SERVICE ENGINEER

EKCO MODEL A.C. 86 FIVE-VALVE A.C. SUPERHET

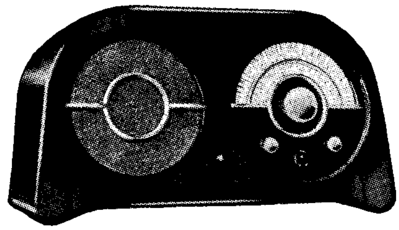
E. K. Cole, Ltd., have enabled THE BROADCASTER *to compile the following service information, but have not allowed publication of the circuit diagram.* THE BROADCASTER *is confident, however, that with the aid of the circuit description, the two lay-out diagrams and the component tables (which describe the duties of each part), engineers will be able to remedy almost all types of fault.*

CIRCUIT.—The input from the aerial is applied to the grid of V1, an octode frequency changer, through an inductively-coupled tuned band-pass filter. This incorporates a pre-set condenser, C27, for the elimination of second-channel interference on the medium waves and an H.F. choke and condenser, C1, for preventing breakthrough on the long waves.

The signal is then passed to the I.F. valve, V2, through an I.F. band-pass transformer, which is tuned to 130 kc.

Bias is applied to the grids of V1 and V2 through a tapping on the V2 bias potentiometer. The bottom of this potentiometer is variable, and acts as a noise suppression control. A.V.C. is applied to V1 and V2 in the orthodox manner.

The coupling to the diode-triode, V3, is through a second I.F. transformer having



Housed in this distinctive moulded cabinet, the Ekco A.C. 86 is a five-valve plus rectifier superhet for A.C. mains operation.

a double secondary, the second winding of which is for A.V.C. and noise suppression purposes.

The rectified output of V3 passes to the L.F. amplifier valve V4. This is a triode resistance-capacity coupled to V5, the pentode output valve. Mains equipment consists of transformer, full-wave indirectly heated rectifier, electrolytic condensers, and the speaker field.

Special Notes.—The external speaker is connected on the low resistance side of the output transformer and should have an impedance of 2.3 to 3 ohms.

The dial lamp is a 6 volt .3 amp. type.

Removing Chassis.—To remove the chassis take off the five knobs from the front of the cabinet. These are secured by grub screws. Remove the four bolts holding the chassis in position (they are reached through holes cut in the bottom of the cabinet). The bolts projecting from the bottom of the cabinet are for holding the two length-wise bars in place and should not be touched.

Unplug the speaker lead from the side of the chassis. The chassis will then slip right out of the cabinet.

For tests with the chassis out of the cabinet, the speaker leads must be extended, as the field forms part of the smoothing equipment.

(For Layouts see next page.)

QUICK TESTS

Quick tests are available on the terminal strip on the speaker. The volts measured between this and the chassis should be :—

(1) Red lead with white tracer, unsmoothed H.T., 380 volts.

(2) Red lead, smoothed H.T., 245 volts.

Matching and Testing Moving-coil Speakers

FOR optimum volume and quality the speaker and output valve must be matched. Usually an output transformer with a suitable ratio is used for this purpose. The correct transformer ratio can be derived from the following formula :—

$$2\sqrt{\frac{\text{Optimum Load}}{\text{Speaker impedance}}}$$

The optimum load can always be obtained from the valve makers' rating. The speaker impedance generally resolves into that of the impedance of the moving coil. This is not always known, but as a rough rule it can be taken as twice the D.C. resistance. If the optimum load of a valve is not given by the makers, this can also be taken as twice the impedance.

When two valves are used in parallel, the valve impedance is halved. With push-pull the effective impedance is doubled. The necessary alteration to the effective impedance must be made when applying the formula.

