"TRADER" SERVICE SHEET

970

McMICHAEL 501AC

Covering also the 502 Console and 505ARG

SIX valves, in addition to the rectifier, are used in the McMichael 501AC, including a push-pull output stage and a double-triode driver. Covering four wavebands of 13.5-50m (S.W.1), 50-171 m (S.W.2), 170-550 m and 900-2,000 m, the receiver is a superhet designed to operate from A.C. mains of 200-250 V (or 100-250 V), 40-100 c/s. An unusual feature is the inclusion of two indicator lamps which glow when the Light or Home Service transmissions are tuned in.

The 502AC is a console employing an identical chassis to that in the 501AC. The 505AC is a 3-speed autoradiogram using a slightly modified 501AC chassis. The differences are fully described under "Radiogram Modifications" overleaf.

Release dates and original prices: 501 *AC, July,* 1950 £21 12*s.* 6*d.*; 502*AC, September* 1950, £31 2*s.* 9*d.*; 505*AC, December* 1950, £69 6*s.* 9*d. Purchase tax extra.*

CIRCUIT DESCRIPTION

Aerial input via I.F. rejector **L1, C1** and coupling coils **L2** (S.W.1), **L3** (S.W.2), **L4** (M.W.) and **L5** (L.W.) to single tuned circuits **L6, C40** (S.W.1), **L7, C40** (S.W.2), **L8, C40** (M.W.), **L9, C40** (L.W.) which precede triode-hexode valve **(V1, Osram X78)** operating as frequency changer with internal coupling. **C2** and **C3** shunt **L4** and **L5** so that they resonate outside the band in use.

Oscillator anode coils **L14** (S.W.1), **L15** (S.W.2), **L16** (M.W.) and **L17** (L.W.) are tuned by **C45.** Parallel trimming by **C41** (S.W.1), **C42** (S.W.2), **C43** (M.W.) and **C15, C44** (L.W.); series tracking by **C11** (S.W.1), **C12** (S.W.2), **C13** (M.W.) and **C14** (L.W.). Inductive reaction coupling from oscillator grid by **L10** (S.W.1), **L11** (S.W.2), **L12** (M.W.) and **L13** (L.W.), with additional coupling across the common impedance of the trackers on S.W.1 and S.W.2.

Second valve **(V2, Brimar 6BA6)** operates as intermediate frequency amplifier, with tuned transformer couplings **C8, L18, L19, C9** and **C20, L20, L21, C21.** **Intermediate frequency 470 kc/s.**

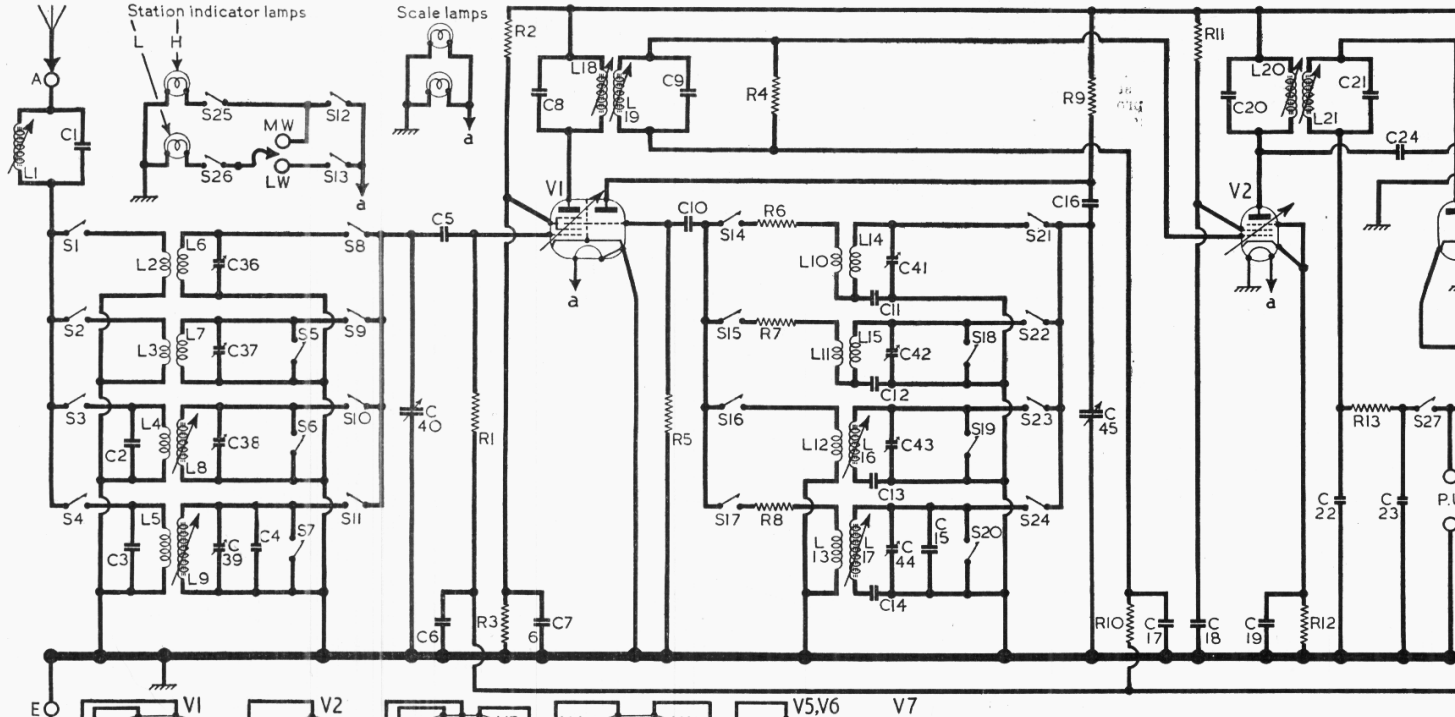
Diode signal detector is part of double diode valve **(V3, Osram D77).** Audio frequency component in rectified output is developed across manual volume control **R14,** which is the diode load. I.F. filtering by **C22, R13** and **C23.** Provision is made for the connection of a pick-up via a switched jack across **R14.** Insertion of the pick-up plug in the jack opens **S27** to mute radio.

