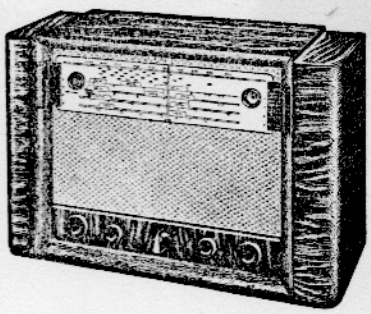
MULLARD RADIO: MODEL 735

7 Valve Superheterodyne Receiver.
Mains Supply—210-250 volts 50 C/s. A.C.
Wave Ranges—Broadcast 545-1620 Kc/s.
Short Wave I 1.66-5.1 Mc/s.
Short Wave II 5-10.1 Mc/s.
Short Wave III 9.8-15.5 Mc/s.
Short Wave IV 14.9-22.2 Mc/s.
Intermediate Frequency 455 Kc/s.



REMOVING THE CHASSIS FROM THE CABINET

The bottom cover plate fitted to this model enables the majority of service work to be carried out without removing the chassis from the cabinet. If it is necessary to remove the chassis from the cabinet proceed as follows. Remove the mains plug from the supply.

Remove the five control knobs, by removing the grub screws and sliding the knobs off the shafts. Note that the two smaller knobs have semicircular packing pieces in them which must be correctly replaced in the knob before refitting.

Remove the speaker plug from its socket.

Loosen off the pointer clamping screw and release the drive cable from the pointer.

Remove the wave band indicator by removing the knurled screw, and lifting the assembly off the bracket.

Loosen off the tuning indicator clamp screws, and remove the tube from the mounting bracket.

Remove the four chassis mounting bolts.

The chassis will now slide out of the cabinet, leaving the dial mechanism and loudspeaker in the cabinet.

To replace the chassis reverse the above procedure.

REMOVAL OF THE DIAL SCALE

To remove the dial scale, slide off the ornamental covers at each end of the scale by pushing them towards the centre of the scale. From behind the baffle board, remove four nuts holding the end assemblies. Pull both ends of the dial scale assembly from the front of the cabinet. The scale may now be released from the end clamping assemblies by loosening off the four nuts. When replacing the dial scale assembly see that the distance between the mounting screws and spacers is such that they clear the cabinet holes without binding, so that no strain is placed on the glass scale. Replace the nuts inside the cabinet baffle and slide the ornamental covers back into position.

To replace the dial lamps, remove the wood screws holding the bakelite mounting plate to the baffle board and withdraw the holder.

To replace the wave band indicator lamp, remove the thumb screw holding the bakelite mounting plate to the wave band indicator assembly.

ALIGNMENT OF THE RECEIVER

For the alignment of the receiver the chassis should be mounted in the cabinet.

Switch on the receiver and allow it to warm up for a few minutes.

Turn the tone control in a clockwise direction until the fidelity switch operates, then turn in an anti-clockwise direction until the switch just clicks again so that the intermediate frequency filters are operating in the narrow bandwidth position.

Place the tuning condenser in the maximum capacity position, the wave band switch in number 1—Broadcast position—and the centre switch in the Radio position.

Turn the volume control to the maximum position and apply a signal of 455 Kc/s., modulated 30% through a capacity of 0.01 mfd to the control grid of the ECH81.

Unscrew the adjusting slugs of the intermediate frequency filters almost right out.

Adjust in succession, for maximum output (see diagram).

1. Diode coil.
2. EAF42 Plate coil.
3. ECH81 Plate coil.
4. EAF42 Grid coil.

It is essential to follow the above order very carefully, and peak the circuits accurately, to obtain a symmetrical response curve in the wide band position.

Disconnect the coupling condenser from the control grid of ECH81 and connect the signal generator through a standard dummy aerial to the aerial and earth wires of the receiver.

Set the pointer to the reference point where thick lines reduce to narrow at the low frequency end of the Broadcast band.

