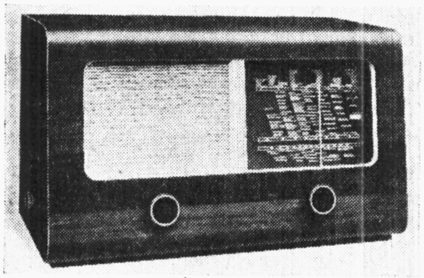
Supplement to The Wireless & Electrical Trader, July 20, 1940

"TRADER" SERVICE SHEET

476

K.B. 885

AC/DC SUPERHET



THE K.B. 885 receiver is a 4-valve (plus valve rectifier) AC/DC 3-band superhet, covering a SW range of 16-52m. It is suitable for use on 200-270V DC or AC (40-60C/S) mains. There is provision for connection of a pick-up and an external speaker, and screw switches are provided for muting radio on gram, and for cutting out the internal speaker.

Release date: *April*, 1940.

CIRCUIT DESCRIPTION

Two alternative aerial input sockets are provided, **A1** and **A2.** Input from **A1** socket is via isolating condenser **C1** and coupling components **C3, L1** and **C4** which form a potential divider across the aerial circuit.

On SW the impedance of **C3** and **C4** is negligible, and the SW coupling coil **L1** is effectively across the aerial circuit. On MW and LW **L1** has negligible impedance, and practically the whole of the input appears across **C3, C4. R2** shunts the aerial circuit.

Input is then fed from **L1** (SW) and **C4** (MW and LW) to tuned circuits **L2, C35** (SW), **L3, C35** (MW) and **L4, C35** (LW).

Input from socket **A2** is developed across a potential divider comprising resistances **R1, R2,** which attenuates the signal, only the fraction of signal across **R2** being passed on to the coupling circuits.

First valve **(V1, Brimar 6K8G)** is a triode hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L5** (SW), **L6** (MW) and **L7** (LW) are tuned by **C36;** parallel trimming by **C37** (SW), **C38** (MW) and **C9, C39** (LW); tracking by series condensers **C12** (MW), **C11** and **C12** (connected in series) (LW) and specially shaped vanes of **C36.** Tracking adjustments are made by varying the positions of the iron cores of **L6** and **L7** (MW and LW).

Reaction coupling is effected by anode coil **L8** (SW), and coupling condenser **C12** which is common to anode and grid circuits (MW and LW).

Second valve **(V2, Brimar 6U7G)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary iron cored transformer couplings **C5, L9, L10, C6** and **C15, L11, L12, C16.**

