'TRADER' SERVICE SHEET 323

McMICHAEL 389

3-BAND BATTERY SUPERHET

A SHORT-WAVE range of 18·5-50 m is covered by the McMichael 389 4-valve battery superhet, a feature of which is the use of two valves with the Mazda type of octal base. Provision is made for an extension speaker, and the construction of the receiver is of an unusual type.

CIRCUIT DESCRIPTION

Aerial input via IF filter circuit **L1, C1, C22,** coupling coils **L2** (SW), **L3** (MW and LW), and coupling condenser **C2** (MW only) to single-tuned circuits **L4, C25** (SW), **L5, C25** (MW) and **L6, C25** (LW), which precede triode-pentode valve (**V1, Mazda metallised TP23**) operating as frequency changer with internal coupling. Triode anode coils **L10** (SW), **L11** (MW) and **L12** (LW) are tuned by **C29**; parallel trimming by **C27** (MW) and **C28** (LW); fixed series tracking by **C7** (SW), **C8** (MW) and **C9** (LW). Reaction by grid coils **L7** (SW), **L8** (MW) and **L9** (LW).

Second valve (**V2, Mazda metallised VP22**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary input and iron-cored tuned-primary output transformer couplings **C30, L13, L14, C31,** and **C32, L15, L16.**

Intermediate frequency 465 KC/S.

Diode second detector is part of separate double diode valve (**V3, Mazda metallised DD207**). Audio frequency component in rectified output is developed across load resistance **R11** and passed via AF coupling condenser **C15,** manual volume control **R12** and grid stopper **R15** to CG of pentode output valve (**V4, Mazda Pen24**). IF filtering by **C13, R10, C14.** Variable tone control by **R14, C18** in anode circuit. Fixed tone correction by **C20.**

Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1.** 9KC/S whistle filter **L17, C19** across primary of **T1.**

Second diode of **V3,** fed from **L16** via **C16,** provides DC potential which is developed across load resistance **R13** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

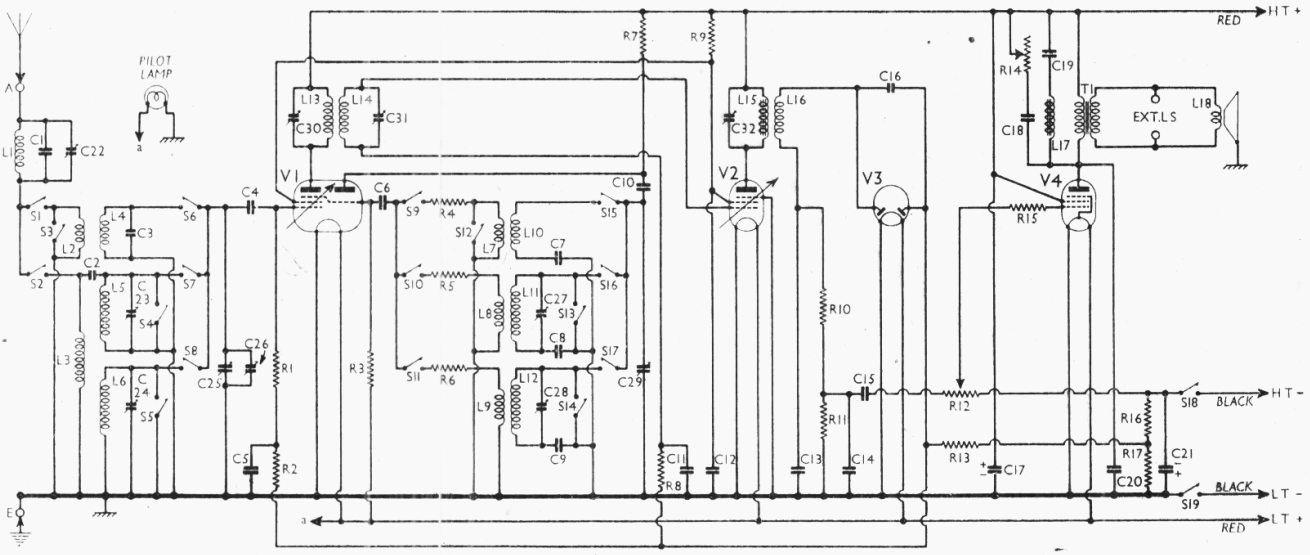
Delay voltage, together with GB potential for **V4,** is automatically developed by the drop across resistances **R16, R17** in HT negative lead to chassis.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 pentode CG resistance	1,000,000
R2	V1 pentode CG decoupling	1,000,000
R3	V1 osc. CG resistance	25,000
R4	Osc. SW reaction stabiliser	10
R5	Osc. MW reaction stabiliser	1,000
R6	Osc. LW reaction stabiliser	1,000
R7	V1 osc. anode HT feed	17,000
R8	V2 CG decoupling	1,000,000
R9	V1, V2 S.G's HT feed	50,000
R10	IF stopper	50,000
R11	V3 signal diode load	1,000,000
R12	Manual volume control	1,000,000
R13	V3 AVC diode load	1,000,000
R14	Variable tone control	50,000
R15	V4 grid stopper	100,000
R16	V4 auto GB and AVC delay voltage resistances	200* 100*
R17		

