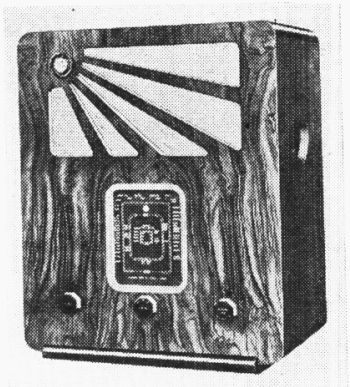
Supplement to The Wireless & Electrical Trader, December 31, 1938

"TRADER" SERVICE SHEET

374

McMICHAEL 373

5-VALVE BATTERY TRANSPORTABLE



A SHORT-WAVE range of 19-50 m is covered by the McMichael 373 5-valve battery 3-band superhet transportable.

Release date: *September*, 1937.

CIRCUIT DESCRIPTION

Input on MW and LW is from independent frame aerial windings **L1** (MW) or **L2** (LW), tuned by **C28.** On SW, the aerial circuit tuning coil **L3** is coupled via **C3** to the low potential ends of **L1, L2** and tuned by **C28.**

First valve (**V1, Mazda metallised VP210**) is a variable-mu pentode operating as RF amplifier.

Tuned-secondary transformer coupling by **L4, L7** (SW), **L5, L8** (MW) and **L6, L9** (LW), tuned by **C31,** between **V1** and triode-pentode valve (**V2, Mazda metallised TP23**) operating as frequency changer with internal coupling. Triode oscillator anode coils **L13** (SW), **L14** (MW) and **L15** (LW) are tuned by **C34**; parallel trimming by **C32** (MW) and **C33** (LW); series tracking by **C10** (MW) and **C11** (LW). Oscillator reaction by grid coils **L10** (SW), **L11** (MW) and **L12** (LW) via damping resistances.

Third valve (**V3, Mazda metallised VP210**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C35, L16, L17, C36** and **C37, L18, L19, C38.**

Intermediate frequency 128·5 KC/S.

Diode second detector is part of double diode triode valve (**V4, Mazda metallised HL21DD**). Audio frequency component in rectified output is developed across load resistances **R11** and **R12,** that at their junction being tapped and passed via gramophone jack-switch **S29,** AF coupling condenser **C19,** manual volume control **R14** and CG stopper **R15** to CG of triode section, which operates as AF amplifier. Provision for connection of gramophone pick-up across **R14.** IF filtering by **C17, C18** and **C21.**

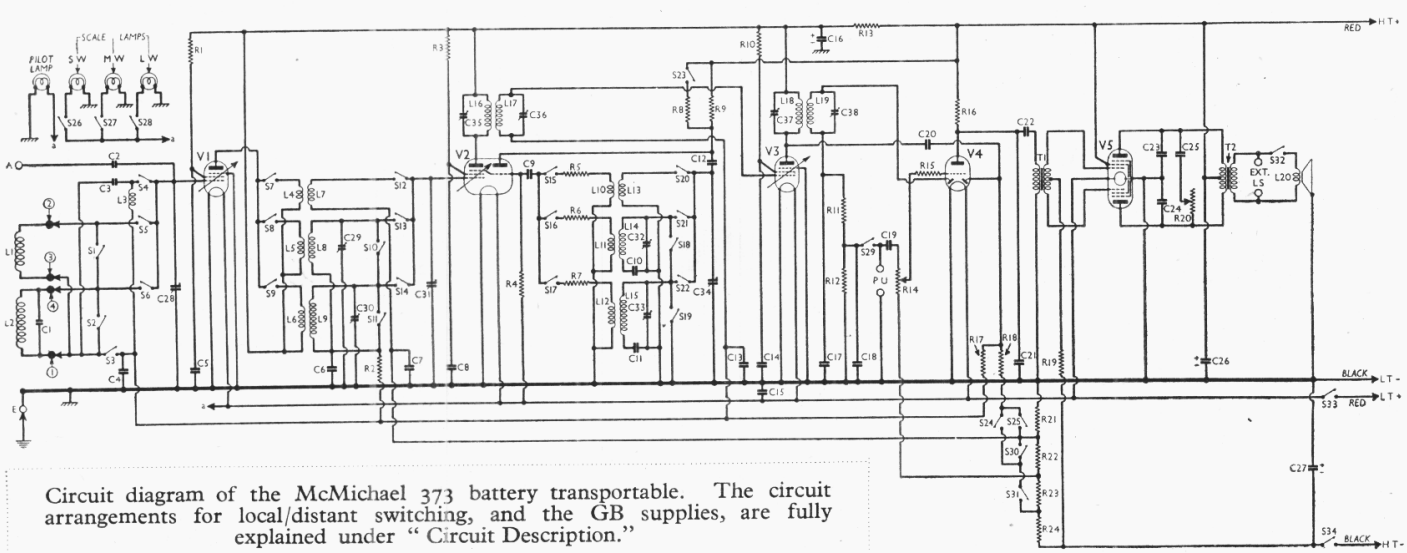
Second diode to **V4,** fed from **V3** anode via **C20,** provides DC potential which is developed across load resistance **R18** and fed back through decoupling circuits as GB to RF (on all bands), FC (except on SW) and IF valves, giving A.V.C.