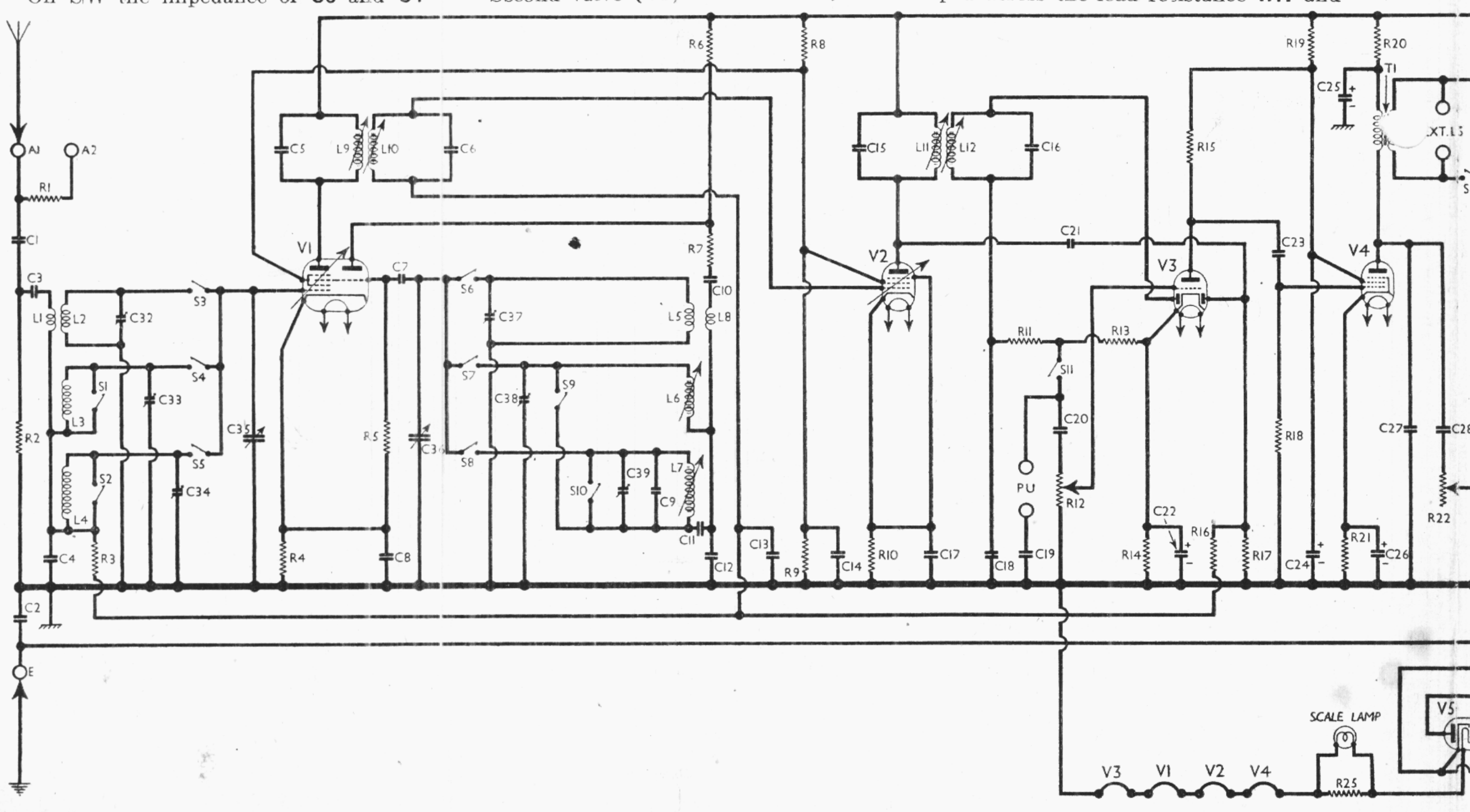
The tuning condensers are fixed, and IF alignment is carried out by adjustment of the moveable iron cores.

Intermediate Frequency 464KC/S.

Diode second detector is part of double diode triode valve **(V3, Brimar 6Q7G).** Audio frequency component in rectified output is developed across load resistance **R13** and passed via switch **S11,** AF coupling condenser **C20** and manual volume control **R12** to control grid of triode section, which operates as audio frequency amplifier.

IF filtering by **C18** and **R11.** Provision for connection of gramophone pick-up across **C20, R12,** while the radio muting switch **S11** prevents the superimposition of radio signals during pick-up operation. Since the receiver is of the AC/DC variety, **C19** is interposed between the pick-up and chassis, so that if **S11** is open, **C20** and **C19** isolate the pick-up sockets, and there is no metallic connection between the sockets and chassis.

Second diode of **V3,** fed from **V2** anode via the small coupling condenser **C21,** provides DC potential, which is developed across the load resistance **R17** and



fed back through decoupling circuits to frequency changer hexode and intermediate frequency amplifier as GB, giving automatic volume control.

Delay voltage, together with GB for triode section, is obtained from drop along **R14** in cathode lead to chassis.

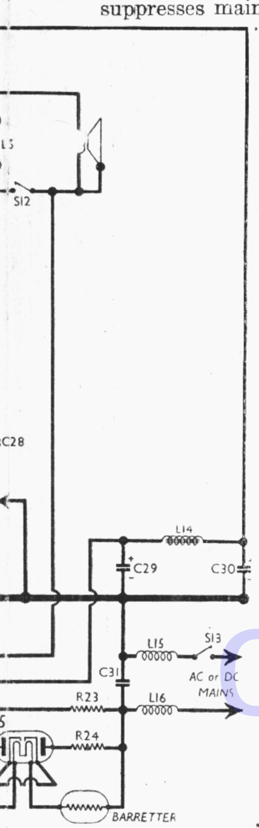
Resistance-capacity coupling by **R15, C23** and **R18** between **V3** triode and pentode output valve **(V4, Brimar 25 A6G)**. Fixed tone correction by **C27** in anode circuit. Variable tone control by **C28** and **R22,** also in anode circuit.

