

COPYRIGHT

This Service Data is for the information of Appointed Ekco Dealers only and must not be copied.

EKCO SERVICE DATA

MODEL A320

See also Service News Sheets Nos.

Page 1 (in 6 pages)

Model A320 is a six valve (including rectifier) superheterodyne receiver offering free tuning of A.M. signals on the Long and Medium wavebands and F.M. signals on the V.H.F. band (Band 2). Waveband selection is by a four position switch which also includes one position for gramophone operation.

For A.M. reception a directional Ferrite rod aerial is fitted whilst a socket is provided for connecting to an external aerial if desired.

Two V.H.F. dipoles are provided with the receiver, either of which may be used in suitable localities, one built in to the receiver cabinet and the other for indoor erection. An outside dipole may, of course, be used if desired. Other special features include a variable tone control and sockets for connecting to an extension loud-speaker and a gramophone pick-up.

MAINS SUPPLY : 200-250 Volts. A.C. 50 c/s.

MAINS CONSUMPTION : 54 Watts.

CONTROLS : The major controls are at the front of the receiver arranged in two concentric pairs, namely :—

Left (inner) VOLUME ON/OFF (outer) TONE
Right (inner) WAVECHANGE (outer) TUNING

At the rear of the receiver are the MUTING control for the internal loud-speaker and the A.M. aerial directional control.

PILOT LAMPS : 6.5 Volts. 0.3 Amp.

VALVES :

V1 ECC85 V.H.F. Amplifier and Mixer.
V2 ECH81 Frequency Changer (A.M.) I.F. Amplifier (F.M.).
V3 EF89 I.F. Amplifier.
V4 EABC80 Ratio Detector (F.M.), Demodulator (A.M.) and A.F. Amplifier.
V5 EL84 Power Output.
V6 EZ80 H.T. Rectifier.

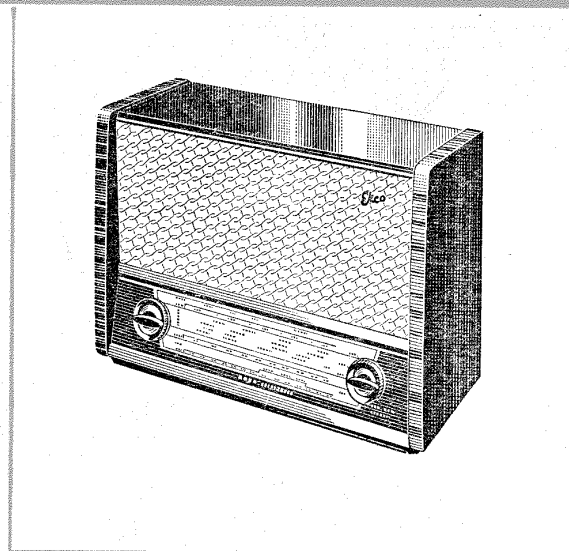
All valve bases are type B9A.

WAVEBAND COVERAGE : F.M. (Band 2) 86-100 Mc/s.,
A.M. M.W. 550-1650 Kc/s. 545-182 Metres.
L.W. 150-250 Kc/s. 2000-1200 Metres.

LOUD-SPEAKER : 8" x 5" Elliptical. Impedance at 400 c/s. 3 ohms.

An external loud-speaker, if connected to the sockets provided, should have a similar impedance to the internal loud-speaker.

OUTPUT : Approximately 3½ watts.



INTERMEDIATE FREQUENCY : A.M. 470 Kc/s., F.M. 10.7 Mc/s.

CIRCUIT DETAILS

F.M. Operation

R.F. AND MIXER STAGE : V.H.F. signals at the dipole are coupled by the aerial coil L1.L2 to the cathode of V1A which operates as a grounded grid R.F. triode. Amplified signal voltages in the anode circuit are then fed to the grid of V1B, L3 forming the variable element of the R.F. tuned circuit. V1B operates as a parallel fed oscillator with the core of L4 providing variable tuning.

The cores of L3 and L4 are ganged to the tuning control and the scale pointer.

I.F. AMPLIFIERS : The I.F. signals at the anode of V1B are transformer coupled by L6.L7 to the grid of V2 which operates as the first I.F. amplifier on F.M. The triode section of V2 is rendered inoperative on F.M. by the switch SW2A which disconnects the H.T. supply from the anode. Amplified signals at the heptode anode are transformer coupled by L11.L13 to the grid of V3. The primary of the first A.M. I.F. transformer, L10, is short circuited by SW2B on F.M. to avoid interference from 470 Kc/s. signals. I.F. signals, amplified by V3, are applied to the ratio detector V4A by the discriminator coil assembly L17.L19.L20.