Parallel-fed transformer coupling by **R16, C22** and **T1** between **V4** triode and double pentode QPP output valve (**V5, Mazda QP230**). Fixed tone correction by **C23** and **C24.** Variable tone control by **C25** and **R20** connected in series between the two anodes. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T2.**

Grid bias potentials for all valves, and AVC delay voltage, are automatically developed across potentail divider formed by resistances **R21, R22, R23** and **R24** in HT negative lead to chassis. Fixed GB for **V1** on all bands, **V2** pentode on MW and LW only, and **V3** is obtained from the common side of switches **S24, S25** and applied via **R17** and **R18. S25** closes on SW and thus **R18** is connected to the junction of **R21** and **R22**; **S24** closes on MW and LW to connect **R18** to the common side of the local/distant switch comprising **S30** and **S31,** so that on these bands the fixed GB and AVC delay can be changed from normal (via **S30**) for distant reception, to a less sensitive position (via **S31**) for local reception. On SW only, GB for **V2** pentode section is fixed at the junction of **R21, R22,** while on all the RF and IF stages the local/distant switch is inoperative on the SW band as **S24** is then open, and **S25** closed.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 SG HT feed	100,000
R2	V2 pentode CG decoupling	500,000
R3	V2 SG HT feed	60,000
R4	V2 osc. CG resistance	50,000
R5	Osc. SW reaction damping	20
R6	Osc. MW reaction damping	1,000
R7	Osc. LW reaction damping	1,000
R8	V1 osc. anode HT feed resistances	50,000
R9		25,000
R10	V3 SG HT feed	100,000
R11	V4 signal diode load resistances	100,000
R12		500,000
R13	V1, V2 pent. and V3 HT feed	5,000
R14	Manual volume control	1,000,000
R15	V4 triode grid stopper	100,000
R16	V4 triode anode load	30,000
R17	AVC line decoupling	1,000,000
R18	V4 AVC diode load	1,000,000
R19	V5 CG's decoupling	100,000
R20	Variable tone control	100,000
R21	Automatic grid bias and AVC delay potential divider resistances	100
R22		20
R23		450
R24		400

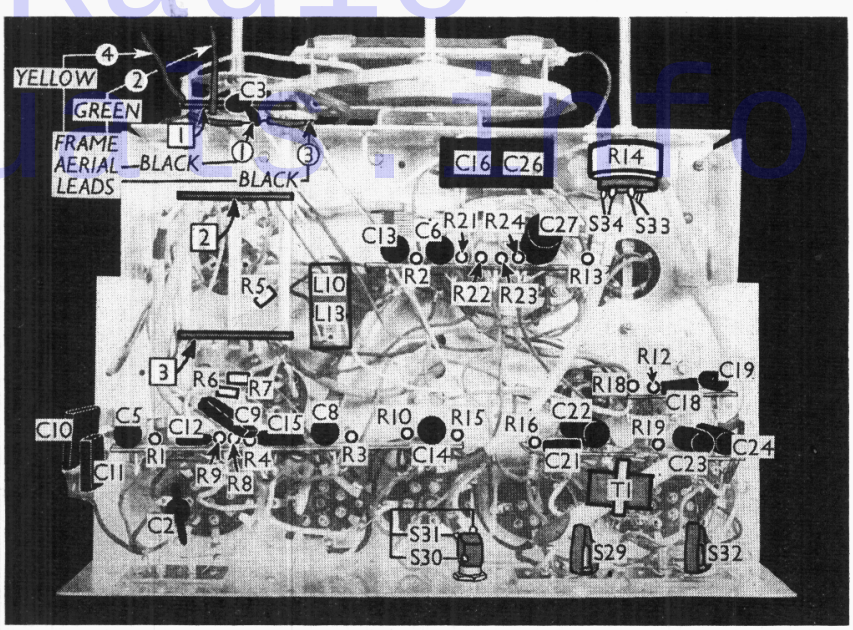


Circuit diagram of the McMichael 373 battery transportable. The circuit arrangements for local/distant switching, and the GB supplies, are fully explained under "Circuit Description."

