NUMBER 118 **'TRADER' SERVICE SHEETS**

# McMICHAEL 361

## 3-VALVE A.C. SUPERHET

THE McMichael 361 A.C. superhet receiver has a valve arrangement consisting of a triode-pentode frequency changer, a variable-mu pentode I.F. amplifier and a double diode output pentode. Provision is made for using an extension speaker and a gramophone pick-up and the receiver is suitable for A.C. mains of 200-250 V, 40-100 c.p.s.

### CIRCUIT DESCRIPTION

Aerial input via fixed series condenser **C1,** coupling condenser **C2** and coupling coil **L1** to inductively coupled band-pass filter. Primary, **L2, L3** tuned by **C23**; secondary **L5, L6** tuned by **C25**; image suppression by coil **L4.**

First valve is a triode-pentode (**V1, Mazda metallised AC/TP**) operating as frequency changer with cathode injection. Triode section forms separate oscillator with anode coils **L9, L10** tuned by **C27,** and coupling coils **L7, L8** in common cathode circuit. Tracking by specially shaped condenser vanes. and additional fixed condenser **C10** (L.W).

Second valve, a variable-mu H.F. pentode (**V2, Mazda metallised AC/VP1**), operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **L12, L13** and **L15, L16.**

**Intermediate frequency 128.5 KC/S.**

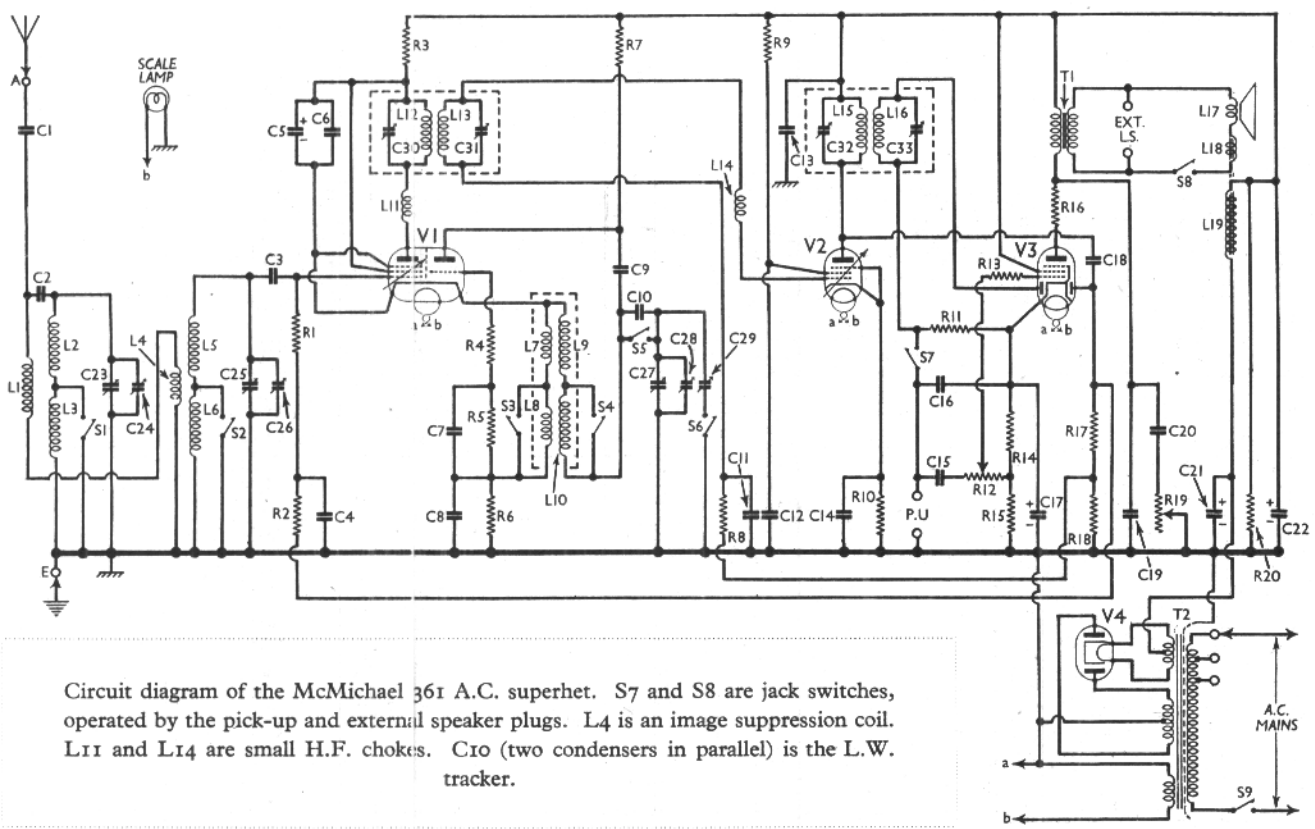
Diode second detector forms part of double diode output pentode (**V3, Mazda AC2/Pen/DD**). Audio-frequency component in rectified output is developed across load resistance **R11** and passed via switch **S7,** coupling condenser **C15,** manual volume control **R12** and I.F. stopper **R13** to C.G. of pentode section. Provision for connection of gramophone pick-up to feed directly into pentode; **S7** prevents radio break-through. Fixed tone correction in **V3** anode circuit by **C19**; variable tone control by R.C. network **R19, C20.** Provision for connection of low-impedance external speaker across secondary of internal speaker transformer **T1.** Switch **S8** breaks internal speaker speech coil circuit.

