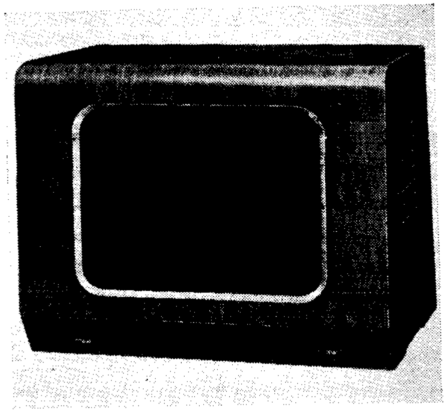
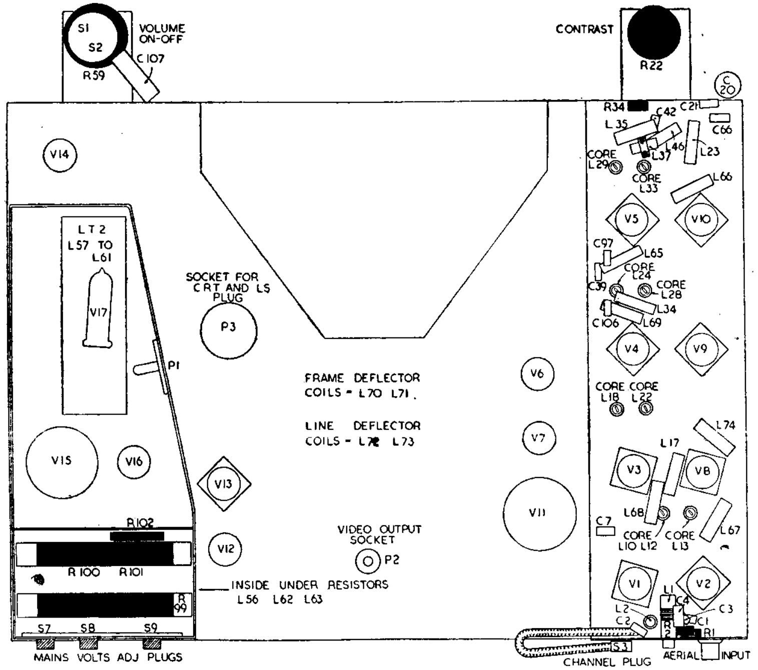
PYE FV1 and FV1C



Seventeen-valve, plus tube, five channel television receiver fitted with a black screen 12in. CRT giving a 10 by 8in. picture. Model FV1 is housed in a walnut finished table cabinet and FV1C in a similarly finished console. Suitable for 200-250V 50c/s AC, also DC. Manufactured by Pye Limited, Cambridge.



THE receiver employs a superheterodyne circuit designed to operate on lower sideband of vision carrier. The RF and frequency-changer stages are fitted with tapped coils to cover all five television channels to be used by the BBC. Channel selection is by a tapping plug for the aerial coil and by shorting screws for the RF and frequency-changer coils.

RF and frequency-changer stages are common to both sound and vision. Vision interference and sound noise-suppression circuits are incorporated. EHT is obtained from line flyback. Mains consumption is approximately 125W.

Aerial input circuit is designed for 75 ohm coaxial. The feeder is isolated from chassis by C1, C3. DC continuity is provided by R1, R2.

RF amplifier. Aerial signal is coupled through C3 to adjustable IF filter L1, C4 and thence fed to tapped aerial coil consisting of L3, L4 in grid of RF amplifier V1. Gain of V1 is adjusted by variation of cathode bias by R66, **Vision Sensitivity** control. Negative feedback across R7 reduces effect of bias on input characteristics of V1 and preserves frequency response. V1 is choke-capacity fed by L5, C9 to tapped bandpass coupling transformer L6, L7, C10, L8, L9 and thence fed by C11 to pentode mixer section of V2. Damping to maintain bandwidth is R9.

Oscillator. Tapped tuned grid coil L14, L16 is coupled by C17 to oscillator grid of V2 whilst feedback coil L15 is in series with HT to oscillator anode. Automatic bias for grid is developed on C17 with R14 as leak. The oscillator output is fed from grid circuit by C14 to mixer grid.

Mixer. The RF and oscillator signals applied to pentode section of V2 produce in the anode circuit intermediate frequencies of 35.9mc/s (vision) and 38.5mc/s (sound).

Vision channel. Both sound and vision IFs are bandpass transformer coupled by L12, L10, L11, L13 to grid of first vision IF amplifier V3, and from there the sound carrier of 38.5mc/s is taken by C47 to first sound IF amplifier V8. Vision IF is amplified by V3, V4, V5 before being passed to crystal rectifier MR1. Four-element high-selectivity bandpass filters are employed between each stage.