	CONDENSERS	Values (μF)
C1	LW frame aerial trimmer	0·00001
C2	External aerial coupling	0·00001
C3	Frame aerial SW coupling	0·00001
C4	V1 CG decoupling	0·01
C5	V1 SG decoupling	0·1
C6	V2 pentode CG MW and LW decoupling	0·1
C7	V2 pent. CG SW decoupling	0·1
C8	V2 SG decoupling	0·1
C9	V2 osc. CG condenser	0·0002
C10	Osc. circuit MW tracker	0·00223
C11	Osc. circuit LW tracker	0·000179
C12	V2 osc. anode coupling	0·0001
C13	V3 CG decoupling	0·1
C14	V3 SG decoupling	0·1
C15	LT circuit RF by-pass	0·01
C16*	V1, V2 pent. and V3 HT reservoir	8·0
C17	IF by-pass condensers	0·0001
C18	IF by-pass condensers	0·0001
C19	AF coupling to V4 triode	0·005
C20	Coupling to V4 AVC diode	0·0001
C21	V4 triode anode IF by-pass	0·0003
C22	AF coupling to T1	0·1
C23	Fixed tone correctors	0·001
C24	Fixed tone correctors	0·001
C25	Part of variable tone control	0·01
C26*	HT reservoir condenser	8·0
C27*	Auto GB circuit by-pass	50·0
C28†	SW and frame aerial tuning	—
C29‡	RF trans. sec. MW trimmer	—
C30‡	RF trans. sec. LW trimmer	—
C31†	RF transformer sec. tuning	—
C32‡	Osc. circuit MW trimmer	—
C33‡	Osc. circuit LW trimmer	—
C34†	Oscillator circuit tuning	—
C35‡	1st IF trans. pri. tuning	—
C36‡	1st IF trans. sec. tuning	—
C37‡	2nd IF trans. pri. tuning	—
C38‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Frame aerial windings	2·0
L2	Frame aerial windings	26·0
L3	SW aerial tuning coil	Very low
L4	RF trans. SW primary	0·3
L5	RF trans. MW primary	4·75
L6	RF trans. LW primary	5·25
L7	RF trans. SW secondary	Very low
L8	RF trans. MW secondary	2·0
L9	RF trans. LW secondary	19·5
L10	Oscillator SW reaction	7·0
L11	Oscillator MW reaction	3·0
L12	Oscillator LW reaction	5·5
L13	Osc. circuit SW tuning coil	0·25
L14	Osc. circuit MW tuning coil	2·7
L15	Osc. circuit LW tuning coil	13·0
L16	1st IF trans. Pri.	40·0
L17	1st IF trans. Sec.	40·0
L18	2nd IF trans. Pri.	40·0
L19	2nd IF trans. Sec.	40·0
L20	Speaker speech coil	3·0
T1	Intervalve trans. Pri.	650·0
T1	Intervalve trans. Sec., total	5,000·0
T2	Speaker input trans. Pri., total	600·0
T2	Speaker input trans. Sec.	0·2
S1-S25	Waveband switches	—
S26-28	Scale lamps switches	—
S29	Gram pick-up jack-switch	—
S30, 31	Local/distant switches	—
S32	Internal speaker jack-switch	—
S33	LT circuit switch ganged	—
S34	HT circuit switch ganged R14	—



Under-chassis view. The switch units are shown in detail in col. 3 overleaf. Note the jack switches **S29** and **S32**, and the local/distant switches **S30, S31.**

DISMANTLING THE SET

It is possible to remove the chassis, speaker and frame aerial as a complete assembly.

Removing Assembly.—Remove the three control knobs at the front of the cabinet and the one at the right-hand side (pull off). Next remove the tone control from the side of the cabinet (nut), free the battery leads from the cleat on the battery platform and remove the platform.

Then remove the nuts and washers from the four screws holding the cross-bar to the brackets on the sides of the cabinet, and the four bolts (with washers) holding the chassis to the bottom of the cabinet. After disconnecting the earthing lead from the tone control to the screen on the side of the cabinet (round-head wood screw) the complete assembly can be withdrawn.

When replacing, make sure that there is a distance piece on each of the screws holding the cross-bar to the cabinet, between the frame and the cross-bar.

