Supplement to The Wireless & Electrical Trader, October 26, 1940

"TRADER" SERVICE SHEET

490

MARCONIPHONE 895 AND H.M.V. 1406

The Marconiphone 895 portable. The H.M.V. 1406 is similar, but has different colouring.

THE Marconiphone model 895 receiver is a self-contained 5-valve superhet 2-band battery portable. It employs a triode-hexode frequency changer and two tetrode output valves in push-pull.

The carrying case is finished in black leatherette and is furnished with a carrying handle and a turntable.

Mechanical press-buttton tuning for four stations is provided and all the normal controls are fitted with edge-operated discs. No sockets are provided for an external speaker or a gramophone pick-up, but a low impedance speaker can be connected across the speech coil tags.

The H.M.V. model 1406 is identical in every respect except that the controls and lining are picked out in ivory instead of red, but this *Service Sheet* was prepared on a Marconiphone receiver.

Release date: both models, July, 1940.

CIRCUIT DESCRIPTION

On MW, tuned frame aerial input **L1, C24** precedes triode-hexode valve **(V1, Marconi metallised X24)**, which operates as frequency changer with internal coupling.

On LW, the LW loading coil **L2** is connected in series with the MW frame winding **L1** and the pair are tuned by **C24. S1** short-circuits **L2** for MW operation.

V1 triode oscillator grid coils **L3** (MW) and **L4** (LW) are tuned by **C25.** Parallel trimming by **C26** (MW) and **C10, C27** (LW); series tracking by **C8** (MW) in series with **C25,** and **C9,** plus **C8** which is in series on both bands, (LW).

Reaction coupling by coil **L5** (MW) and **C9,** which forms a common coupling impedance in grid and anode circuits, (LW).

Second valve **(V2, Marconi metallised Z21)** is a variable-mu RF tetrode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary iron-dust cored transformer couplings **C28, C5, L6, L7, C6, C29** and **C30, C13, L8, L9, C14, C31.** The cores are fixed, and alignment is carried out by adjusting the capacity of the tuning trimmers.

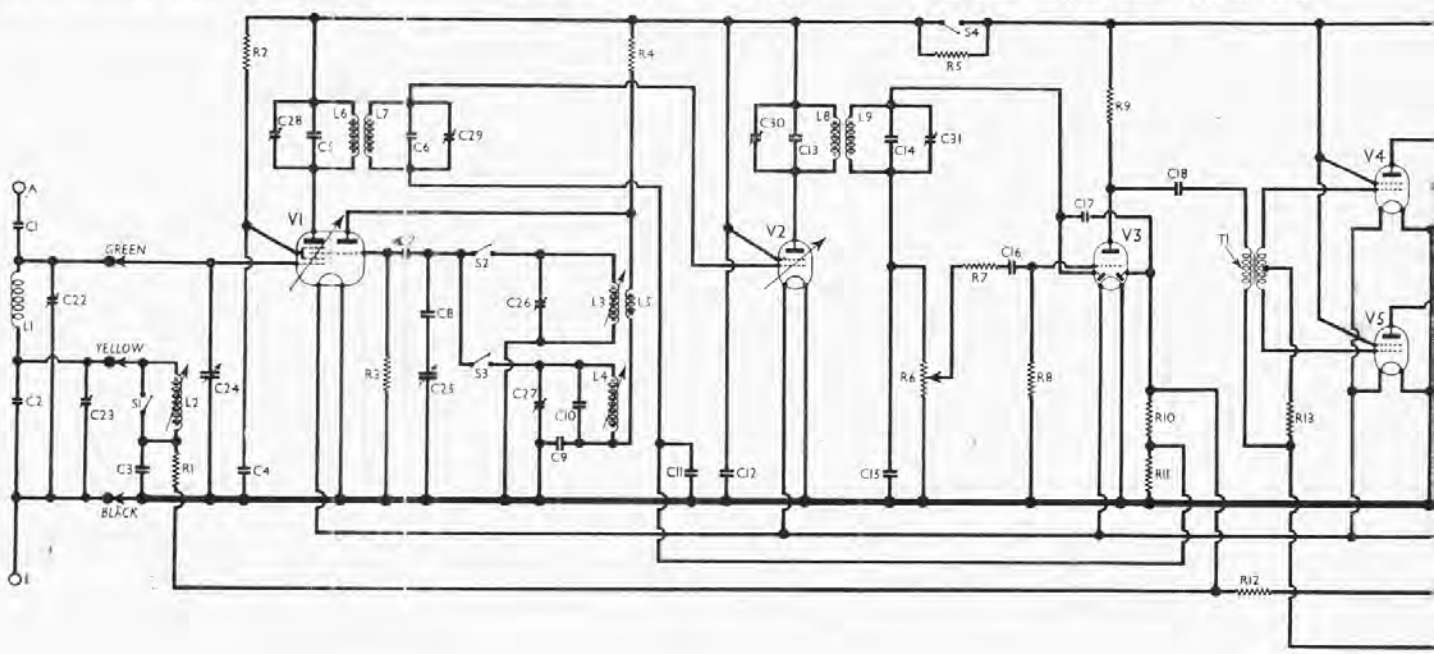
Intermediate frequency 465 KC/S.