Apply a modulated R.F. signal and adjust the R.F. circuit as indicated in the following table:—

	B.C.	SW1	SW2	SW4	SW3
1. Wave band switch in position					
2. Turn pointer with tuning knob to the frequency indicated and apply the correct frequency	600 Kc/s.	1.8 Mc/s.	5.5 Mc/s.	16 Mc/s.	10 Mc/s.
3. Adjust for maximum output	Padder C34	Padder C35	L11	L9 L2 (Low end) L1 „	L10 L2 (High end) L1 „
4. Turn pointer with tuning knob to frequency indicated and apply the correct frequency	1400 Kc/s.	4.5 Mc/s.	10 Mc/s.	15 Mc/s.	22 Mc/s.
5. Adjust for maximum output	C38 Osc C16 Trans C15 Ant	C37 Osc C17 Trans C14 Ant	C39 Osc C11 Trans C9 Ant	C21 Osc C12 Trans C10 Ant	C20 Osc C4 Trans C3 Ant

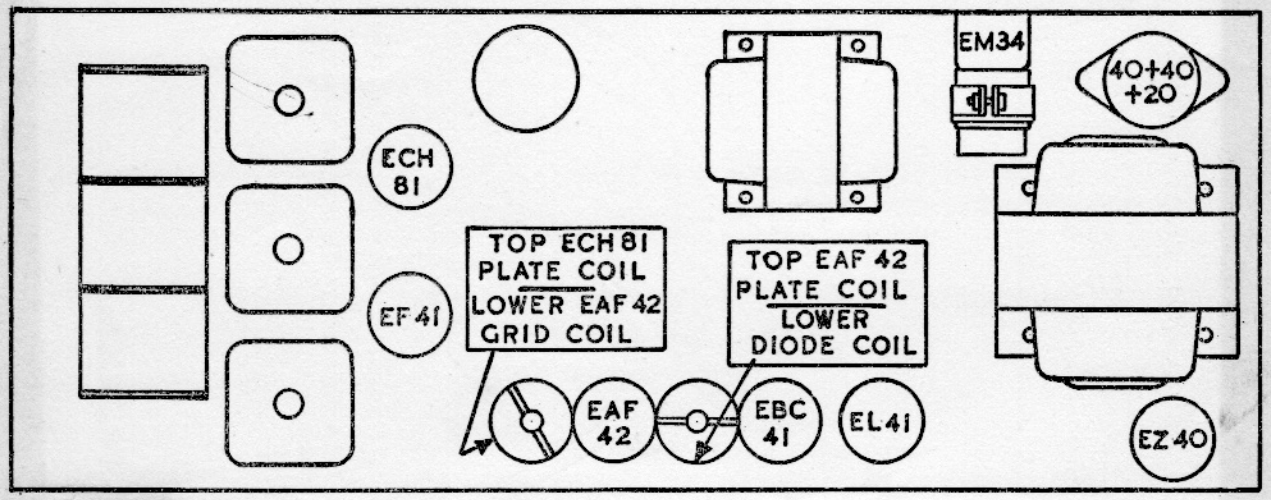
Repeat the points above until correct calibration and good sensitivity are obtained over each band. When all adjustments are correct seal all trimmers. Adjustment of coil inductances is obtained by moving the loop inside the coil. Note that on Broadcast, SW1, SW2 and SW3 the oscillator frequency is 455 Kc/s. above the signal frequency while on SW4 the oscillator frequency is 455 Kc/s. below the signal frequency. It is important to remember the above when checking whether the image is on the correct side of the fundamental signal. Maximum sensitivity figures are given below. These are given mainly as a guide, and final sensitivities should not anything be better than the figures quoted. The standard output is 50 milliwatts into a 7 ohm load.