Provision for connection of low impedance external speaker across secondary winding of internal speaker input transformer **T1.** Switch **S12**, in the internal speaker speech coil circuit, permits this circuit to be broken for muting. One side of the speech coil, and the metal parts of the speaker assembly, are connected directly to the earth socket, which is metallically isolated from chassis by condenser **C2.**

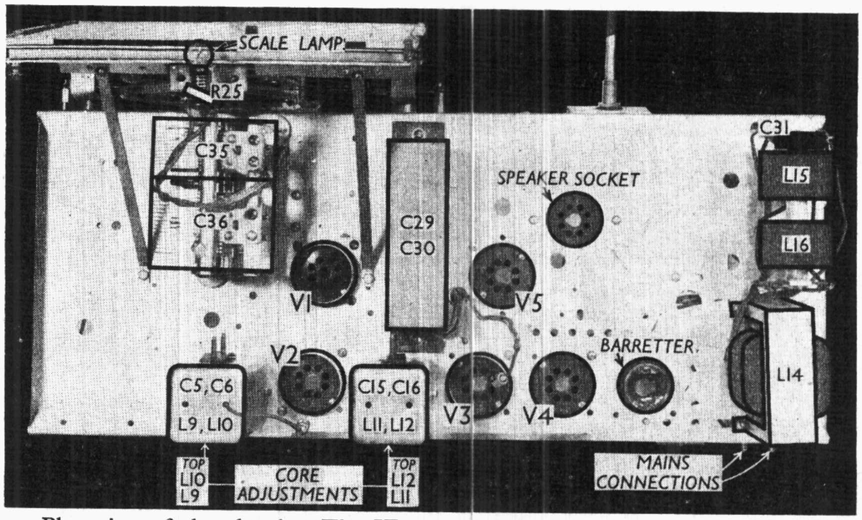
When the receiver is used with AC mains, HT current is supplied by indirectly heated rectifying valve **(V5, Brimar 25Z6G)**, which with DC mains behaves as a low resistance. The two cathodes are strapped together, and the anodes are connected in parallel, together with their surge limiting resistances **R23** and **R24.** Smoothing is effected by iron cored choke **L14** and electrolytic condensers **C29** and **C30.**

Valve heaters, together with the scale lamp and current regulating ballast resistance **(Barretter, Osram 301)**, are connected in series across mains input. The scale lamp is shunted by **R25.**

A filter circuit comprising air cored chokes **L15, L16** and condenser **C31** suppresses mains interference.



Circuit diagram of the K.B.885 AC/DC 3-band superhet. **S11** is the radio muting switch used when a pick-up is employed; **S12** is for internal speaker muting. Note that the lower pick-up socket is isolated from chassis; in the maker's diagram it is shown connected to true earth. The speaker frame and speech coil circuit are also connected to true earth. A diagram of the speaker plug and connection arrangements is given overleaf.



Plan view of the chassis. The IF core adjustments are indicated. **L15, L16** are mains filter chokes. **R25** is connected across the scale lamp holder.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	A2 aerial potential divider resistances	10,000
R2		1,000
R3	V1 hexode CG decoupling ...	500,000
R4	V1 fixed GB resistance ...	300
R5	V1 osc. CG resistance ...	50,000
R6	V1 osc. anode HT feed ...	50,000
R7	Oscillator reaction damping	150
R8	V1, V2 SG's HT feed potential divider ...	20,000
R9		25,000
R10	V2 fixed GB resistance ...	300
R11	IF stopper	50,000
R12	Manual volume control ...	500,000
R13	V3 signal diode load ...	500,000
R14	V3 triode GB; AVC delay ...	5,000
R15	V3 triode anode load...	250,000
R16	AVC line decoupling... ...	500,000
R17	V3 AVC diode load... ...	500,000
R18	V4 CG resistance	500,000
R19	V3 triode; V4 SG, HT feed...	15,000
R20	V4 anode HT feed	1,000
R21	V4 GB resistance	400
R22	Variable tone control ...	50,000
R23	V5 anodes surge limit resistances	100
R24		100
R25	Scale lamp shunt	150

