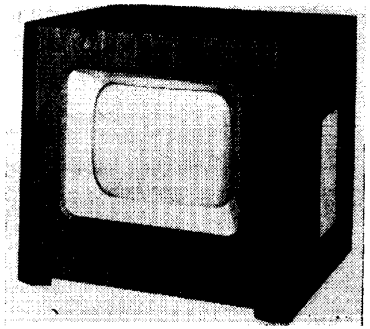
McMICHAEL TM51



Fourteen-valve five-channel television receiver, 12in. tube giving a $10\frac{1}{2}$ by $7\frac{7}{8}$in. picture. Highly polished figured walnut veneered table cabinet. Suitable for 190-250V 50 c/s. Made by McMichael Radio Limited, Slough, Bucks.

THE receiver is a superhet designed to operate on lower sideband of vision carrier. The aerial, RF and oscillator circuits employ permeability adjusted inductances which are tuneable from 40 to 65mc/s, covering all five television channels. Vision interference and sound noise suppression circuits are incorporated, and EHT is obtained from line flyback pulses. Mains consumption 150W.

Aerial input circuit is for use with 75-ohm co-axial feeder. Outer screen of co-axial is isolated from chassis by C2, and inner conductor is coupled through C1 to tap on aerial coil L1.

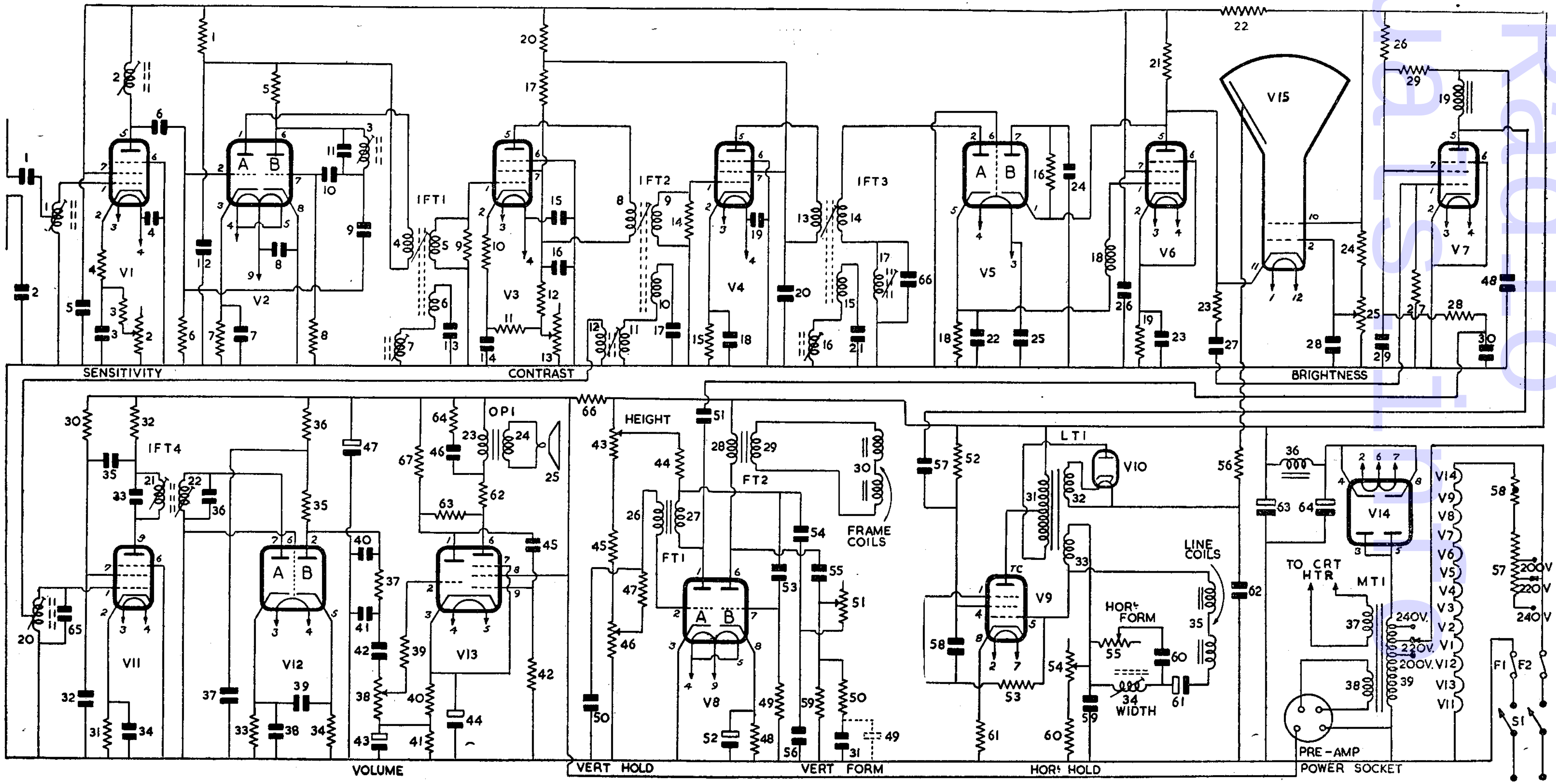
RF amplifier. Aerial signal is developed across L1 in grid of RF amplifier V1, the gain of which is controlled by R2, the **Sensitivity** control, in its cathode. Compensation for changes in input capacity of V1 with variation of bias is provided by negative feedback across R4. Amplified signal across tuned coil L2 is coupled by C6 to grid of triode mixer V2A.

