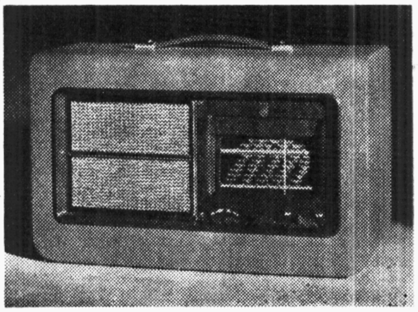
"TRADER" SERVICE SHEET

504

PHILIPS 229B

ALL-DRY PORTABLE



The Philips all-dry battery superhet portable receiver.

ALL-DRY type valves with 1.4V filaments are employed in the Philips model 229B 2-band 4-valve superhet portable.

Separate HT and LT units are used, and the LT unit is connected by a plug and socket. Provision is made by a single turn of wire in the frame winding for an external aerial if required. Grid bias is automatic. Disc-type control knobs are fitted, and they need not be disturbed when dismantling the receiver.

Release date : June, 1940.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L2** (MW), plus **L3** (LW), and the tuning condenser **C26** precedes the frequency changer valve **(V1, Mullard metallised DK1),** a heptode operating with electronic coupling.

Provision for connection of external aerial via the coupling coil **L1,** which is tapped into **L3** for LW coupling. An earth socket is also provided.

Oscillator control grid coils **L4** (MW), plus **L5** (LW), are tuned by **C27.** Parallel trimming by **C5, C28** (MW) and **C6, C29** (LW); series tracking by **C8** (MW) and **C7,** in series with **C8,** (LW). Reaction from oscillator anode via coupling coils **L6** (MW) and **L7** (LW).

Second valve **(V2, Mullard metallised DF1)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary iron-cored transformer couplings **C2, L8, L9, C3** and **C14, L10, L11, C15.**

The tuning condensers are fixed, and alignment tuning is carried out by adjusting the positions of the iron-dust cores.

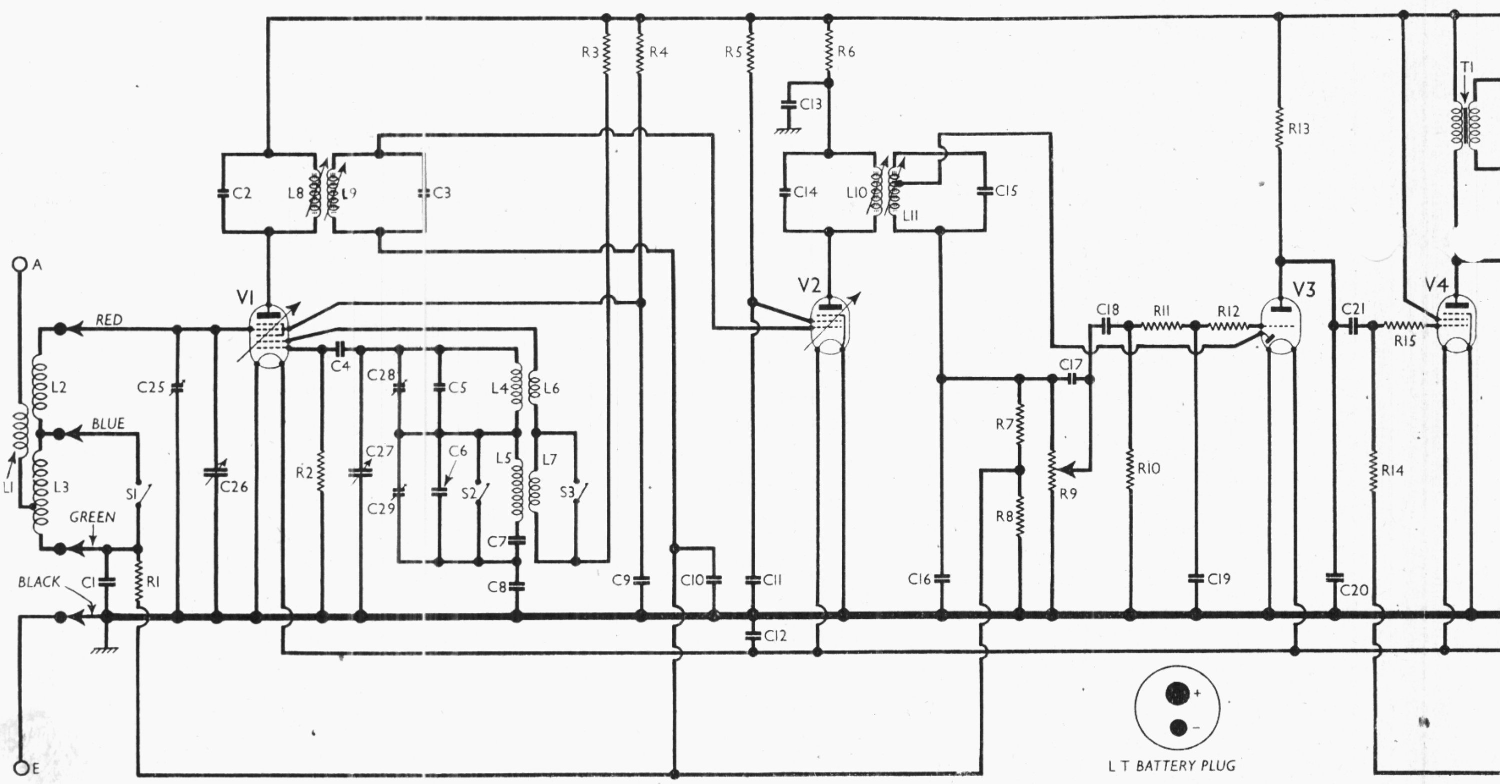
Intermediate frequency 470 KC/S.

