PRIVATE AND CONFIDENTIAL

FOR TRADE USE ONLY

"His Master's Voice"

SERVICE MANUAL

for

DUAL WAVE

VIBRATOR RECEIVERS

Models 99 and 325

TECHNICAL SPECIFICATION

BATTERIES

The battery requires for the operation of these receivers is as follows:—

Model 99 } 1-6 volt 130 amp. hour accumulator.
„ 325 }

The battery supplied with the receiver is already fully charged. This battery should be re-charged at least once monthly, or alternatively whenever the specific gravity as measured with a hydrometer falls below 1.140, or the voltage with the receiver in operation falls below 5.4 volts.

CONSUMPTION

The battery consumption of these models is approximately 0.95 amp. in normal operation, or 1.1 amp. when the dial light is in use.

SPEECH OUTPUT

Approximately 1 watt undistorted.

WAVE LENGTH RANGE

200 to 545 metres (1,500 Kc. to 550 Kc.).
16.5 to 50 metres.

DIMENSIONS

	Height	Width	Depth
Model 99 ..	15″	11″	8″
„ 325 ..	35¾″	24¼″	14″

WEIGHT

	Model 99	Model 325	Model 99 with Battery & Vibrator	Model 325 with Battery
Nett	19½ lbs.	61 lbs.	79 lbs.	110 lbs.
Gross	24 „	75 „	88¾ „	128 „

LOUDSPEAKER

The loudspeakers used are of the permanent magnet dynamic type. Model 99 has a 6-inch speaker with a voice coil impedance at 400 cycles of 3 ohms, while Model 325 employs an 8-inch speaker with a voice coil impedance of 2.35 ohms.

VALVES

1C7G.
1F7G (2).
1H4G.
1J6G.

CIRCUIT DESCRIPTION

(See figure, pages 4–5.)

These models employ a 5-valve superheterodyne chassis using the conventional pentagrid frequency changing circuit with slight modifications, followed by a two-stage intermediate frequency amplifier using in the first stage a 1F7G valve, and a second I.F. stage employing another 1F7G arranged in a reflex circuit, so that it also functions as detector and first stage audio amplifier, resistance capacity coupled to a 1H4G triode which is employed as a driver for the 1J6G valve used in a class B push-pull output stage.

AVC is taken from one diode plate of the first 1F7G and applied to its grid and grid of the frequency changer, while one diode plate of the reflex 1F7G is used as signal rectifier.

Coupling to the aerial on the broadcast band is effected through an iron core transformer having the normal tuned secondary.

The three intermediate frequency transformers are permeability tuned and employ tapped Litz wound coils with sliding iron cores, the coupling being adjusted to give the best compromise between gain and selectivity. In the case of the first I.F. transformer the windings are somewhat over-coupled to provide a relatively broad-top curve in the interests of improved high note reproduction, which might otherwise suffer due to the exceptionally high adjacent channel selectivity of this model.

All bias voltages are obtained from the filament circuits, eliminating the necessity of a separate bias battery.

The volume control acts simultaneously on both the I.F. and audio inputs to the grid of the reflex valve, thus ensuring silent operation and complete control of volume down to zero without distortion.

Padding on the broadcast band is effected by adjustment of the oscillator secondary inductance, by means of an adjustable iron core, in conjunction with a fixed padding condenser. On the short-wave band no padding adjustment is required.

All R.F. trimmers are of the air di-electric type, using a robust plunger type construction, which is entirely immune to change of capacity or detrimental atmospheric influences.

WAVE BAND SWITCHING

This is carried out by means of a single-deck switch. The oscillator primary coils are connected in series and are not switched; however, a little feed-back is applied across the padding condenser on the short-wave band, and this is switched in and out by contacts on the wave-change switch.

TONE CONTROL

The tone is controlled by a four-position single-deck switch, the first position on which switches the receiver off; the second position switches the receiver on and gives normal reproduction, while the third and fourth positions introduce an increasing degree of high frequency cut by means of a condenser resistor combination shunted across the driver transformer primary. This switch simultaneously controls three circuits, viz., the filament circuit, the vibrator supply and the tone-control circuit.