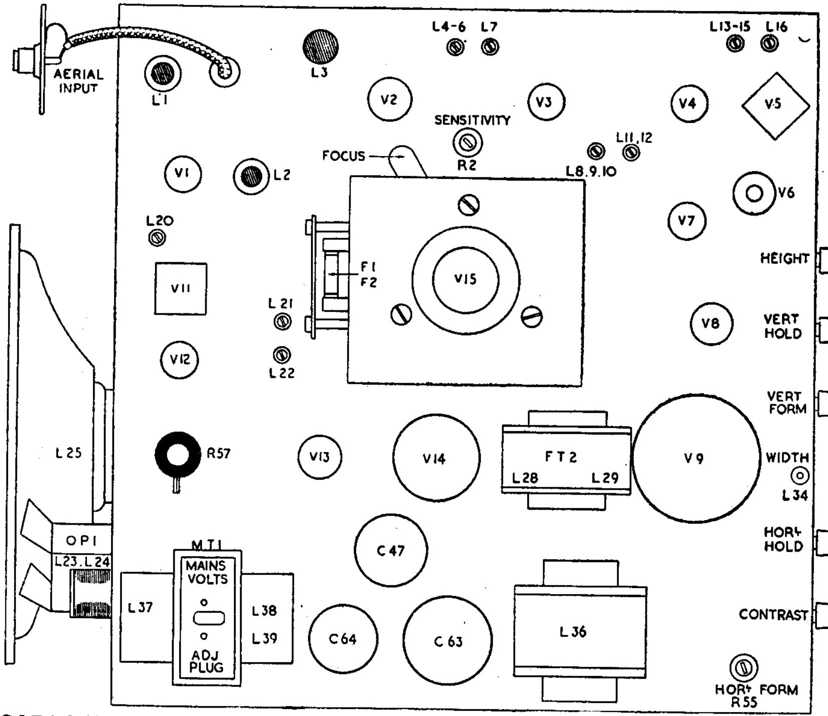
Frequency-changer is double-triode V2 operated as a combined oscillator and mixer. The second triode V2B is employed as oscillator in a modified Hartley circuit. Automatic bias for oscillator grid is provided by C10 R8 ; R5 is anode load. Oscillator output is taken by C9 and fed, with RF signal, to grid of triode mixer V2A, producing across L4 of IFT1 a vision IF of 24mc/s and sound IF of 27.5mc/s.