MULLARD RADIO: MODEL 735

MAXIMUM SENSITIVITY FIGURES

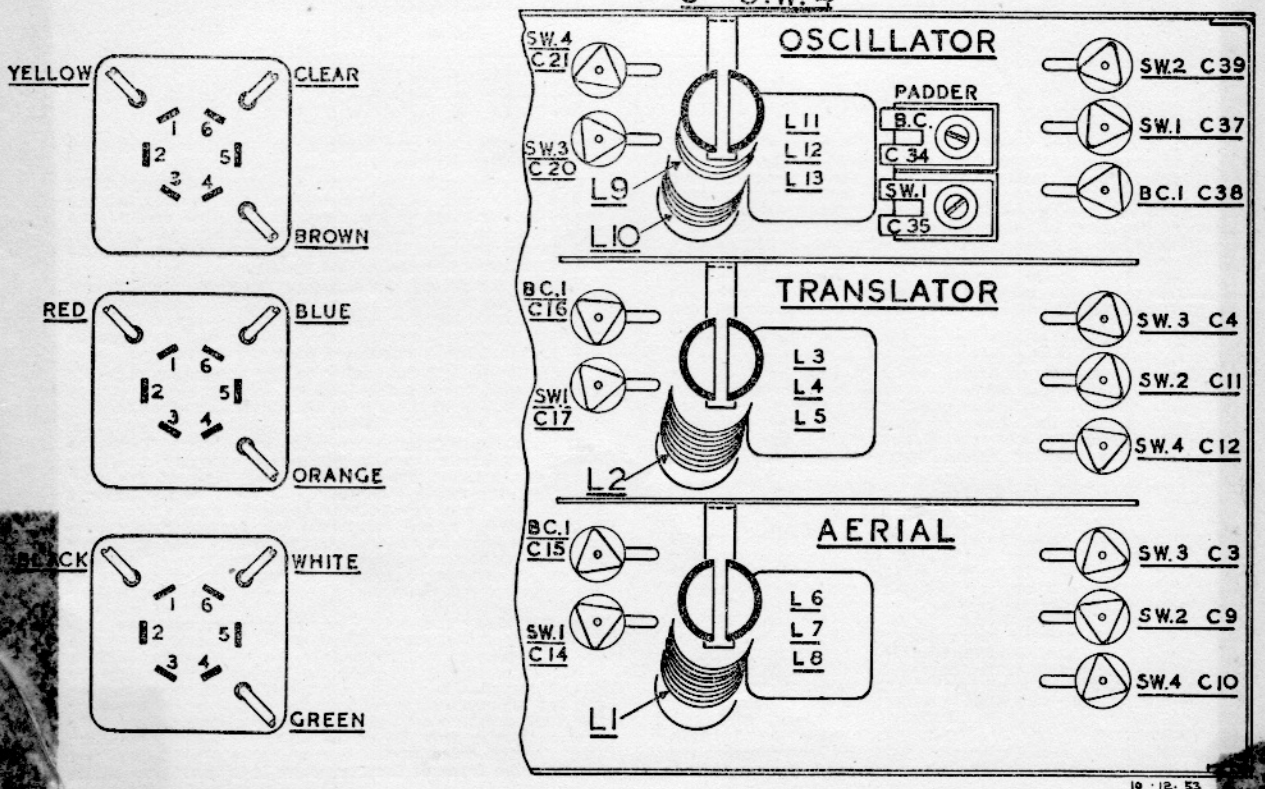
455 Kc/s.	Narrow bandwidth position, signal applied to the control grid of ECH81	25 μV
Broadcast	Signal applied via dummy aerial to aerial and earth wires	2 μV
SW1	" " " " " " " "	3 μV
SW2	" " " " " " " "	3 μV
SW3	" " " " " " " "	4 μV
SW4	" " " " " " " "	4 μV

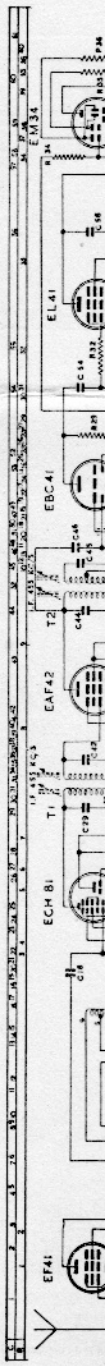
CHASSIS LAYOUT



TRIMMER AND COIL DIAGRAM

SCALE POS. 1 B.C.
2 S.W. 1
3 S.W. 2
4 S.W. 3
5 S.W. 4





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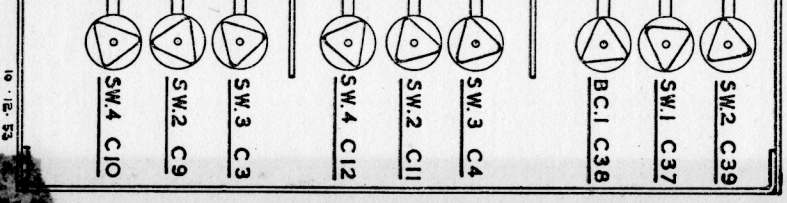