* May be 220 Ω and 110 Ω respectively.

	CONDENSERS	Values (μF)
C1	Aerial IF filter fixed trimmer	0·0002
C2	Aerial MW coupling	0·000007
C3	Aerial SW fixed trimmer	0·000017
C4	V1 pentode CG condenser	0·001
C5	V1 pentode CG decoupling	0·1
C6	V1 osc. CG condenser	0·0002
C7	Osc. circuit SW tracker	0·0035
C8	Osc. circuit MW tracker	0·0004823
C9	Osc. circuit LW tracker	0·000174
C10	V1 osc. anode coupling	0·0002
C11	V2 CG decoupling	0·1
C12	V1, V2 SG's decoupling	0·1
C13	IF by-pass condensers	0·0001
C14		0·0001
C15	AF coupling to V4	0·01
C16	Coupling to V3 AVC diode	0·00001
C17*	HT circuit reservoir	16·0
C18	Part of variable tone control	0·03
C19	Part of whistle filter	0·0015
C20	Fixed tone corrector	0·002
C21*	Auto GB decoupling	50·0
C22‡	Aerial IF filter tuning	—
C23‡	Aerial circuit MW trimmer	—
C24‡	Aerial circuit LW trimmer	—



Circuit diagram of the McMichael 389. Note that **L16** has no trimmer.

CONDENSERS (Con'inued)		Values (μF)
C25†	Aerial circuit tuning	—
C26‡	Aerial circuit SW trimmer ..	—
C27‡	Osc. circuit MW trimmer ..	—
C28‡	Osc. circuit LW trimmer ..	—
C29†	Oscillator circuit tuning ..	—
C30‡	1st IF trans. pri. tuning ..	—
C31‡	1st IF trans. sec. tuning ..	—
C32‡	2nd IF trans. pri. tuning ..	—

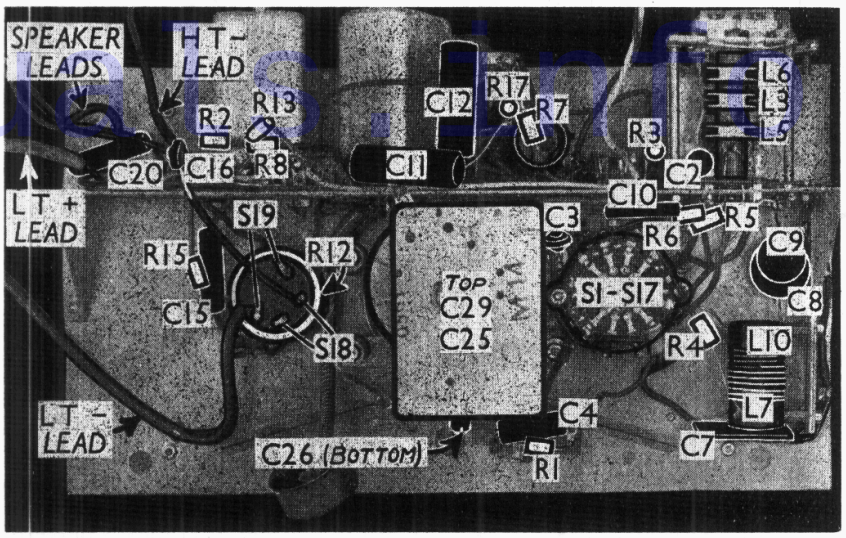
* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial IF filter coil	6·75
L2	Aerial SW coupling coil ..	0·2
L3	Aerial MW and LW coupling	15·0
L4	Aerial SW tuning coil. . ..	Very low
L5	Aerial MW tuning coil ..	2·0
L6	Aerial LW tuning coil ..	20·0
L7	Oscillator SW reaction ..	5·5
L8	Oscillator MW reaction ..	3·6
L9	Oscillator LW reaction ..	4·5
L10	Osc. circuit SW tuning coil ..	0·1
L11	Osc. circuit MW tuning coil	2·5
L12	Osc. circuit LW tuning coil ..	9·0
L13, L14	1st IF trans. Pri. .. .. Sec.	12·5 12·5
L15, L16	2nd IF trans. Pri. .. .. Sec.	2·75 12·5
L17	Whistle filter coil	300·0
L18	Speaker speech coil	3·0
T1	Speaker input trans. Pri. .. Sec. ..	700·0 0·3
S1-S17	Waveband switches	—
S18	HT circuit switch ganged	—
S19	LT circuit switch R12	