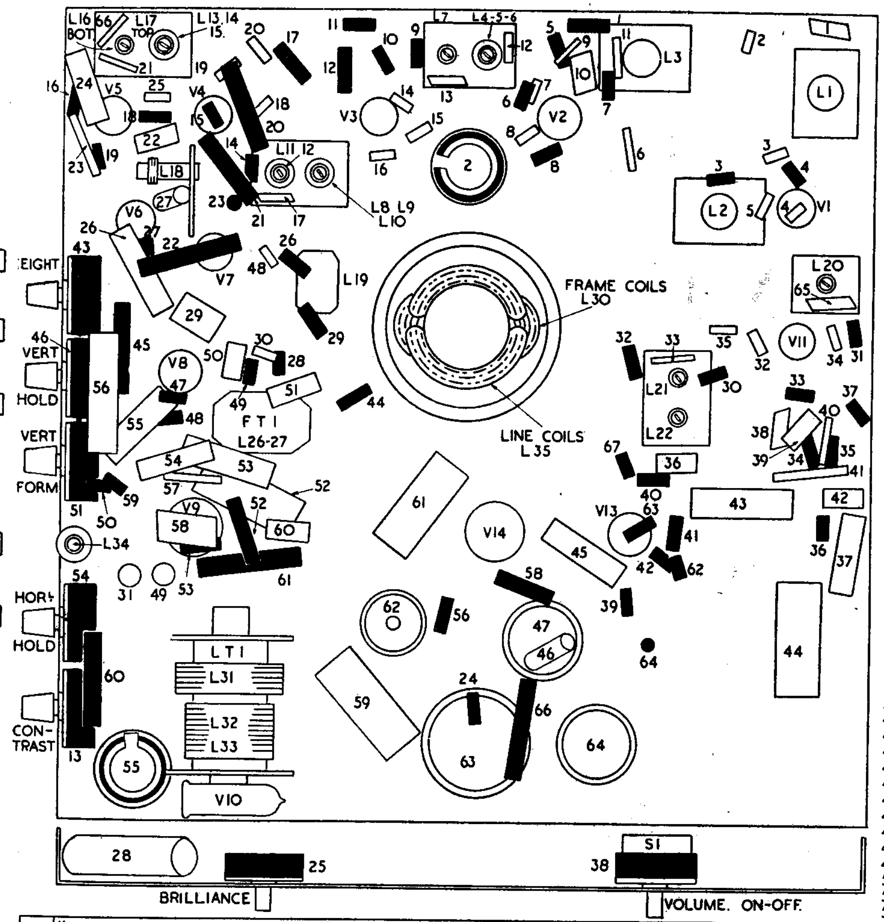
Vision and Sound IF. Signals are single peak transformer coupled by IFT1 to common vision and sound IF amplifier V3, the gain of which is controlled by R13, the **Contrast** control, in its cathode. Negative feedback compensating for changes of bias is developed across R10. Wide bandwidth to cover both vision and sound frequencies is maintained by damper R9. Adjacent sound frequency rejection is given by L7 tuned to 22.5mc/s and link coupled by L6 to IFT1. Amplified vision and sound signals are developed across L8 of single-peak transformer IFT2.

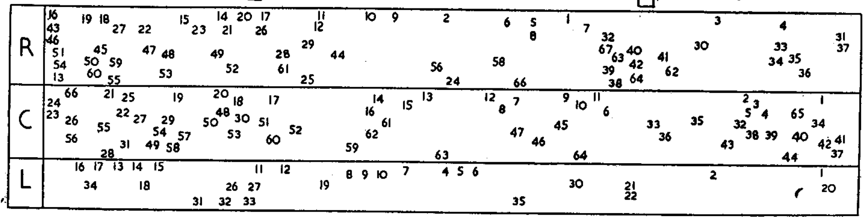
Vision channel. Vision signal is coupled by secondary L9 of IFT2 to final vision IF amplifier V4, the output of which is single-peak transformer coupled by IFT3 to vision signal rectifier V5A. Sound-on-vision rejection at 27.5mc/s is given by L11. L12 link coupled by L10 to IFT2, by L16 link coupled by L15 to IFT3 and by L17, C66 in bottom end of secondary L14 of IFT3.