Diode second detector is part of single diode triode valve **(V3, Mullard metallised DAC1),** fed from a tapping on **L11.** Audio frequency component in rectified output is developed across manual volume control **R9,** which also operates as load resistance, and passed via AF coupling condenser **C18,** CG resistance **R10** and IF filter circuit comprising resistances **R11, R12** and the condenser **C19,** to control grid of triode section, which operates as audio frequency amplifier.

IF filtering by **C16** in the diode circuit, the filter referred to above in **V3** triode control grid circuit and **C20** in the triode anode circuit.

DC potential developed across **R9** appears also across the potential divider comprising resistances **R7** and **R8,** which are connected across **R9,** and is tapped at their junction and fed back through decoupling circuits as GB to frequency changer and IF valves, giving automatic volume control. Since the same diode is used to rectify the signal and to provide AVC, no delay voltage is imposed on the circuit, and the diode end of the filament is taken to chassis.

Resistance-capacity coupling by **R13, C21** and **R14,** via grid stopper **R15,** between **V3** triode and pentode output valve **(V4, Mullard DL2).** Fixed tone correction by **C22** in anode circuit. No provision is made for the connection of an external speaker, but one of low impedance could



Circuit diagram of the Philips 229B portable all-dry superhet. An accumulator may be used if desired, as explained in "General Notes." Pr earth connections via the coupling winding L1. The frame aerial connections are indicated in the diagram. Diagrams of the base connectio the right of the circuit diagram.

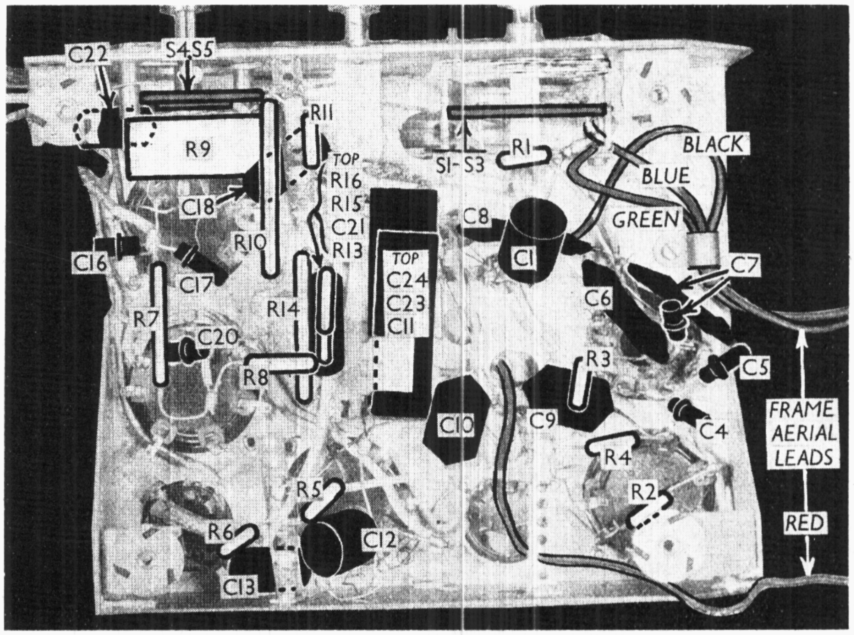
be connected across the speech coil tags of the internal speaker.

