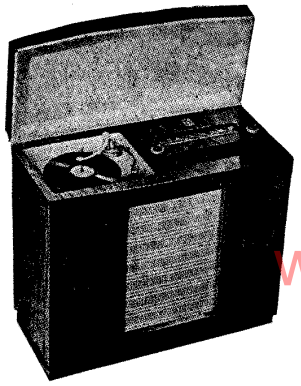


COSSOR

F.M. — A.M. RECEIVERS SERVICE MANUAL

AUTORADIOGRAM MODEL 522.A

"MELODY MASTER" MODEL 523.A

GENERAL DESCRIPTION ... 6 valve plus rectifier four waveband (inc. F.M. band II) receiver for operation on A.C. mains supplies of 200-255 volts, at 50 cycles for Model 522.A and 50-100 cycles for Model 523.A. Model 522.A also includes a three-speed record changer and dual stylus pick-up.

PRICE ... ... **Model 522.A :** £49.5.9. Plus P.T. **Model 523.A :** £23.11.1. Plus P.T.

CABINET ... ... **Model 522.A :** Walnut veneer console with space for records 33½″ × 30″ × 15½″.
Model 523.A : Contemporary two tone walnut veneer 20″ × 13½″ × 8¼″.

CONSUMPTION ... ... **Model 523.A :** 60 watts. **Model 522.A :** 60 watts (radio) ; 75 watts (gram.).

WAVEBANDS ... ...

LONG waveband	320-146 kc/s	940-2050 metres
MEDIUM waveband	1605-545 kc/s	187-550 metres
SHORT waveband	19-5.8 mc/s	15.8-51.3 metres
Band II (F.M.)	87.5-100 mc/s	

INTERMEDIATE FREQUENCY 470 kc/s (A.M.) 10.7 mc/s (F.M.)

VALVES ... ...

6AQ8	Double Triode F.M. R.F. Amplifier and Frequency Changer
6AJ8	Triode Hexode I.F. Amplifier (F.M.) and Frequency Changer (A.M.)
6BY7	I.F. Amplifier (A.M. and F.M.)
6AK8	Triple Diode Triode, Ratio Detector (F.M.), Detector (A.M.), A.F. Amplifier
6BQ5	Pentode, Output Valve
6V4	Full Wave Rectifier
65ME	Tuning Indicator

DIAL LIGHTS ... ... 6.5 volts 0.3 amp M.E.S. fitting

LOUDSPEAKER ... ... **Model 522.A :** Twin 8″ 3+3 ohms
Model 523.A : 10″ × 6″ elliptical, 3 ohms.
Ext. L.S. sockets are provided (3 ohms) on both models.

GRAMOPHONE UNIT ... **Model 522.A :** Three-speed record changer for 33½, 45 or 78 r.p.m. records with dual stylus crystal pick-up.
Model 523.A : Has switched sockets for connecting to high impedance or crystal pick-up.

ALIGNMENT PROCEDURE

Apparatus Required :

Frequency Swept Oscillator with 70-80 ohms impedance output, such as Cossor F.M. Receiver Alignment Generator Model 1324. Oscillograph such as Cossor Models 339B, 1035, 1039M*, 1052. Simple diode probe as illustrated in Fig. 8 (and supplied with Model 1324). An accurate signal generator. An Output meter.

See Figs. 8 and 9 for position of trimmers etc.

F.M. Alignment

The alignment procedure of the 10.7 mc/s I.F. transformers must precede the alignment of the 470 kc/s I.F. transformers.

Mechanical Alignment of F.M. Tuner Unit (if required)

The outer edge of each aluminium core must coincide with a groove cut in the former, and is coarsely adjusted

Amendments. Except in early models, these receivers are fitted with a 4.7K ohm resistor (R6) across the primary (anode coil) of L17, and a 2.2 megohm resistor (R23) between output from detector (AM or FM) and earth; i.e., across the volume control when the set is on radio; they are also fitted with a variable trimmer, connected to earth at one end, in lieu of C.2.

by rotating the brass collar on the gang condenser shaft. Individual positioning is effected by screw adjustment of the cord pulleys.

I.F. Alignment Procedure

The lid of the F.M. tuner unit must be securely fixed in position before alignment.