Second diode of **V3,** fed from **V2** anode via **C18,** provides D.C. potentials which are developed across load resistances **R17, R18** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along **V3** cathode resistances **R14, R15.**

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V4,** Mazda **UU3**). Smoothing by speaker field coil **L19** and dry electrolytic condensers **C21, C22.**

### COMPONENTS AND VALUES

| | Resistances | Values (ohms) |
|---|---|---|
| R1 | V1 pentode C.G. resistance .. | 1,000,000 |
| R2 | V1 pentode C.G. decoupling .. | 1,000,000 |
| R3 | V1 pent. anode and S.G. decoupling .. .. .. | 5,000 |
| R4 | V1 osc. harmonic suppressor.. | 3,000 |
| R5 | V1 osc. C.G. resistance .. | 50,000 |
| R6 | V1 fixed G.B. resistance .. | 750 |
| R7 | V1 osc. anode resistance .. | 60,000 |
| R8 | V2 C.G. decoupling .. .. | 500,000 |
| R9 | V2 S.G. H.T. feed .. .. | 10,000 |
| R10 | V2 fixed G.B. resistance .. | 100 |
| R11 | V3 signal diode load .. .. | 500,000 |
| R12 | Manual volume control .. | 500,000 |
| R13 | V3 C.G. I.F. stopper .. .. | 100,000 |
| R14 | V3 G.B. and A.V.C. delay | 150 |
| R15 | voltage resistances | 350 |
| R16 | V3 anode circuit stabiliser .. | 50 |
| R17 | V3 A.V.C. diode load .. | 500,000 |
| R18 | | 500,000 |
| R19 | Variable tone control .. .. | 100,000 |
| R20 | Speaker field coil bleeder .. | 40,000 |