Grid bias potential for **V4** is obtained automatically from drop along **R16** in the negative HT lead to chassis. This automatic GB circuit is by-passed by an electrolytic condenser **C24**, while a second electrolytic condenser **C23** forms an HT reservoir.

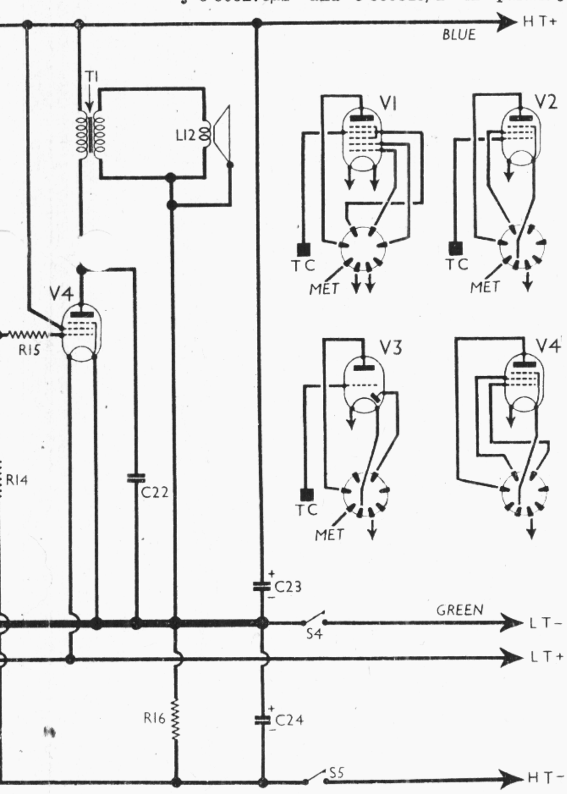
COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	V1 pentode CG decoupling	0·056
C2	} 1st IF transformer tuning {	0·000097
C3	} condensers ... ... {	0·000091
C4	V1 osc. CG condenser ...	0·00027
C5	Osc. circ. MW fixed trimmer	0·000033
C6	Osc. circ. LW fixed trimmer	0·00012
C7	Osc. circuit LW tracker...	0·000291§
C8	Osc. circuit MW tracker...	0·00063
C9	V1 SG decoupling ...	0·056
C10	V2 CG decoupling ...	0·056
C11	V2 SG decoupling ...	0·056
C12	LT circuit RF by-pass ...	0·056
C13	V2 anode decoupling ...	0·01
C14	} 2nd IF transformer tuning {	0·000097
C15	} condensers ... ... {	0·000103
C16	IF by-pass	0·0001
C17	Tone compensator ...	0·000082
C18	AF coupling to V3 triode	0·0056
C19	Part of IF filter circuit ...	0·0001
C20	IF by-pass ...	0·0001
C21	V3 triode to V4 AF coupling	0·0056
C22	Fixed tone corrector ...	0·0022
C23*	HT circuit reservoir ...	8·0
C24*	V4 GB circuit by-pass ...	50·0
C25‡	MW frame aerial trimmer	0·00003
C26†	Frame aerial tuning ...	0·00049
C27†	Oscillator circuit tuning...	0·00049
C28‡	Osc. circuit MW trimmer	0·00003
C29‡	Osc. circuit LW trimmer	0·00003

* Electrolytic. † Variable. ‡ Pre-set. § 0·000276μF and 0·000015μF in parallel.



Under-chassis view. The connections of the frame aerial leads can be gauged approximately, while the colours marked agree with those in the circuit diagram.