Rectified signal across R18 C22 is DC coupled through peaking coil L18 to grid of video amplifier V6, the output of which is applied direct to cathode









RESISTORS

R	Ohms	Watts
1	820	½
2	10K	WW Potr.
3	120	¼
4	33	¼
5	27K	½
6	150K	¼
7	220	¼
8	47K	¼
9	10K	¼
10	33	¼
11	120	¼
12	100K	½
13	5K	WW Potr.
14	10K	½
15	150	¼
16	3.3M	¼
17	1K	½
18	5.6K	¼
19	270	¼
20	1K	1
21	12K	1
22	1K	6
23	10K	¼
24	150K	½
25	250K	Potr.
26	27K	½
27	4.7M	¼
28	56K	¼
29	27K	½
30	4.7K	¼
31	150	¼
32	820	½
33	33K	¼
34	1M	¼
35	2.2M	¼
36	1M	½
37	33K	¼
38	1M Potr. Log Law fitted with DPST switch	
39	18K	½
40	270	½
41	220	½
42	680K	¼
43	25K	WW Potr.
44	820K	½
45	22K	1
46	25K	WW Potr
47	2.7M	¼
48	1.8K	½
49	2.2M	¼
50	100K	¼
51	25K	WW Potr.
52	4K	6
53	2.2M	½
54	500	WW Potr.
55	1K	WW Potr.
56	100K	½
57	240 Vitreous 30W Tapped 110 and 175	
58	Thermistor Type CZ1	
59	270K	¼
60	390	1
61	82	2
62	47	¼
63	680K	¼
64	8.2K	¼
65	No Component	
66	1K	6
67	56K	¼

CAPACITORS

C	Capacity	Type
1	100pF	Silver Mica
2	1000pF	Tub. Ceramic
3	1000pF	Tub. Ceramic
4	1000pF	Tub. Ceramic
5	1000pF	Tub. Ceramic
6	50pF	Silver Mica
7	1000pF	Tub. Ceramic
8	1000pF	Tub. Ceramic
9	10pF	Silver Mica
10	15pF	Silver Mica
11	25pF	Silver Mica
12	1000pF	Tub. Ceramic
13	40pF	Silver Mica
14	1000pF	Tub. Ceramic
15	1000pF	Tub. Ceramic
16	1000pF	Tub. Ceramic
17	30pF	Silver Mica
18	1000pF	Tub. Ceramic
19	1000pF	Tub. Ceramic
20	1000pF	Tub. Ceramic
21	40pF	Silver Mica
22	8pF	Silver Mica
23	2000pF	Silver Mica
24	.1	Tubular 350V
25	1000pF	Tub. Ceramic
26	.1	Tubular 250V
27	.02	Tubular 350 V
28	.5	Tubular 350V
29	300pF	Silver Mica
30	1000pF	Tub. Ceramic
31	.05	Tubular 350V
32	1000pF	Tub. Ceramic
33	20pF	Silver Mica
34	1000pF	Tub. Ceramic
35	1000pF	Tub. Ceramic
36	8pF	Silver Mica
37	.1	Tubular 350V
38	30pF	Silver Mica
39	.01	Tubular 350V
40	200pF	Silver Mica
41	300pF	Silver Mica
42	.01	Tubular 350V
43	50	Electrolytic 12V
44	100	Electrolytic 25V
45	5000pF	Tubular 350V
46	.01 pF	Tubular 350V
47	16	Electrolytic 450V
48	1000pF	Tub. Ceramic
49	.05	Tubular 350V
50	.01	Tubular 350V
51	200pF	Silver Mica
52	50	Electrolytic 25V
53	.1	Tubular 350V
54	.02	Tubular 350V
55	.1	Tubular 350V
56	.05	Tubular 350V
57	150pF	Silver Mica
58	500pF	Silver Mica
59	.5	Tubular 350V
60	.01	Tubular 350V
61	8	Electrolytic 200V
62	1000pF	Visconol
63	120	Electrolytic 450V
64	32	Electrolytic 450V
65	25 or 40pF	Silver Mica
66	100pF	Silver Mica

INDUCTORS

L	Ohms
1—17	low
18	9.5
19	40
20—22	low
23	600
24	.5
25	2.5
26	500
27	250
28	700
29	2.5
30	27
31	500
32	low
33	5
34	8
35	9
36	67
37	1.5
38	1.5
39	65