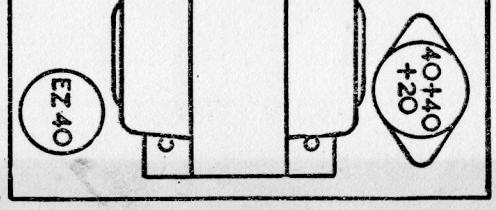

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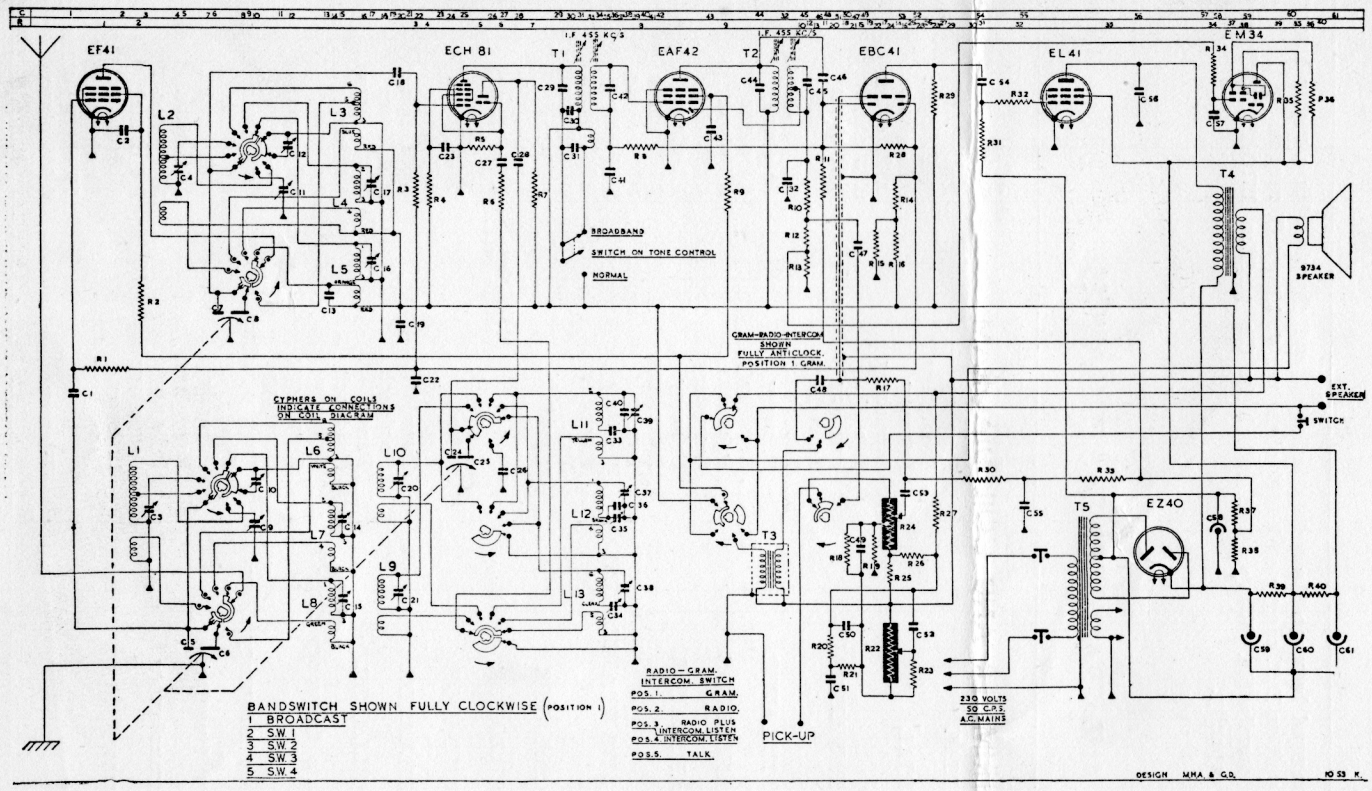