RATIO DETECTOR : V4A operates as a conventional ratio detector in which the signal voltage across L19 is 90 degrees out of phase with the primary voltage when the F.M. signal is at the mean frequency and the sum total of signal voltages at the ends of L19 are equal and opposite. L20 applies a signal voltage, to the centre of L19, which is in constant phase relation with the primary voltage.

The voltage across L19 is applied to the opposed diodes of V4A which, at the mean I.F., produces a constant output. When the signal voltage in L17 deviates above or below the mean frequency, the phase in L19 changes relative to the degree of deviation.

The total voltage applied to one diode, i.e. $\frac{1}{2} L19 \pm L20$, will increase while the other will decrease. The resultant output from the diodes will vary in direct sympathy with the deviation of the F.M. signal, i.e., in accordance with the audio content and is fed through the I.F. filter R14.C36.C37 and SW1C.C42 to the Volume control.

The capacitor C45 operates as a reservoir across the two diodes and assists in removing any A.M. content from the output.

A.G.C. : A D.C. voltage, developed across R19.C45, has an amplitude which varies in sympathy with the signal amplitude. This voltage is applied to the suppressor grid of V3 as A.G.C.

A.M. OPERATION

R.F. MIXER STAGE : The directional aerial for M.W. and L.W. reception consists of the coils L9 and L8 which are located at the ends of a Ferrite rod. Provision is included for coupling an external aerial into the bottom end of the aerial coils if required.

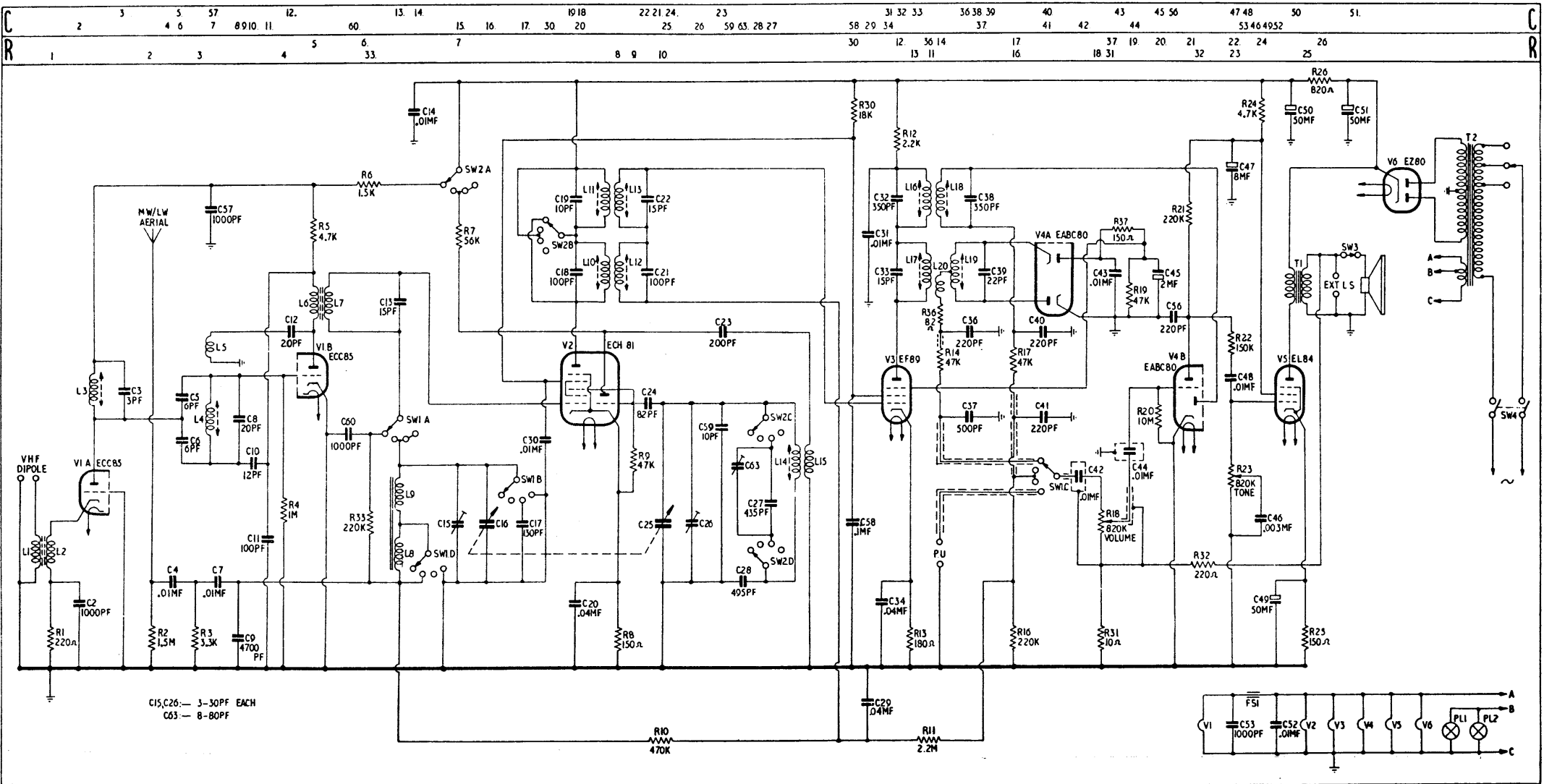
Aerial circuit waveband selection is by SW1A.SW1B.SW1D and tuning is effected by C16 with C15 as a pre-set trimmer. R.F. signals are fed through L7 to the control grid of V2 heptode.