	CONDENSERS	Values (μF)
C1	Aerial isolating condenser...	0·001
C2	Earth isolating condenser...	0·01
C3	Aerial coupling condensers	0·005
C4		0·004
C5	1st IF transformer tuning condensers	0·00015
C6		0·00015
C7	V1 osc. CG condenser ...	0·00005
C8	V1 cathode by-pass ...	0·1
C9	Osc. circ. LW fixed trimmer	0·000025
C10	V1 osc. anode coupling ...	0·001
C11	Osc. circuit LW tracker ...	0·00023
C12	Osc. circuit MW tracker ...	0·0004
C13	V2 CG decoupling	0·1
C14	V1, V2 SG's decoupling ...	0·1
C15	2nd IF transformer tuning condensers	0·00015
C16		0·00025
C17	V2 cathode by-pass... ...	0·02
C18	IF by-pass	0·0005
C19	PU isolating condenser ...	0·1
C20	AF coupling to V3 triode ...	0·005
C21	Coupling to V3 AVC diode	0·000025
C22*	V3 cathode by-pass	25·0
C23	V3 triode to V4 AF coupling	0·02
C24*	V3 triode anode and V4 SG decoupling	2·0
C25*	V4 anode decoupling ...	2·0
C26*	V4 cathode by-pass... ...	25·0
C27	Fixed tone corrector ...	0·001
C28	Part of variable tone control	0·03
C29*	HT smoothing condensers	16·0
C30*		16·0

	CONDENSERS (*Continued*)	Values (μF)
C31	Mains RF by-pass	0·01
C32‡	Aerial circuit SW trimmer	—
C33‡	Aerial circuit MW trimmer	—
C34‡	Aerial circuit LW trimmer	—
C35†	Aerial circuit tuning ...	—
C36†	Oscillator circuit tuning ...	—
C37‡	Osc. circuit SW trimmer ...	—
C38‡	Osc. circuit MW trimmer ...	—
C39‡	Osc. circuit LW trimmer ...	—

* Electrolytic. † Variable. ‡ Preset.

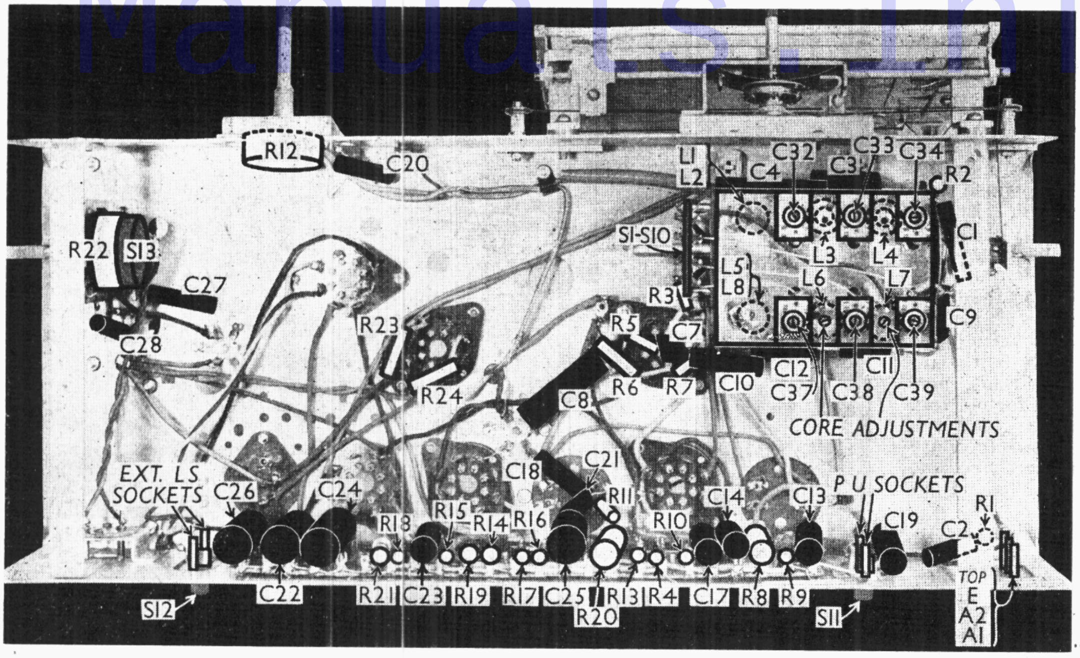
	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial SW coupling coil ...	0·5
L2	Aerial SW tuning coil ...	0·05
L3	Aerial MW tuning coil ...	2·4
L4	Aerial LW tuning coil ...	35·0
L5	Osc. circuit SW tuning coil	0·05
L6	Osc. circuit MW tuning coil	5·0
L7	Osc. circuit LW tuning coil	11·0
L8	Oscillator SW reaction ...	0·5
L9	1st IF trans. Pri.	4·0
L10	1st IF trans. Sec.	4·0
L11	2nd IF trans. Pri.	4·0
L12	2nd IF trans. Sec.	2·5
L13	Speaker speech coil	2·0
L14	HT smoothing choke ...	220·0
L15	Mains filter chokes	2·3
L16		2·3
T1	Speaker input trans. Pri. ...	260·0
	Sec.	0·2
S1-S10	Waveband switches... ...	—
S11	Radio muting switch ...	—
S12	Internal speaker switch ...	—
S13	Mains switch, ganged R22...	—