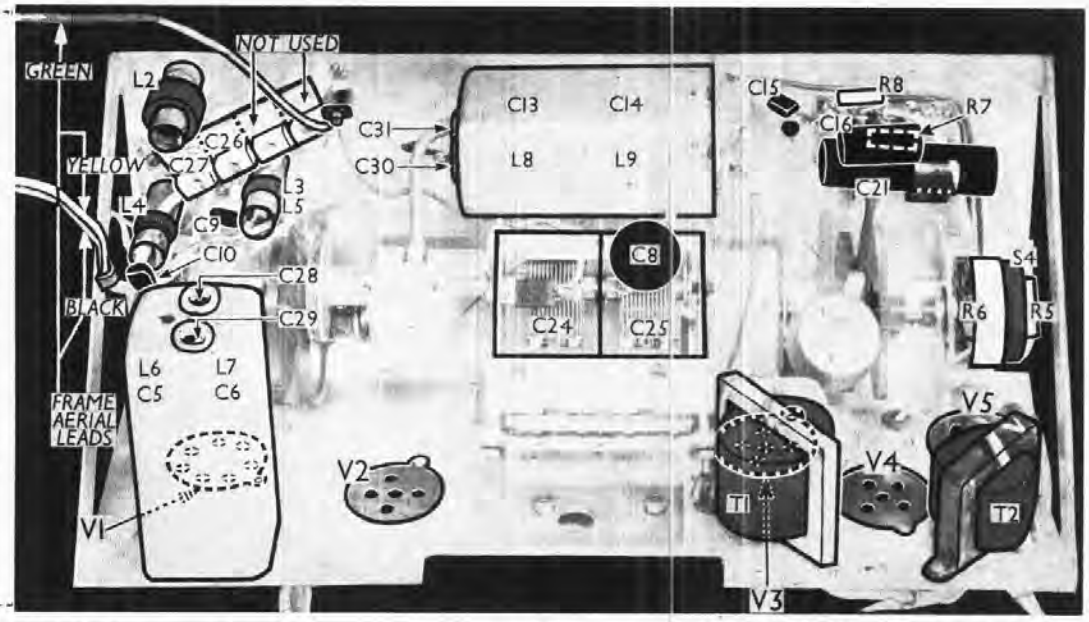
Diode second detector is part of double diode triode valve **(V3, Marconi metallised HD24).** Audio frequency component in rectified output is developed across the manual volume control **R6,** which also operates as load resistance, and passed via grid stopper **R7** AF coupling condenser **C16** and control grid resistance **R8** to CG of triode section, which operates as audio frequency amplifier. IF filtering by **C15** and **R7.**

Second diode of **V3,** fed from **L9** via the small coupling condenser **C17,** provides DC potentials which are developed across load resistances **R10** and **R11** and fed back through decoupling circuits as GB to frequency changer and IF amplifier valves, giving automatic volume control.