Gain of V3, V4 is controlled by R22, **Contrast** control, in the cathode. Feedback developed across R20, R26 respectively, preserves shape of response curve. Bandwidth is maintained by damping resistors R19, R23, R28. Overall bandwidth of vision channel amplifier is 2.75mc/s.

Rectified vision signal across R34, L37 is DC coupled to video amplifier V7 the output of which is DC/AC coupled by R40, R41, C46 to cathode of CRT.

The Metrosil in V7 cathode provides a bias which, owing to the characteric of the Metrosil, does not vary appreciably with change of cathode current.

Interference limiter is diode V6A connected with anode to V7 grid and cathode through C43 to V7 anode. Cathode is biased positively through R35 from R103, the **Vision Noise** control, so that the diode is just at cut-off with peak-white signal. When an interference pulse greater than peak-white appears on its anode the diode conducts and limits the effect of the pulse.

Sound channel signal is taken from grid V3 by C47 and fed to grid of first sound IF amplifier V8. Sound signal is amplified by three single-peak transformer-coupled IF amplifiers V8, V9, V10 before being passed to crystal rectifier MR2. Approximately half DC component across R55, R57 is decoupled by R56, C65 and applied through RF chokes L75, L74 to grids of V8, V9 for automatic gain control.

Audio signal is fed by C70 through noise suppressor diode V6B and C69 to **Volume Control** R59 in grid of pentode sound amplifier V11, the output of which is transformer coupled by OP1 to a 6½in. speaker L49.

Noise suppressor. Audio signal is fed through IF filter L45, L46, C66 and by C70 to anode of diode V6B. The anode is biased positively from HT through R63 hence the diode conducts and produces a voltage across cathode load R58. Time constant of R58, C67 is such that the cathode voltage follows the audio signal fed to the anode by C70. A large-amplitude high-frequency interference pulse, however, drives the anode heavily negative and, due to the longer time constant of R58, C67, the cathode potential does not follow and the diode cuts off. The high-frequency sawtooth waveform developed as a result of the sudden fall in voltage is filtered out by R60, C68.

Sync. separator. The video signal applied to cathode of CRT is also fed through R70, C74 to grid of sync. separator V12. The positive sync. pulses drive V12 into grid current and a negative charge is built up on C74 which is sufficient to place video signal below cut-off ; thus only the sync. pulses appear at anode. V12 grid load R67 is returned to chassis through V13 cathode resistor R85 to obtain a small positive bias which has the effect of increasing grid current during sync. pulses and reduces the noise present on base of pulses. Line sync. pulses are fed by R73, C85 to screen of line scan oscillator V14. Frame sync. pulses are fed through interlace filter MR3, MR4 to anode of triode frame scan oscillator section of V13.

Interlace filter is to ensure that only frame sync. pulses are fed to frame scan oscillator. Between line sync. pulses V12 is cut off and anode V12, MR3 rise to HT line potential. MR3 conducts and allows C75 to charge through R72 to HT potential. During line sync. pulses V12 conducts and anode MR3 is driven negative ; its cathode remains unchanged due to long time constant of R74, C75—hence the rectifier is cut off.

During the longer frame pulses C72 discharges to a lower potential. Anode MR4 is connected to potential divider R76, R79 and is held at a lower potential than anode MR3. Hence when the strapped cathodes of MR3, MR4 fall negatively during frame pulse period, MR4 conducts, thus allowing frame sync. pulse to be passed by C78 to anode of triode frame scan oscillator section of V13.

Frame scan oscillator is triode section of V13 operated as a grid-blocking oscillator with anode to grid back-coupling by transformer FT1. Scan waveform is generated on C77 and fed via C80 and **Amplitude Control** R83 to grid of amplifier. Frequency is determined by charging of C79, the variation of R81 providing **Frame Hold.**

Frame amplifier is pentode section of V13. **Frame Linearity** control R84 forms part of network across grid circuit. Output waveform is transformer coupled by FT2 to frame deflector coils L70, L71 on neck of CRT. R92 damps deflector coils to prevent ringing whilst R88 reduces interaction between frame and line deflector coils.

Line scan oscillator is pentode V14 operated as a grid-blocking oscillator with screen to grid transformer back-coupling by LT1. Scan waveform is developed on T1, C87. **Amplitude** of waveform is adjusted by alteration of T1, whilst **Line Hold** control R89 varies the grid current of V14.

Line amplifier. Scan voltage on T1, C87 is fed by C86, R95 to grid of pentode output amplifier V15. Amplified output waveform at anode is transformer coupled by LT2 to line deflector coils L72, L73 on neck of CRT.

Line linearity is controlled by adjustment of inductance L56 in series with booster-diode V16 circuit in HT feed to line output valve V15. **Line amplitude** is adjusted by inductance L62 connected in parallel with section of secondary L58 of LT2.