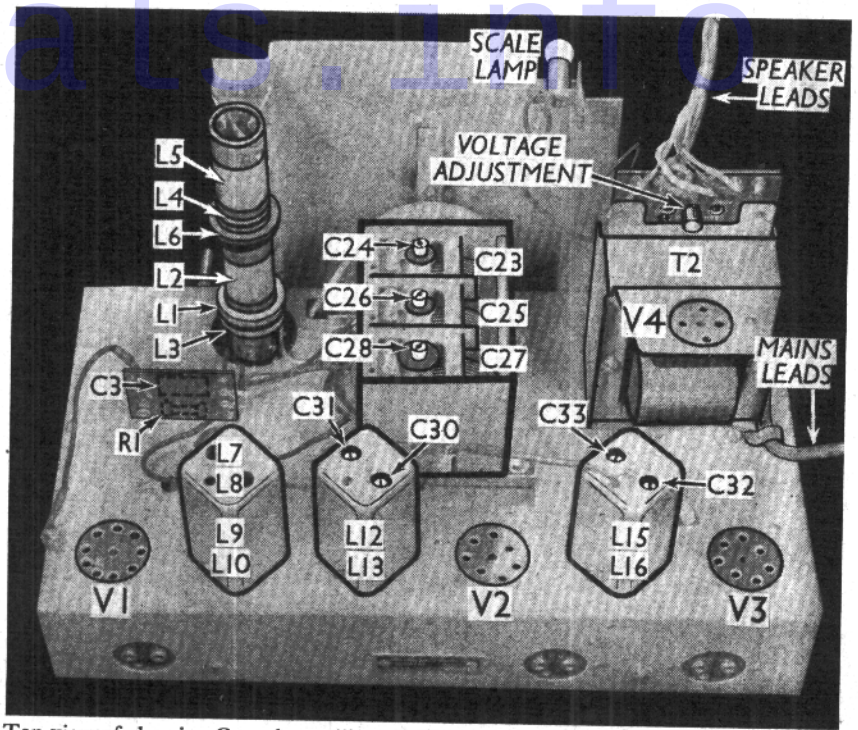



Circuit diagram of the McMichael 361 A.C. superhet. S7 and S8 are jack switches, operated by the pick-up and external speaker plugs. L4 is an image suppression coil. L11 and L14 are small H.F. chokes. C10 (two condensers in parallel) is the L.W. tracker.

| | Condensers | Values (μF) |
|---|---|---|
| C1 | Aerial series condenser | 0·0002 |
| C2 | Aerial coupling | 0·00001 |
| C3 | V1 pentode C.G. condenser | 0·001 |
| C4 | V1 pentode C.G. decoupling | 0·1 |
| C5* | V1 pentode anode and S.G. decoupling | 2·0 |
| C6 | | 0·1 |
| C7 | V1 osc. C.G. condenser | 0·0002 |
| C8 | V1 cathode by-pass | 0·1 |
| C9 | V1 osc. anode condenser | 0·1 |
| C10§ | Oscillator L.W. tracker | 0·00108 |
| C11 | V2 C.G. decoupling | 0·1 |
| C12 | V2 S.G. by-pass | 0·1 |
| C13 | V2 anode decoupling | 0·1 |
| C14 | V2 cathode by-pass | 0·1 |
| C15 | L.F. coupling to vol. control | 0·005 |
| C16 | I.F. by-pass | 0·0001 |
| C17* | V3 cathode by-pass | 25·0 |
| C18 | Coupling to V3 A.V.C. diode | 0·0001 |
| C19 | Fixed tone corrector | 0·002 |
| C20 | Part tone control filter | 0·03 |
| C21* | H.T. smoothing | 8·0 |
| C22* | | 8·0 |
| C23† | Band-pass primary tuning | — |
| C24‡ | Band-pass primary trimmer | — |
| C25† | Band-pass secondary tuning | — |
| C26‡ | Band-pass secondary trimmer | — |
| C27† | Oscillator tuning | — |
| C28‡ | Oscillator M.W. trimmer | — |
| C29‡ | Oscillator L.W. trimmer | — |
| C30‡ | 1st I.F. trans. pri. tuning | — |
| C31‡ | 1st I.F. trans. sec. tuning | — |
| C32‡ | 2nd I.F. trans. pri. tuning | — |
| C33‡ | 2nd I.F. trans. sec. tuning | — |

* Electrolytic. † Variable. ‡ Pre-set.
§ Two condensers in parallel.