Resistance-capacity coupling by **R9, C18** and tapped-secondary intervalve transformer **T1** between **V3** triode and output stage comprising two tetrode valves **(V4, V5, Marconi KT2's)** connected to operate in push-pull. Fixed tone correction by **C19** and **C20** in anode circuits.

Grid bias potential for **V4** and **V5** is tapped off from potential divider comprising resistances **R14, R15** and **R16** which are connected across the GB section of the HT battery. Fixed GB potential for **V1** and **V2** is obtained from a subsidiary potential divider made up of **R12** and the AVC diode load resistances **R10** and **R11,** and connected across **R14.** AVC delay voltage is also derived from this second potential divider and applied to the diode anode from the junction of **R10** and **R12.**





Half-rear view of the chassis. **V1** and **V3** valve holders are shown dotted through other components. The IF trimmers and frame aerial leads are indicated. The adjusting screws of **C26** and **C27** are reached through holes in the chassis and are indicated in the half-front view.

DISMANTLING THE SET

Removing Chassis.—Unsolder the three leads from the tags on the frame aerial connecting assembly in the lid of the carrying case;

free the frame aerial leads from the two cleats on the side of the case and from one holding the green lead to the side of the lid;

remove the two small wood screws holding the lower edge of the chassis to the front of the case;

remove the two round-head set-screws (with washers and lock-washers) holding the ends of the chassis to the front of the case, and two further similar screws and washers holding the chassis to the top of the case.

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, slacken the dust-bag covering the speaker, and unsolder the connecting leads from the two tags on the speech coil panel.

When replacing, the yellow speaker lead should be connected to the speech coil tag marked +, and the yellow/black lead to the tag marked −.

The two long set-screws should be used to secure the ends of the chassis, while the short one holds it at the top.

The green frame aerial lead should be connected to the lower left-hand tag on the frame aerial assembly;

the yellow lead should go to the lower right-hand tag; and

the black lead should go to the upper right-hand tag. There is no external connection to the upper left-hand tag.

Removing Speaker.—The speaker can be removed without first removing the chassis, since a hole is left in the chassis to give access to the top fixing screw.

Unsolder the two connecting leads from the speech coil panel;

remove the three round-head set-screws (with metal washers) holding the speaker to the sub-baffle.

When replacing, the speech coil panel should point towards the bottom right-hand corner of the case when viewed from the rear.

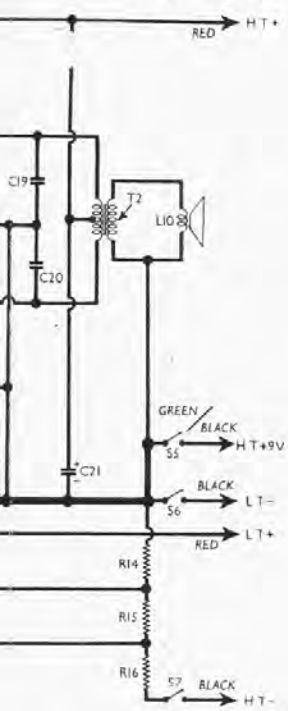
A thick packing washer should be fitted to each fixing screw, between the speaker frame and the threaded bush in the sub-baffle, besides the thin washer beneath the screw-head.

Connect the speaker leads as indicated above.

Removing Escutcheon Moulding.—Access to the switch unit can be more easily achieved if the bakelite escutcheon is first removed as shown in our front view of the chassis.

To do this, remove the five counter-sunk head screws.

When replacing, the three short screws with plain shanks go at the top of the moulding.