Booster-diode V16 is employed to absorb the surge current set up in LT2 when V15 is cut off. Voltage developed across C89 provides approximately an additional 80V for anode of line output valve V15. L63 shunted by R98 damps out residual oscillations not completely removed by V16.

Metrosil R105 with C90, connected between top of deflection secondary L58 and positive side of C89, provide a further source of HT which together with that developed on C89 is used as first anode volts of CRT.

As cathode of booster-diode V16 is connected to a high pulse voltage section of circuit a " bifilar " winding consisting of L60, L61 is incorporated on line output transformer. These windings are connected in series with valve heater chain on either side of V16 heater and develop an opposing pulse voltage thus avoiding possible heater-cathode breakdown.

EHT of approximately 9kV is obtained by rectification by V17 of the large surge voltage across overwound primary L57 when V15 is cut off. EHT is fed direct to final anode of CRT — smoothing being provided by capacity between inner and outer coatings of CRT.

HT, on AC supplies, is provided by a halfwave metal rectifier MR5 fed from the input mains direct in the case of 200V supplies and through tapped dropper R99 on the higher voltages. On DC supplies

Continued overleaf

up to 230V the input is fed by S7, one of the mains voltage adjusting links, direct to HT smoothing circuit, but on 240V and 250V DC supplies the rectifier is brought into circuit to provide a voltage drop. Choke-capacity smoothing is given by L64, C95, C96. HT feeds to sections of sound and vision channels is RF decoupled by L34, C34, L17, C25. Reservoir capacitor C96 should be rated to handle 500mA ripple current. HT line is fitted with a 1A fuse F2.

Heaters of all valves except EHT rectifier V17 are series connected and obtain their current from the mains through tapped dropper R99, R100 and thermal surge limiter R102 shunted by R101. Heater line is RF decoupled by L65 to L69 in conjunction with C97 to C106. Bifilar windings L60, L61 which are incorporated in line output transformer LT2 are connected in series with heater chain on either side of V16. Heaters are protected by a 500mA fuse F1.

S1, S2 ganged to volume control spindle form the ON/OFF switch. Mains input is fitted with filter capacitor C107.

CRT is a 12 in. tetrode with PM focusing. Variation of grid bias by R80 gives control of **Brightness.**

ALIGNMENT INSTRUCTIONS

All tuned circuits in the vision and sound channels are factory adjusted by means of a " wobbulator " and realignment should not be necessary when a valve is renewed. If major repairs are carried out, such as replacement of coil units, then realignment will be necessary.

Connect a diode voltmeter between cathode of CRT and chassis. Connect a 2.5 ohm AF power output meter across secondary L48 of OP1.

Remove screening can and cover on underside of RF unit.

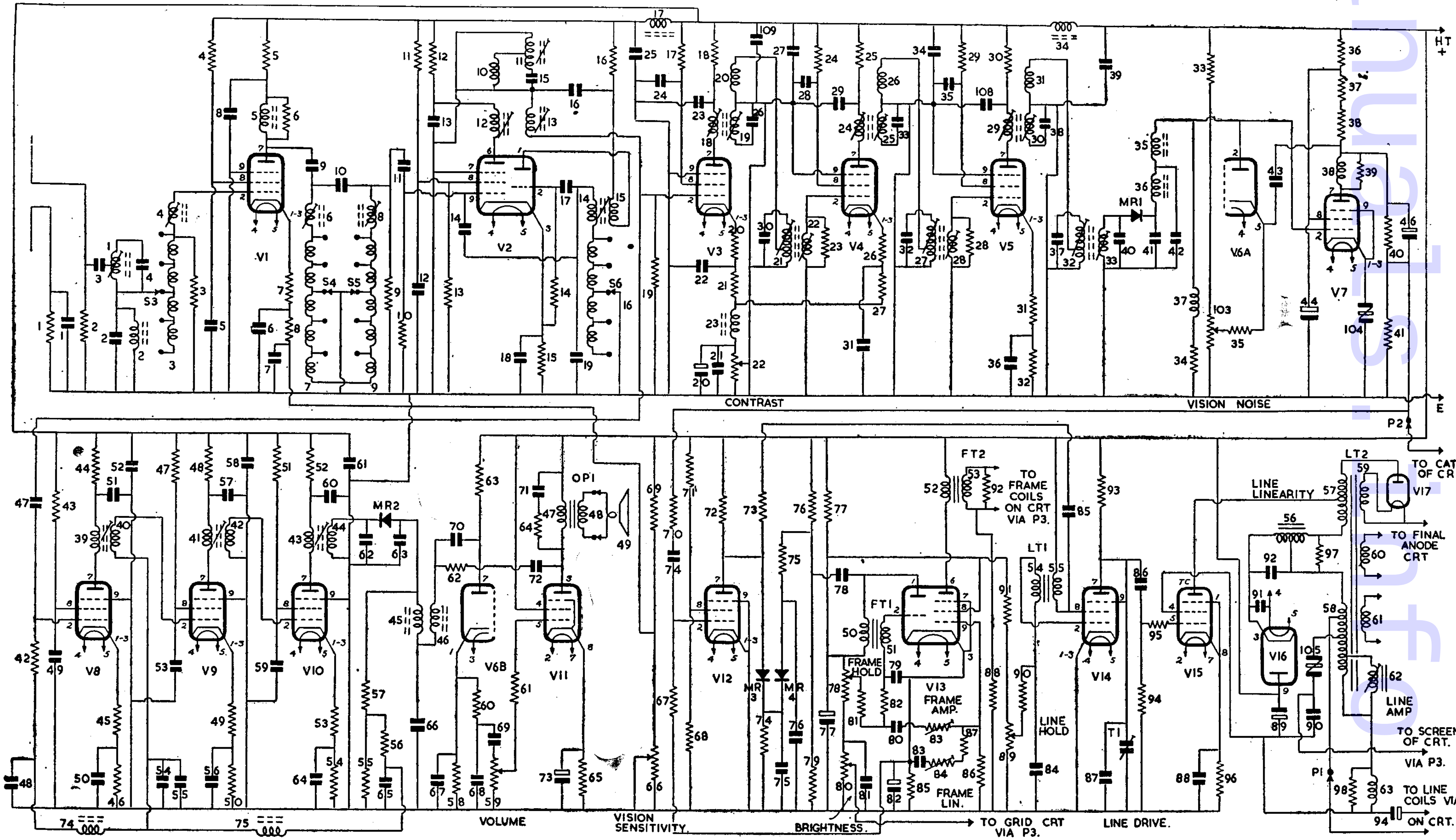
Vision IF. Set Contrast R22 at maximum and Vision Sensitivity R66 at minimum. (1) Connect 10pF damping capacitor between anode V5 and chassis and switch diode voltmeter to 2.5V range. Inject 35.9mc/s to gl of V4 and adjust L30 for maximum output.