	RESISTANCES	Values (ohms)
R1	V1 pentode CG decoupling	100,000
R2	V1 osc. CG resistance ...	100,000
R3	V1 osc. anode HT feed ...	1,000
R4	V1 SG HT feed	56,000
R5	V2 SG HT feed	10,000
R6	V2 anode HT feed ...	2,200
R7	} AVC feed potential divider {	2,200,000
R8	} AVC feed potential divider {	1,000,000
R9	Manual volume control; V3 diode load resistance	1,000,000
R10	V3 triode CG resistance ...	2,200,000
R11	} Parts of IF filter circuit {	100,000
R12	} Parts of IF filter circuit {	100,000
R13	V3 triode anode load ...	1,000,000
R14	V4 CG resistance... ...	2,200,000
R15	V4 grid stopper	100,000
R16	V4 GB resistance... ...	1,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Ext. aerial coupling ...	0·2
L2	} Frame aerial windings ... {	3·0
L3	} Frame aerial windings ... {	9·5
L4	Osc. circ. MW tuning coil	6·5
L5	Osc. circ. LW tuning coil	15·0
L6	Oscillator MW reaction ...	2·5
L7	Oscillator LW reaction ...	5·0
L8	} 1st IF trans. { Pri. ...	7·0
L9	} 1st IF trans. { Sec. ...	7·0
L10	} 2nd IF trans. { Pri. ...	7·0
L11	} 2nd IF trans. { Sec., total.	7·0
L12	Speaker speech coil ...	3·0
T1	Output trans. { Pri. ...	600·0
	Output trans. { Sec. ...	0·6
S1-S3	Waveband switches ...	—
S4	LT circuit switch } ganged R9	—
S5	HT circuit switch } ganged R9	

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 6) are those measured in our receiver when it was operating with a new HT battery reading 90V on load.

The receiver was tuned to the lowest wavelength on the medium wave band and the volume control was at maximum, but the frame aerial leads were disconnected and connected together, so that 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 DK1	{ 82	0.5 }	36	0·74
	{ Oscil	lator }		
	{ 79	1·0 }		
V2 DF1	77	1·4	76	0·35
V3 DAC1	14	0·04	—	—
V4 DL2	80	3·6	82	0·7

DISMANTLING THE SET

Removing Chassis.—Remove the smaller bakelite escutcheon which surrounds the tuning scale (four counter-sunk head screws, one in each corner at front of the carrying case);

unsolder the three leads from the frame aerial tags on the hinged flap forming the back cover of the case, and one lead from the earth socket;

remove the cleat holding these leads to the bottom of the case (one round-head wood screw);

unsolder from the speaker transformer the leads connecting it to the chassis;

remove the four cheese-head screws holding the chassis to the bottom of the case.

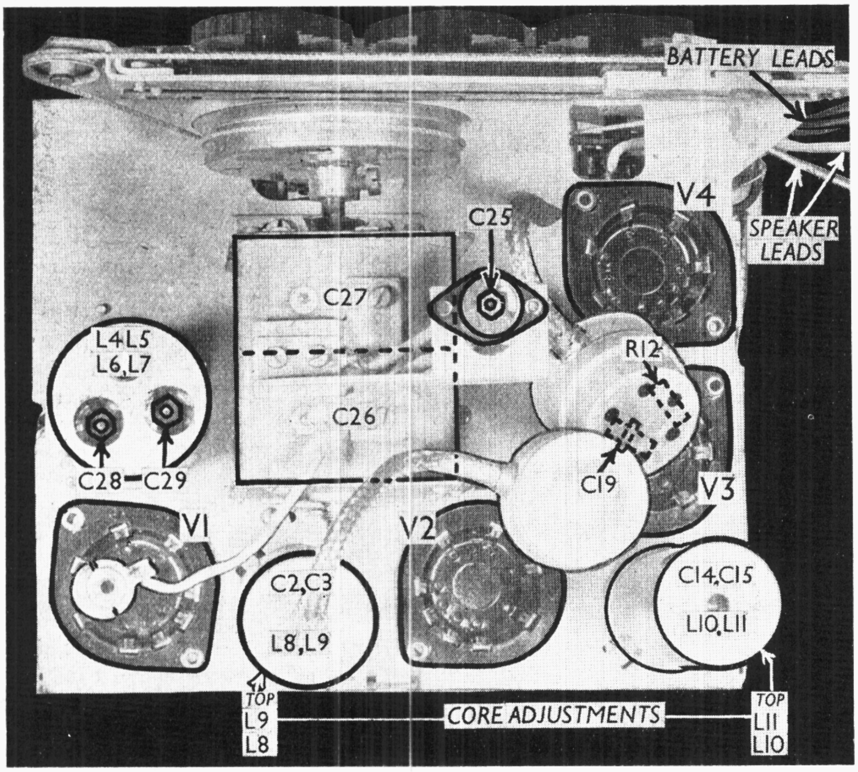
When replacing, connect the screened speaker lead to the left-hand tag at the rear of the speaker transformer, and the screening strip to the left-hand tag at the front;

connect the plain yellow lead to the right-hand tag at the rear of the transformer.