The triode section of V2 operates as a conventional parallel fed oscillator in which waveband selection is by SW2C.SW2D and tuning by C25. C26 and C63 are pre-set trimmers. Mixing is by electronic coupling in the valve.

I.F. AMPLIFIER AND DEMODULATOR : I.F. signals at the anode of V2 are transformer coupled by L10.L12 to the grid of V3 which operates as a conventional I.F. amplifier.

SW2B short circuits the primary of the second F.M. I.F. transformer during A.M. operation.

Amplified I.F. voltages at the anode of V3 are fed to the diode demodulator V4B by the coils L16.L18. The diode load consists of R17.R16 and A.F. voltages are fed through SW1C to C42 and the volume control.



A.G.C. : The rectified signal voltages developed across R16 are applied across C29 and fed as bias to the control grids of V2 and V3.

GRAM. OPERATION : Sockets for connecting to an external gramophone pick-up are coupled to the volume control by SW1C and C42.

A.F. AMPLIFIER AND AUDIO OUTPUT STAGES : The A.F. amplifier and audio output stages are common to A.M., F.M. or Gram operation.

A.F. voltages at the volume control are fed through C44 to the grid of V4B triode and, after amplification, are coupled by C48 to the grid of the output valve V5.

R23, C46 operate as a variable tone correction circuit. A.F. currents in the secondary of the output transformer, T1, are applied across the network R31, R32 and the voltages developed across R31 are coupled to the volume control to improve the overall response of the circuit.

The loud-speaker is also fed from the secondary of the output transformer, T1, SW3 operating as the internal loud-speaker muting switch.

POWER SUPPLIES : A.C. mains are applied through the on/off switch SW4 to the tapped primary of the mains transformer T2. A tapped secondary winding on T2 provides heater currents for the valves and pilot lamps.

V6 operates as a full-wave rectifier the anodes of which are fed from the H.T. secondary of the mains transformer.

The D.C. output is smoothed by C51, C50, C47, R26 and R24.

CIRCUIT ALIGNMENT—Instruments Required : An AM/FM signal generator, an oscilloscope, an A.F. output meter or low range A.C. voltmeter, a 0-50 μ A meter and two matched 220K carbon resistors.

I.F. (F.M.) : Two methods are given (a) Visual and (b) Meter.

(a) **VISUAL :** Disconnect the earthed (positive) side of the stabilising condenser C45. Tune the receiver to the low frequency end of the band. Switch to F.M. and adjust the volume control for minimum output. Connect the oscilloscope across R19 and inject sweep input to pin 2 V3.

Tune L17 for peak response. Re-connect C45 and connect the oscilloscope across C36. Tune L19 for the best 'S' waveform, re-adjusting L17 if necessary. If the alignment equipment has the

facility to superimpose A.M. on the F.M. signal, the adjustment of L19 should be made for the best compromise between A.M. rejection at 10.7 Mc/s. and 'S' waveform, or L17 adjustment for 'S' waveform only.