| | Other Components | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial coupling coil | 11·0 |
| L2 | Band-pass primary coils | 3·5 |
| L3 | | 12·0 |
| L4 | Image suppression coil | 0·5 |
| L5 | Band-pass secondary coils | 3·5 |
| L6 | | 12·0 |
| L7 | Oscillator coupling coils | 0·5 |
| L8 | | 1·5 |
| L9 | Oscillator tuning coils | 2·0 |
| L10 | | 7·0 |
| L11 | V1 pent. anode S.W. choke | Very low |
| L12 | 1st I.F. transformer Pri. | 68·0 |
| L13 | 1st I.F. transformer Sec. | 68·0 |
| L14 | V2 C.G. S.W. choke | Very low |
| L15 | 2nd I.F. transformer Pri. | 68·0 |
| L16 | 2nd I.F. transformer Sec. | 68·0 |
| L17 | Speaker speech coil | 2·0 |
| L18 | Hum neutralising coil | 0·05 |
| L19 | Speaker field coil | 2,000·0 |



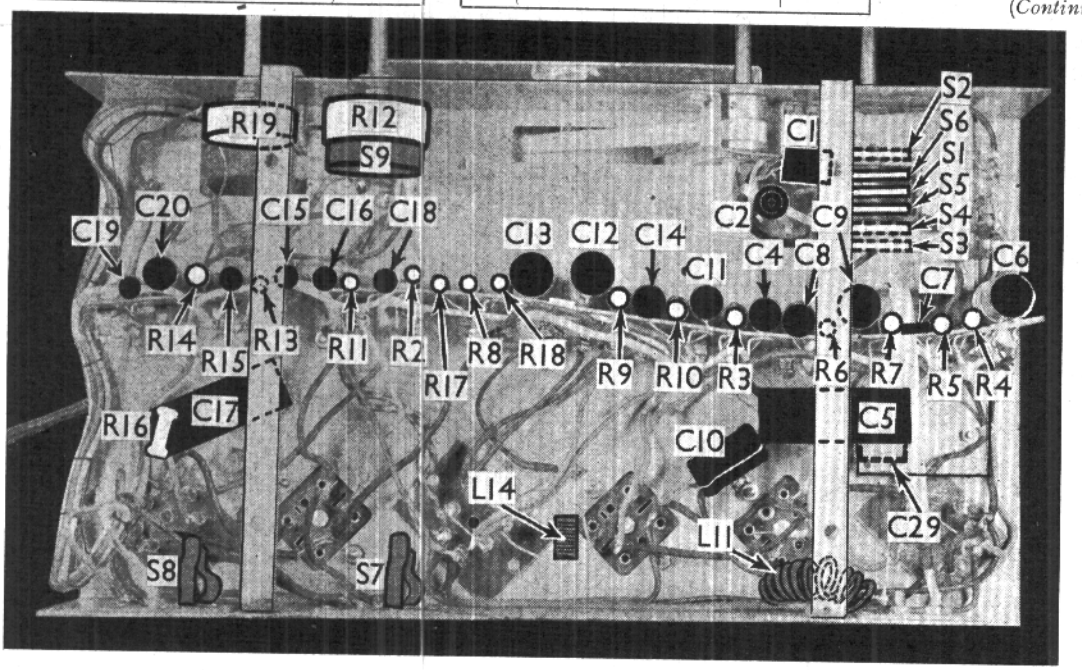

Top view of chassis. C29, the oscillator L.W. trimmer, is not indicated, but is reached through the hole in the chassis seen on the left of the L7-L10 unit. C3 and R1 are behind a small vertical paxolin panel.

| | Other Components (Contd.) | Approx. Values (ohms) |
|---|---|---|
| T1 | Speaker input trans. Pri. | 650·0 |
| | Speaker input trans. Sec. | 0·25 |
| T2 | Mains trans. Pri. total | 30·0 |
| | Mains trans. Heater sec. | 0·05 |
| | Mains trans. Rec. heat. sec. | 0·05 |
| | Mains trans. H.T. sec. total | 600·0 |
| S1-S6 | Waveband switches | — |
| S7 | Gram. pick-up switch | — |
| S8 | Internal speaker switch | — |
| S9 | Mains switch, ganged R12 | — |