DIAL LAMPS

The dial lighting is controlled by a push button mounted on the side of the cabinet, which should be pressed during the process of tuning-in stations. When released, this button will extinguish the dial lighting, thus saving unnecessary drain on the battery.

VIBRATOR CIRCUIT DESCRIPTION

The circuit of the vibrator unit used with these models is indicated on page 5. This unit includes the vibrator itself, which is enclosed in a separate metal container arranged so that it can be plugged into or removed from a socket located in the vibrator unit in a manner similar to a valve. The remainder of the vibrator unit consists of the necessary transformer and filters, the whole being contained in a metal box provided with rubber mounting buffers and coupled to the chassis and battery by means of a special plug and leads.

PRELIMINARY TESTS

(1) Check over battery connections in accordance with the diagram given on page 5.

(2) Check over battery voltage as specified in paragraph headed "Batteries."

(3) Remove fuse from A+ battery lead and check for continuity in the fuse.

(4) Switch the receiver on by means of the combined battery and tone-control switch, and, having removed the earth wire and turned the volume control to the maximum position, touch the finger to the grid cap of the second 1F7G valve (at back of chassis). A loud hum should be heard; this denotes that the audio frequency side of the receiver is functioning, and the fault probably lies in the 1C7G or first 1F7G valves, or possibly in some of the circuits associated with the reflex valve. If no hum is heard, the fault is probably between the reflex valve and the output stage.

(5) Check all valves for filament continuity and freedom from internal shorts.

(6) To determine if the fault lies in the loud speaker, connect a high impedance A.C. voltmeter or output meter, with a range of approximately 0 to 3 volts across the voice terminals on the speaker. With the receiver switched on and adjusted for the broadcast band, turn the volume control fully up and rotate the tuning control. If no deflection is noticeable on the meter, the fault lies in the receiver chassis. If a deflection is obtained but no audible sound, the loudspeaker is at fault.

(7) If the fault is still undiscovered, remove the chassis and loudspeaker from the cabinet and compare voltages with the valve table given below.

Note.—All voltages must be measured with a volt meter having a resistance of not less than 1,000 ohms per volt, and should then be within 10% of the specified values.

DISMANTLING

REMOVAL OF CHASSIS

(1) Remove knobs.

(2) Disconnect loudspeaker and battery plug, not forgetting the loudspeaker earth connection, which will be found held by a screw on the chassis adjacent to the 1J6G valve.

(2) Remove four fixing bolts from under side of the cabinet; the chassis is now free.

Note.—In the case of Model 325, do not disturb the wood screws which hold the rubber mounting buffers in place.

REMOVAL OF LOUDSPEAKER

(1) Remove speaker connections from jacks and disconnect earth wire from screw on chassis.

(2) Remove four screws or nuts holding speaker chassis, and remove speaker.

VOLTAGE TABLE

Values given are ± 10% with receiver tuned to a point of no reception, unless otherwise stated, and volume control at maximum. Bias voltages measured between negative side of filament and chassis. If a volt meter with an internal resistance of less than 1,000 ohms per volt is utilised, allowance must be made for the voltage drop caused by the voltmeter.

Models 99 and 325	V1–1C7G	V2–1F7G	V3–1F7G	V4–1H4G	V5–1J6G
Plate to chassis volts	150	150	50	110	150
Screen to chassis volts	35	65	45	—	—
Oscillator plate to chassis volts	B.C. 80 S.W.75	—	—	—	—
Filament Voltages	2.0	2.0	2.0	2.0	2.0
Bias voltages	0	0	—2.0	—4.0	—4.0

H.F. TESTS AND ADJUSTMENTS

Instability, insensitivity, or poor selectivity indicate that the alignment of the tuned circuits is not correct. If a coil or other component associated with the H.F. or I.F. side of the receiver has been replaced or repaired, or if wiring has been disarranged, all circuits must be re-aligned.

To do this, the following apparatus is required:

An oscillator or signal generator capable of tuning to 1,400 Kc., 600 Kc., 460 Kc., and 17.65 megacycles (17 metres), suitably screened and with an attenuator; and an output meter having a range of 0 to 2 volts A.C. approximately.