CONDENSER VALUES

C1 150 mmfd Ceramic
C2 0.01 mfd 500V. Paper
C3 3-30 mmfd Air Dielectric Trimmer
C4 3-30 mmfd Air Dielectric Trimmer
C5 60.3 mmfd Max. Cap Aerial Small Sect.
C6 381.9 mmfd Max. Cap Aerial Large Sect.
C7 60.3 mmfd Max. Cap Translator Small Sect.
C8 381.9 mmfd Max. Cap Translator Large Sect.
} Gang
C9 3-30 mmfd Air Dielectric Trimmer
C10 3-30 mmfd Air Dielectric Trimmer
C11 3-30 mmfd Air Dielectric Trimmer
C12 3-30 mmfd Air Dielectric Trimmer
C13 100 mmfd Mica
C14 3-30 mmfd Air Dielectric Trimmer
C15 3-30 mmfd Air Dielectric Trimmer
C16 3-30 mmfd Air Dielectric Trimmer
C17 3-30 mmfd Air Dielectric Trimmer
C18 150 mmfd Ceramic
C19 0.01 mfd 500V. Paper
C20 3-30 mmfd Air Dielectric Trimmer
C21 3-30 mmfd Air Dielectric Trimmer
C22 0.05 mfd 500V. Paper
C23 0.01 mfd 500V. Paper
C24 120.6 mmfd Max. Cap Osc. Small Sect.
C25 321.6 mmfd Max. Cap Osc. Large Sect.
} Gang
C26 50 mmfd Ceramic Special
C27 80 mmfd Silver Mica
C28 100 mmfd Silver Mica
C29 115 mmfd In I.F. Transformer
C30 1500 mmfd Silver Mica
C31 1500 mmfd Silver Mica
C32 80 mmfd Silver Mica
C33 0.007 mfd Silver Mica 2½%
C34 150-750 mmfd Variable Padder
C35 150-750 mmfd Variable Padder
C36 0.0012 mfd Mica 2½%
C37 3-30 mmfd Air Dielectric Trimmer
C38 3-30 mmfd Air Dielectric Trimmer
C39 3-30 mmfd Air Dielectric Trimmer
C40 47 mmfd Ceramic
C41 0.05 mfd 500V. Paper
C42 230 mmfd In I.F. Transformer
C43 0.01 mfd 500V. Paper
C44 110 mmfd in I.F. Transformer
C45 110 mmfd In I.F. Transformer
C46 10 mmfd Ceramic
C47 0.005 mfd 350V. Paper
C48 0.001 mfd 500V. Paper
C49 0.02 mfd 500V. Paper
C50 400 mmfd Mica
C51 0.01 mfd 500V. Paper
C52 0.01 mfd 500V. Paper
C53 0.01 mfd 500V. Paper
C54 0.01 mfd 500V. Paper
C55 0.25 mfd 400V. Paper
C56 0.005 mfd 750V. Paper
C57 0.05 mfd 500V. Paper
C58 100 mfd 12V. Electrolytic
C59 40 mfd 350V.
C60 40 mfd 350V.
C61 20 mfd 350V.
} Triple Electrolytic

RESISTOR VALUES

R1 470K ¼W. Carbon
R2 100K ½W. Carbon
R3 470K ¼W. Carbon
R4 25K 1W. Carbon
R5 47K ½W. Carbon
R6 100 ohm ¼W. Carbon
R7 33K 1W. Carbon
R8 1 Meg. ¼W. Carbon
R9 100K ½W. Carbon
R10 68K ¼W. Carbon
R11 1 Meg. ¼W. Carbon
R12 150K ¼W. Carbon
R13 150K ¼W. Carbon
R14 10 Meg. ¼W. Carbon
R15 100K ¼W. Carbon
R16 470K ¼W. Carbon
R17 100K ¼W. Carbon
R18 220K ¼W. Carbon
R19 47K ¼W. Carbon
R20 7500 ohm ½W. Carbon
R21 47K ¼W. Carbon
R22 0.5 Meg. Tone Control and Special I.F. Switch
R23 470K ¼W. Carbon
R24 0.65 + 2 Meg. Volume Control and Switch
R25 27 ohm ¼W. Carbon
R26 27 ohm ¼W. Carbon
R27 330 ohm ¼W. Carbon
R28 1 Meg. ¼W. Carbon
R29 100K ½W. Carbon
R30 2.2 Meg. ¼W. Carbon
R31 680K ¼W. Carbon
R32 10K ¼W. Carbon
R33 330K ¼W. Carbon
R34 470K ¼W. Carbon
R35 1 Meg. ½W. Carbon
R36 1 Meg. ½W. Carbon
R37 75 ohm 1W. Carbon
R38 25 ohm ½W. Carbon
R39 500 ohm 4W. Wire Wound
R40 1800 ohm 4W. Carbon