Connect damper between anode MR1 (white

Continued on page 6.

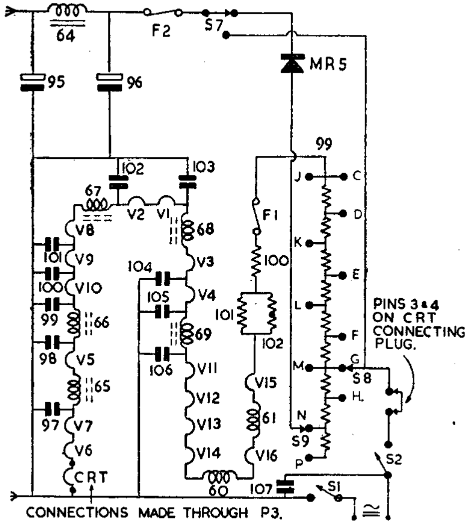
INDUCTORS

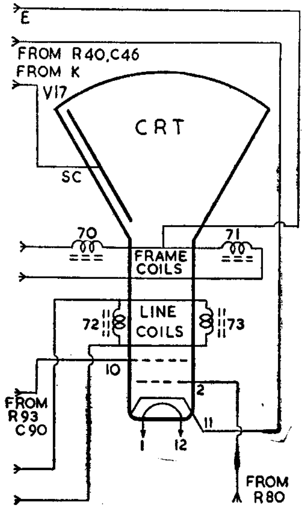
L	*Ohms*	*L*	*Ohms*
1-4 6-16 18-22 24-33	v. low	51	130
5	.5	52	1850
17	1.5	53	2.7
23	1.5	54	90
34	1.5	55	8.5
35	1.5	56	15
36	1.5	57	375
37	4.5	58	6
38	6	59	Very low
39—44	Very low	60, 61	6.5
45	1.5	62	22
46	1.5	63	17.5
47	550	64	40
48	Very low	65—69	.5
49	2.5	70, 71	9.5
50	550	72, 73	20
		74, 75	1.5