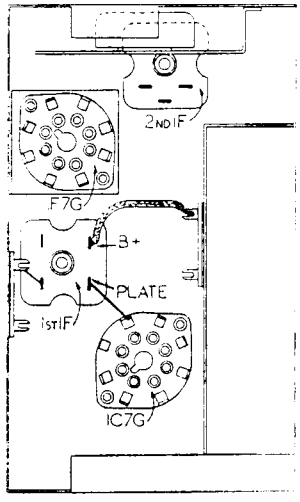
I.F. alignment should always precede H.F. alignment, and even if only one coil or one range of coils has been serviced, the whole of the realignment should be done in the order given, i.e., broadcast band first followed by short-wave band.

In carrying out the following operations, it is important that the input to the receiver from the oscillator should be kept low and progressively reduced as the circuits are brought into line, so that the reading on the output meter does not exceed about 0.5 volt.

For all alignment operations, the output meter should be connected across the voice coil of the loudspeaker.

I.F. ALIGNMENT

Before commencing alignment, connect a 1/3 watt 50,000 ohm carbon resistor from grid of first I.F. valve to chassis; also connect a 1/3 watt 100,000 ohm carbon resistor underneath the chassis between the plate lug and B— lug of the first I.F. transformer, as shown on the adjoining sketch; it is essential that the resistor leads be as short as possible, and clear all wiring and other components to avoid introducing unwanted capacity into the I.F. circuits. Rotate the volume control fully clockwise and tone control to second clockwise position, set wave-change switch to broadcast band, and fully engage the vanes of the tuning condenser. Connect the output leads of the signal generator to the grid cap of the 1C7G valve through a 0.1 mfd. condenser and to the chassis. (Note.—Do not disconnect the clip and lead from the 1C7G grid.)

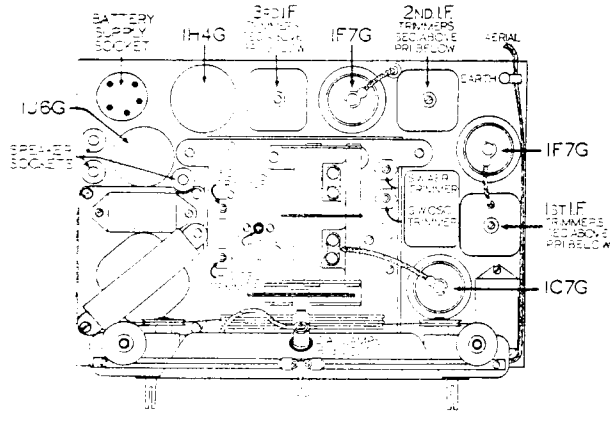


(1) Tune signal generator to exactly 460 Kc.

(2) Adjust the trimmer screws on the I.F. transformers (the top screw is the secondary and the bottom screw the primary in all three transformers) for maximum deflection of the output meter. Continue this alignment on each transformer in turn until no greater output can be obtained. (Note.—If trimmer screws are screwed in too far, it is possible to obtain a false peak due to coupling effects between the movable iron cores. Any trimmer which appears to require screwing too far in should be screwed out considerably and the true peak will then be found.)

After completing the trimmer adjustments as described, carefully remove the resistors from I.F. transformer and I.F. valve grid, taking care not to disturb adjacent wiring; the I.F. alignment process is now complete. The temporary connection of resistors, as described above, is necessary to temporarily produce a single peak on the first I.F. transformer, whose adjustment would otherwise be impossible without the use of a cathode ray oscillograph, by reason of the over-coupling referred to in the paragraph headed "Circuit Description."

R.F. ALIGNMENT



The sketch above shows the layout of all principal components and adjustments referred to in the following procedure.

With controls set as for I.F. alignment, connect the signal generator output leads through a standard dummy antenna of 200 MMF capacity to the aerial terminal (nearest front of chassis) on the 5-terminal strip in R.F. tuning compartment, and to chassis. Check that when the gang condenser is fully meshed the pointer falls directly over the thin vertical line at the extreme lower right of the scale.

(1) Tune signal generator to 600 Kc.

(2) Rotate tuning knob until pointer is exactly over 600 Kc. mark on scale, and by means of padding adjustment (brass screw to left of ganged condenser) align receiver so that the 600 Kc. signal is tuned in exactly on line.