## DISMANTLING THE SET

**Removing Chassis.**—Should it be necessary to remove the chassis from the cabinet, first remove the back (four round-head wood screws) and the four control knobs (pull off), taking care not to lose the springs. Now remove the four bolts (with washers) holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn if the back is tilted upwards, to a sufficient extent for normal purposes. *When replacing*, note that the

(*Continued overleaf*)




Under-chassis view. Most of the components are on either side of a long paxolin strip extending across the chassis. The switches are all indicated (some by dotted lines). C29 is beneath C5, and is adjusted through a hole in the chassis deck.

## McMICHAEL 361 (*Continued*)

knobs are marked with their purpose and must be placed on the correct spindles.

To free the chassis entirely, unsolder the leads on the speaker transformer terminal panel. *When replacing*, connect the leads as follow: F, brown; 1, yellow; 2, black; 3, green; 4, white; F, red. The blue lead goes to the speaker frame. It should be noted that one end of the 40,000 Ω resistance and a red lead from one of the 8 μF electrolytic condensers go to the F tag connected to the red lead, the other end of the resistance and the black lead from the condensers go to the speaker frame, and the other red lead from the condenser block goes to the F tag connected to the brown lead.

**Removing Speaker.**—If it is desired to remove the speaker from the cabinet, free the electrolytic condenser from the clip holding it to the sub-baffle and remove the nuts from the three bolts holding the speaker to the sub-baffle. *When replacing*, see that the transformer is at the top.

### VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from mains of 225 V, using the 220 V tapping on the mains transformer. The volume control was at maximum and the set was tuned to the lowest wavelength on the medium band but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

| Valve | Anode Volts | Anode Current (mA) | Screen Volts | Screen Current (mA) |
|---|---|---|---|---|
| V1 AC/TP* | 220 | 5·3 | 220 | 1·7 |
| V2 AC/VP1 | 255 | 13·0 | 216 | 3·1 |
| V3 AC/2Pen/DD | 230 | 32·0 | 255 | 6·6 |
| V4 UU3 | 360† | — | — | — |

* Osc. anode 102 V, 2·1 mA.
† Each anode, A.C.

### GENERAL NOTES

**Switches.**—**S1-S6** are the waveband switches, ganged in a single unit beneath the chassis. Their positions are clearly shown in our under-chassis view, and the table below gives the switch positions for the M.W. and L.W. control settings, O indicating open, and C closed.

| Switch | M.W. | L.W. |
|---|---|---|
| S1 | C | O |
| S2 | C | O |
| S3 | C | O |
| S4 | C | O |
| S5 | C | O |
| S6 | O | C |

**S7** and **S8** are jack switches for pick-up and internal speaker switching. They are both mounted at the rear of the chassis, and are normally closed. On fully inserting the special plugs into the corresponding sockets, the jacks are forced open.

**S9** is the Q.M.B. mains switch, ganged with the volume control, **R12.**

**Coils.**—**L1-L6** are in an unscreened unit on the chassis deck, the individual coils being indicated in our plan chassis view. **L7-L10** are in a screened unit, also on the chassis deck, while the I.F. transformers are in two further screened units.

The chokes **L11** and **L14,** comprising small single layer coils of wire, are beneath the chassis.

**Scale Lamp.**—This is an Osram M.E.S. type, rated at 6.2 V, 0.3 A.

**External Speaker.**—Provision is made at the rear of the chassis for a low resistance (2O) external speaker. A special plug is provided for its connection. By partially inserting the plug into the sockets, both internal and external speakers are in use, but by fully inserting the plug, **S8** opens, and switches off the internal speaker.