L1 Band 4 & 5 Aerial Coil VK-469-61
L2 Band 4 & 5 Transl. Coil VK-473-17
L3 Band 3 Translator Coil
L4 Band 2 Translator Coil
L5 Band 1 B.C. Transl. Coil
} VK-473-16
L6 Band 3 Aerial Coil
L7 Band 2 Aerial Coil
L8 Band 1 B.C. Aerial Coil
} VK-469-60
L9 Band 5 Oscillator Coil
L10 Band 4 Oscillator Coil
} VK-471-41
L11 Band 3 Oscillator Coil
L12 Band 2 Oscillator Coil
L13 Band 1 B.C. Osc. Coil
} VK-471-40
T1 Special I.F. Transformer A3-122-38
T2 I.F. Transformer VK-476-36
T3 Intercom. Input Trans. Assy. VK-660-00
T4 Output Transformer VK-670-88
T5 Power Transformer VK-630-76

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4	SW3
Mc/s.	10 Mc/s.
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Mc/s.	22 Mc/s.
Osc	C20
Trans	C4
Ant	C3

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VOLTAGE TABLE

All readings taken with a primary input of 230 volts 50 C/s. A.C. Full load primary current 250 ma.
Primary power 50 watts.
Voltage across R37 + R38 = 100 ohms — 6.5 volts.
Voltage across R38 = 25 ohms — 1.65 volts.

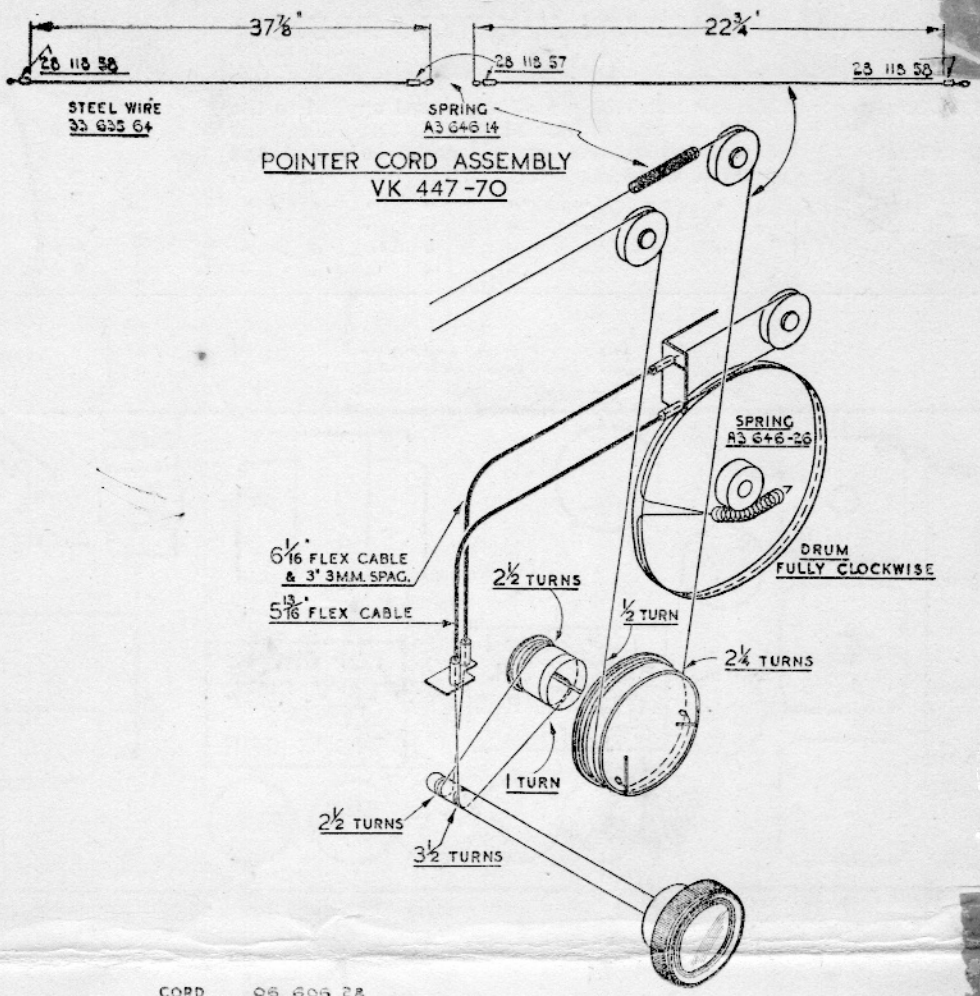
VALVE	FUNCTION	FILAMENT	CATHODE	SCREEN	PLATE
EF41	Pentode—R.F. Signal Amplifier	6.2	—	50	195
ECH81	Triode — oscillator, Hexode — frequency changer	6.2	—	75	195 Hexode 65 Triode
EAF42	Pentode — Intermediate frequency amplifier — Diode — Demodulator	6.2	—	60	195
EBC41	Diodes—A.V.C., Triode—Audio voltage amplifier	6.2	—	—	130
EL41	Pentode—Power output	6.2	—	240	250
EZ40	Fullwave rectifier	6.2	260	—	A.C. 240 per plate
EM34	Tuning indicator—dual sensitivity	6.2	—	Target 240	30 per plate