Second diode of **V3,** fed via **C24** from **V2** anode, provides D.C. potential which is developed across load resistor **R16** and fed back as bias to the F.C. and the I.F. valves, giving automatic gain control.

Audio frequency component developed across **R14** is passed via **C25** and stopper **R18** to grid of triode **V4a,** part of double triode valve **(V4, Osram B65),** which operates as A.F. amplifier, with resistance-capacitance coupling by **R21, C27** and **R23, R24** to one side of beam tetrode push-pull output stage **(V5, V6, Osram KT61's).**

Second valve of output stage is fed via the phase inverting triode **V4b,** which obtains its input from the control grid of **V5** via the step-down potential divider **R23, R24,** giving an overall stage gain of unity.

Three-position tone control is introduced by the network **R25, R27, C29** and **C30, R26** in conjunction with switches **S28, S29.** Grid stoppers **R30, R31, R32** and **R33** are inserted in screen and control



Circuit diagram of the McMichael 501AC tab
ences in the 505 autoradiogram are explained
leaf, where a separate diagram shows the mod
step-down coupling to **V4b** to balance its gain
device. The fuse lamp, in the negative H.T
working, and it forms a useful ready-

The McMichael 501AC table superhet.

grid circuits to suppress parasitic oscillation. Provision is made for the connection of a low impedance external speaker across the secondary winding of **T1**, and a jack-type switch, operated by the external speaker plug, permits the internal speaker to be muted if desired.

H.T. current is supplied by I.H.C. full-wave rectifying valve **(V7, Brimar 5V4G).** Smoothing by iron-cored choke **L22** and resistor **R34** in conjunction with electrolytic capacitors **C33, C34** and **C35. V7** is protected against an H.T. short-circuit by a fuse lamp in series with the H.T. negative lead to chassis.

The station indicator lamps are lit when the receiver is tuned to a preselected station on M.W. or L.W. by the closing of **S25** or **S26** (controlled by discs on the gang spindle) and **S12** which closes on M.W. or **S13** which closes on L.W. A link joining **S26** to **S12** or **S13** allows the lamp in this circuit to be used on either a M.W. or a L.W. station.