CAPACITORS

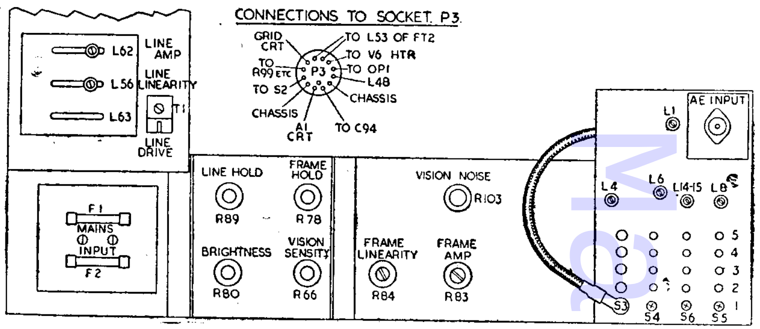
C	Capacity	Type
1	.001	Tubular 300V AC
2	33pF	Ceramic
3	.001	Tubular 300V AC
4	100pF	Silver Mica
5	.002	Tubular 350V
6	.002	Tubular 350V
7	.002	Tubular 350V
8	.002	Tubular 350V
9	120pF	Ceramic
10	Formed by Flat PVC Twin Flex	
11	33pF	Ceramic
12	.002	Tubular 350V
13	.002	Tubular 350V
14	2pF	Ceramic
15	10pF	Ceramic
16	.002	Tubular 350V
17	15pF	Ceramic
18	.002	Tubular 350V
19	10pF	Silver Mica
20	25	Electrolytic 25V
21	.002	Tubular 350V
22	.002	Tubular 350V
23	.002	Tubular 350V
24	.002	Tubular 350V
25	.002	Tubular 350V
26	10pF	Ceramic
27	.002	Tubular 350V
28	.002	Tubular 350V
29	.002	Tubular 350V
30	10pF	Ceramic
31	.002	Tubular 350V
32	10pF	Ceramic
33	10pF	Ceramic
34	.002	Tubular 350V
35	.002	Tubular 350V
36	.002	Tubular 350V
37	10pF	Ceramic
38	10pF	Ceramic
39	.002	Tubular 350V
40	4.7pF	Ceramic
41	4.7pF	Ceramic
42	4.7pF	Ceramic
43	.1	Tubular 350V
44	12	Electrolytic 275V
45	No Component	
46	2	Electrolytic 200V
47	120pF	Ceramic
48	.002	Tubular 350V
49	.002	Tubular 350V
50	.002	Tubular 350V
51	.002	Tubular 350V
52	.002	Tubular 350V
53	.002	Tubular 350V
54	.002	Tubular 350V
55	.05	Tubular 350V
56	.002	Tubular 350V
57	.002	Tubular 350V
58	.002	Tubular 350V
59	.002	Tubular 350V
60	.002	Tubular 350V
61	.002	Tubular 350V
62	6.8pF	Ceramic
63	10pF	Ceramic
64	.002	Tubular 350V
65	.002	Tubular 350V
66	10pF	Ceramic
67	.001	Tubular 350V
68	.001	Tubular 350V
69	.05	Tubular 350V
70	.1	Tubular 350V
71	.01	Tubular 300V AC
72	.02	Tubular 500V
73	60	Electrolytic 12V
74	.05	Tubular 350V
75	220pF	Silver Mica
76	470pF	Silver Mica
77	12	Electrolytic 275V
78	.01	Tubular 350V
79	.25	Tubular 350V
80	.5	Tubular 350V
81	.02	Tubular 500V
82	50	Electrolytic 25V
83	.05	Tubular 350V
84	220pF	Silver Mica
85	100pF	Silver Mica
86	.01	Tubular 1000V
87	330pF	Silver Mica
88	.25	Tubular 350V
89	12	Electrolytic 275V
90	.001	Tubular 350V
91	.005	Tubular 1000V
92	.25	Tubular 350V
93	No Component	
94	25	Electrolytic 25V
95	200	Electrolytic 275V
96	100	Electrolytic 275V
97	.002	Tubular 350V
98	.002	Tubular 350V
99	.002	Tubular 350V
100	.002	Tubular 350V
101	.002	Tubular 350V
102	.002	Tubular 350V
103	.002	Tubular 350V
104	.002	Tubular 350V
105	.002	Tubular 350V
106	.002	Tubular 350V
107	.01	Tubular 300V AC
108	.002	Tubular 350V
109	.002	Tubular 350V