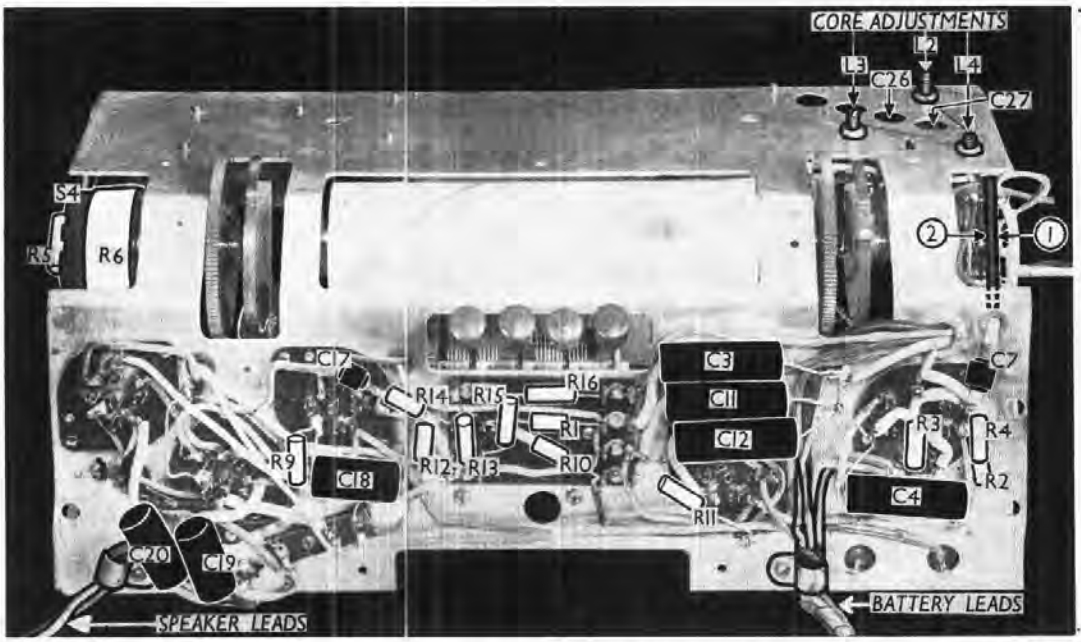
Circuit diagram of the Marconiphone 895 battery portable superhet. The H.M.V. 1406 is identical. Tracking adjustments are made by means of variable iron-dust cores on both wavebands. The frame aerial leads are colour-coded to agree with those shown in the half-rear view of the chassis.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 hexode CG decoupling	2,300,000
R2	V1 SG HT feed	23,000
R3	V1 osc. CG resistance ...	100,000
R4	V1 osc. anode HT feed ...	23,000
R5	HT economiser resistance	10,000
R6	Manual volume control; V3 signal diode load ...	500,000
R7	V3 triode grid stopper ...	100,000
R8	V3 triode CG resistance ...	2,300,000
R9	V3 triode anode load ...	100,000
R10	V3 AVC diode load resistances	2,300,000
R11		350,000
R12	Part GB pot. divider ...	2,300,000
R13	V4, V5 CG's decoupling ...	230,000
R14	GB and AVC delay potential divider resistances	150
R15		300
R16		450

	CONDENSERS	Values (μF)
C1	External aerial series condenser	0·000015
C2	Aerial circuit LW fixed trimmer	0·000005
C3	V1 hexode CG decoupling	0·1
C4	V1 SG decoupling ...	0·1
C5	1st IF transformer fixed trimmer condensers ...	0·00015
C6		0·00015
C7	V1 osc. CG condenser ...	0·000075
C8	Osc. circuit MW tracker...	0·0005
C9	Osc. circuit LW tracker...	0·0004
C10	Osc. circuit LW fixed trimmer	0·000075
C11	V2 CG decoupling ...	0·1
C12	V2 SG decoupling ...	0·1
C13	2nd IF transformer fixed trimmer condensers ...	0·00015
C14		0·00015
C15	IF by-pass	0·0001
C16	AF coupling to V3 triode	0·05
C17	Coupling to V3 AVC diode	0·000075
C18	AF coupling to T1 ...	0·05
C19	Fixed tone correction condensers	0·001
C20		0·001
C21*	HT reservoir condenser...	8·0
C22‡	Frame aerial MW trimmer	—
C23‡	Aerial circuit LW trimmer	—
C24†	Aerial circuit tuning ...	—
C25†	Oscillator circuit tuning...	—
C26‡	Osc. circuit MW trimmer	—
C27‡	Osc. circuit LW trimmer	—
C28‡	1st IF trans. pri. tuning...	—
C29‡	1st IF trans. sec. tuning...	—
C30‡	2nd IF trans. pri. tuning	—
C31‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.