If it is necessary to remove the chassis from the assembly, unsolder from the frame aerial terminal strip the green, yellow and black leads and the condenser connected to the left-hand tag, and free the speaker and pilot lamp leads from the cleat on the side of the frame aerial and unsolder them.

Next remove the four screws (with lock washers) holding the front and back of the chassis to the cross-bars underneath it and remove the bars (four countersunk-head bolts with nuts). Finally, remove the four bolts (with nuts and washers) holding the sides of the chassis to the frame aerial.

When replacing, connect the frame leads as follows, numbering the tags from left to right: 1, black lead and free end of **C3**; 2, green; 3, free end of black lead; 4, yellow. Connect the speaker leads as follows, numbering the tags from bottom to top:—1, yellow; 2, red; 3, green; 4, blue; 5, white; 6, yellow. The white/red lead goes to the pilot lamp and the black lead goes to the tag on the speaker frame and continues on to the pilot lamp.

Removing Speaker.—To remove the speaker from the cabinet remove the nuts and washers from the four screws holding the cross-bar to the brackets on the sides of the cabinet and the four countersunk-head wood screws holding the cross-bar to the frame aerial. Then unsolder the leads and slacken the four clamps holding the speaker to the sub-baffle and swivel them out of the way.

When replacing, see that the transformer is on the left and connect the leads as follows, numbering the tags from bottom to top:—1, yellow and the yellow lead from the tone control; 2, red; 3, green; 4, blue; 5, white; 6, yellow and the free end of **C25.** The two black leads go to the tag on the speaker frame, the longer continuing on to the pilot lamp.

Before fixing the cross-bar to the brackets on the sides of the cabinet make sure that there is a distance piece on each of the screws.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with a new HT battery reading 123 V on load. The receiver was tuned to the lowest wavelength on the medium band and both the volume and sensitivity controls were at maximum (the latter down), but there was no signal input.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP210	92	1·6	46	0·4
V2 TP23	92	0·5	44	0·7
	Oscillator			
	53	2·0		
V3 VP210	92	1·4	4‡	0·4
V4 HL21DD	77	0·5	—	—
V5 QP230	112†	0·9	113	1·0

† Each anode.
‡ Will vary considerably according to the meter used.

GENERAL NOTES

Switches.—**S1-S25** are the waveband, and **S26-S28** the scale lamp switches, ganged in three rotary units beneath the chassis, one being outside the front member of the chassis. These units are indicated in our under-chassis view, and

are shown in detail in the diagrams in col. 3.

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

S29 is the pick-up jack switch, at the rear of the chassis, which opens when a pick-up is inserted, and mutes radio.

S30, S31 are the local/distant switches, in a single QMB unit at the rear of the chassis. In the local (L) position, **S30** is *open* and **S31** *closed*, while in the distant (H) position, **S30** is *closed*, and **S31** *open*.

S32 is the internal speaker jack switch, at the rear of the chassis, which opens when the plug is fully inserted.

S33 and **S34** are the QMB battery circuit switches, ganged with the volume control **R14.**

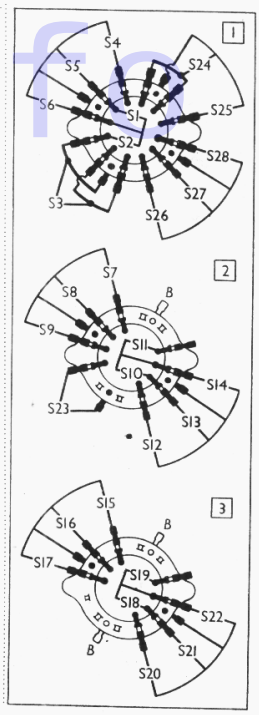
Coils.—**L1** and **L2** are the MW and LW frame aerial windings. **L3,** and **L4, L7** are in two unscreened units on the chassis deck, while **L5, L6, L8, L9 ; L11, L12, L14, L15** and the IF transformers **L16, L17** and **L18, L19** are in four screened units on the chassis deck. Each of these contains two associated trimmers, reached through holes in the tops of the cans, while the last contains in addition **R11, R17, C17** and **C20.**

Scale and Pilot Lamps.—These are four Ever Ready MES types, rated at 2·0 V, 0·1 A. The pilot lamp is inside the frame aerial assembly, and is illuminated when the set is switched on. The scale lamps are switched by **S26-S28,** according to the waveband in use.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2O) external speaker. If the special plug provided is pushed in only slightly, both internal and external speakers will be in use, but on fully inserting the plug, **S32** opens and mutes the internal speaker.

