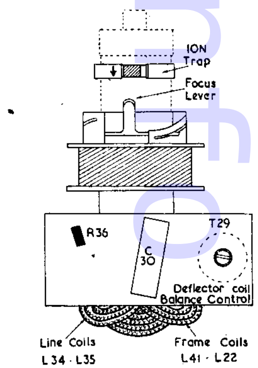
C	Capacity	Type
17	3000pF	Tubular 350V
18	3000pF	Tubular 350V
19	2pF ±0.5pF	Ceramic
20	3000pF	Tubular 350V
21	4pF ±0.5pF	Silver Mica
22	.1	Tubular 350V
23	500pF—15kV	
24	.1	Tubular 300 V-AC
25	200pF	Sil. Mica 500V
26	.1	Tubular 500V
27	.1	Tubular 150V
28	500pF—15kV	
29	No Component	
30	50	Electrolytic 12V
31	1000pF	Silver Mica
32	30pF	Silver Mica
33	3000pF	Tubular 350V
34	3000pF	Tubular 350V
35	.1	Tubular 350V
36	3000pF	Tubular 350V
37	3000pF	Tubular 350V
38	30pF	Silver Mica
39	.1	Tubular 350V
40	.02	Tubular 350V
41	.005	Tubular 600V
42	.1	Tubular 350V
43	50	Electrolytic 25V
44	.001	Tubular 350V
45	.002	Tubular 350V
46	.002	Tubular 350V

C	Capacity	Type
47	.002	Tubular 350V
48	8	Electrolytic 275V
49	.005	Tubular 350V
50	.005	Tubular 1000V
51	.1	Tubular 350V
52	4	Electrolytic 150V
53	10pF	Silver Mica
54	.1	Tubular 350V
55	150pF	Silver Mica
56	.1	Tubular 350V
57	.02	Tubular 1000V
58	500pF	Silver Mica
59	100pF	Silver Mica
60	.01	Tubular 350V
61	.1	Tubular 350V
62	.1	Tubular 350V
63	.05	Tubular 350V
64	.05	Tubular 350V
65	50	Electrolytic 25V
66	250	Electrolytic 275 V
67	60	Electrolytic 275 V
68	.01	Tubular 350V
69	100	Electrolytic 25V
70	.1	Tubular 300V-AC
71	100	Electrolytic 25V

INDUCTORS

L	Ohms
1	Very low
2	Very low
3	Very low
4	Very low
5	.5
6	.4
7	Very low
8	Very low
9	.5
10	.4
11	Very low
12	.5
13	.6
14	No component
15	Very low
16	Very low
17	Very low
18	Very low
19	Very low
20	2.5

L	Ohms
21	9
22	5
23	6.5
24	4.5
25	1.5
26	2.5
27	10
28	35
29	44
30	250
31	7.5
32	4
33	Very low
34	7.5 together
35	7.5 together
36	750
37	Very low
38	2.5
39	400
40	1.75
41	7.5 together
42	7.5 together



FERGUSON 989T—*Continued*

ripple current. On DC supplies rectifiers can be shorted out to give increased HT by insertion of a 1A fuse in holder F2.

Heaters V1-8, V10-19 and CRT are series connected with thermal surge limiter R91 shunted by R89 and fed from input mains direct on 200-210V or through droppers R88 and R87 on 220-230 and 240-250V supplies respectively.

Appropriate dropping resistors for HT rectifier anode voltage and valve heater circuit are selected by calibrated adjustable plug at rear of chassis.

Mains input to receiver is fitted with fuse F1 in live lead. On AC supplies fuse should be 1A P 4 type and on DC supplies a 2A P 6 type. C70 is mains RF bypass capacitor. S5, which is ganged to sound volume control, is ON/OFF switch.

CRT is a tetrode Mullard MW41—1 with metal cone and 16in. diameter flat screen. Permanent magnet focusing is employed. Video signal is applied to its cathode and **Brilliance** is controlled by variation of grid voltage by R34.

ALIGNMENT INSTRUCTIONS

Apparatus required: Signal generator covering 10-20mc/s and 40-70mcs/; AC output meter; Avometer model 7 to indicate vision output. Connect AC output meter across or in place of LS speech coil.

Connect positive lead of Avometer through a 50K resistor to cathode of CRT (resistor must be connected as close as possible to cathode pin of CRT holder). Connect negative lead of Avometer to slider of 20K potentiometer connected between HT line and chassis. Switch meter to 2mA DC range and adjust potentiometer to give a reading of 20V with zero signal input (full scale reading of meter connected as above is 100V).

Signal-generator should be connected to injection point by short length of co-axial cable the bared ends of which should also be kept as short as possible. Place Volume and Contrast controls in their maximum positions.

IF stages. Short circuit L4 and feed signal as given below, through a .01 mF capacitor to anode V1.