(*a*) Apply 10.7 mc/s signal wobbulated ±300 kc/s from an 80 ohm source to a test point situated at the rear of the F.M. tuner unit (tapped junction of R45 and R46) and connect the detector assembly (Fig. 6) to the anode of V2 (6BY7). Turn the gain of the oscilloscope to a maximum.
Adjust both cores of the I.F. transformers (2nd I.F. transformer on the chassis and 1st I.F. transformer in F.M. unit) until a response similar to Fig. 2 is displayed.

Note :—To adjust this response accurately to frequency it is advantageous to use a crystal 'pip.' If difficulty is experienced in obtaining the correct overall response (Fig. 2), a check can be made on the 2nd I.F. transformer as follows :—
Apply 10.7 mc/s signal wobbulated ±300 kc/s from 80 ohm termination to grid of V1 (6AJ8) and adjust both cores of the 2nd I.F. transformer until a response similar to Fig. 1 is obtained.

(*b*) Disconnect detector assembly and clip oscilloscope leads to A.F. changeover slider contact (i.e., across the Volume Control R29).
Oscilloscope gain turned to a maximum.
Adjust 3rd I.F. transformer (discriminator) until Fig. 3 is obtained.

Note :—The peaks of this response must be carefully balanced relative to the detuned datum line. Slight readjustment of the secondary of the 2nd I.F. transformer (i.e., under chassis core) may be necessary to obtain optimum balance and linearity.

To check linearity and balance of the discriminator response at higher signal levels, increase the input signal 40 dB, simultaneously reducing output.

I.F. Alignment (A.M.)

Inject signal of 470 kc/s modulated at 400 c/s, 30% into grid of V1 (6AJ8, pin 2) and connect output meter (impedance 3 ohms) to EXT. LS. sockets. Then with set switched to M.W. and tuning condenser at its mid-position, adjust cores for maximum output in the following sequence, keeping output at about 200 mW :

Second I.F. transformer secondary
Second I.F. transformer primary
First I.F. transformer secondary
First I.F. transformer primary

Repeat adjustments.

Dial pointer alignment (if required) with tuning condenser at mechanical maximum, set the pointer to the MAX mark on the dial.

R.F. Alignment (F.M.)

Before proceeding with the alignment, care must be taken to ensure that the F.M. tuner unit is aligned mechanically (see " Mechanical Alignment ") and the lid is securely clamped down by the self tapping screw.

(*a*) Align pointer, if necessary, to a maximum at the extreme end of the dial (i.e., gang condenser set to a maximum). Retune pointer to 90 mc/s calibration mark.

(*b*) Apply signal of 90 mc/s modulated ±100 kc/s (or ±75 kc/s) from an 80 ohm source into the dipole aerial socket and connect the oscilloscope to the AM/FM slider switch (i.e., across Volume control) as before. Adjust the air spaced oscillator trimmer C61 for a maximum undistorted response similar to Fig. 4 or Fig. 5. (Fig. 4 will be obtained if a Frequency Swept Oscillator locked to the oscillograph is used and Fig. 5 for an F.M. signal generator modulated by a sine wave).

(*c*) Similarly adjust the R.F. core pulley screw for maximum amplitude. Check calibration and sensitivity at 87.5 mc/s, 90 mc/s, 95 mc/s and 100 mc/s.

R.F. Alignment (A.M.)

Connect output meter as for A.M. I.F. alignment. Switch to S.W. and set pointer at 18 mc/s. Inject 18 mc/s via all wave dummy aerial and adjust the S.W. oscillator (C20) and aerial (C1) trimmers, using the *higher* oscillator frequency for maximum output, rocking the tuning condenser to avoid pulling. Set pointer to 6 mc/s and adjust first the S.W. oscillator core and then the aerial core for maximum output (the inner of the two peaking positions is correct).

Return to 18 mc/s and repeat both adjustments until neither affects the other.

Switch to M.W., set pointer to ' M ' (193 metres) on scale and inject 1550 kc/s to aerial socket via dummy aerial. Adjust medium wave aerial and oscillator trimmers, using the higher oscillator frequency for maximum output. Set pointer to ' M ' (522 metres) mark and inject 575 kc/s, adjust first the M.W. oscillator core and then the M.W. aerial inductance (by sliding the matching coil) for maximum output.

Repeat both adjustments until neither affects the other.

Switch to L.W. Adjust to ' L ' (1875 metres) mark. Inject 160 kc/s signal to aerial socket via dummy aerial. Adjust first the L.W. oscillator core and then slide main L.W. aerial coil on core for coarse adjustment and finally small matching coil, for maximum output.