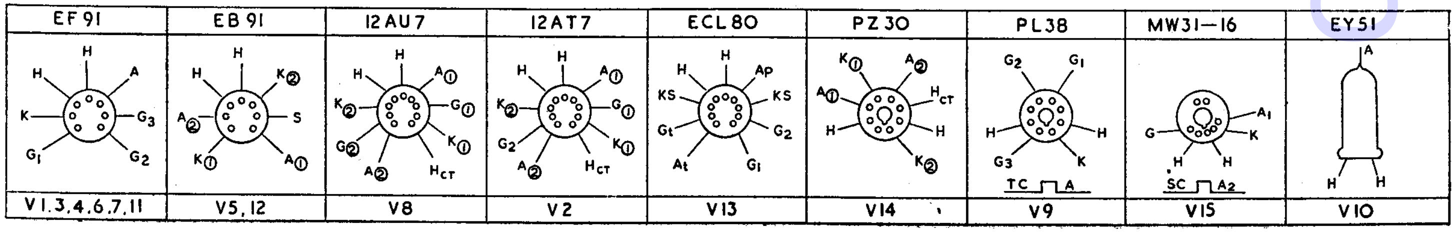
VOLTAGE READINGS

V	Type	A	G2	K
1	EF91	250	250	1.8*
2	12AT7 A	240	—	2
	12AT7 B	80	—	0
3	EF91	210	210	1.8**
4	EF91	220	220	1.8
5	EB91 B	—	—	145
6	EF91	145	250	2.8
7	EF91	40	155	0
8	12AU7 A	12	—	0
	12AU7 B	295	—	15
9	PL38	305	130	15†
10	EY51	—	—	6.6kV
11	EF91	255	250	1.8
12	EB91 B	12	—	—
13	ECL80	135	—	12
		250	255	
14	PZ30	300 RMS	—	325
15	MW31-16 CRT	6.6kV	305	145

Footnotes to table

* R2 at maximum.
** R13 at maximum
† Controls in working position.

Total HT 235mA
Mains consumption 700mA at 230V



of CRT. Video response in higher frequencies is boosted by C23, which is across cathode load R19 and functions by reducing the negative feedback.

Interference limiter is diode V5B, shunted by R16, and connected with cathode to anode of video amplifier and anode through C24 to chassis. C24 charges through R16 to a potential approximately equal to peak white. When a high-frequency interference pulse appears cathode V5B is driven negative, but, due to comparatively long time constant of R16 C24, its anode potential remains unchanged, V5B conducts, thus short circuiting the interference pulse to chassis through C24.

Sound channel intermediate frequency is taken from IFT2 by L12 which is coupled to sound-on-vision rejector circuit L10 L11 C17 and is fed to tapping on L20 in grid of sound IF amplifier V11.

Amplified signal at anode V11 is bandpass transformer coupled by IFT4 to diode signal rectifier V12A. Rectified audio signal is developed across R33 C38 and fed by C39 through series noise suppressor diode V12B and RF filter R37 C40 C41 and thence coupled by C42 to **Volume** control R38 in grid of triode AF amplifier section of V13.

Noise suppressor. Anode of diode V12B is biased positively from HT line through R35 R36 and conducts to set up a voltage across cathode load R34. The time constant of R35 C40 is such that voltage on C40 follows the audio signal which is fed by C39 to cathode V12B. When a large-amplitude high-frequency interference pulse is passed by C39, then, because of the comparatively long time constant of R35 C40, the cathode of V12B is driven positive to the anode and the diode cuts off.

Sync separator. Signal at anode of video amplifier V6 is applied through R23 C27 to grid of sync separator V7. Positive sync pulses drive V7 into grid current, and the resultant bias produced across R27 is sufficient to place video portion of signal below cut-off, thus only the sync pulses appear at anode. Anode and screen voltages are low to shorten grid base of V7 to ensure good separation on weak signals.

Frame sync pulses are obtained from screen (g2), shaped by R26 C29 and fed through R28 C51 to anode of frame scan oscillator V8A. Line sync pulses are developed across L19 and fed by C57 to screen of line scan oscillator and output valve V9.

Frame scan oscillator is triode V8A operated as a grid blocking oscillator with anode-grid back coupling by transformer FT1. Scan voltage is developed on C54 C56. Amplitude is controlled by adjustment of anode voltage by R43 the **Height** control and adjustment of grid bias by R46 provides **Vertical Hold.**

Frame amplifier. Scan voltage developed across C54 C56 is fed by C53 to grid of triode frame amplifier V8B. Amplified scanning voltage at anode is transformer coupled by FT2 to frame deflector coils L30 on neck of CRT. Linearity of scan is adjusted by **Vertical Form** control R51 which varies the amount of anode to grid negative feedback. C31 and C49 affect linearity of middle and bottom of scan.