DISMANTLING THE SET

The bottom of the cabinet is fitted with a detachable cover, upon removal of which (two round-head wood screws) access may be gained to most of the components beneath the chassis, including the six pre-set trimmer condensers, which are adjusted during the alignment process.

Removing Chassis.—Remove the two control knobs from the front of the cabinet;

remove two of the fixing staples from each of the two cardboard protecting strips guarding the heads of the chassis fixing bolts beneath the chassis, and bend back the cardboard;



Under-chassis view. A diagram of the **S1-S10** unit, viewed from the tone control **(R22)** end of the chassis is in column 3 below. **S11** and **S12** are screw-type switches for radio muting (on gram) and internal speaker muting respectively. Note the assembly on the right containing the tuning coils, trimmers and associated components. The core adjustments of **L6** and **L7** are indicated

switch the receiver to SW and turn the tone control to a convenient position, so as to bring the fixing screw head of each control knob opposite to a hole in the bottom of the cabinet, slacken the screws and remove the knobs;

withdraw the speaker connecting plug from its socket on the chassis deck. This socket is obscured from the rear of the receiver by a metal shield suspended from the top of the cabinet, and the best way to remove the plug is to prise it up carefully with a screwdriver.

Remove the four round-head screws (with lock-washers and claw-washers) holding the chassis to the bottom of the cabinet.

When replacing, do not omit to re-wax the heads of the two control knob fixing screws at the front of the cabinet, and staple down the cardboard protecting strips beneath the cabinet.

Removing Speaker.—Slacken the four clamp screws (with lock-washers) holding the rim of the speaker to the sub-baffle; then remove one screw of the lower pair, when the speaker may be lifted clear.

When replacing, the transformer should be at the top.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on AC mains of 235V. The receiver was tuned to the lowest wavelength on the MW band and the volume control was at maximum, but there was signal input.

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

If valve adaptors are used to insert the meter for current measurements, care should be taken to see that the screens are all in position and earthed while readings are being taken, as in some cases the readings may otherwise be considerably influenced.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6K8G	250 Oscil 86	1·6 lator 3·3	85	3·4
V2 6U7G	250	6·3	85	2·0
V3 6Q7G	46	0·3	—	—
V4 25A6G	206	36·0	142	6·7
V5 25Z6G	265†	—	—	—

† Cathode to chassis, D.C.

GENERAL NOTES

Switches.—**S1-S10** are the waveband switches, in a single rotary unit beneath the chassis. It is indicated in our under-chassis view, and shown in detail in the diagram (col. 3), where it is drawn as seen from the tone control end of the chassis. The table (col. 3) gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the spindle. A dash indicates open, and **C**, closed.