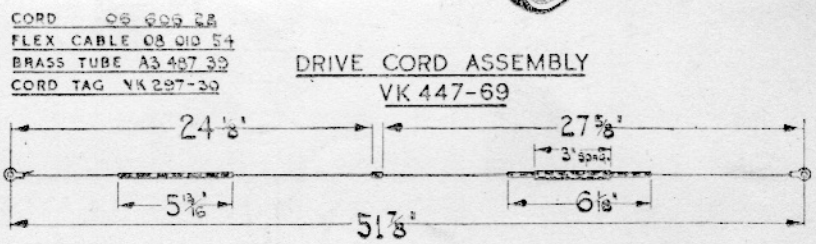
The above voltages are measured between the points indicated and chassis with a meter having a resistance of 20,000 ohms per volt on D.C. ranges and 1000 ohms per volt on A.C. ranges.

Variations up to + 5% are permissible. Wave band switch in the position BROADCAST and tuning condenser at maximum capacity.

COIL AND TRANSFORMER RESISTANCES

VK-469-60	L8 B.C. AERIAL	Primary	36 ohms
		Secondary	4.4 ohms
	L7 SW1 AERIAL	Primary	0.5 ohms
		Secondary	0.465 ohms
	L6 SW2 AERIAL	Primary	0.33 ohms
		Secondary	0.125 ohms
		Tap	0.53 ohms
VK-469-61	L1 SW4 and SW5 AERIAL	Primary	0.23 ohms
		Secondary	0.043 ohms
		Tap	0.0275 ohms
VK-473-16	L5 B.C. TRANSLATOR	Primary	80 ohms
		Secondary	4.4 ohms
	L4 SW1 TRANSLATOR	Primary	0.5 ohms
		Secondary	0.465 ohms
	L3 SW2 TRANSLATOR	Primary	1.3 ohms
		Secondary	0.125 ohms
		Tap	0.055 ohms
VK-473-17	L2 SW4 and SW5 TRANSLATOR	Primary	0.34 ohms
		Secondary	0.043 ohms
		Tap	0.0275 ohms
VK-471-40	L13 B.C. OSCILLATOR	Tuned	4 ohms
		Feedback	1.1 ohms
	L12 SW1 OSCILLATOR	Tuned	0.242 ohms
		Feedback	0.7 ohms
	L11 SW2 OSCILLATOR	Tuned	0.034 ohms
		Feedback	0.35 ohms
	L10 SW3 OSCILLATOR	Tuned	0.031 ohms
		Feedback	0.35 ohms
VK-471-41	L9 SW4 OSCILLATOR	Tuned	0.022 ohms
		Feedback	0.28 ohms
A3-122-38	T1 Intermediate frequency filter	Primary	7.4 ohms
		Secondary	4.5 ohms
		Coupling	0.5 ohms
VK-476-36	T2 Intermediate frequency filter	Each winding	7.25 ohms
		Tap	4.4 ohms
VK-660-00	T3 Audio input transformer	Primary	0.22 ohms
		Secondary	2.75 ohms
VK-670-88	Audio output transformer	Primary	170 ohms
		Secondary	0.4 ohms
VK-603-76	Power transformer	Primary	17.5 ohms
		Secondary	83 ohms) 160
			77 ohms) ohms
		Filament	0.065 ohms