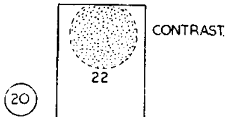




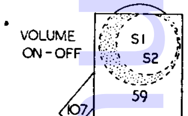
RESISTORS

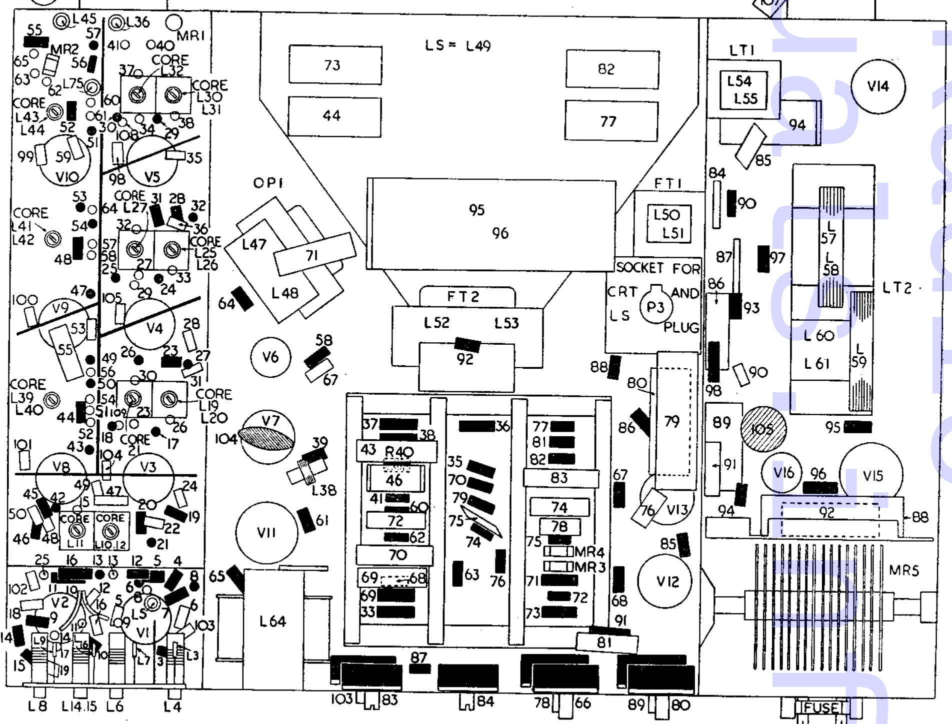
R	Ohms	Watts
1	2.2M	¼
2	2.2M	¼
3	47K	¼
4	120K	¼
5	560	¼
6	15K	¼
7	47	¼
8	150	½
9	5.6K	¼
10	120K	¼
11	47K	½
12	560	¼
13	22K	¼
14	47K	¼
15	270	¼
16	22K	½
17	120K	¼
18	560	¼
19	3.3K	¼
20	47	¼
21	150	¼
22	3K WW Potr.	
23	3.3K	¼
24	120K	¼
25	560	¼
26	47	¼
27	150	¼
28	3.3K	¼
29	5.6K	¼
30	560	¼
31	47	¼
32	150	¼
33	82K	½
34	2.7K	¼
35	100K	¼
36	1.5K	½
37	3.3K	½
38	2.7K	½
39	10K	¼
40	10K	¼
41	33K	¼
42	56K	¼
43	120K	¼
44	560	¼
45	47	¼
46	150	¼
47	120K	¼
48	560	¼
49	47	¼
50	150	¼
51	5.6K	¼
52	560	¼
53	47	½
54	150	¼
55	4.7K	¼
56	1.2M	¼
57	4.7K	¼
58	2.2M	¼
59	500K Potr. with DPST Switch	
60	33K	¼
61	330	¼
62	330K	¼
63	1M	¼
64	2.7K	¼
65	150	½
66	3K WW Potr.	
67	2.2M	¼
68	15K	¼
69	100K	½
70	10K	¼
71	47K	½
72	22K	¼
73	56K	¼
74	220K	¼
75	150K	¼
76	470K	¼
77	2.7K	¼
78	25K WW Potr.	
79	1M	¼
80	25K WW Potr.	
81	470K	¼
82	82K	¼
83	500K Potr.	
84	150K Potr.	
85	680	¼
86	2.2M	¼
87	47K	¼
88	4.7K	¼
89	10K WW Potr.	
90	150K	¼
91	39K	½
92	180	¼
93	560K	¼
94	470K	¼
95	1K	¼
96	33	½
97	220	¼
98	270	½
99	230 Tapped Dropper	
100	75 Dropper	

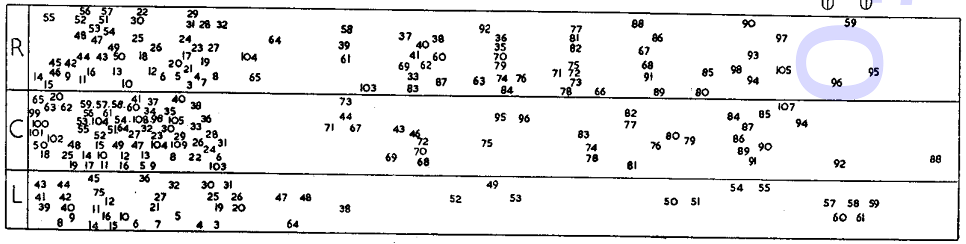




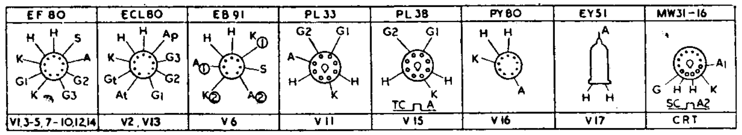
R	Ohms
101	375 Dropper
102	85 Thermistor
103	25K WW Potr.
104, 105	Metrosils







PYE FVIC *Contd.*



end) and chassis and adjust L32 for maximum Connect damper across L32 and adjust L33. Connect damper across L30 and adjust L29.