Connect the frame aerial leads as follows, viewing the receiver from the rear, with the hinged flap lying flat, and numbering the four tags on it from left to right :

1, red;
2, blue;
3, no external connection;
4, green.

Notes." Provision is made for external aerial and
se connections of the four valves are shown on



Plan view of the chassis. The positions of the three pre-set trimmers and the IF transformer core adjustments are indicated.

Connect the remaining (black) lead to the earth socket.

Do not omit to refix the small paper cover over the two right-hand tags.

Removing Speaker.—Unsolder from the three speech coil tags the two leads connecting them to the transformer;

remove the three nuts (with washers) holding the speaker to the sub-baffle.

When replacing, the speech coil connecting panel should be on the right.

Connect the yellow lead from the right-hand front tag on the transformer to the bottom speech coil tag;

connect the bare wire from the left-hand front tag on the transformer to the two upper speech coil tags.

GENERAL NOTES

Switches.—S1-S3 are the waveband switches, in a single disc-type rotary unit mounted on the front member of the chassis. All three switches are closed in the MW position (anti-clockwise position of the control knob) and open in the LW position.

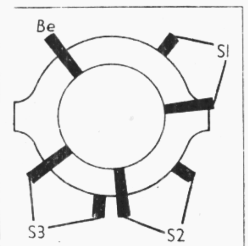
The position of the unit is indicated in our under-chassis view, and shown in detail in the diagram (col. 2), where it is drawn as seen when viewed from the rear of the underside of the chassis.

The only remaining switches in the receiver, **S4** and **S5**, are the LT and HT circuit switches respectively; they are mounted on the front of the volume control **R9** and are controlled by its spindle, opening in the usual way when the control knob is turned to the minimum position. Both switches are in the negative leads of their respective circuits.

Coils.—L1, L2, L3 are the frame aerial windings. They are wound on moulded supports inside the back cover of the carrying case, and are not shown in our chassis illustrations. The connections are brought out to four tags and the aerial socket, the latter taking the free end of **L1.** The connections are as follows, numbering from left to right while viewing the tags from the rear of the cabinet, with the flap down: 1 (red), to top of **L2** (spaced winding of enamelled wire); 2 (blue), junction of **L2** and **L3** (bunched winding of cotton-covered wire); 3, junction of single turn **L1** and tapping on **L3;** 4 (green), bottom end of **L3.** A black lead from chassis goes to the earth socket.

The oscillator coils **L4-L7** are contained in a screening can mounted on the chassis deck with their associated pre-set trimmer condensers. The fixed trimmer and tracker condensers are fitted beneath the chassis.

Diagram of the switch unit, as seen when viewed from the rear of the underside of the chassis.



L8, L9 and **L10, L11** are the IF transformers, mounted in screening cans on the chassis deck. Their fixed tuning condensers are also in the cans. The two units are shown in our plan view of the chassis, where the positions of the moveable iron-dust core adjustments are approximately indicated.

External Speaker.—No provision is made for this, but one of low impedance (about 4-5 O) could be connected to the two lower tags on the internal speaker speech coil connecting panel.

Pre-set Condensers.—There are only three pre-set condensers in the receiver, and their positions are all indicated in our plan view. They are adjusted and then fixed by wax. When re-adjusting them, the wax should first be softened by the application of a warm screwdriver or soldering iron, and after adjustment they should again be sealed with wax.

Batteries.—LT, Ever Ready All-dry No. 1, 1.5 V; HT, Ever Ready type Portable 61, 90 V. The LT unit is provided with a two-pin socket, the larger pin being positive. The unit is held in the receiver in a metal frame, which in turn is fitted into two lugs on the bottom of the carrying case.

The HT battery stands vertically on one end on the floor of the case, beside the LT unit, with its connecting plugs facing the unit. It is a very close fit, and the only method we found of fitting it was to insert it first, with the positive end at the bottom, then to insert the positive plug, and finally to fit the LT unit and its frame, with its connecting plug in position. The negative HT plug may be inserted in the battery before the latter is fitted into the case. Furthermore, before the HT battery will go into the case, the hinged back cover must be in a hanging position; i.e., in a vertical downward position, not horizontal.