**Condensers C21, C22.**—These are two 8 μF dry electrolytics in a single unit, mounted inside the cabinet to the left of the speaker unit. The black lead is the common negative, the red lead to the left "F" tag and one end of **R20** is the positive of **C22,** while the red lead to the right "F" tag is the positive of **C21.**

**Resistance R20.**—This is mounted on the speaker unit, between the left "F" tag and a tag on the frame. It is thus in parallel with **C22.**

**Trimmer C29.**—This is beneath **C5** in our under-chassis view, but is actually adjustable through a hole in the chassis deck close to the **L7-L10** coil unit.

**Condensers C5 and C6.**—**C5** is an electrolytic, and **C6** a paper type, and they are connected in parallel.

**Condenser C10.**—This actually consists of two mica condensers in parallel.

### CIRCUIT ALIGNMENT

**Aligning I.F. Circuits.**—Connect a low reading (say 0-12 V) A.C. voltmeter across the external speaker sockets, to serve as output meter. Switch the set to M.W., and connect across **C27** a 0.1 μF condenser to swamp out the local oscillations. Remove the top cap connection of **V1** and connect in its place the screened lead from the signal generator, the other lead going to chassis.

Set signal generator to 128.5 KC/S and adjust **C33, C32, C31** and **C30** for maximum output, in that order. Keep the input low, to avoid A.V.C. influence. Remove the swamp condenser.

**Aligning Signal Frequency and Oscillator Circuits.**—Turn gang condenser so that large pointer is at bottom of M.W. scale. It should be exactly opposite the "&" in "Bournem'th & Plym'th" when the moving vanes are fully out of mesh. If not, hold the moving vanes fully out, loosen the screws holding the two pointers, and set the large one opposite the "&" and the small one opposite 200 m. Tighten the screws, and rotate gang until large pointer is opposite the "i" in "Radio Lyons."

Inject a 1,400 KC/S (214 m.) signal into A and E sockets, and adjust **C28** for maximum output. Use a weak signal. Two tuning points will be found, the correct one being that with the trimmer screw in the slacker position.

Now adjust **C26** and **C24** for maximum output, reducing input if necessary.

Switch receiver to L.W., and tune to 1,000 m. by small pointer (large pointer will be over "Newcastle.") Inject a 300 KC/S signal, and adjust **C29** through hole in chassis deck for maximum output

# HINTS AND PROBLEMS

(*Continued from page* IV)

## Hum Due to Displaced Wiring

A customer with an A.C. straight 4 V set who recently had had a new volume control fitted sent in a complaint that loud humming was present on all stations. After testing the smoothing circuits in vain, I examined the wiring to the new volume control and while moving this, noticed that the hum had stopped. I then found that the wires had been lying adjacent to other wiring carrying A.C., from which they had evidently picked up the hum.—N. S.

## Gang Condenser Trouble

I read with much interest E.L.'s account of the trouble he experienced in an Ekco AD65 receiver in the April 25 issue of "Radio Maintenance," as I myself had a very similar experience with the self-same model. The symptoms were identical, i.e., crackling badly on all stations with the noise becoming worse upon touching the condenser control.

I took the chassis out of the bakelite cabinet, and upon testing the gang condenser found the oscillator section had a variable short as the control was operated.

On taking out the condenser unit and testing this outside the chassis no trace whatever could be found of the short, and the vanes were quite evenly spaced with little or no dust in between.

I suspected contact resistance might be the cause of the crackling, but an ohmmeter connected between the moving vanes and the frame gave zero ohms, so the condenser was refitted and again the trouble was experienced.

I took it out a second time and again examined and tested everything with the same result as before. Those who are familiar with this model will probably know that the condenser is insulated against vibration by rubber bushes, and this point made me decide to fit a lead from the chassis to the condenser frame.

To my relief this cured the trouble, but to this day I have not discovered why, because there was no intermittent connection as far as I could ascertain between the holding bolts which pass through the rubber bushes and the chassis, nor was there any adjacent component touching the condenser which might account for the trouble, so it will remain an unsolved mystery to me.—R. A. C.

[NOTE.—We cannot understand why the oscillator section should have shown a "variable short" when the condenser was tested on the chassis.—TECH. ED.]