(2) Replace screening can and connect damper between anode V4 and chassis. Inject 35.9mc/s to gl of V4 and adjust L25 for maximum. Connect D (damper) across L28, adjust L27. Connect D across L27, adjust L28. Connect D across L25, adjust L24.

(3) Connect damper between anode V3 and chassis. Inject 35.9mc/s to gl of V3 and adjust L19. Connect D across L22, adjust L21. Connect D across L21, adjust L22. Connect D across L19, adjust L18.

(4) Connect damper across L11. Set contrast R22 to mid-position. Inject 36.6mc/s through C11 to gl of V2. Adjust L12, L13 maximum. Connect D between anode V2 and chassis, adjust L11.

Sound IF. Place R22 and R66 to minimum and volume control R59 to approximately mid-position.

(5) Inject 38.5mc/s to V8 keeping sig-gen output at 200 microvolts.

Adjust L39/40, L41/42 and L43/44 for maximum on AF power output meter.

RF alignment. As an example, alignment of channel 3 is given :—

See that S3, S4 and S5 are in their correct positions for Channel 3 (Kirk O'Shotts). Place Contrast R22 to minimum, Vision Sensitivity R66 to maximum and Volume Control R59 to mid-position.

(6) Inject 53.25mc/s (sound carrier) to V1 and adjust L14/15 for maximum on sound output meter. Connect 150 ohm damping resistor between junction of C9, C10 and chassis. Inject 55.4mc/s (mean between sound and vision carriers) to V1 grid and adjust L6 for maximum on diode voltmeter.

Remove damping and connect across R9. Adjust L8 for maximum. Remove damping and inject 55.4mc/s to aerial socket. Adjust L4 for maximum.

Change sig-gen to 35.9mc/s and adjust L1 for *minimum* output on diode voltmeter.

Setting Up. L14/15 is the "Finer Tuner," accessible with back cover in position, for adjustment when setting up on a new channel. Adjust for max. definition without sound breakthrough.

Vision Bandwidth. Place Contrast Control R22 to maximum and Vision Sensitivity R66 to minimum. Inject 35.9mc/s at 1mV to gl of V1. Vary sig-gen frequency from 34.25 to 37.6mc/s. The attenuator setting to maintain a constant output on diode voltmeter should be within 1.3 times that at 35.9 mc/s.

Place Contrast R22 to mid-position. Inject 36.3mc/s at 1mV through C11 to V2. Vary sig-gen frequency from 35.75 to 37.6mc/s. The attenuator setting to maintain a constant output on diode voltmeter should be within 1.3 times that at 36.6mc/s.

Vision Sensitivity will vary from 12 microvolts (Channel 1) to 26 microvolts (Channel 5) for an output of 6.5V on the diode voltmeter, measured at mid-frequency of each channel.

Sound Sensitivity will vary from 3 (Channel 1) to 7 microvolts (Channel 5) for an output of 20mW on power output meter.

VALVES AND VOLTAGES

V	Type	A	G2	K	Remarks
1	EF80	219	85	1	R66 Max. R22 Min.
2	ECL80 P	219	66	}2.5	R66 Min. R22 Min.
	T	115	—		
3	EF80	219	85	1	R66 Min. R22 Max.
4	EF80	219	85	1	R66 Min. R22 Max.
5	EF80	215	200	2.5	R66 Min. R22 Max.
6A 6B	EB91	—	—	—	
7	EF80	170	210	3.8	R66, R22 Min.
8	EF80	219	85	1	R66, R22 Min.
9	EF80	219	85	1	R66, R22 Min.
10	EF80	215	200	2.5	R66, R22 Min.
11	PL33	205	220	5	
12	EF80	140	45	—	
13	ECL80 P	200	195	}9	
	T	195	—		
14	EF80	17	220	—	
15	PL38	—	300	3.5	
16	PY80	220	—	—	
17	EY51	—	—	9K	
CRT	MW 31/16	9kVA$_2$	495VA$_1$	125	Grid O—95V

Total HT current—230mA.

D-L SHORT CAUSED HUM

AN early superhet came in for repair accompanied with a complaint of hum. Testing proved the condensers OK and cleared the speaker.

The output stage was of the directly-heated triode variety in which the filament is returned to HT negative via the slider of a potentiometer (humdinger). Adjustment of this potentiometer was found to vary the heater supply voltage to the valves and it was found that a dial lamp was making contact to the chassis thereby upsetting the balance point of the LT winding.—A.C.T.

PORTOGRAM JUNIOR 8 *Continued*

Indicator lamp is wired across shunt resistor R14 in mains lead to negative side of circuit.