Transfer the input to the junction of R5, R6 (4.7K and 1.5K). This point is alive to H.T. potential and suitable precautions should be taken.

Tune L13, L11, L6 and L7 in that order for maximum output at 10.7 Mc/s.

The curve should be substantially flat over ± 75 Kc/s. and within -2 dB for ± 100 Kc/s.

(b) **METER METHOD :** Connect the output meter across the loud-speaker leads. Adjust the volume and tone controls to maximum. Connect the 220K resistors in series across R19. Connect the μ A meter between the junction of the 220K resistors and chassis. Set the receiver tuning control to the low frequency end of the band.

Input to pin 2 V3, tune L17 at 10.7 Mc/s. for peak reading on μ A meter.

Disconnect the μ A lead from chassis and connect to the junction of R14, C36 and tune L19 for zero reading. This should be tunable from a maximum in one direction to a maximum in the other direction.

Transfer the μ A meter leads so that the meter is now connected across C36.

Input to pin 2 V2, tune L13 and L11 for peak reading on the μ A meter. Re-tune L17 if necessary.

Input to the junction of R5 and R6. (This point is at H.T. potential and should be isolated from the generator by a 0.001 μ F condenser).

Tune L6 and L7 for maximum reading at 10.7 Mc/s.

Disconnect the test resistors and μ A meter.

I.F. (A.M.) : Switch to M.W. and tune the receiver to 550 Kc/s. Connect the output meter across the loud-speaker leads. Input at 470 Kc/s. amplitude modulated 30% at 400 c/s. to pin 2 V2. Adjust L18, L16, L12 and L10 in that order for maximum output and symmetrical response.

R.F. (F.M.) : Check that with the gang fully open the tuner carriage is $\frac{1}{8}$ " from fully open, adjust if necessary by rotating the drive collar on the gang shaft ; also check that the pointer coincides with the datum mark at the right hand end of the scale, adjust if necessary by sliding the pointer along the drive cord.

Tune the receiver to 91 Mc/s. and inject an F.M. signal of that frequency to the aerial input.

Adjust L4 for alignment and L3 for peak output.

R.F. (A.M.) : M.W. Input to the aerial socket. Align L14 at 600 Kc/s. and C26 at 1500 Kc/s.

Adjust C15 at 1500 Kc/s. and L9 at 700 Kc/s.

L.W. Align C63 at 214.3 Kc/s. and adjust L8 for maximum output.

Note : The adjustment of L8 and L9 is carried out by sliding the coils along the Ferrite rod until a point of maximum output is reached. The coils should be sealed on the Ferrite rod after completion of alignment.