Repeat adjustments until correct.

Note :—Above alignment instructions are primarily for external aerial conditions and can be modified for internal aerial operation by re-adjustment of the M.W. aerial trimmer and the L.W. aerial coil. This can be done on a station such as the M.W. Light Programme transmitter and Droitwich for long waves.

* For oscillographs with low gain amplifiers it is not possible to connect directly across the Volume control, but by connecting to the output valve grid circuit (i.e., across R38), the amplification of the A.F. triode may be utilized. The volume control should be set near maximum, but overloading of the oscillograph should be avoided, and vertical amplitude of the trace kept down to about 2-2½ cms.

Note :—The shape of the marker pip may be improved by connecting a small capacitor 0.002-0.005 mfd across the oscillograph input.

DESCRIPTION OF CIRCUITS

Model 522.A is an auto-radiogram with crystal pick-up, three-speed record changer and twin loudspeakers.

Model 523.A is a table receiver with 10″ × 6″ elliptical loudspeaker and switched gramophone sockets.

The circuits of both models are similar and cover Band II (87.5-100 mc/s) for F.M. reception, as well as the usual Long, Medium and Short wavebands.

The aerial input on F.M. (whether internal compressed dipole or external) is by 70-80 ohm balanced twin feeder to a socket on the rear of the F.M. box, which is mounted above the main chassis at the R.F. end, whence it is passed by a matching transformer to the cathode of the earthed grid triode R.F. amplifier, which is one half of V7 (6AQ8), the other half being a self-oscillating frequency changer. A neutralizing adjustment (C65) is provided, but should not be adjusted unless excessive oscillator radiation is detected. L14 is the anode coil of the frequency changer and L15 provides some positive feedback. L16 forms the secondary of

the first I.F. transformer and feeds the signal via co-axial cable to the main chassis, (I.F. = 10.7 mc/s), where it is amplified by the Pentode section of V1 (6AJ8), it is then passed by the second I.F. transformer (T4), which has switched primaries and series secondaries to enable it to function at both Intermediate Frequencies, to V2 (6BY7) and thence via the third I.F. transformer (T5) (this transformer has primaries in series and switched secondaries) to the diodes of the ratio detector (part of V3, 6AK8), the audio frequency load of which is the Volume control. A.G.C. voltage is obtained from the grid current limiting of V2 (6BY7) and is applied to the R.F. amplifier (V7a).

A centre tap is provided on the F.M. aerial input coil, to enable an external F.M. aerial to be used as an aerial on the A.M. bands. The connecting plug need not be removed from the A.M. aerial socket when receiving F.M. signals.

An external horizontal dipole aerial for use on F.M. is necessary to obtain the best results and avoid the effects of fading and interference when the magic eye is less than a half open on the signal or when the A.G.C. voltage across C38 and R27 is less than 6 volts measured on AVO model 8 (25 volt range) or 5 volts measured on AVO model 7 (100 volt range).

On the Medium and Long wave ranges an internal aerial is fitted and used as aerial coils when an external aerial is used; for Short waves an external aerial is always needed. The A.M. signal goes to the grid of the pentode section of V1 (6AJ8) which is now the frequency changer, having its triode section as a separate oscillator. The I.F. signal (470 kc/s) is passed via the same transformers (T4 and T5), now switched to 470 kc/s where necessary, and amplified by V2 (6BY7). The third diode in V3 (6AK8) acts as a conventional detector and, as for F.M., the Volume control is the A.F. load of the detector circuit. The A.G.C. circuit is conventional.

The audio frequency circuits are conventional. The Volume control is switched to A.M., F.M. or GRAM circuits as required and controls the signal on the grid of the triode section of V3 (6AK8). The Tone control is in the anode circuit of this valve, which is coupled to the grid circuit of V5 (6BQ5), the output valve, which drives, via a split primary output transformer, the loud-speaker (or twin L.S.'s in the 522.A). Negative feedback from the transformer secondary is applied to the cathode of the 6BQ5; a conventional power pack with V6 (6V4) rectifier is employed.

Note:—C71 (which is shown in Fig. 7 but not in Fig. 8) is fitted in some sets.