S11 and **S12** are the radio muting (on gram) and internal speaker muting switches respectively. Both are of the screw type, having small knobs for adjustment. They are mounted at the rear of the chassis, and are associated with the pick-up and external speaker sockets respectively.

S13 is the QMB mains switch, ganged with the tone control **R22**.

Coils.—**L1, L2; L3; L4; L5, L8; L6** and **L7** are on six tubular formers beneath the chassis, where they form a unit with their associated trimmers and the wavechange switch unit. The core adjustments of **L6** and **L7** project through the metal screen over the coils, which also carries the six trimmers.

The IF transformers **L9, L10** and **L11, L12** are in two screened units on the chassis deck, the core adjustments being towards the rear of the chassis. Their positions are indicated in our plan chassis view. Each IF unit contains its associated fixed trimmers.

L14 is the smoothing choke, and **L15, L16** the mains filter chokes, mounted at one end of the chassis deck, and shown in our plan chassis view.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2—5 O) external speaker. Unscrewing the knob of **S12** mutes the internal speaker.

Scale Lamp.—This is a Tre-Vita MES type, rated at 8V, 0.3A.

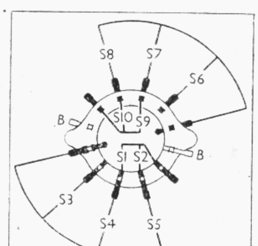
Condensers C29, C30.—These are two 16μF dry electrolytics (550V peak) in a single carton on the chassis deck, having a common negative (black) lead. The yellow lead (to **V5** holder) is the positive of **C29**, while the red lead is the positive of **C30.**

Barretter.—This is an Osram type 301,

SWITCH TABLE

Switch	SW	MW	LW
S1	C	—	—
S2	C	C	—
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	C	C	—

Diagram of the wave-change switch unit, viewed from the tone control end of the chassis.



fitted with an Edison screw base, which fits a holder on the chassis deck.

Speaker Plug and Socket.—The speaker leads terminate in an octal plug,

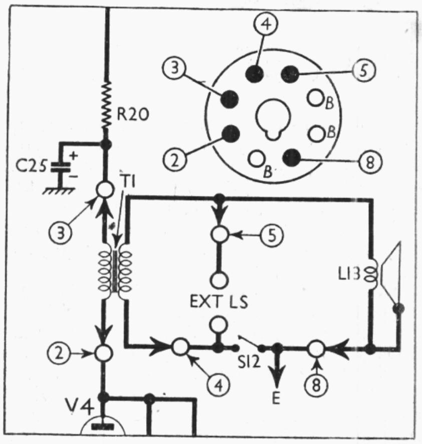


Diagram showing the speaker connection arrangements with (inset) a view of the octal plug, looking at the free ends of the pins.

which fits a socket on the chassis deck. The connections of this plug and socket are shown by numbered arrows and circles in a separate diagram of this part of the circuit (previous column; not in the main circuit). A view of the plug, looking at the free ends of the pins, is also given, the pins being numbered to agree with the diagram. The colour coding of the leads to the plug (and to the socket) is: 1, blank; 2, blue; 3, red; 4, green; 5, yellow; 6, blank; 7, blank; 8, black.

Chassis Divergency.—The makers show the lower pick-up socket connected to the true earth line; in our chassis it is connected via a 0.1μF condenser (**C19**) to chassis.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator via a 0.1μF condenser to control grid (top cap) of **V1**, and earth socket. Switch set to MW, and turn gang to maximum. Feed in a 464KC/S signal, and adjust cores of **L9, L10, L11** and **L12** in turn for maximum output. Repeat these adjustments.

RF and Oscillator Stages.—With gang at maximum, pointer should cover the vertical lines at the right hand ends of the three scales. Connect signal generator, via a suitable dummy aerial, to **A1** and **E** sockets.

MW.—Switch set to MW, tune to 500m on scale, feed in a 500m (600 KC/S) signal, and adjust core of **L6** for maximum output. Tune to 214m (white spot) on scale, feed in a 214m (1,400 KC/S) signal, and adjust **C38,** then **C33,** for maximum output. Repeat the 500m adjustment, rocking the gang slightly for optimum results, then repeat the 214m adjustments.