14.5mc/s adjust L8 for min. vision.
19.5mc/s adjust L11 for min. vision.
19.5mc/s adjust L7 for min. vision.
19.5mc/s adjust L17 for max. sound.
19.5mc/s adjust L15 for max. sound.
17.75mc/s adjust L13 for max. vision.
17.75mc/s adjust L12 for max. vision.
17.75mc/s damp L9 with 1K resistor and adjust L10 for max. vision.
17.75mc/s damp L10 and adjust L9 for max. vision.
17.75mc/s damp L5 and adjust L6 for max. vision.
17.75mc/s damp L6 and adjust L5 for max. vision.

Note on TS (fringe area) receivers the last six operations should be carried out at 17.1mc/s.

RF Stages. It is essential to adjust oscillator trimmer T9 so that sound rejection peak occurs exactly at sound carrier frequency.

Inject appropriate sound carrier frequency into Direct aerial socket and with Fine Tuner at rear of chassis set in approximately mid position, adjust T9 for maximum sound and also maximum vision outputs. Inject appropriate vision carrier frequency and adjust L3 and L2 for maximum vision output.

Finally check to see that sound frequency rejection relative to vision carrier frequency is at least 35 dB—approximately 56 : 1.

Image rejector. This is factory aligned to 95mc/s but can be realigned to any known interference frequency between 70-100mc/s. Adjustment can be made by trimming T2 for minimum interference on CRT or if exact frequency of interference signal is known then this frequency can be injected into aerial socket and T2 adjusted for minimum deflection on vision output meter.

SERVICE CASEBOOK

ULTRA 431

REPLACEMENT of rectifier valve U404 by recommended equivalent Mullard UY41. Pins 2 and 5 (anode) are joined internally in U404. Pin 2 only is anode in UY41.

Since AC supply to anode is connected to pin 5 on valveholder in this model, no supply reaches anode of UY41.

To avoid dismantling set, pins 2 and 5 were connected on valve by 5amp fuse wire in 1mm. sleeving.

ULTRA 611

INTERMITTENT weak reception. During periods of weak reception, the fault was found to be prior to the AF stage (by checking at the PU sockets). Tapping of the chassis produced noise and intermittent change in volume.

By following up this clue, a dry joint was located at trimmer condenser (fixed type) in second IF can.

These trimmers are moulded (in pairs) as a coil base, and connection from IF coil pass through eyelets terminating the condenser. Resoldering all such connections recommended.

PHILIPS 588A

INTERMITTENT noise. During periods when fault was present, with volume control at minimum, noise was eliminated, indicating fault to be in previous stages.

Shorting grid of IF valve to earth produced same results. Shorting grid of FC4 valve to earth had no effect. FC4 replaced, made no difference.

During prolonged tests sparking was noted from first IF trimmer. Fault was due to arcing between HT and trimmer adjusting screw.

EKCO UAW78

INTERMITTENT fading. Prolonged tests when fading occurred eliminated valves and AF circuits. Any electrical disturbance would clear fault.

When second IF can was tapped the fault could occasionally be brought on. A faulty fixed trimmer, which was intermittently open circuit, was located.

All IF trimmers were changed; these were of foreign type, which caused so much trouble in Bush pre-war sets.

AMBASSADOR 545H

INTERMITTENT noise. During periods when noise was present, the following tests were made.

Volume control at minimum: no noise. With grid of IF valve shorted to earth: no noise.

With grid of FC4 earthed, noise was still present. Valve changed without effect, leaving transformer suspect.

The IF transformer was disconnected, and for a quick test a resistance of some 100,000ohms was used as anode load. The output was coupled to the next stage through a small condenser.

The fault was due to an intermittent primary winding.—T. E. P.

BUSH TV22

BUSH TV22 came in with no EHT. Usual suspect, PZ30, found to be OK. Line transformer found normal.

Trouble was due to 2mF electrolytic condenser, EHT boost reservoir (C21), going o/c.

Subsequently a number of similar failures have been dealt with.—M.H.

INVICTA 33

AERIAL signal is switched by S1 to aerial coupling coils L1 (SW), L3 (TW), L5 (MW) and L7, C1 (LW). Grid coils L2 (SW), L4 (TW), L6 (MW), L8 (LW), which are trimmed by T1 T2 T3-C2 respectively, are switched by S2 to aerial tuning capacitor VC1 and coupled by C3 to triode-hexode frequency-changer V1.

AVC voltages decoupled by R11 C21 are fed through R1 to grid. Cathode bias is provided by L 4 decoupled by C5. Screen voltage is obtained from divider R2 R3 decoupled by C4. Primary 16, C12 of IFT1 is in the hexode anode circuit.