For example, to match two 2,000 ohms valves in parallel, using a speech coil with an impedance of 5 ohms, the correct transformer ratio is : —

$$2\sqrt{\frac{2{,}000}{5}} = 20$$

With a 4.2 ohms impedance coil and a pair of 8,000 ohms valves in push-pull, the ratio is :—

$$2\sqrt{\frac{32{,}000}{4 \cdot 2}} = 87$$

SPEAKERS can be tested in two different ways, for faults and for frequency response. The only satisfactory way of testing the frequency response of a speaker is to connect it to a good amplifier energised either from a beat oscillator or from a constant note record. This test will show two qualities of the speaker, a complete cut off or a resonance.

A good moving-coil speaker should give excellent radiation at both ends of the scale, while the characteristic should be reasonably flat.

Record scratch does not necessarily indicate that a moving-coil speaker gives good top response, because very frequently scratch frequencies come out well, but frequencies in the neighbourhood of 4,000 to 6,000 cycles may show a distinct drop.

AN excellent way of testing the bass response of a speaker is to utilise a 50 cycles mains supply. A true 50 cycle note should be used. It is easily obtained by connecting a long length of flex to the input of an amplifier and bringing it near to the mains leads. A grid leak should be connected between the grid and chassis.

This arrangement will pick up a large amount of 50 cycle energy which should be reproduced by the set in addition, of course, to the harmonics. A true 50 cycle note has a very deep boom, the presence of which can be almost felt. Even a 50 cycle note of low intensity produces a mild sensation of deafness. Turned up to greater volume it becomes exceedingly unpleasant. A good speaker should be capable of producing this effect. If it does not do so, it can be taken that the radiation at 50 cycles is poor.

WHILE this test is conducted, the diaphragm should be touched with the hand. This should practically completely remove all the 50 cycle radiation, leaving only the harmonics audible. This actually occurs in a moving-coil speaker if the moving-coil is restricted owing to touching the gap. An excellent laboratory method of centreing the coil is to supply a 50 cycle input.

A coil should not get out of adjustment in the normal way. But if it has done so, there is a possibility of the turns shorting owing to the insulation being scraped off due to friction in the gap.

EKCO ALIGNMENT NOTES (Continued)

I.F. Circuits.—Connect modulated oscillator to aerial and earth sockets and output meter across the external speaker sockets.

Tune set near to maximum capacity on long waveband and the oscillator to 130 kc. Then adjust T.1, T.3, T.2 and T.4 for maximum reading on output meter, and T.6 for minimum reading.

Signal Circuits.—(1) Connect modulated oscillator to aerial and earth terminals and output meter across external speaker sockets. Set modulated oscillator and receiver to 200 metres. Adjust receiver oscillator trimmer for maximum on output meter.

(2) Set modulated oscillator and receiver to 250 metres, and adjust band-pass trimmers for maximum.

(3) Check calibration on other wavelengths.

(4) Set modulated oscillator to 1,600 metres, and tune in the signal. If dial reading is incorrect, adjust by T.6 for maximum on output meter.

While adjusting the trimmer, swing the tuning condenser slightly at the same time.

VALVE READINGS

No signal. Volume and tuning controls turned fully clockwise and automatic noise suppressor at "all stations." 200 volts mains.