Where it is desired by a customer, a larger LT unit or a portable accumulator can be substituted for the existing LT unit. The additional space can be obtained simply by removing the two right-angle brackets which are secured to the battery frame by one screw each, and in the case of a larger dry unit the substitution can be made right away.

In the case of the accumulator, however, a voltage-dropping resistance must be interposed in one of the LT leads before the accumulator is connected, otherwise the valves will be damaged. The value of the resistance must be 2 ohms, and it must be capable of carrying 0.3 A continuously; it should be rated, therefore, at not les than 0.2 watt. The L.T. leads would, of course, have to be appropriately terminated with spade tags.

A special resistance coupling lead (code No. MK.796.000) can be supplied for the purpose from the makers' Sales Department, Century House, Shaftesbury Avenue, London, W.C.2.

Battery Leads and Voltages.—The LT leads terminate in a two-pin plug, which fits into a pair of sockets in the LT unit container. The positive is the larger pin of the two.

The black lead with a green plug is HT negative, and the lead with a blue paint mark and a blue plug is HT positive 90 V. Grid bias is automatic.

Chassis Divergencies.—C6 in our chassis was 0.00012 μF, whereas in the makers' manual it is given as 0.00011. **C7** in our chassis was composed of two condensers in parallel, one 0.000276 μF and one 0.000015μF; in the makers' manual this is indicated as a single 0.00029 μF condenser.

CIRCUIT ALIGNMENT

IF Stages.—Remove control grid (top cap) connector of **V1**, and connect a 50,000 O resistance between the control grid and the AVC line. Switch set to MW, turn gang to minimum and volume control to maximum. Connect signal generator via a 0.032 condenser to control grid and chassis.

Feed in a 470 KC/S (638.3 m) signal, connect a shunt, consisting of a 10,000 O resistance and a 0.1 μF condenser connected in series, between **V2** anode (pin 8) and chassis, and adjust the core of **L11** for maximum output. Remove the damping shunt, connect it between **V3** diode anode (pin 6) and the top of the volume control, and adjust the core of **L10** for maximum output.

Remove the damping shunt, connect it between **V1** anode (pin 8) and chassis, and adjust the core of **L9** for maximum output. Remove the shunt, connect it between the control grid (top cap) of **V2** and chassis, leaving existing connector in place, and adjust the core of **L8** for maximum output. Remove damping shunt and 50,000 O resistance, and replace top cap connector on **V1**.

RF and Oscillator Stages.—Transfer signal generator to aerial and earth sockets, inserting a standard dummy aerial in the leads. A 15 degree jig (part No. 09.992.440) and an insulated trimming spanner (part No. M.646.565) are required for the following adjustments.

MW.—Set gang to the 15 degree jig, feed in a 1440 KC/S (208 m) signal, and adjust **C28**, then **C25**, for maximum output. Tracking is fixed.

LW.—With the gang still set to the 15 degree jig, feed in a 316 KC/S (950 m) signal, and adjust **C29** for maximum output. Tracking is fixed.

Finally, adjust the scale pointer on the drive cord so that the calibration has a reasonable tolerance at all wavelengths.

SUBSTITUTE FREQUENCY CHANGERS

Replacing Mazda AC/TP Valves with the Later TH41

FOR some time the Mazda AC/TP valve was popular with certain manufacturers, and quite a number of receivers were fitted with it.

Replacements of this type are at present unobtainable, so that it is necessary when replacements are required to find a substitute.

Critical Part of Circuit

Now, frequency changers are sensitive affairs, and sometimes their operating conditions are very critical. Among the seven-pin types, for instance, it may be found that different types such as heptodes, octodes, triode-hexodes and triode-heptodes may be interchanged and the receiver will still operate at a given position on the tuning scale, but that signals will cease at some other part of the scale, or that they do not appear at all on another waveband.

The cause of this is not far to seek. The oscillator circuit is designed round the frequency-changer valve, and when a new type of valve is produced there is a reason for its introduction. New methods of construction, reduced inter-electrode capacities, improved conversion conductance and the elimination of harmonics, among other things, provide the designer with plenty of scope, and often his solution requires a change in valve design, with the result that a new type is required.

Usually, however, a suitable substitution can be made of one valve for another, if a suitable substitute is chosen and the operating voltages are adjusted to suit it; but the advice of the designer is desirable before decisions are made as to modifications and substitution.