Half-front view of the chassis. The switch unit is indicated on the right and diagrams of both sides are shown in col. 3 below. The core adjustment screws and oscillator trimmers are indicated in a group in the top right-hand corner.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Frame aerial winding (MW)		0·7
L2	Frame loading coil (LW) ...		9·0
L3	Osc. circuit MW tuning coil		2·2
L4	Osc. circuit LW tuning coil		7·0
L5	Osc. MW reaction coil ...		1·8
L6	1st IF trans.	Pri. ...	3·75
L7	1st IF trans.	Sec. ...	3·75
L8	2nd IF trans.	Pri. ...	3·75
L9	2nd IF trans.	Sec. ...	3·75
L10	Speaker speech coil... ...		3·0
T1	Intervalve trans.	Pri.	200·0
		Sec., total ...	5,500·0
T2	Output trans.	Pri., total ...	450·0
		Sec.	0·2
S1-S3	Waveband switches ...		—
S4	Battery economiser switch		—
S5	HT circuit switch		—
S6	LT circuit switch		—
S7	GB circuit switch		—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with a new battery reading 109 V overall on load. The economiser switch was at max.

The receiver was tuned to the lowest wavelength on the medium wave band, and the volume control was at maximum; in order, however, to prevent the receiver from responding to a possible signal the frame aerial was disconnected and the green and yellow leads joined to connect together the input CG and the AVC line.

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 X24	100	0·8	60	1·7
	Oscillator			
	67	1·4		
V2 Z21	100	1·9	100	0·8
V3 HD24	57	0·4	—	—
V4 KT2	98	0·8	100	0·2
V5 KT2	98	0·8	100	0·2

GENERAL NOTES

Switches.—S1-S3 are the waveband switches, and **S5-S7** the battery switches, in a single double-sided rotary unit at one end of the chassis. The unit is indicated in our half-front view of the chassis, and shown in detail in the diagrams of each side in col. 3, where side **1** is seen as viewed from the end of the chassis, as indicated by the arrow numbered **1** in the chassis view, but with the chassis in the upright position that it assumes when in position in the carrying case. Side **2** is viewed from the opposite direction, with the chassis in the same position.

The table (col. 3) gives the switch positions, starting from the "off" position with the control disc pushed fully up. A dash indicates open, and **C** closed.

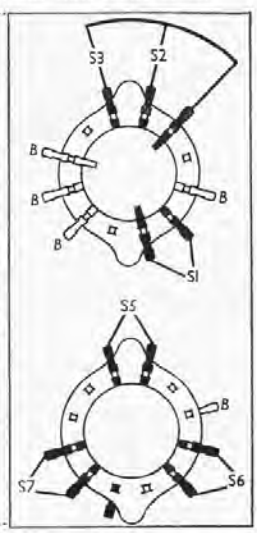
S4 is the battery economiser switch; it forms part of the volume control assembly, but is not ganged with it, the control spindle being concentric with that of the volume control. The assembly is fitted at the opposite end of the chassis to that occupied by the waveband and battery switch unit, but like the latter is operated by a disc. In the upper (max.) position of the disc the switch is closed, in the lower position it is open.

Coils.—L1 is the frame aerial winding, wound in a vertical plane and fixed inside the lid of the carrying case by paxolin cleats. Its ends terminate at a small assembly comprising trimmers, fixed condensers and the external aerial and earth sockets. The connections between the frame and the chassis are indicated in the diagram and described under "Dismantling the Set."

The aerial LW loading coil **L2** and the oscillator coils **L3, L5** and **L4** are located beneath the top panel of the chassis and consist of three tubular units. Each unit has an adjustable iron core, the adjusting screws of which project through the top of the chassis. These coils, and the IF transformers **L6, L7** and **L8, L9** in screened units with their associated trimmers, are shown in our half-rear view of the chassis, while the three core adjustments are shown in the other view.