APPROXIMATE D.C. RESISTANCE OF COILS AND TRANSFORMERS

Circuit Code No	Description	D.C. Resistance (ohms)	Part Number
T.1	Mains Transformer		
	Primary 200–210 V Tap	17	MC.413063
	Primary 220–230 V Tap	18	MC.413063
	Primary 240–250 V Tap	20	MC.413063
	Secondary H.T. Winding	120-0-120	MC.413063
	Secondary Main L.T.	V.L.	MC.413063
	Secondary Rectifier L.T.	0.5	MC.413063
T.2	Output Transformer		
	Model 522.A		MC.412064
	Primary (Sound portion)	550	MC.412064
	Primary (Smoothing portion)	50	MC.412064
	Secondary	1.7	MC.412064
	Model 523.A		MC.412063
	Primary (Sound portion)	550	MC.412063
	Primary (Smoothing portion)	50	MC.412063
	Secondary	0.72	MC.412063
L1 ...	S.W. Aerial Coil (Primary)	1	MC.430483
	Secondary	V.L.	MC.430483
L2 ...	F.M. Aerial Coil (Primary)	V.L.	MC.430467
L3 ...	F.M. Aerial Coil (Secondary)	V.L.	MC.430467
L4 ...	M.W. Aerial	0.5	MC.432068
L5 ...	L.W. Aerial	8	MC.432068
L6 ...	Heater Choke	V.L.	MC.430471

Circuit CodeNo	Description	D.C. Resistance (ohms)	Part Number
L7 ...	F.M. R.F. Coil	V.L.	MC.430468
	2nd I.F. Transformer (1st on A.M.)		
L8 ...	Primary (A.M.)	10.5	MC.415051
L9 ...	Primary (F.M.)	1	MC.415051
L10...	Secondary (A.M.)	10.5	MC.415051
L11...	Secondary (F.M.)	1	MC.415051
L12...	F.M. Oscillator Coil (Feed-back)	V.L.	M. 430470
L13...	F.M. Oscillator Coil (Tuned)	V.L.	M. 430470
L14...	1st I.F. Transformer (Primary)	1	MC.430464
L15...	1st I.F. Transformer (Reaction)	V.L.	MC.430464
L16...	1st I.F. Transformer (Secondary)	1	MC.430464
L17...	S.W. Oscillator Coil (Grid Coil)	V.L.	MC.430480
	S.W. Oscillator Coil (Anode Coil)	0.5	MC.430480
L18...	M.W. Oscillator Coil (Grid Coil)	3.5	MC.430481
	M.W. Oscillator Coil (Anode Coil)	2.5	MC.430481
L19...	L.W. Oscillator Coil (Grid Coil)	6	MC.430482
	L.W. Oscillator Coil (Anode Coil)	4	MC.430482
L20...	3rd I.F. Transformer (Primary)	10	MC.415052
L21...	3rd I.F. Transformer (Primary)	1	MC.415052
L22...	3rd I.F. Transformer (Secondary)	10	MC.415052
L23...	3rd I.F. Transformer (Secondary)	0.5	MC.415052
L24...	3rd I.F. Transformer (Tertiary)	V.L.	MC.415052

(N.B.—"V.L." denotes very low resistance)

APPROXIMATE VALVE VOLTAGE READINGS

Taken on AVO Model 8 (20,000 ohms/volt) for D.C. readings using 250V D.C. range except those in excess of 250V for which 1000V range was used. Heater volts 10V A.C. range and readings on H.T. winding of transformer on 1000V A.C. range.
Set operating on 200 volt mains and transformer tap 200–210. Wave change switch on M.W. (V7 readings on F.M.).

Valve No.	Valve Type	PIN NUMBER 1	2	3	4	5	6	7	8	9	Function	Description
1	6AJ8	g_2, g_4 58	g_1 VL—	kg_5s O	h 6.3 AC	h O	a_h 225	g_3 —4	a_t 80	g_t —5	A.M. Freq. Changer F.M. I.F. Amp.	Triode Heptode
2	6BY7	k VL	g_1 VL—	k VL	h 6.3 AC	h O	s O	a 210	g_2 70	g_3 O	I.F. Amplifier	V.M. R.F. Pentode
3	6AK8	a'''_d VL—	a''_d VL—	k''_d VL—	h 6.3 AC	h O	a'_d VL—	ks O	g NR	a_t 60	A.M. Detector F.M. Detector A.F. Amplifier	Triple Diode Triode
4	65ME	g VL—	k O	IC —	h 6.3 AC	h O	IC —	a 36*	IC —	t 235		Tuning Indicator
5	6BQ5	IC —	g NR	k, g_3 7	h O	h 6.3 AC	IC —	a 265	IC —	g_2 232	Output	Pentode
6	6V4	a' 250 AC	IC —	k 285	h 6.3 AC	h	IC —	a" 250AC	IC —	IC —		Rectifier
7	6AQ8	a" 95	g" O	k" NR	h 6.3 AC	h O	a' 85	g' NR	k' NR	s O	F.M., R.F. Amp. & Freq. Changer	Double Triode