Oscillator is triode section of V1 in a shunt-fed anode-tuned circuit. Anode coils L10 (SW), L12 (TW), L14 (MW), L15 (LW), which are trimmed by T4 T5 T6-C10 and padded by C7 C8 C9 C29 respectively, are switched by S4 to oscillator tuning capacitor VC2 and coupled by C11 to oscillator anode of V1 of which R6 is the load.

Grid reaction voltages, which are obtained from L9 (SW), L11 (TW), L13 (MW) and capacitively from padder C29 (LW), are switched by S3 through C6 to oscillator grid. Bias is developed on C6 with R5 as leak.

IF amplifier operates at 420 kc/s. Secondary L17 C13 of IFT1 feeds signal and AVC voltages, decoupled by R11 C21 to IF amplifier V2. Cathode bias is provided by R7 C16. Screen voltage is obtained in common with that of V1. Suppressor (g3) is internally strapped to cathode. Primary L18, C14 of IFT2 is in the anode circuit.

Signal rectifier. Secondary L19 C15 of IFT2 feeds signal to one diode of V3, of which R9 is the load with R8 C17 C18 an IF filter. Rectified audio signal across R9 is fed by C19 to the four radio positions of S5.

AVC. Signal at anode of V2 is fed by C20 to second diode of V3, of which R12 is the load. AVC voltages are decoupled by R11 C21 and fed to V1 V2.

Cathode voltage across R13 provides a small delay bias for AVC diode.

Pickup. Sockets are provided for a high-resistance magnetic or crystal pickup. Pickup signal is fed to PU contact on S5 which is ganged to wavechange switches S1—S4. When wavechange switch is in Gram position then aerial, and oscillator tuning capacitors and oscillator grid (through C6) are shorted to chassis to prevent radio breakthrough.

AF amplifier. Rectified audio, or pickup, signal is switched by S5 through volume control R10 to grid of triode AF amplifier section of V3. Cathode bias is by R13. Anode load is R15 and HT feed to anode is decoupled by R16 C26.

Tone control. Three degrees of tone control are given by adjustment, by S6—S7 and C22, of negative feedback circuit between secondary L21 of output matching transformer OP1 and cathode V3. Maximum top is given when C22 is between R14 and junction R17 R18.

Output stage. Signal at anode V3 is fed by C23 through stopper R21 to grid of pentode output amplifier V4. Cathode bias is by R20 decoupled by C25. Screen voltage is obtained direct from HT line decoupling being given by C27. Amplified signal at anode is transformer coupled by OP1 to a 6½in. PM speaker L22.

HT is provided by indirectly-heated full-wave rectifier V5 fed from HT secondary L24 of mains input transformer MT1. Resistance-capacity smoothing is by R22, C27, C28. Reservoir smoothing capacitor C28 should be rated to handle 100 mA ripple current.

Heaters V1 to V4 are parallel connected and fed from secondary L25 of MT1. Dial lamps, which are 6.5V .3A type, are parallel connected and fed from a 4V tapping on secondary L25 of MT1. Primary L26 of MT1 is tapped for inputs of 200-210, 220-230, 240-250V, 50-100 c/s AC. S8, which is ganged to volume control spindle, is the ON/OFF switch.

TRIMMING INSTRUCTIONS

Apply signal as stated below	Tune receiver to	Trim in order stated for maximum output
(1) 420kc/s to gl of V1 via .01mF	—	Cores L19, L18, L17, L16
(2) 210kc/s to aerial socket via dummy aerial	LW Band 1428 metres	Cores L15, L8
(3) 1.5mc/s as above	MW Band 200 metres	T6, T3
(4) 600kc/s as above	500 Metres	Cores L14, L6. Repeat operations (3) and (4)
(5) 3.3 mc/s as above	Trawler Band 90 metres	T5, T2
(6) 1.5mc/s as above	200 metres	Cores L12, L4. Repeat operations (5) and (6)
(7) 20mc/s as above	SW Band 15 metres	T4, T1
(8) 8mc/s as above	37.5 metres	Cores L10, L2. Repeat operations (7) and (8)

Casebook

MARCONIPHONE AC/DC RECEIVER

A PRE-WAR model came in with persistent crackling on LW. Chassis was checked for usual causes of crackle without success.

More by luck than skill, the fault was found when one of the two mains fuses was replaced. The crackling immediately ceased, though putting the old fuse back caused it to recur. The fuse in question was tested and found OK and has since been fitted in another set where it functions perfectly.—P.G.

AMERICAN MAINS/BAT. PORTABLE

CAME in "dead" on both mains and batteries, though the latter were definitely OK. Valves were checked, then valveholder voltages. Tracing the signal through it was found the FC was operating but no signals could be obtained beyond it.

The grid lead from the first IF transformer is taken across the length of the chassis to the IF valve, and to hold this rigid its screening is soldered to the frame of the tuning condenser. Under the metal braiding the rubber insulation had been perished by the heat of soldering the screen, and the grid of the IF valve was shorted to earth.—P.G.