TABLE AND DIAGRAMS OF THE SWITCH UNITS

Switch	SW	MW	LW
S1	C	—	—
S2	—	C	—
S3	—	C	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
S18	C	—	—
S19	—	C	—
S20	C	—	—
S21	—	C	—
S22	—	—	C
S23	C	—	—
S24	—	C	C
S25	C	—	—
S26	C	—	—
S27	—	C	—
S28	—	—	C



Diagrams of the three wavechange and scale lamp switch units, as seen from the rear of the underside of the chassis.

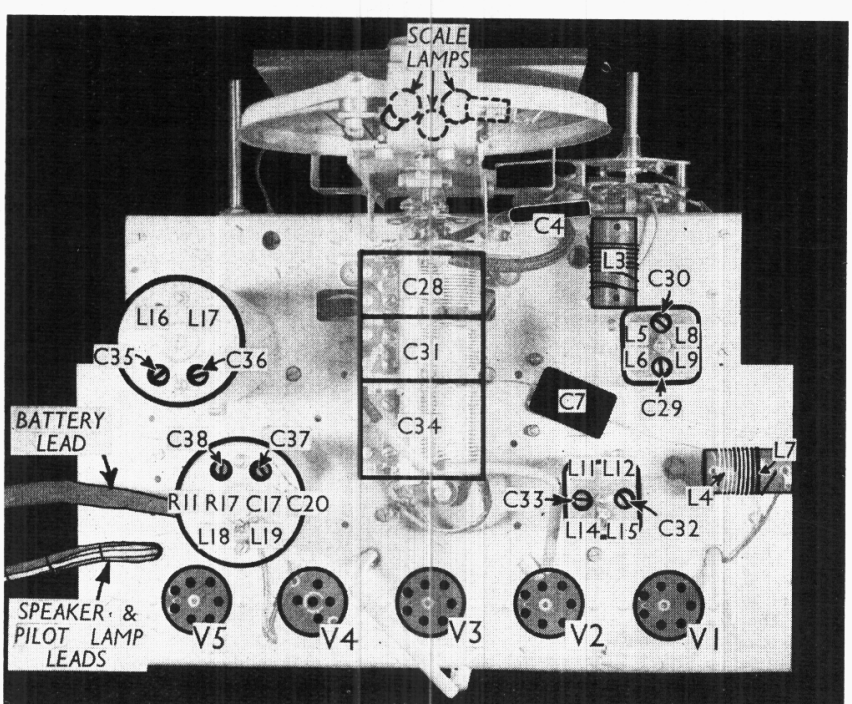
Condensers C16, C26.—There are two 8 μF (120 V peak) dry electrolytic condensers, in a single carton beneath the chassis, having a common negative (black) lead. The red lead to the end of **R13** nearer the chassis deck is the positive of **C16,** while the red lead to the other end of **R13** is the positive of **C26.**

Condenser C1.—This is a disc-type, directly across the tags of **L2** inside the frame assembly, and is therefore not shown in our chassis pictures. It was not included in the makers' diagram.

Batteries.—LT, 2 V 26 AH celluloid-cased cell, Exide PLF5. HT, 120 V dry HT battery, Drydex Yellow Triangle, type H1132. GB is automatic.

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

Components R20, C25.—The tone control components are inside the frame aerial assembly, in series across the two outer tags on **T2** terminal panel. They are not shown in our chassis pictures.



Plan view of the chassis. All the trimmer adjustments are indicated, and it will be seen that **C34,** the oscillator section of the gang, is larger than the others.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to control grid (top cap) of **V2** and chassis. Connect a 0·1 μF condenser across **C34** to swamp the oscillator section of **V2.** Switch set to MW, and turn gang and volume control to maximum.

Feed in a 128·5 KC/S signal, and adjust **C35, C36, C37** and **C38** for maximum output, keeping the input low to avoid AVC action. Finally, remove the 0·1 μF condenser.

RF and Oscillator Stages.—With gang at maximum, the leading edge of the MW tuning light should be in line with the last calibration mark about ⅛ in. from the top end of the MW scale. Adjust it, if necessary, by means of the set screws on the condenser coupling.

Connect the signal generator to a few turns of wire inductively coupled to the frame aerials.

MW.—Switch set to MW, tune to 214 m on scale (short line opposite "Rad. Lyons"), feed in a 214 m (1,400 KC/S) signal, and adjust **C32,** then **C29,** for maximum output.

LW.—Switch set to **LW,** tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust **C33,** then **C30,** for maximum output.

Tracking in this receiver is fixed, and there are no SW alignment adjustments.

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