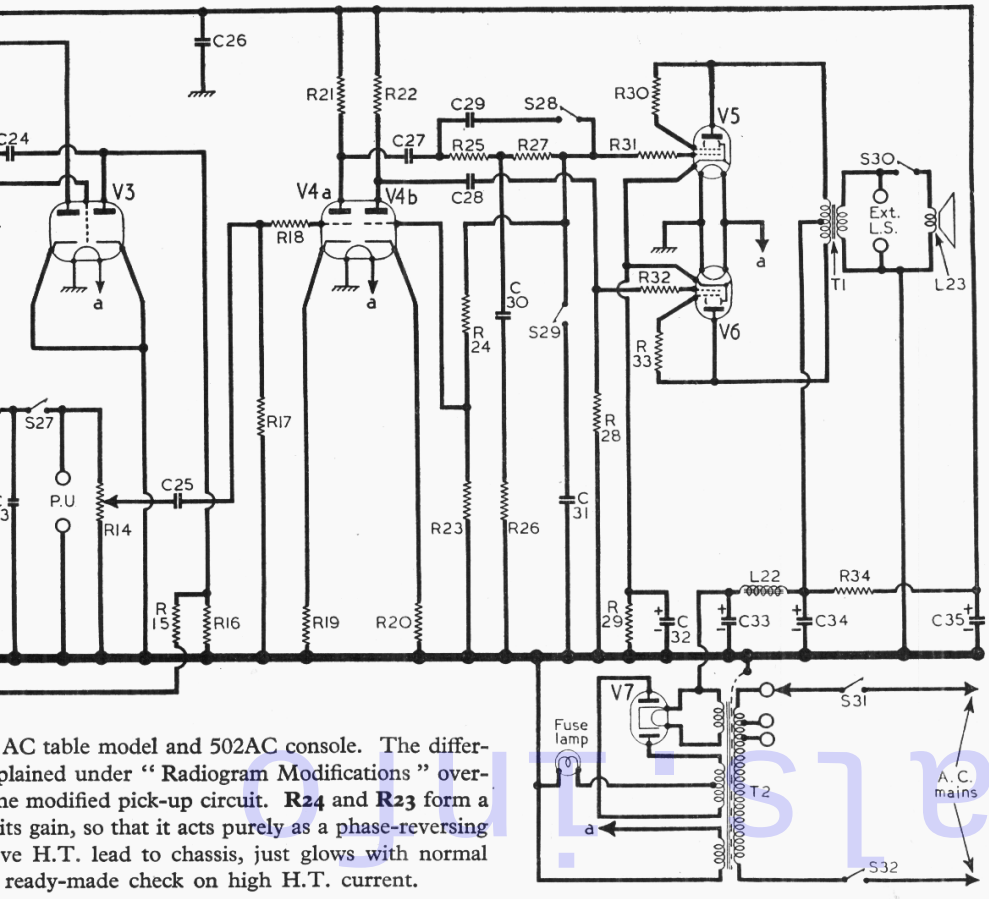
COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	V1 C.G.	1MΩ	F5
R2	V1 S.G. pot.	22kΩ	F5
R3	divider	33kΩ	F5
R4	I.F. trans. shunt	1MΩ	F6
R5	V1 osc. C.G. ...	47kΩ	F5
R6	S.W.1 stabiliser ...	47Ω	G5
R7	S.W.2 stabiliser ...	390Ω	G4
R8	L.W. stabiliser ...	680Ω	G5
R9	Osc. anode feed ...	27kΩ	F5
R10	A.G.C. decoupling	470kΩ	F6
R11	V2 S.G. feed ...	39kΩ	E6
R12	V2 G.B.	100Ω	E6
R13	I.F. stopper ...	22kΩ	E6
R14	Volume control ...	250kΩ	H4
R15	A.G.C. decoupling	1MΩ	E5
R16	A.G.C. diode load	470kΩ	E5
R17	V4a C.G.	2.2MΩ	E5
R18	V4a stopper ...	47kΩ	E5
R19	V4 cath.	1.2kΩ	E5
R20	resistors	1.2kΩ	F5
R21	V4 anode loads	68kΩ	E6
R22		68kΩ	E5
R23	V4b C.G.	33kΩ	E5
R24	A.F. coupling ...	390kΩ	E5
R25	Tone control ...	180kΩ	E5
R26		180kΩ	E5
R27		56kΩ	E4
R28	V6 C.G.	470kΩ	F5
R29	V5, V6 G.B.	150Ω	E5
R30	V5 stoppers ...	47Ω	E4
R31		47kΩ	E4
R32	V6 stoppers ...	47kΩ	F5
R33		47Ω	F4
R34	H.T. smoothing ...	3kΩ	E6