LW.—Switch set to LW, tune to 1,714m (white spot) on scale, feed in a 1,714m (175KC/S) signal, and adjust core of **L7** for maximum output. Tune to 857m on scale, feed in an 857m (350 KC/S) signal, and adjust **C39,** then **C34,** for maximum output. Repeat the 1,714m adjustment, rocking the gang slightly for optimum results, then repeat the 857m adjustments.

SW.—Switch set to SW, tune to 20m on scale, feed in a 20m (15 MC/S) signal, and adjust **C37,** then **C32,** for maximum output.

SERVICING AVC CIRCUITS

THE general principles of automatic volume control circuits, with special reference to delayed AVC, are fully described in an article which appears on pages 34 and 35 of *The Trader* this week. This article is intended for beginners to service work who may not be clear as to how AVC operates in modern receivers. It does not, however, go into the question of faultfinding and repairing.

A faulty AVC circuit in a receiver can cause distortion, insensitivity or instability, and for this reason it is imperative that when these faults are encountered the AVC circuit should not be passed over without checking.

Simplest Way of Checking

The simplest way to check whether AVC is present is to insert a milliammeter in series with the anode circuit of one of the controlled valves, and tune to a station, or feed in a signal from a generator. If AVC is not present, the anode current will remain unchanged (unless, of course, the signal overloads the stage). On the other hand, with AVC in operation, the anode current will fall and then rise again as one tunes through the station, the minimum reading being at the point where the station is exactly in tune.

The amount by which the current falls should depend on the strength of the signal and, the stronger the signal, the greater will be the current drop.

In the case of delayed AVC, weak signals should not produce a control voltage, and consequently the controlled valve's anode current should not change. A good way of checking this is to use a signal generator, and by means of the attenuator gradually increase the signal strength from a low value. At first the anode current should be absolutely constant, but as soon as the delay voltage is overcome by the signal at the AVC diode the current should begin to fall off fairly rapidly.

If no change of current occurs, the AVC circuit is not operating; if it changes even for a weak signal, the delay voltage is not present, and overall sensitivity on weak signals will be very low. Failure of the AVC circuit may be due to a faulty diode, excessive delay voltage, an open circuited resistor in the AVC line, or a short-circuited by-pass condenser.

If a resistor in series with the AVC line falls off in value, or becomes shorted, AVC will be present, but its value will fluctuate with the modulation due to this not being smoothed out. On the other hand, a resistance which has gone high may affect the time constant of the valve grid circuit and cause the action of the AVC to be sluggish.

Another effect of a shorted series resistance (and of an open circuited by-pass condenser) is to cause instability or distortion due to IF and possibly RF voltages being fed back to the early stages.

Insufficient AVC action (if it is not due to faulty design of the circuit) may be caused by low emission of the AVC diode, or by its load resistance being too low in value. Care must be taken in using a signal generator to check the extent of the AVC action, for it is quite easy to feed in a far greater signal than the set would ever be called upon to accept, and which no AVC circuit, however perfect, could be expected to control.

Too great or too small a delay voltage is caused by a fault in the part of the circuit from which this voltage is obtained. For instance, if the cathode voltage of a double-diode triode or of the following AF valve is used for delay, faults in these valves will alter or remove the delay voltage. Usually, however, such a fault manifests itself far more decidedly in its other effects, such as AF distortion or loss in output and, in curing these faults, the delay voltage is automatically restored.

A note of warning should be given about attempting to measure the AVC control voltage by means of an ordinary voltmeter. This is not possible unless the voltmeter has an extremely high internal resistance, as otherwise the AVC line will be partially short-circuited. It is possible to use a DC valve voltmeter (providing that it is realised that its input capacity may alter the tuning of the controlled valve's grid circuit) if such an instrument is available. Alternatively, one can connect a microammeter in series with the AVC diode load resistance and measure the current flowing, finally calculating the voltage from a knowledge of the value of the load resistance.

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, which appeared on pages 234 and 235 of the June 29 issue. (Incidentally, the complete revised index—which covers "equivalent" models — appears at the end of each quarter.)

Printed in Great Britain by St. Clements Press, Ltd., Portugal Street, Kingsway, London, W.C.2.