Amplifier metal casing and chassis are isolated from wiring by C2 and auto-changer chassis by separate capacitor C11.

Removal of auto-changer. Secure pickup arm on rest by means of transit clip. Remove the three plywood strips positioned on inside of cabinet at sides and rear of auto-changer unit. Undo and remove the three player unit fixing screws situated around outer edges of top plate.

Grasp column of record balancing arm firmly and carefully raise rear of top plate upwards sufficiently to allow front edge of plate to clear ventilation louvres on amplifier cover. Then tilt auto-changer backwards and allow it to rest in a semi-vertical position with knob of record balancing arm and outer corners of plate bearing on support battens on inside of cabinet. Unsolder pickup leads and earth lead from tag strip screwed on to batten on amplifier chassis. Disconnect mains lead from auto-changer motor terminals. Auto-changer can now be removed.

Removal of amplifier. The auto-changer or record player unit must first be removed as described above.

Turn cabinet on its side to undo and remove the two bolts securing lower flange of amplifier chassis to bottom of cabinet. Disconnect mains leads from terminals on input socket at rear. Undo and remove the four chassis screws positioned two at each end of chassis adjacent to sides of cabinet. Carefully withdraw amplifier chassis, as far as LS leads will permit, by moving righthand side (V1 end) in towards centre of cabinet first and then tilting to give clearance. Unsolder leads from tags on LS—chassis is now free.

RECORD PLAYER

Warning. On certain units the pickup connecting sockets on underside of moulded Bakelite tone arm are at mains potential and are protected by Systoflex sleeving pushed well up over sockets and clamped by means of tag positioned midway along underside of arm. The sleeving should be carefully inspected and repositioned if any part of socket or wiring is exposed.

Some Causes of Instability in Receivers

THE IF stage being the most likely source of instability it pays the engineer to direct his attention there first. Anode, screen and cathode decoupling condensers if o/c can cause partial or complete self-oscillation, resulting in the familiar heterodyne whistle each side of signals.

In earlier receivers using 4V or 13V valves, a break in the metallising contact often causes instability.

Sometimes an IF stage will go into oscillation when the trimmers are peaked yet function fairly well, though with distorted sidebands, a little above or below optimum.

Assuming the IF transformer to be tuned to the correct frequency and all decoupling condensers perfect, instability is often caused by poorly earthed screened lead, a dry joint, an IF can not making good chassis contact or our old aquaintance the faulty valve holder.

The 8 mF electrolytic smoothing condenser may have developed a comparatively high internal resistance to RF currents. Many manufacturers guard against this fault by paralleling a paper .1 or .01 mF capacitor across the smoothing electrolytic.

The IF filter condensers associated with the diode load resistor can, if o/c, make reception "hissy" and a little unstable at high volume.

Even o/c tone control condensers have effect on the stability of the IF amplifier, since there are traces of IF right up to the output stage—and even to the speaker frame.

In small receivers, particularly where RF and AF components are close together, the risk of HF getting into AF stages is all the greater; instability can result from an unearthed speaker frame.

Some receivers, owing to exceptionally high gain or to unorthodox layout, require exceptional screening. For instance, the popular prewar Marconi 219 had a VMP4G IF amplifier and, although the valve was metallised, and although the anode top cap lead was hardly more than two inches long and well screened, the stage would go into oscillation unless a small can screening the thimble cap connector was fitted.

Similarly, one or two early Philco's would get very hissy if the lead to the top cap of the 78 from the first IF can was allowed too close to the top cap of the adjacent 6A7 frequency-changer, even though both valves were perfectly screened by Philco's customary tight fitting cans.

With universal receivers, we come across models that must have a good exterior earth for stable operation since HF chokes in the mains leads isolate the sets from "mains earth." AF instability is not so common as RF and usually occurs in receivers which have an AF stage preceding pentode or tetrode output.

Strangely enough, I have found that receivers with push-pull output most troublesome in this respect—generally because of individual valve variations with age, dry joints, or insufficient smoothing.

Failing electrolytics are the principal cause of AF instability but some of the older types of receiver, which derived their AF bias by resistor network across a negative-lead field coil go unstable if any of the resistors and small paper condensers concerned deteriorate.

Again, unearthed speaker frames, and speech coils, sometimes can stimulate instability, especially at high volume, while o/c pentode tone corrector condensers can cause a particularly unpleasant form of instability.

Battery receivers are fairly susceptible to this fault and in them it is caused by, in order of probability: high-resistance HT battery, o/c electrolytic auto-bias by-pass condenser, where auto-bias is used, o/c HT decoupling condenser, and use of clear bulb detector valve instead of metallised type.—G. R. WILDING.

NEXT MONTH'S SUPPLEMENT

A fully-illustrated service review of the English Electric washing machine and a chart dealing with the Etronic projection-type receiver will be two of the features in next month's Service Chart Supplement.