DISMANTLING THE SET

It should be noted that the control panel is pivotted at each side, and that access can be gained to the components on the top deck of the chassis by removing the two large coin-slot screws at the front edge of the panel and swivelling it up. Components on the other face of the chassis can be reached from the back of the cabinet, after the back has been removed (four round-head wood screws).

Removing Chassis.—If it should prove necessary to remove the chassis from the cabinet, first free the battery leads from the cleat on the chassis and the battery and tone control leads from the cleats on the side of the cabinet. Then free the flexible leads to the IF filter from the clip on the side of the cabinet and remove the filter and aerial and earth socket panel from the cabinet (four round-head wood screws).



View looking at the rear of the control panel. Some of the components above the platform are not marked, as they are seen in the view at the bottom of the page.

Next lift up the control panel, unsolder the leads to the indicator lamp and remove the two counter-sunk head wood screws holding the chassis to the control panel.

Then remove the four screws (with cup washers and nuts) holding the control panel to the chassis, thus exposing four screws (with nuts) holding the chassis to the brackets on the sides of the cabinet. Remove these screws and swivel the brackets out of the way, when the chassis can be withdrawn to the extent of the tone control leads, which is sufficient for normal purposes.

To free the chassis entirely, cut the leads from the chassis to the tone control close up to the tone control tags and *when replacing*, connect them as follows :—red lead to tag carrying two other red leads, yellow lead to that tag on the whistle filter panel which carries another yellow braided lead, black lead to the tag on the case of the control.

Removing Speaker.—If it is desired to remove the speaker from the cabinet, unsolder the leads, remove two of the clamps holding it to the sub-baffle (two round-head wood screws) and slacken the other two.

When replacing, see that the transformer is at the bottom and connect the leads as follows, numbering the tags at the top from left to right :—1, yellow lead to whistle filter coil, yellow lead from chassis and free side of **C18** ; 2 and 3 joined together, blue lead to extension speaker panel ; 4, green lead to extension speaker panel ; 5, tinned copper lead in yellow insulating sleeving going to **C19,** and the red lead to the bottom left-hand tag on the speaker terminal panel.

The bottom left-hand tag also goes to the red lead to the tone control, and one end of **C17,** while the tag on the speaker frame goes to the other end of **C17** and the black lead to the tone control.

VALVE ANALYSIS

Valve voltages and currents given in the table (p. IV) are those measured in our receiver when it was operating with a new HT battery reading 122 V, on load. The receiver was tuned to the lowest wavelength on the medium band, and