VL = Very low reading
NR = No reading
VL— = Very low negative reading
* = V5 pin 7 reads about 36V in absence of signal. With signal up to 200 volts may be present
Readings taken to earth, except V6 heaters which are floating

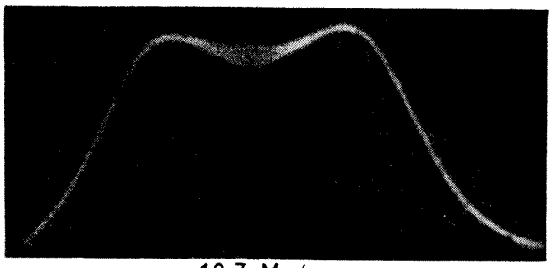


FIG. 1

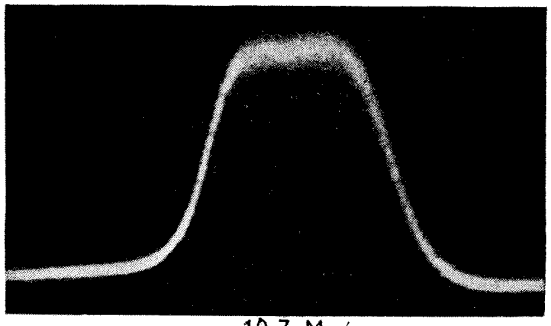


FIG. 2

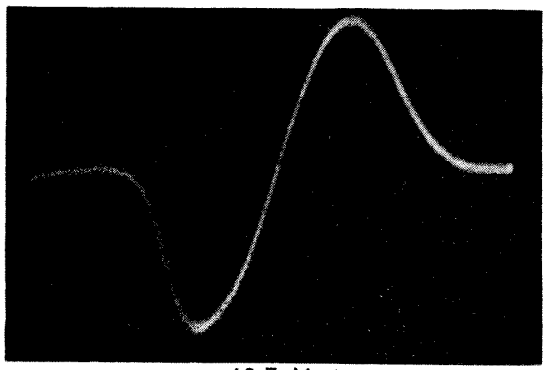


FIG. 3

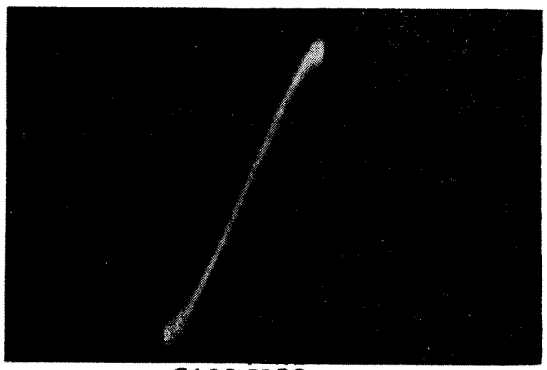
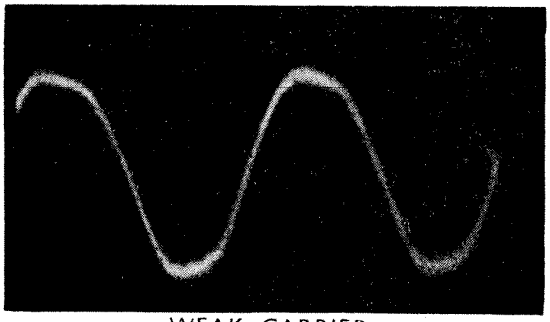