Pre-set Condensers.—Apart from the four IF trimmers **C28, C29** and **C30, C31,** there are two aerial circuit trimmers **C22** and **C23** and two oscillator circuit trimmers **C26** and **C27.** **C22** and **C23** are mounted on the frame aerial panel in the lid of the case, and their adjusting screws are reached from outside of the lid after the **A** and **E** socket escutcheon has been removed; **C22** is then on the right. **C26** and **C27** form part of a four-unit trimmer assembly, but the remaining two trimmers are not used. The adjusting screws are reached through holes in the top of the chassis near the core adjustment screws, and are shown in our half-front view.

Diagrams of the two sides of the switch unit: above, as viewed in the direction of the arrow numbered **1** in the half-front view above; below, as viewed in the direction of the arrow numbered **2.**



Switch Table

Switch	Off	MW	LW
S1	—	C	—
S2	—	C	—
S3	—	—	C
S5	—	C	C
S6	—	C	C
S7	—	C	C

External speaker.—No sockets are provided for connection of an external speaker, but one of low impedance (as near 5 Ω as possible) can be connected to the two tags on the speech coil panel on the internal speaker if desired.

Condensers C1, C2.—These are mounted in the lid of the case with **C22** and **C23**, and like them are not shown in the chassis illustrations. Viewed from inside the lid, **C1** is on the left.

Condenser C21.—This is an 8 μF, 125 V, working tubular electrolytic condenser in a cardboard container.

Bearer Tags.—There are in the chassis two moulded bearer tags which have the appearance of small fixed condensers. They are, however, intended to provide a rigid point to which to make connections.

One of these tags is mounted at the unused end of the **C26, C27** trimmer unit, and supports **V1** top cap lead and the green frame lead. The other is mounted on the **C24** end of the condenser gang frame, and supports one connecting wire from **C8.**

Batteries.—LT, Exide 2 V, 24 AH celluloid cased unspillable accumulator cell, type PC-3. HT and GB, Marconiphone 108 V, type B 496; it has a 9 V tapping, and the section between HT− and 9 V+ becomes the GB section.

Battery Leads and Voltages.—Black rubber lead, spade tag, LT negative; red rubber lead, spade tag, LT positive 2 V; black rubber lead, yellow plug, HT negative; black/green or black/yellow rubber lead, yellow plug, HT positive 9 V; red rubber lead, yellow plug, HT positive 108 V.

HT Battery Position.—There have been a small number of complaints concerning the burning out of the auto GB resistances **R15** and **R16,** the symptoms usually being smoke issuing from the chassis.

This has been due to the fact that the HT battery has been connected incorrectly. A hasty glance at the instruction book or the illustration appearing on the label inside the cabinet does not reveal that the battery sockets face inwards and that the battery is upside down.

Consequently the battery leads are reversed and the resistances mentioned burn out; even if the leads are correctly connected, but the battery is facing the wrong way, instability is liable to occur at about 500 m.

PRESS-BUTTON UNIT

A mechanical press-button unit is employed for automatic tuning, in which the gang condenser spindle is connected up by means of a toothed sector driving a spring-loaded toothed wheel mounted on the gang spindle, the sector being attached to a flat metal rocker plate which is pivoted at each end. When this pressing is rocked on its pivots, the gang condenser is rotated.

Each press-button, of which there are four, actuates a plunger carrying a semi-circular contact plate. When a button is depressed, this plate moves towards the rocking mechanism, and eventually rotates it to a certain degree depending on the angle of the leading edge of the contact plate.

The angle of the contact plate can be altered by virtue of the fact that the plate is pivoted. It is normally clamped by screwing up its locking screw, but when the locking screw is slacked off, the contact plate can be re-set to any position required, and then clamped again.

To set a button to a selected station, pull off the press-button knob, insert a screwdriver blade into the plunger hole in the escutcheon and engage it in the head of the locking screw just to the left of the plunger, then loosen the screw about half a turn.

Now carefully tune in the station manually and, holding the tuning disc carefully in position, press down the screw with the screwdriver as far as it will go, and tighten up the screw.

Finally, replace the knob on the plunger and check the setting, repeating the process of adjustment if necessary.