(3) Tune signal generator to 1400 Kc.

(4) Set pointer exactly over 1400 Kc. point on scale and adjust oscillator trimmer (nearest **front** of chassis on **left-hand side** of ganged condenser) until signal is correctly tuned in with the pointer on the 1400 Kc. line.

(5) Adjust aerial trimmer (nearest **back** of chassis on **left-hand side** of ganged condenser) for maximum output as shown on output meter.

(6) Repeat operations 1 to 5 (inclusive). **This is important.** Note that any broadcast stations receivable are tuned in correctly on calibration.

SHORT-WAVE ALIGNMENT

(1) Set wave-change switch to SW range (fully anticlockwise). Remove the standard dummy antenna from the output lead of the signal generator and substitute a 400 ohm non-inductive resistor; connect to same receiver terminal as previously.

(2) Tune signal generator to 17.65 MC (17 metres).

(3) Set pointer to 17 metre mark and adjust oscillator trimmer (nearest **front** of chassis on **right-hand side** of ganged condenser) until signal is tuned in on correct position of scale. Two points will be found at which this trimmer will peak. Care should be taken to see that the point finally selected is that which gives the lower capacity in the trimmer (plunger further out). Failure to select the correct position of the two will cause serious tracking errors.

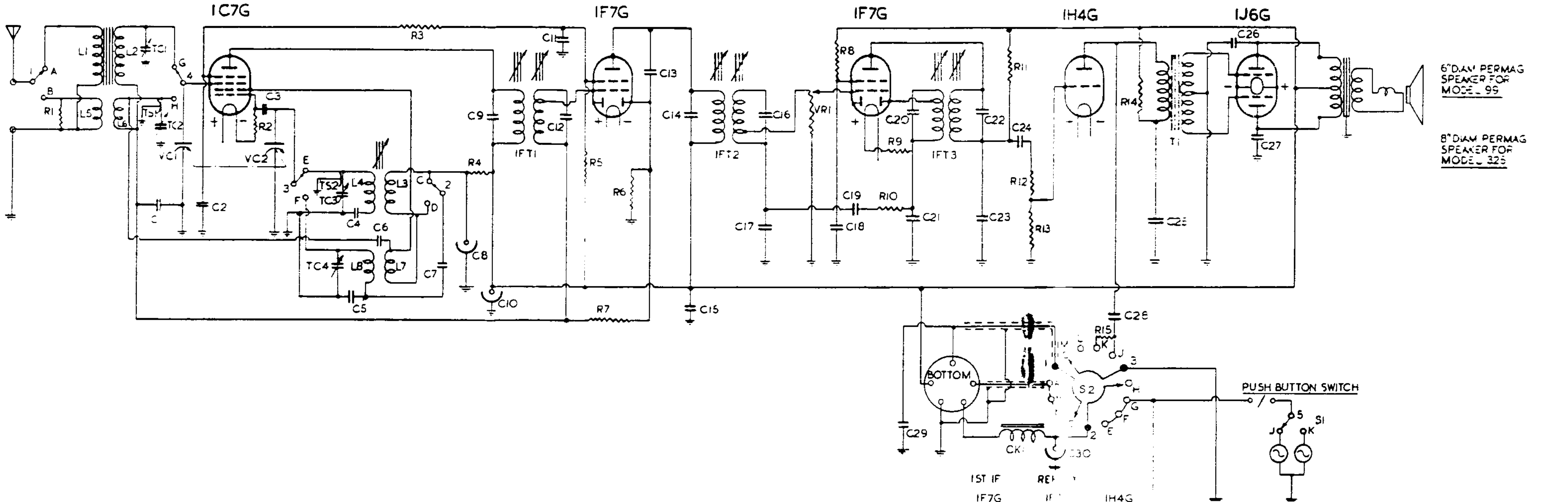
(4) Adjust SW aerial trimmer (nearest **back** of chassis on **right-hand side** of ganged condenser) for maximum output while "rocking" the ganged condenser to obtain the correct resonant point. The maximum reading on the output meter should be noted, and then the plunger of this aerial trimmer moved inwards (increasing capacity) until the output voltage has fallen by about 10%. These operations should be done very carefully and with constant rocking of the gang to make sure that the receiver is correctly tuned to the signal at all times.