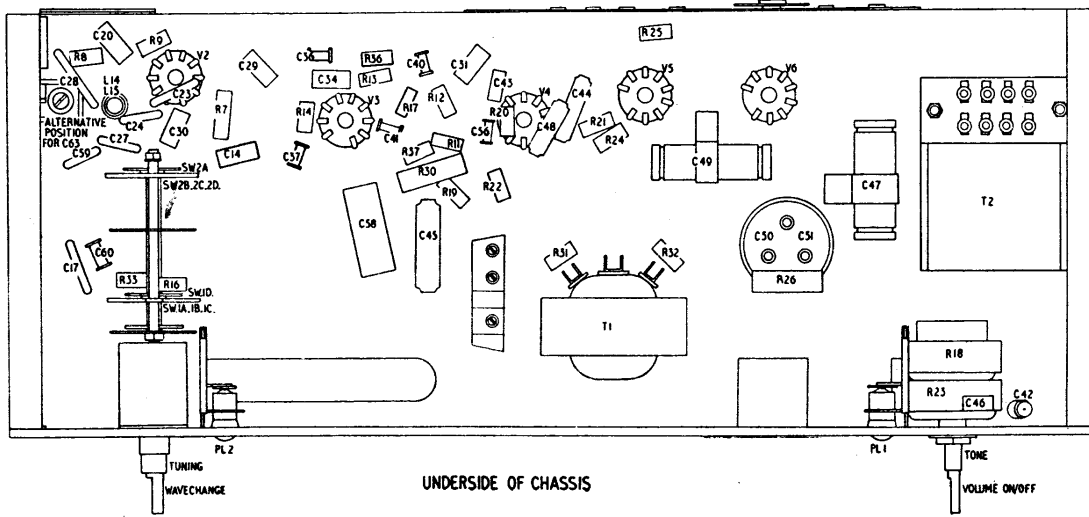
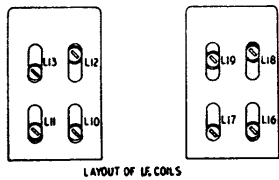
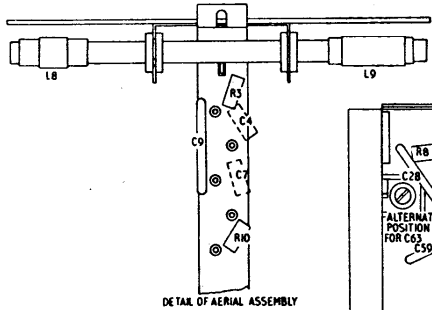
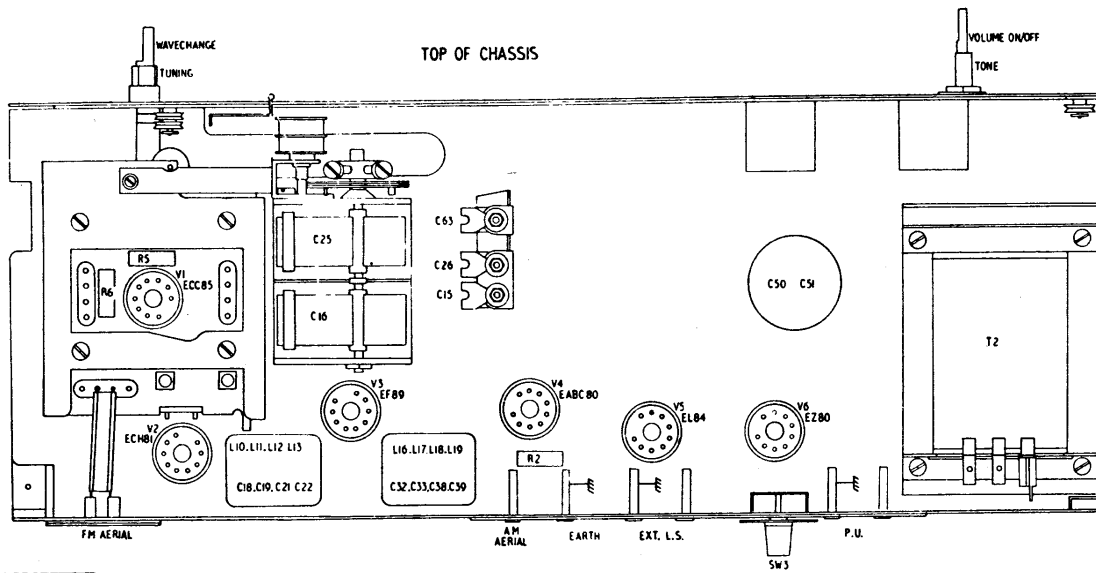
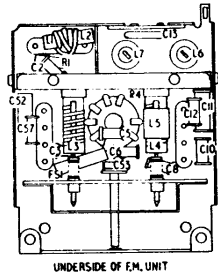
CHASSIS REMOVAL : Disconnect the receiver from the mains supply then remove the rear cover. Remove the two pairs of push-on control knobs then the four screws securing the chassis to the cabinet. Slacken the retaining screw and lift the Ferrite rod aerial bracket free from the cabinet. The chassis may now be withdrawn to the extent of the loud-speaker leads.

DRIVE CORD DETAILS

POINTER DRIVE : A length of nylon cord of approximately 47 inches, having a small loop in one end, is required.

Attach the cord spring to the knot in the new cord and anchor the spring temporarily at a point above the volume control spindle.

With the gang fully meshed the slots in the drive pulley 'A' should be approximately 45 degrees clockwise of the upright position. Pass the cord two turns clockwise round the front section of pulley 'A', through the slot in the central fin and then five turns clockwise round the rear section of the pulley. The cord should next be



taken over the rear pulley 'B', then $1\frac{1}{2}$ turns anti-clockwise round the tuning knob spindle, back over the front pulley 'C' and clockwise round the pulley 'D'. Release the spring from its temporary anchor and tie the free end of the cord to the free end of the spring so that the spring is under slight tension.