Line scan voltage is generated by pentode V9 which is driven into self-oscillation by positive feedback to grid derived from secondary L33 of line output transformer LT1. Sawtooth voltage across screen resistor R52 during scanning cycle is applied through C58 to suppressor grid to improve linearity. R53 provides an initial bias to suppressor grid.

Frequency of scan is controlled by R54 the **Horizontal Hold** control in the grid circuit. Output waveform is coupled by secondary L33 of LT1 to line deflector coils L35 on neck of CRT. Amplitude of line scan **(Width)** is adjusted by variation of inductance of series coil L34 and linearity by adjustment of its damping by R55 **Horizontal Form.**

EHT of approximately 6.6kV for final anode of CRT is obtained by rectifying by V10 the surge voltage developed on overwound primary L31 of LT1 when V9 is cut off. EHT is smoothed by C62 and fed through R56 to final anode of CRT. Capacity between inner and outer coatings of CRT provides further smoothing.

HT is provided by indirectly-heated rectifier V14 in a halfwave circuit. Anode voltage is obtained from auto-transformer primary L39 of heater transformer MT1. Choke-capacity smoothing is by L36 C63 C64. HT feed to sound channel and pre-amplifier power output socket is voltage dropped and further smoothed by R66 C47. Vision channel feed is dropped and smoothed by R22 C26.

Reservoir smoothing capacitor C64 should be rated to handle 500mA ripple current.

Heaters of all valves except CRT are series connected and obtain their current from the mains through dropper R57, which is tapped for adjustment to mains voltage, and thermal surge limiter R58.

Heaters of V1 to V5 are RF decoupled by C4, C8, C15, C19, C25 respectively. Heater supply for CRT is obtained from secondary L37 of transformer MT1.

Pre-amplifier power output socket heater supply is obtained from a separate secondary L38 of MT1. Both primary L39 of MT1 and dropper resistor R57 are tapped for 190-210, 220-230, 240-250V 50c/s.

S1, ganged to sound volume control, is ON/OFF switch. Mains input incorporates a 2A fuse in each lead.

CRT is 12in. tetrode, Mullard type MW31-16, with permanent magnet focusing. **Brightness** is controlled by R25.

Modifications. 270K ½W resistor added between pin 7 V1 and top of R2. R39 omitted. C65 changed from 25 to 40pF enabling any set to be tuned to 24mc/s for London or 23mc/s for elsewhere.

ALIGNMENT INSTRUCTIONS

Apparatus required: Accurately calibrated signal generator covering 23-28mc/s and 40-65mc/s. A 1mA full-scale deflection MC milliammeter. A 10K ½W resistor and 1,000pF capacitor. Suitable sound output meter.

(1) Connect 1mA meter, shunted by 1,000pF, in series with 10K resistor between g1 of V6 and chassis.

(2) Connect sound output meter across secondary L24 of OP1.

(3) Disconnect C6 from L2 and connect sig/gen. output between free end of C6 and chassis.

Frequencies below are for London model. For all other models reduce all frequencies by 1mc/s.

(4) Inject 27.5mc/s modulated and tune L20 L21 L22 for maximum on sound output meter.

(5) Inject 26.5mc/s unmodulated and tune L4/5 for maximum deflection on vision meter.

(6) Inject 22.5mc/s—tune L7 for minimum.

(7) Inject 24.25mc/s—tune L8/9 for maximum.

(8) Inject 27.5mc/s—tune L11/12 for minimum.

(9) Inject 26mc/s—tune L13/14 for maximum.

(10) Inject 27.5mc/s—tune L16 for minimum.

(11) Inject 27.5mc/s—tune L17 for minimum.

(12) Reconnect C6 to L2 and inject appropriate sound channel frequency through a 68 ohm resistor into aerial.

(13) Adjust L3 for maximum sound output.

(14) Finally adjust L1 and L2 to a position approximately midway betwee maximum sound and vision.

SERVICE CASEBOOK

"How to Prevent Record Slip" has produced two "follow-up" suggestions, each better then its predecessor. Do other Casebook items remind you of useful hints and experiences? If so, write in at once.