	CAPACITORS	Values	Locations
C1	I.F. rejector tune...	500pF	G6
C2	M.W. aerial shunt...	250pF	F6
C3	L.W. aerial shunt...	0·001μF	G6
C4	L.W. aerial trim. ...	50pF	G5
C5	V1 C.G.	100pF	G5
C6	A.G.C. decoupling	0·1μF	E6
C7	V1 S.G. decoup. ...	0·1μF	F5
C8	1st I.F. trans. tune	125pF	C3
C9		125pF	C3
C10	V1 osc. C.G. ...	100pF	G5
C11	S.W.1 tracker ...	0·0054μF	H5
C12	S.W.2 tracker ...	0·001μF	G4
C13	M.W. tracker ...	538pF	G4
C14	L.W. tracker ...	220pF	F4
C15	L.W. osc. trim. ...	120pF	G4
C16	Osc. anode coup. ...	100pF	G5
C17	A.G.C. decoupling	0·1μF	F6
C18	V2 S.G. decoup. ...	0·1μF	E6
C19	V2 cath. by-pass ...	0·1μF	F6
C20	2nd I.F. trans. tune	125pF	D3
C21		125pF	D3
C22	I.F. by-passes ...	50pF	E6
C23		50pF	E6
C24	A.G.C. coupling ...	50pF	E5
C25	A.F. coupling ...	0·01μF	E5
C26	R.F. by-pass ...	0·1μF	F6
C27	A.F. couplings ...	0·02μF	E5
C28		0·02μF	F5
C29		150pF	E4
C30	one correctors ...	0·005μF	E5
C31		0·001μF	F4
C32*	V5, V6 cath. decoup.	25μF	E4
C33*	H.T. smoothing ...	16μF	J5
C34*		16μF	J5
C35*		4μF	F6
C36‡	S.W.1 aerial trim....	50pF	B3
C37‡	S.W.2 aerial trim....	50pF	B3
C38‡	M.W. aerial trim. ...	50pF	C3
C39‡	L.W. aerial trim. ...	50pF	C3
C40†	Aerial tuning ...	—	C2
C41‡	S.W.1 osc. trim. ...	50pF	B2
C42‡	S.W.2 osc. trim. ...	50pF	B1
C43‡	M.W. osc. trim ...	50pF	C1
C44‡	L.W. osc. trim. ...	50pF	C2
C45†	Oscillator tuning ...	—	C2

* Electrolytic. ‡ Pre-set. † Variable.

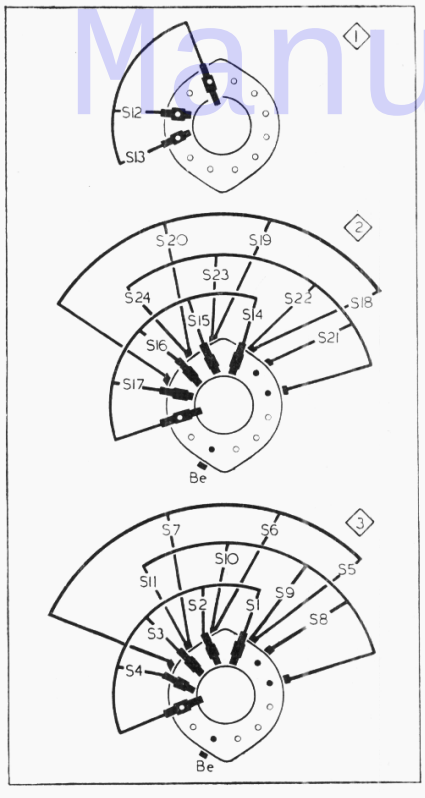
	OTHER COMPONENTS		Approx. values (ohms)	Locations
L1	I.F. rejector ...		5.0	H6
L2			Very low	G6
L3	Aerial coupling		1.2	H5
L4	coils		16.5	G5
L5			23.0	G6
L6			Very low	G6
L7			0.5	H5
L8	Aerial tuning coils		2.5	G5
L9			22.0	G6
L10			Very low	H5
L11	Oscillator reaction		1.3	H4
L12	coils		1.6	G4
L13			4.0	G5
L14			Very low	H5
L15	Oscillator tuning		Very low	H4
L16	coils		2.0	G4
L17			7.5	G5
L18	1st I.F. trans.	Pri.	7.0	C3
L19		Sec.	5.5	C3
L20	2nd I.F. trans.	Pri.	5.5	D3
L21		Sec.	5.5	D3
L22	H.T. smoothing ...		225.0	A2
L23	Speech coil ...		2.6	—
T1	O.P.trans.	Pri.	550.0	—
		Sec.	0.6	
T2	Pri. total		20.0	A3
	H. T. Sec., total ...		290.0	
	Rect. htr. ...		Very low	
	6.3 v. htr. ...		Very low	
S1-24	Waveband switches		—	G5
S25, S26	Station indicators		—	B2
S27	P.U. jack switch		—	F6
S28, S29	Tone control ...		—	F4
S30	L.S. switch ...		—	E6
S31, S32	Mains sw., g'd R14		—	H4