Recommended Modifications

Two manufacturers who used the AC/TP were Murphy and Ultra, and we were glad to see in the *Murphy News* for October 12 an article entitled "New Valves for Old," which described the modifications necessary for a change-over from the AC/TP to the TH41 and the TH2620 to the TH233 for all their models so fitted.

We have since approached Ultra Electric Ltd., and obtained their recommendations for their models which used the AC/TP, and it is hoped that by publishing these details we shall be helping many dealers out of a difficulty.

It is unfortunate that when the valve was produced it was fitted with a nine-pin base, and obviously the first requirement is to replace the existing valve-holder with one that suits the new valve. Both firms recommended the Mazda TH41 as the substitute in AC receivers, and this valve is fitted with a Mazda octal base, as is also the TH233.

Murphy Sets Using AC/TP

In the case of Murphy receivers, the recommended procedure is as follows:

Models A24 and A26.—Replace the existing oscillator grid resistance R3 with one of 1,000 O.

Increase the value of the screen resistance R2 to 40,000 O.

Connect a 0.01 μF tubular condenser directly between the screen and cathode sockets.

Remove the link connecting the cathode and suppressor grid, since it is no longer required.

Check alignment of the receiver.

Model A28.—Increase the screen resistance R6 to 40,000 O, and discard the cathode/suppressor connection.

Connect a 0.01 μF tubular condenser directly between screen and cathode sockets.

Check alignment.

Models A39, A34, A36, A38 and A40.—Replace the existing common anode and screen resistance with one of 15,000 O. This resistance is R3 in the A30, R6 in the A34 and R4 in the A36, A38 and A40.

Connect a 0.01 μF tubular condenser directly between the screen and cathode sockets, and discard the cathode/suppressor connection.

Check alignment.

Replacing TH2620 With TH233

Model D26.—Replace the oscillator grid resistance R3 with one of 1,000 O.

Connect a 0.01 μF tubular condenser directly between the screen and cathode sockets.

Insert a 100 O resistance in the lead to the heptode anode, connecting one end of the resistance directly to the anode socket.

Discard the cathode/suppressor connection.

Check alignment.

Models D28, AD32 and D38.—Connect a 0.01 μF tubular condenser directly between the screen and cathode sockets.

Discard the cathode/suppressor connection.

Check alignment.

Models D30, D34 and D36.—In cases where a high-resistance speaker field is fitted, the common feed resistance to the anode and screen should be replaced by one of 6,500 O. This resistance is R3 in D30, and R6 in D34 and D36.

Connect a 0.01 μF tubular condenser directly between the screen and cathode sockets.

Discard the cathode/suppressor connection.

Check alignment.

A 100 O resistance should be fitted as described for the model D26 in any of the foregoing models where instability is observed at the high-wavelength end of the LW band.

It will be noticed that in all models a 0.01 μF condenser is fitted between the cathode and screen sockets. This should be fitted whether there is already one there or not; it should be a non-inductive tubular type, its leads should be as short as possible, and they should be connected directly to the respective sockets, across the valve-holder. The component numbers quoted are those found in Murphy service manuals.

Ultra Sets Using AC/TP

In the following Ultra receivers, the modifications are the same for all models.

Models 25AC, 26, 96, 99 and 101.—Replace the valve-holder with a Mazda octal type.

Replace the pentode anode HT feed resistance by one of 5,000 O.

Replace the fixed GB resistance by one of 200 O.

Replace the 0.0002 μF oscillator coupling condenser by one of 0.002 μF.

Remove the 1,000 O oscillator grid stabilising resistance (R1 in all models).

Check alignment.

Old and New Base Connections

For the convenience of those who are not familiar with the base connections, they are as follows:

AC/TP and TP2620.—Pin 1 (starting at the arrow-head on the valve base, and counting anti-clockwise), heater; 2, cathode; 3, oscillator anode; 4, oscillator grid; 5, metallising; 6, screen; 7, pentode anode; 8, suppressor grid; 9, heater.

TH41 and TH233.—Pin 1, heater; 2, cathode; 3, heptode anode; 4, oscillator anode; 5, oscillator grid; 6, metallising; 7, screen; 8, heater.

When replacing the valve-holder, the simplest method is first to label the connecting leads, then to unsolder them, connecting them again, according to the labels, to the new holder.

Printed in Great Britain by The Cornwall Press Ltd., Paris Garden, London, S.E.1 ★