Seal the knots with adhesive and attach the pointer to the cord close to pulley 'C'. Adjust to the datum mark on the scale by sliding the pointer along the cord.

F.M. UNIT DRIVE : Replacement of this drive necessitates the complete removal of the F.M. tuner unit and should not be undertaken unless facilities are available to re-align the F.M. circuits.

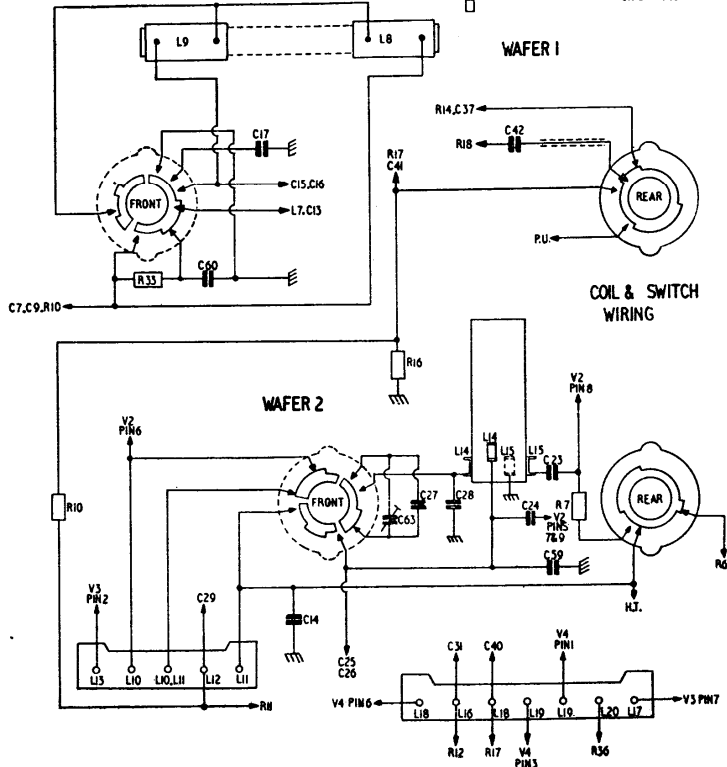
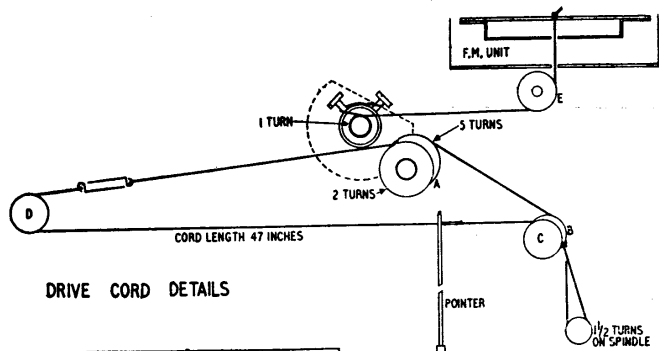
A length of nylon cord, approximately 10 inches, is required together with a securing nipple, both of which are available from Ekco Service Dept.

To proceed, disconnect the leads and bonding braid from the F.M. unit, release the pointer drive and remove four screws from beneath the chassis, securing the bracket to the chassis grommets. Remove four screws securing the unit to the bracket and withdraw the unit. The cover on the underside of the unit should now be removed (four 6BA cheese head screws). Make a half inch loop in one end of the cord and seal the knot with adhesive, then holding the cord taut make a mark $6\frac{3}{8}$ " from the end of the loop. Press the tuner carriage forward against the tension of the spring and thread the free end of the cord through the central hole in the front of the unit then through the corresponding holes in the carriage bracket and insulated panel. The eyelet should now be threaded on to the cord so that the shank faces the front of the unit. Tie a small knot at the $6\frac{3}{8}$ " mark, seal with adhesive, and pull the cord so that this knot is slightly embedded into the eyelet and the shank of the latter enters the hole in the insulated panel. Release the carriage and ensure that it is free to travel to the full extent of the guides. Apply a trace of light grease if necessary.

Replace the cover and re-assemble the unit on to the receiver chassis.

Pass the looped cord round the pulley 'E' and then one turn anti-clockwise round the gang spindle and secure to the grub screw on the collar.

Carry out final adjustment and alignment as detailed above.



VOLTAGE AND CURRENT DATA

F.M.