FIG. 4


WEAK CARRIER
400c /s SINE WAVE MODULATION
DEVIATION ± 100 Kc/s
FIG. 5

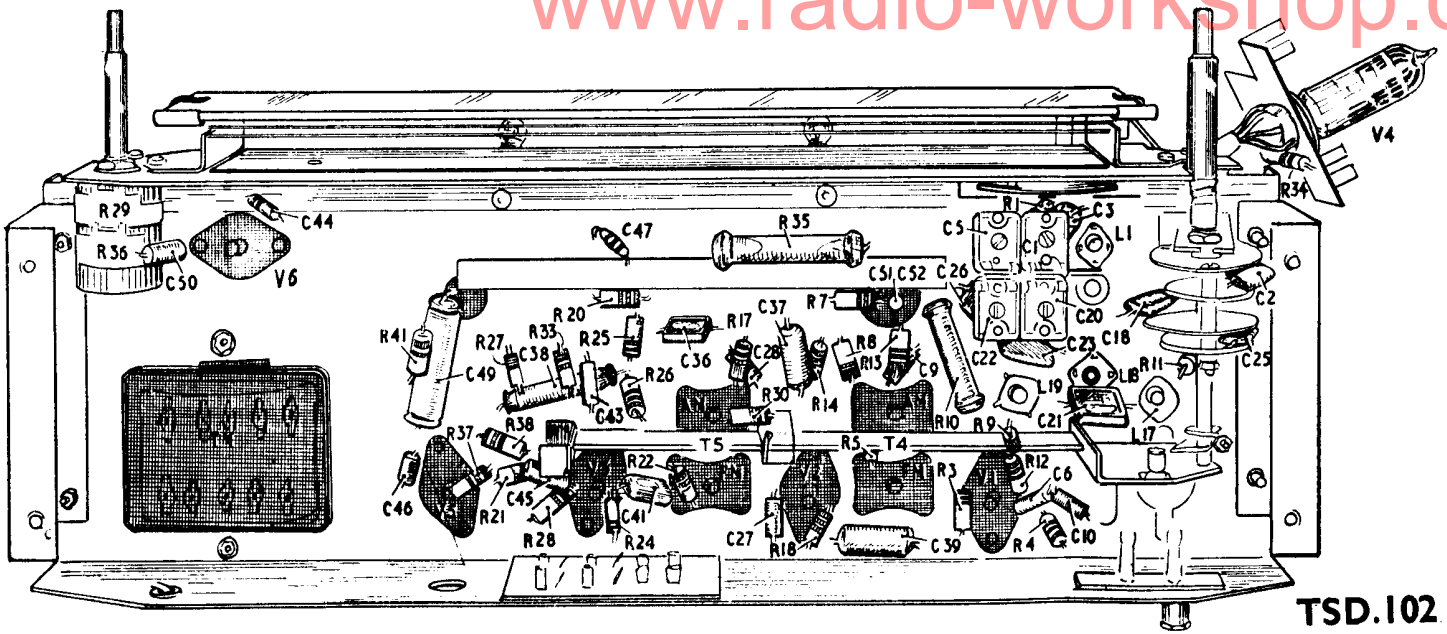


FIG. 9 CHASSIS LAYOUT