AC table model and 502AC console. The differ-plained under "Radiogram Modifications" over-ne modified pick-up circuit. **R24** and **R23** form a its gain, so that it acts purely as a phase-reversing ve H.T. lead to chassis, just glows with normal ready-made check on high H.T. current.

DISMANTLING THE SET

Removing Chassis.—Remove the two outer control knobs (recessed grub screws) and the two centre knobs (fixed to concentric spindles by recessed grub screws);
remove two large hexagonal bolts (with washers) securing chassis to bottom of cabinet and



Diagrams of the waveband switch units, drawn as seen from the rear of an inverted chassis. **Be** indicates bearer tags. The associated switch table is on the right, in col. 2.

Switch	S.W.1	S.W.2	M.W.	L.W.
S1	C	—	—	—
S2	—	C	—	—
S3	—	—	C	—
S4	—	—	—	C
S5	C	—	—	—
S6	C	C	—	—
S7	C	C	C	—
S8	C	—	—	—
S9	—	C	—	—
S10	—	—	C	—
S11	—	—	—	C
S12	—	—	C	—
S13	—	—	—	C
S14	C	—	—	—
S15	—	C	—	—
S16	—	—	C	—
S17	—	—	—	C
S18	C	—	—	—
S19	C	C	—	—
S20	C	C	C	—
S21	C	—	—	—
S22	—	C	—	—
S23	—	—	C	—
S24	—	—	—	C

withdraw chassis to extent of speaker leads; unsolder six coloured leads from the tag strip on the output transformer, when the chassis may be completely withdrawn from the cabinet.

When replacing, the speaker leads should be connected to the output transformer in the following order, starting at the top: yellow, red, white, green, blue, black.

Removing Speaker.—Remove four 4BA nuts with small circular washers and square brackets securing speaker to sub-baffle, when the speaker and the rubber washer round its circumference may be withdrawn.

When replacing, the output transformer should be on the right.

CIRCUIT ALIGNMENT

All the following adjustments are easily accessible, and the chassis need not be removed from the cabinet to reach them.

I.F. Stages.—Switch set to M.W. and tune to 550 m. Connect signal generator, via a 0.01 μF capacitor in the "live" lead, to top tag on **C40,** and chassis, feed in a 470 kc/s (638.3 m) signal and adjust the cores of **L21, L20** (location reference D3) and **L19, L18** (C3), in that order, for maximum output, reducing the input as the circuits come into line to avoid A.G.C. action.

I.F. Rejector.—Transfer signal generator leads to **A** and **E** sockets, feed in a 470 kc/s signal and adjust the core of **L1** (H6) for minimum output.

R.F. and Oscillator Stages.—Check that with the gang at maximum capacitance, the cursors coincide with the dots at the high wavelength ends of the M.W. scales. Connect signal generator leads to **A** and **E** sockets via a suitable dummy aerial.

S.W.1.—Switch set to S.W.1, tune to 13.5 m on scale, feed in a 13.5 m (22.2 Mc/s) signal and adjust **C41** (B2), **C36** (B3) for maximum output.

S.W.2.—Switch set to S.W.2, tune to 50 m on scale, feed in a 50 m (6 Mc/s) signal and adjust **C42** (B1) **C37** (B3) for maximum output.

M.W.—Switch set to M.W., tune to 190 m on scale, feed in a 190 m (158 kc/s) signal and adjust **C43** (C1), **C38** (C3) for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal and adjust the cores of **L16** (C1), **L8** (C3) for maximum output. Repeat these adjustments.