VALVE	ANODE		SCREEN		CATHODE	
	Volts	mA	Volts	mA	Volts	mA
V1A	208	9.3	—	—	—	—
V1B	182	5.6	—	—	—	—
V2H	230	7.3	103	4.5	1.8	11.8
V2T	0	—	—	—	—	—
V3	213	7.4	103	2.3	1.9	9.1
V4T	75	0.6	—	—	—	—
V5	248	39	207	4.1	6.2	43
V6	245	each anode A.C.	—	—	—	—

A.M. Receiver switched to M.W. tuned to low frequency end of scale, no signal input.

VALVE	ANODE		SCREEN		CATHODE	
	Volts	mA	Volts	mA	Volts	mA
V1A	0	—	—	—	—	—
V1B	0	—	—	—	—	—
V2H	251	2.3	96	6.2	1.8	11.5
V2T	74	2.9	—	—	—	—
V3	225	6.9	96	2.1	1.78	8.5
V4T	78	0.7	—	—	—	—
V5	255	43	225	4.6	6.8	47.6
V6	245	each anode A.C.	—	—	—	—

All voltages taken on Avo Model 8 (20,000 ohms per volt) with negative connection to chassis and are D.C. unless otherwise stated.

ERRATA : On wafer 2 wiring (at left) reverse circuit references R10 and R11.

D.C. RESISTANCE OF WINDINGS

Cir. Ref.	Component	Ohms	Part No.
L1	F.M. Aerial Coil Primary	*	DP23003
L2	F.M. Aerial Coil Secondary	*	
L3	V1A Anode Coil	*	DP24033
L4	V1B Grid Coil	*	DP24038
L5	Osc. Primary Coil	*	
L6	1st F.M. I.F. Primary	*	DP24035
L7	1st F.M. I.F. Secondary	*	DP24036
L8	L.W. Aerial Coil	7	DP24793
L9	M.W. Aerial Coil	*	DP24792
L10	1st A.M. I.F. Primary	10	DP24640/A
L12	1st A.M. I.F. Secondary	10	
L11	2nd F.M. I.F. Primary	*	DP24642/A
L13	2nd F.M. I.F. Secondary	*	
L14	A.M. Osc. Secondary	2	DP24687
L15	A.M. Osc. Primary	1	
L16	2nd A.M. I.F. Primary	5	DP24641/A
L18	2nd A.M. I.F. Secondary	6	
L17	Discriminator Coil Primary	*	DP24644/A
L19	Secondary	*	
L20	Tertiary	*	
T1 Pri.	Output Transformer	400	SA5622
Sec.		*	
T2 Pri.	Mains Transformer	30	SA5620/A
H.T. Sec.		220	
L.T. Sec.		*	

* Less than 1 ohm.

NOTES

VALVE BASE DATA

VALVE	TYPE	PINS								
		1	2	3	4	5	6	7	8	9
V1	ECC85	A'	G'	K'	H	H	A'	G'	K'	S
V2	ECH81	G2.G4	GI	K	H	H	A	G3	At	Gt
V3	EF89	S	GI	K	H	H	S	A	G2	G3
V4	EABC80	Ad'	Ad''	Kd''	H	H	Ad''	Kd'K	G	A
V5	EL84	IC	G	K	H	H	IC	A	IC	G2
V6	EZ80	A	IC	K	H	H	IC	A'	IC	IC

Miscellaneous Components	Part No.
Ferrite rod	B49298
Ferrite sleeve	B49338
Knob (Wavechange)	C49861
Knob (Volume)	C49752
Knob (Tone)	DP24654/A
Knob (Tuning)	DP24654/B
Loud-speaker	D107838
Drive Cord (Pointer)	B107637
Drive Cord (F.M. Unit)	B108229
Eyelet for F.M. unit drive cord	56479/1

SERVICE DEPT., E. K. COLE Ltd.,
 Somerton Works, Arterial Road,
 Southend-on-Sea
 'Phone: Southend 42296
 Head Office: Ekco Works, Southend-on-Sea

SCOTTISH SERVICE DEPOT:
 17, Cadogan Street,
 Glasgow, C.2
 'Phone: Central 3633/4

NORTHERN SERVICE DEPOT:
 115, Jersey Street,
 Ancoats, Manchester 4,
 'Phone: Collyhurst 4421/3

MIDLAND SERVICE DEPOT:
 11, Brook Street,
 Birmingham, 3
 'Phone: Central 2505 '6