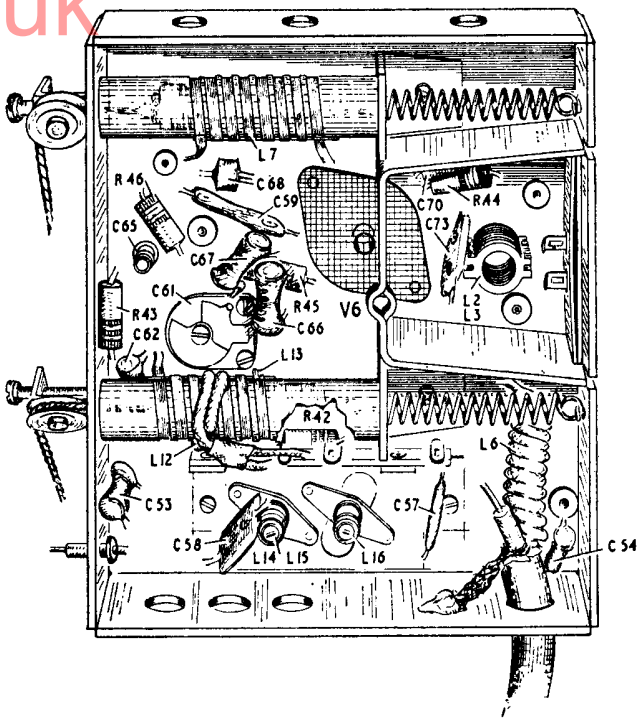


FIG. 8 F.M. BOX

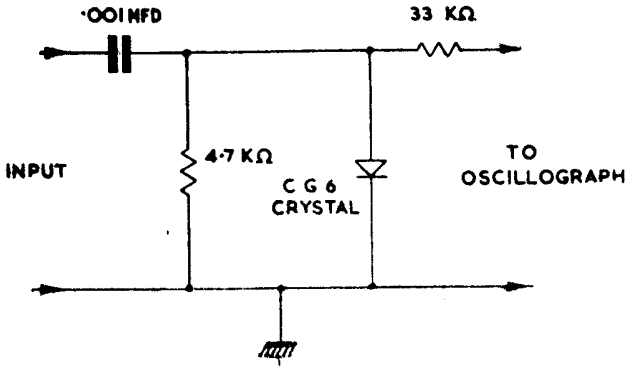


FIG. 6
PROBE

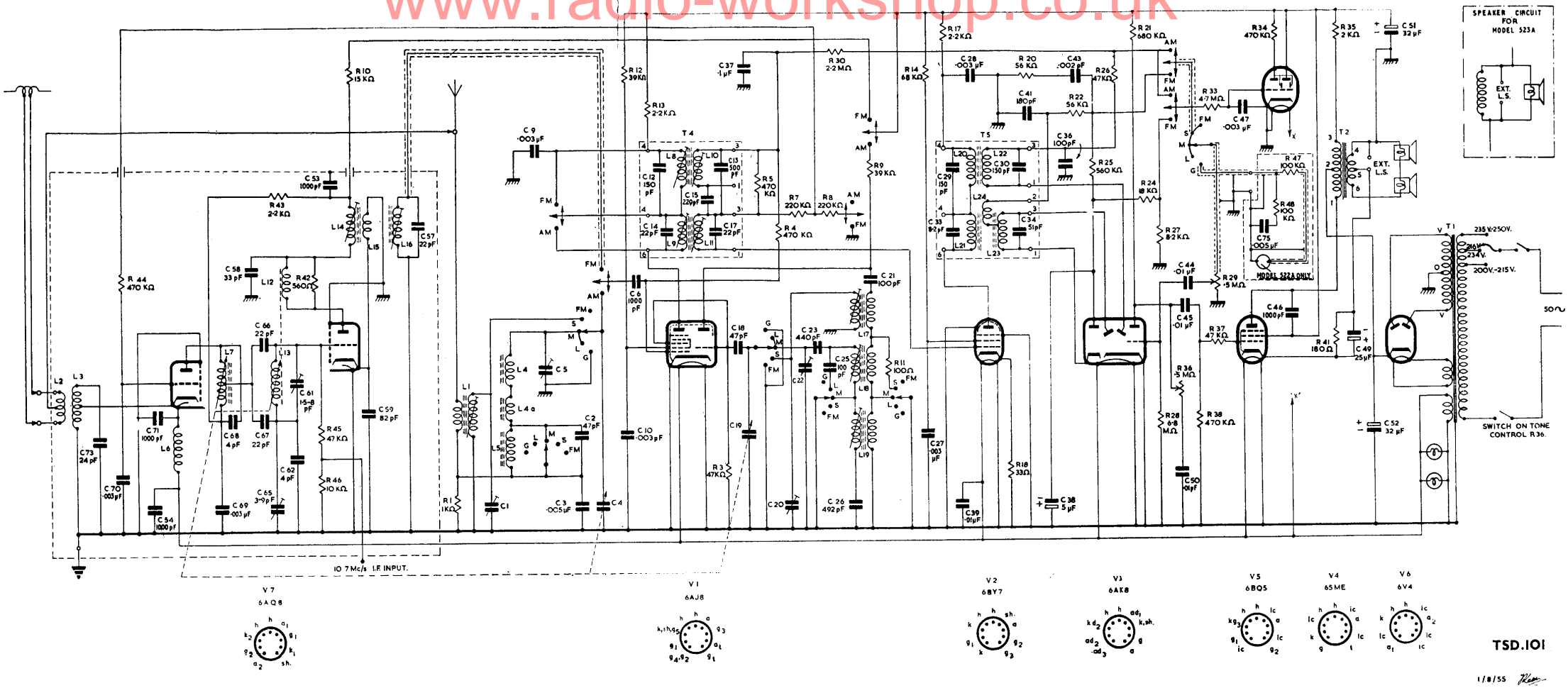


FIG. 7 CIRCUIT DIAGRAM