A number of station name labels is supplied with the receiver. To fit one of these, remove the two screws holding the small escutcheon and replace the existing label with the new one.

The mechanical press-button unit employed cannot be expected to function with the accuracy of an electrical press-button switch unit, especially on distant stations.

Any criticisms in this respect should be countered with the explanation that the action of the press-buttons is that of a station selector rather than a means of accurate tuning; in other words, the station will be heard when the appropriate button is pressed, and in many cases of strong signals no further adjustment will be required, but in the case of a weaker transmission a slight manipulation of the manual tuning disc may be necessary to bring in the station to the best advantage, and this action is quite standard.

CIRCUIT ALIGNMENT

It is necessary in carrying out the alignment first to remove the chassis and the lid, with the frame aerial, from the case and reassemble them, with the batteries, on the bench.

At all stages of alignment, the overall voltage of the HT battery must be not less than 100 V on load, the frame aerial must be connected, the volume must be at maximum and the economiser switch at "Max."

The output from the signal generator must be kept as low as is consistent with providing a useful output reading and should be progressively reduced as the circuits are brought into line.

IF Stages.—Remove the small metal screen covering the **C15, R8, C16, R7** assembly on the right of the second IF transformer, switch receiver to MW, and turn gang to minimum.

Connect signal generator via a 0.1 μF condenser to anode (top cap) of **V2** and chassis, leaving existing connector on **V2** in place, and connect a 35,000 Ω resistance and a 0.1 μF condenser in series across **L9.** Feed in a 465 KC/S (645.2 m) signal and adjust **C30** for maximum output. Remove damping circuit from **L9** and connect it across **L8.** Adjust **C31** for maximum output at the same frequency. Remove damping circuit.

Remove signal generator lead from **V2** and connect it to **V1** control grid (top cap) leaving existing connector in place. Connect damping circuit across **L6** and adjust **C29** for maximum output at 465 KC/S. Remove damping circuit from **L6,** connect it across **L7,** and adjust **C28** for maximum output at the same frequency. Remove damping circuit and replace the small screen.

Do not make any further adjustments unless the whole procedure is repeated in the same order. After adjusting the IF circuits, the RF and oscillator stages must be re-aligned.

RF and Oscillator Stages.—The chassis, frame aerial and batteries must now be arranged on the bench to occupy exactly the same relative positions as they would if they were in the case.

The space between the frame winding and the HT battery must be ⅜ inch, the battery label must face away from the aerial and the frame aerial leads must be "dressed" to approximately the same positions as they would occupy in the case.

Any adjustment made to the circuits on MW must be followed by LW adjustment. See that spiral indicator line registers with the end of the MW scale when the gang is at maximum.

Connect the screening of the signal generator lead to the receiver chassis, but leave the live end (not more than 6 inches long) free. If this arrangement does not provide sufficient coupling, the live lead may be connected to the aerial socket via a condenser not larger than 5 μμF (0.000005 μF).

MW.—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal and adjust **C26** for maximum output. Feed in a 225 m (1,333 KC/S) signal, tune it in and adjust **C22** for maximum output.

Feed in a 520 m (576.9 KC/S) signal, tune it in, and adjust the core of **L3** for maximum output while rocking the gang for optimum results. Repeat the 200 m, 225 m and 520 m adjustments.

LW.—Switch set the LW, tune to 900 m on scale, feed in a 900 m (333.3 KC/S) signal and adjust **C27** for maximum output. Feed in a 1,350 m (222.2 KC/S) signal, tune it in and adjust **C23** for maximum output while rocking the gang for optimum results.

Tune to 1,900 m on scale, feed in a 1,900 m (157.9 KC/S) signal and adjust the cores of **L2** and **L4** for maximum output. Repeat 900 m, 1,350 m and 1,900 m adjustments.

Finally assemble the receiver in the case and check over the adjustment of **C22** at 225 m and **C23** at 1,350 m.

Service Sheet Index

Radio Servicemen who want to look up quickly just what receivers have been covered by *The Trader* series of Service Sheets should consult the last complete index on pages 6 and 7 of the October 5 issue.

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

★