L.W.—Switch set to L.W., tune to 900 m on scale, feed in a 900 m (333 kc/s) signal and adjust **C44** (C2), **C39** (C3) for maximum output. Tune to 1,800 m on scale, feed in a 1,800 m (166.7 kc/s) signal and adjust the cores of **L17** (C2), **L9** (C3) for maximum output. Repeat these adjustments.

Setting Station Indicator Lamps.—First slacken the fixing screws holding the cam discs to the gang spindle, then switch to M.W., tune in the Home Service on the best frequency locally, and adjust the cam on the front disc so that the "H" lamp lights, then tighten the screw.

Before adjusting the "L" cam for the Light Programme, it must be decided whether the best results are obtained on L.W. or M.W., and the tag on the station indicator lamp adjustment panel must then be attached to the appropriate screw terminal. Then the procedure is the same as for the "H" lamp except that the rear cam disc is adjusted in this case.

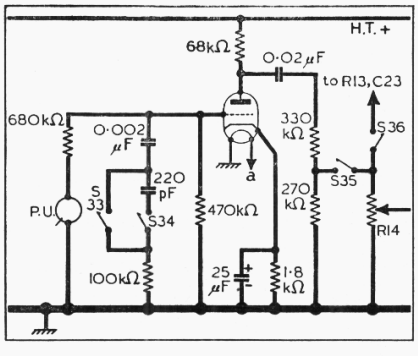


Diagram of the pick-up input circuit in the 505 autoradiogram.

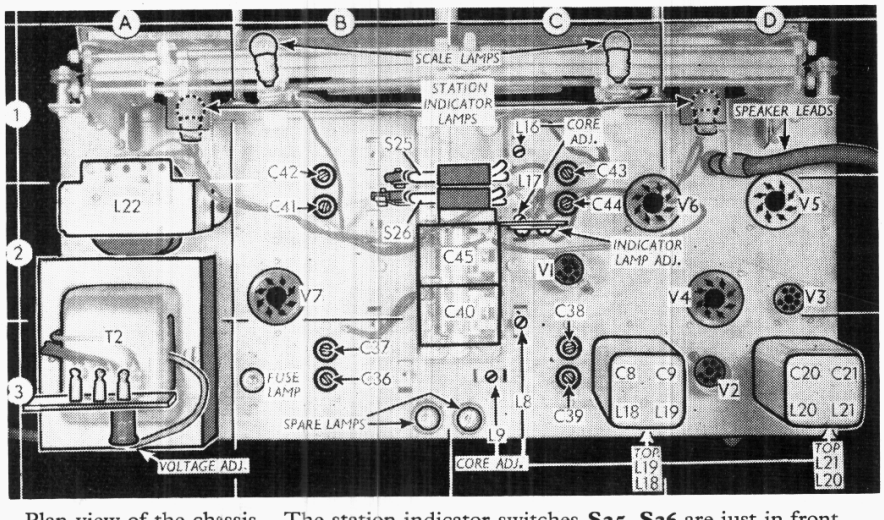
VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from A.C. mains of 230 V. The receiver was tuned to the highest wavelength end of M.W., and the volume control set at maximum, but there was no signal input.