CORRESPONDENT, J.B., Levenshulme, appears to have missed the easiest and cleanest way of dealing with record slip. This is to place a small piece of sticking plaster, about half an inch square on the label, on both sides of the records.

This looks much better than scoring the label with a scriber, and cures the worst case of record slip, no matter what the cause.

Care should be taken to place the sticking plaster at approximately the same radius on all records, when the two facing pieces will engage.—F. PACK, Clapham Park, SW4.

McMICHAEL 851U

A NEW model gave no MW reception, LW calibration was badly out, and rotating the gang caused horrible crackles. All these faults were due to the earthing lead of the gang becoming disconnected during transit.

In this model, the rubber-mounted gang has a separate lead to chassis.—A. J. STRONG, Hoddesdon.

HMV 1807A

IT has been noted on some of these models that after a few months' service the frame hold control becomes increasingly difficult to set correctly, the line hold control operating reliably.

This fault has usually been found to be due to the screen resistor of the Z63 (sync. valve) going high. One of these resistors recently measured was found to be of the order of 12M whereas the correct value is 680K.

We are now replacing these resistors with one of a higher wattage rating and hoping that this action will prevent the recurrence of the trouble.—C. H. W., Enfield.

WARTIME CIVILIAN AC

COMPLAINT: Slow fade to very weak signal. Usual tests showed loss in IF stages.

After much work with meters (including valve voltmeter) it was found that standing bias on FC and IF valves faded with the signal.

Valves were replaced *one at a time*, no better. We then found a voltage from a bias battery as standing bias held signal steady. In desperation both FC and IF valves were replaced *at the same time*. Fault cleared.

Both valves slowly developed grid emission when hot—but why both at the same time!—E. CAINS, Pocklington.

REPLACING THE OBSOLETE TV4

ENGINEERS occasionally come across the older receiver employing a TV4 as tuning indicator, and this is rarely working due to its long service. As this valve is now obsolete with no equivalent or near-equivalent, one is at first inclined to think there is nothing that can be done.

An EM1, however, is of identical characteristics and base connections, the only difference being the heater voltage of 6.3V as compared with the 4V of the TV4.

This difference can be overcome by using an auto-transformer to "step-up" the 4V supply. One is readily wound using an old OP transformer for the core. The heavier gauge enamelled wire used on the heater winding of an old mains transformer is suitable and with an OP transformer whose core is ½ sq. in., 15 turns/volt should be allowed. A tapping at 60 turns must be made for the existing 4V supply, the EM1 being supplied from the outer ends of the winding (95 turns in all).

Ordinary insulating tape should be used after each layer of wire is wound, and the core laminations should be packed tightly, a small wedge being used if necessary, to prevent vibration.

There is a negligible increase in heater current and very little work in fitting this.—J. C. HALL.

EKCO PRINCESS

ONE model had excessive HT consumption which was traced to corrosion in the IFT can causing leakage to chassis.

Another model suffered from audio howl when the VC was turned beyond a certain point. All parts of the DDT and OP stages were OK and removing the IF valve did not clear the trouble.

The howl disappeared on disconnecting the primary of IFT2. On examination a leakage of 2M was found between primary and secondary, again due to corrosion.—A. J. STRONG, Hoddesdon.

PYE FVI FVIC

LINE time-base causing interference to next door radio. Cure: fit .05mF condenser of high AC working volts to heater chain at junction of V15 heater to L61—other side of condenser to chassis. (Part Nos. refer to SERVICE CHART, not to maker's sheet.)

Radiation is via mains as line transformer is well screened.

Small chokes (which look like resistors in systoflex) in heater chain can cause intermittent open heater chain and are easily overlooked when testing valves. Usually wire is broken at end and can with care be repaired. Chokes are L65-6-7-8-9.—E. CAINS, Pocklington.

VIDOR 396

FAULT: weakness on all stations as though batteries were down. Noticed, when testing, strong oscillation in middle of MW band. After much checking of decoupling condensers it was noticed that a test lead on IF anode of FC valve improved volume.

Tried to re-align IFT1 but found primary would not peak. Further tests proved 65pF tuning condenser across primary to be O/C. A replacement brought set up to standard.

It would seem IFT was acting as oscillator on MW at one point and damping signal at all other settings.—E. CAINS, Pocklington.