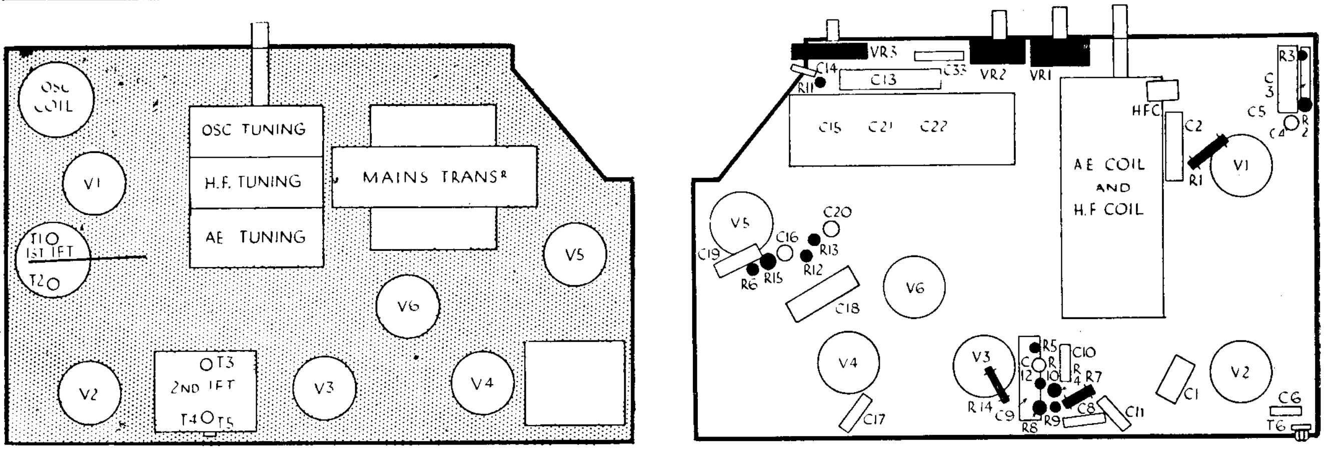
V.	Type.	Electrode.	Volts.	M.a.
1	MullardFC4(7) (Met)	Anode ..	245	3.5
		Osc.anode	120	3.
2	Mazda AC/ VP1 (7)	Anode ..	245	7.4
	(Met)	Aux. grid	245	1.
3	MazdaV914(5)	Diode ..	—	—
4	Mullard 354V (5) (Met)	Anode ..	145	2.7
5	Mazda AC pen (7)	Anode ..	220	30
		Aux. grid	245	5.5
6	MazdaUU3(4)	Anodes ..	350	—

RESISTANCES

R.	Purpose.	Ohms.
1	V1 oscillator leak	50,000
2	V1 cathode bias	6,000
3	V1 screen feed	15,000
4	V1 grid leak	500,000
5	V3 demod. diode load	100,000
6	V2 A.V.C.	250,000
7	V2 grid leak	250,000
8	V2 V3 cathode bias	300
9	Part V2 V3 bias pot.	5,000
10	V3 demod. diode load	100,000
11	V4 grid leak	1 meg.
12	Part V4 anode decoupling	9,000
13	" " "	25,000
14	V5 grid leak	250,000
15	V4 V5 cathode bias	400
VR1	Noise suppression	10,000
VR2	Volume control	250,000
VR3	Tone control	500,000

CONDENSERS

C	Purpose.	Mfd.
1	Series aerial	.0008
2	V1 grid by-pass	.1
3	V1 cathode L.F. by-pass	10
4	V1 cathode H.F. by-pass	.1
5	Oscillator anode coupling	.1
6	Long wave	.0007
7	Oscillator grid	.001
8	V2 A.V.C. decoupling	.01
9	V2 cathode by-pass	.1
10	Demodulator decoupling	.0002
11	A.V.C. decoupling	.01
12	L.F. coupling	.01
13	Tone compensating	.25
14	Tone control	.0005
15	V4 anode decoupling	2.
16	L.F. coupling	.01
17	V4 anode by-pass	.001
18	V5 cathode by-pass	25
19	V5 anode by-pass	.0025
20	H.F. by-pass	.1
21	H.T. smoothing	8.
22	H.T. smoothing	8.
23	Aerial tuning	—
24	H.F. tuning	—
25	Oscillator tuning	—
26	Long-wave trimmer	—
27	Second channell trimmer	—
33	H.F. by-pass	.0003



These layout diagrams in conjunction with the above tables enable components to be identified and their purpose determined. The "tinted" diagram on the left is the plan view and the other shows the underneath arrangement. As explained on the previous page a circuit is not given, but the information provided enables practically all faults to be traced and remedied.