REPLACING THE POINTER DRIVE CORD

It is necessary when replacing the gang drive cord to remove the pointer drive cable drum. This is done by removing the pointer cable from the drum, removing the three fixing screws and sliding the drum forward. Attach the spring A3-646-26 securely to the drum, and turn the gang to the maximum capacity position.

The small bakelite driving drum has a slot across the rim with two small grooves to position the cord VK-447-69. Under the slot is a round hole into which the brass tube on the cord is fitted, with the long end (27⅜") of the cord towards the rear of the drum.

With the slot at the top of the drum the back cord is passed round the drum two and a quarter turns in an anti-clockwise direction towards the front of the drum. The front cord is passed round the drum approximately one and a quarter turns in a clockwise direction. A small piece of sellotape placed over the turns and drum will assist in keeping the cord in place while further threading operations are carried out.

The back cord is next fed over the drive shaft in an anti-clockwise direction for two and a half turns towards the chassis, and the flex cable $6^{1}/_{16}$" is fitted into the right-hand cable socket on the chassis bracket, and the upper cable socket on the tuning condenser pulley bracket. This end of the cord is then fed round the pulley on to the tuning condenser drum in an anti-clockwise direction, through the slot in the drum, and the cord tag fixed over the end of the spring. The tuning condenser should now be opened slightly to take up the slack in the cord, without placing any tension on the small driving drum. The front cord of the driving drum is next fed under the drive shaft in a clockwise direction for three and a half turns towards the front of the shaft, and the flex cable ($5^{13}/_{16}$") is fitted into the left-hand cable socket on the chassis bracket, and the lower socket on the tuning condenser bracket. This cord is now placed round the tuning condenser drum on the front edge in a clockwise direction.

Remove the sellotape from the small driving drum and with a pair of pliers expand the spring, at the same time taking up the slack in the free end of the cord, until it can be continued round the gang drum, and passed through the slot in the gang drum, and the tag placed over the end of the spring.

Release the spring and see that the cord is positioned on the drive shaft in such a way that it does not bind in the chassis bearing and close up any gaps between adjacent turns. Turn the drive shaft a few times so that the tension is equalised over the cord.

Turn the tuning condenser to the maximum capacity position and replace the pointer driving drum so that the longest slot in the rim of the drum is approximately at the seven o'clock position.

Replace the pointer drive cable as follows: Turn the tuning condenser to the minimum capacity position. Place the smaller brass clamp (28-118-58) of the 22¾" length of the cable assembly VK-447-70 in the longest slot in the rim of the pointer driving drum. The cable is then passed round the drum for approximately one-third of a turn in an anti-clockwise direction and over the top right-hand pulley on the gantry. Turn the tuning condenser to maximum capacity by means of the tuning shaft, keeping tension on the cable feeding on to the driving drum. The 37⅛" length of cable is next fed along the length of the gantry, over the left-hand pulley, then over the idler pulley, and on to the driving drum at approximately the 10 o'clock position. Stretch the spring slightly so that the cable can be placed round the drum in an anti-clockwise direction and the brass clamp fitted into the slot at approximately 3 o'clock position on the rim of the driving drum. The cables should now be adjusted on the drum so that they do not cross and the rear cable should progress towards the front of the rim when it is taking up cable.