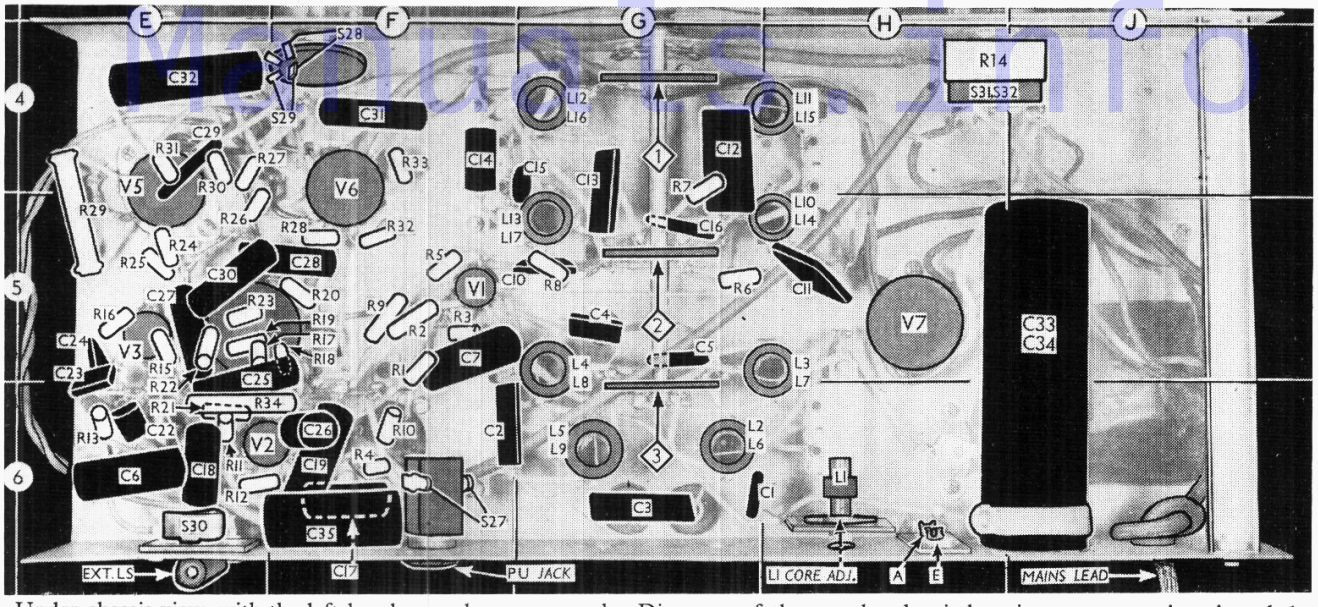
Voltage measurements were made with an

Valve		Anode		Screen		Cath.
		V	mA	V	mA	V
V1	X78 ...	250 (Oscillator) 88	3·5 4·0	96	9·0	—
V2	6BA6 ...	250	9·0	122	3·2	1·4
V3	D77 ...	—	—	—	—	—
V4	B65 {a...	93	2·3	—	—	3·0
	{b...	93	2·3	—	—	3·0
V5	KT61 ...	350	28·0	350	4·4	8·5
V6	KT61 ...	350	28·0	350	4·4	8·5
V7	5V4G ...	300§	—	—	—	380·0

§ A.C. each anode.



Plan view of the chassis. The station indicator switches **S25, S26** are just in front of the gang. The Light Programme lamp adjustment panel is seen behind them.



Under-chassis view, with the left-hand cross-brace removed. Diagrams of the waveband switch units **1, 2, 3** are given in col. 1.

Avo Electronic TestMeter, which introduces no appreciable voltage drop, and allowances must be made for the current taken by other meters.

GENERAL NOTES

Switches.—**S1-S24** are the waveband switches, ganged in three rotary units beneath the chassis. These units are indicated in our under-chassis view where they are identified by the numbers **1, 2, 3,** in diamonds. Arrows show the direction in which they are viewed in the diagrams in col. 1, where they are shown in detail.

The table (col. 2) gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C,** closed.

S25, S26 are the station indicator switches, cam operated by projections on semi-circular discs mounted on the gang spindle. **S25** controls the H (for Home Service) lamp on the left-hand scale, and **S26** controls the L (for Light Programme) lamp.

Switches **S12** (M.W.) and **S13** (L.W.) govern these control switches, permitting **S25** to operate its lamp only on M.W. **S13** closes on L.W. to permit **S26** to switch on lamp L when the Light programme is received on L.W.

In areas where it is preferable to receive the Light Programme on M.W., a flexible lead from **S26** may be transferred from the L.W. band to the M.W. band by means of screw terminals marked "M.W." and "L.W."

When the switch cams are correctly adjusted (as explained under "Circuit Alignment") the H lamp lights up when the Home Service transmission is tuned in; and the L lamp lights when the Light Programme transmission is tuned in, on M.W. or L.W. according to the district. **S12, S13** prevent the lamps from lighting anywhere on the wrong waveband.

S27 is the radio muting switch associated with the pick-up jack. It opens when the plug is inserted.

S28, S29 are the tone control switches, ganged in a 3-position unit beneath the chassis. In the anti-clockwise position of the control knob, **S28** closes for brilliant tone; in the central position for normal response, neither switch closes; **S29** closes in the fully clockwise position for deep tone.

S31, S32 are the double-pole mains Q.M.B. switches, ganged with the volume control **R14.**

Scale and Indicator Lamps.—These are all of the same type and rating. They are Osram lamps, with small clear spherical bulbs and M.E.S. bases, rated at 6.5 V, 0.3 A.

Two spare lamps are carried in rubber grommets near the rear edge of the chassis deck.