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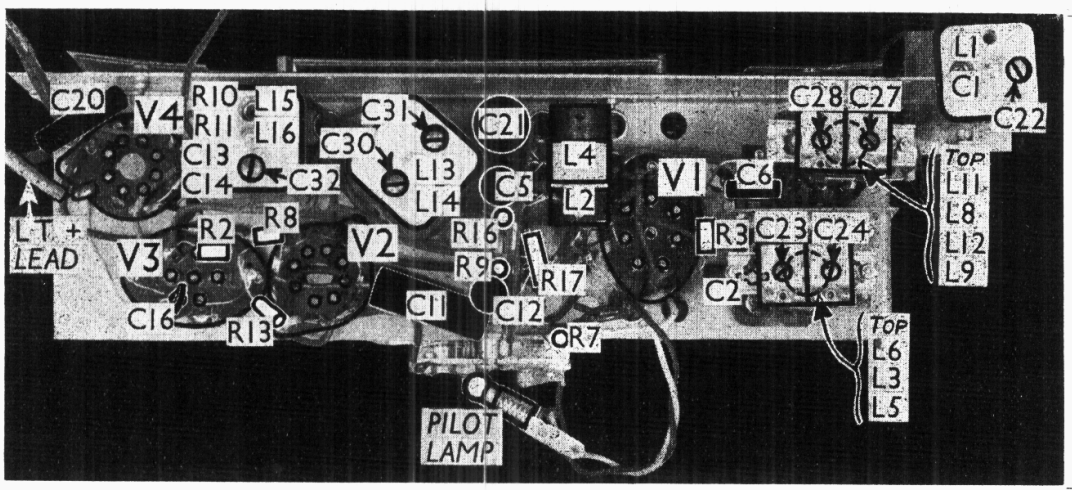


View looking at the underside of the valve-holders. The **L1, C1, C22** unit screws on the inside of the cabinet. Certain other components are also inside the cabinet, and are not shown in the chassis pictures (see "General Notes").

McMICHAEL 389—*Continued*

the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

If, as in our case, **V1** should become unstable when its anode current is being measured, it can be stabilised by connecting a non-inductive condenser of about 0·1 μF from grid (top cap) to chassis.

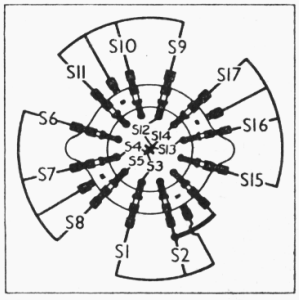
Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TP23	(118 Oscillator 55)	0·8 4·1	43	1·0
V2 VP22	118	2·2	43	0·5
V3 DD207	—	—	—	—
V4 Pen24	115	3·4	118	0·6

GENERAL NOTES

Switches.—**S1-S17** are the wavechange switches, in a single rotary unit behind the control panel. The unit is indicated in our view showing the rear of the panel, and the switches are shown in detail in the diagram below which is drawn looking at the rear of the panel.

The table below gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates *open*, and **C**, *closed*.

Switches	SW	MW	LW
S1	C	—	—
S2	—	C	C
S3	—	—	C
S4	C	—	—
S5	—	C	—
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C
S12	C	—	—
S13	—	—	C
S14	—	C	—
S15	C	—	—
S16	—	C	—
S17	—	—	C



The switch unit, as seen looking at the rear of the control panel.

S18 and **S19** are the QMB HT and LT circuit switches, ganged with the volume control **R12.**

Coils.—**L1** is in a separate screened unit (with **C1** and **C22**) attached by a bracket to the inside of the cabinet, on the right. It is shown to the right of our view looking at the underside of the valve-holders. **L2** and **L4** are on an unscreened tubular former, seen in the same view, **L4** being the thick wire winding.

L3, L5, L6 and **L8, L9, L11, L12** are in two further unscreened units, with two trimmers mounted at the top of each. **L7, L10** are in another unscreened tubular unit, seen in the rear panel view, **L10** being the thick wire winding.

The IF transformers **L13, L14** and **L15, L16** are located in two screened units, with their associated trimmers. Note that the second only has one trimmer (for the primary winding), but it also contains two resistors and two fixed condensers.

L17, the whistle filter coil, is inside the cabinet, and is iron-cored.

Components Not on Chassis.—Apart from **L1, C1, C22** and **L17** already mentioned, the following components are also external to the chassis: **R14** (tone control at right-hand side of cabinet); **C18** (tubular 0·03 μF); **C19** (moulded 0·0015 μF); **C17** (tubular 16μF electrolytic) and, of course, the speaker and **T1.**

Scale Lamp.—This is an Ever Ready MES type, rated at 2·0 V, 0·1 A.