Fuse Lamp.—A third lamp receptacle near the rear of the chassis deck is the fuse lampholder. This lamp, which is of the same type and rating as the scale lamps, glows very dimly when the receiver is operating normally. If it glows more brightly than this, H.T. current is higher than it should be. Spare lamps can be used as fuse lamps if a replacement is required.

External Speaker.—A special 2-pin plug and socket device is provided at the rear of the chassis for the connection of a low impedance (2-4 ohms) external speaker.

Associated with the sockets is switch **S30,** which may be opened when the plug is in its sockets by rocking the plug, turning it a few degrees anti-clockwise, to mute the internal speaker. When the plug is inserted vertically, both speakers operate.

Chassis Divergencies.—In our chassis **C12** was a 1,000 pF (0.001 μF) Lemco tracker, with a tolerance of ±10%, but in the makers' diagram it is specified at 1,800 pF, ±2%. Our sample chassis, too, was provided with three mean voltage adjustments of 200 V, 220 V and 240 V, but on later versions these are changed to 110 V, 210 V and 240 V.

Increased Sensitivity.—The manufacturers state that where it is desirable to increase the sensitivity of the receiver, the gain may be increased by replacing **V4** with a Mullard ECC33. To compensate for the additional gain, **R23** must then be changed to 27 kΩ, 5% tolerance, ¼ W rating. The change is unnecessary in the neighbourhood of a powerful transmitter, but is useful in remote areas.

RADIOGRAM MODIFICATIONS

In the 505 AC autoradiogram the pick-up jack is replaced by a radiogram change-over switch, and the pick-up is connected via a pre-amplifier using an Osram L77 valve. The record changer is a Garrard RC72. The circuit diagram of the amplifier appears in col. 3, where the change-over switches are **S35, S36,** but in addition to these is another switch which open-circuits **V1** screen and oscillator anode H.T. feed lead on gram. **S33, S34** are the matching switches for 33 r.p.m. and 78 r.p.m. records.

The **S35, S36** unit occupies the position shown in our chassis photograph for the volume control (with mains switches), which in the 505 goes on the side of the cabinet. The chassis is mounted scale-upwards on the rear of a board which forms its support, and the pre-amplifier is mounted on the front of the same board.

S33 closes for 33 r.p.m. records, and **S34** for 78 r.p.m., and their control spindle emerges from the top panel of the cabinet in front of the tuning control spindle.

The tone control circuit is slightly modified in the 505, which in effect amounts to the removal of **S29** and **C31** and the addition of 330 kΩ resistor in series with **C29,** while the latter is changed to 100 pF. The three tone conditions are obtained by closing **S28** with the resistor in circuit; closing **S28** with the resistor short-circuited; and by opening **S28.** An additional lamp illuminates the pick-up compartment.

DRIVE CORD REPLACEMENT

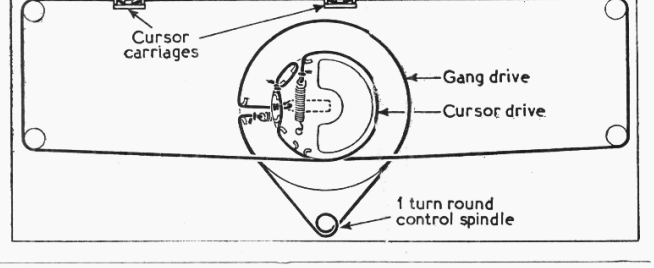
There are two separate tuning drive systems in this receiver: the gang drive, and the cursor drive. Together they require about six feet of high-grade flax fishing line, plaited and waxed. It is immaterial which cord is replaced first, but a short length of wire with a hook at one end is a useful aid in feeding the cords past obstructions.

Gang Drive.—This requires about two feet of cord, which should be run round the larger drum on the gang spindle and the control spindle as shown in our sketch below, where the two systems are drawn as seen from the rear of the chassis with the gang at maximum capacitance.

Cursor Drive.—This requires about four feet of cord, which should be run round the smaller drum on the gang spindle and the four pulleys as seen in our sketch below, where both systems are shown together as explained for the gang drive.

The cord can be slipped into the 3-point cord grips on the two cursor carriages after running round, and the carriages can then be adjusted so that the cursors cover the dots at the right-hand ends of the M.W. scales when the gang is at maximum capacitance.

Sketch showing the two cord drives, as seen from the rear with the gang at maximum. Each cord has its own drive drum.



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