External Speaker.—Two sockets are provided on a panel at the rear of the cabinet for a low impedance (2 O) external speaker.

Batteries.—LT, 2 V 20 AH accumulator cell Exide type CZH2-B; HT, 120 V dry battery, Drydex Super 120 V. GB is automatic.

Battery Leads and Voltages.—Black rubber lead, spade tag, LT negative; red rubber lead, spade tag, LT positive 2 V; black braided lead and plug, HT negative; red braided lead and plug, HT positive 120 V.

V2 and V4 Connections.—These valves are of the Mazda British octal type. The base connections, looking at the underside of the base, and numbering the pins anti-clockwise from the key (when the key is at the bottom of the central spigot) are as follows:—

V2.—1, filament; 2, no pin; 3, anode; 4, G2; 5, G3; 6, metallising; 7, no pin; 8, filament; top cap, G1.

V4.—1, filament; 2, no pin; 3, anode; 4, G2; 5, G1; 6, blank; 7, no pin; 8, filament.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW, and turn gang condenser to minimum. Connect signal generator to control grid (top cap) of **V1** and chassis, feed in a 465 KC/S signal, and adjust **C30, C31** and **C32** for maximum output.

IF Filter.—Connect signal generator to **A** and **E** sockets, turn gang to maximum, and feed in the 465 KC/S signal. Adjust **C22** (in **L1** unit inside cabinet) for *minimum* output.

RF and Oscillator Stages.—With gang at maximum, the left-hand edge of the pointer of the wavelength scale should be in line with the white adjustment mark at the extreme right-hand end of the scale. The top edge of the LW station pointer should then be in line with the adjustment mark at the bottom of the LW station scale. The MW station pointer should indicate London Regional when the wavelength pointer has its left-hand edge in line with the 340 m calibration mark.

Connect signal generator to **A** and **E** sockets.

SW.—Switch set to SW, feed in an 18·5 m (16·22 MC/S) signal, tune it in on the set, and adjust **C26** for maximum output, rocking the gang very slightly, if necessary, for optimum results.

MW.—Switch set to MW, tune to 230 m on scale, feed in a 230 m (1,304 KC/S) signal, and adjust **C27,** then **C23,** for maximum output.

LW.—Switch set to LW, tune to 1,100 m on scale, feed in a 1,100 m (272·7 KC/S) signal, and adjust **C28** for maximum output. Feed in a 1,800 m (166·7 KC/S) signal, tune it in, and adjust **C24** for maximum output.

MAINTENANCE PROBLEMS

Incorrect Frame Connections

A PYE S/Q portable came in with the complaint that MW reception was extremely noisy. On test this proved to be the case, although LW reception was above suspicion.

The set was removed from the cabinet, but extensive testing revealed nothing out of the ordinary, so it was decided to connect up everything outside the cabinet to facilitate tests. I was connecting the four different coloured leads from the frame aerial to the screws on the chassis and being familiar with this type of receiver, did this from memory, and at the same time spotted the trouble.

To indicate the correct position of the frame leads on this model, each screw on the chassis is marked by a blob of coloured paint by its side, and two of the colours were the reverse of usual practice. Evidently the mistake had occurred in manufacture, and had I not memorised the correct connections, I should probably have spent considerable time in locating the trouble.—R. A. C.

Unusual Gang Breakage

A COSSOR 438 receiver which was supplied to a customer only a few weeks ago, came in with the calibration badly out, and morse signals accompanied all reception. The trouble suggested that the alignment of either the IF or RF circuits had gone adrift in some manner, so the chassis was thoroughly examined for a likely cause of the fault.

Quite by accident the cause was revealed by the finding in the cabinet bottom of what was thought to be a small cachou. This was about to be thrown away when it was noticed that it was extremely hard. Close scrutiny proved it to be a piece of porcelain, and upon looking round, the gang condenser was found to have one of the porcelain stator insulators broken on the oscillator section.

This had resulted in the stator vanes shifting so that they were nearly touching the rotor vanes, thereby causing a change in capacity of this section. Upon fitting a replacement condenser and re-aligning the oscillator and RF circuits all was well again.—R. A. COATES, WHITBY.