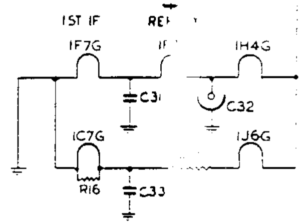
(5) Check the foregoing adjustments to ensure that the correct settings have been obtained on all trimmers.

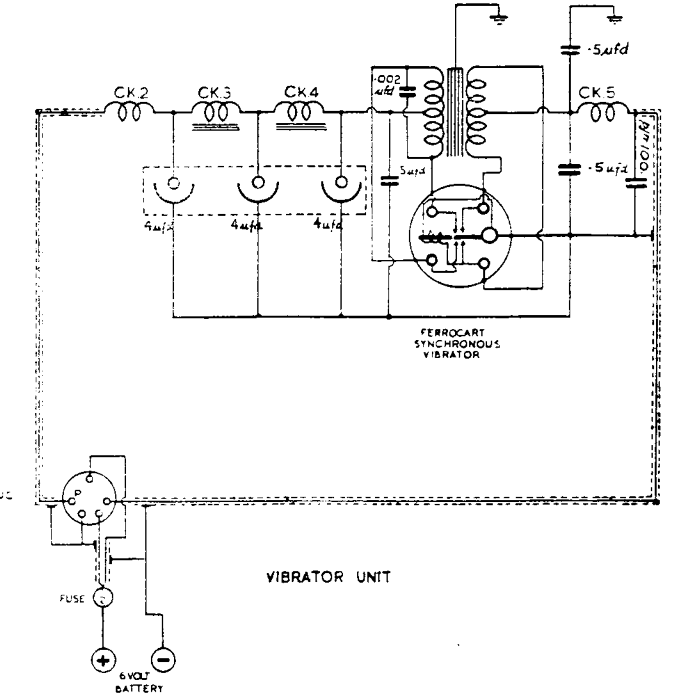
Note.—The R.F. trimmers on these models are of a new plunger type with air di-electric, and possess exceptionally high stability and efficiency. A special adjusting tool can be obtained from the factory incorporating a box spanner for the condenser lock nut, and an adjusting hook for the plunger. After loosening the large lock nut at the top of the condenser, the adjusting hook is inserted in the hole which will be found in the top of the plunger, which can then be easily adjusted by moving up or down as required with a **slight** rotary movement. When adjustment is completed, tighten the lock nut securely.

ADDITIONAL DATA

Any further service information desired can be obtained by addressing an inquiry to The Servicce Department, The Gramophone Co. Ltd., 2 Parramatta Road, Homebush, N.S.W.



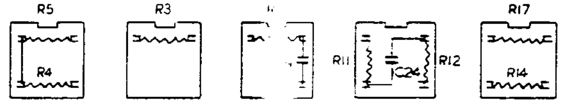




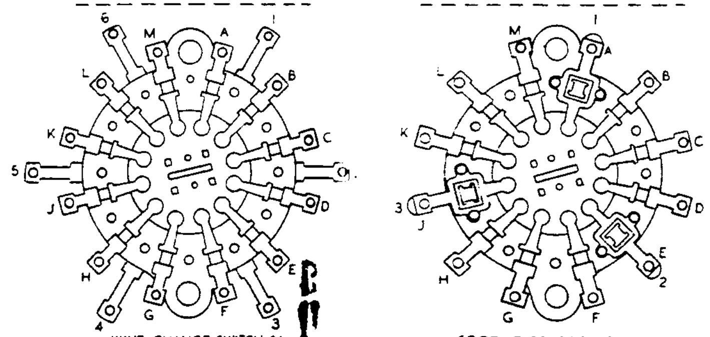
REF	PART No	DESCRIPTION
R1	B1X	500 OHMS 1/4 WATT
R2	H1X	50000 OHMS 1/4 WATT
R3	H1X	50000 OHMS 1/4 WATT
R4	W2XX	30000 OHMS 1/2 WATT
R5	H1X	50000 OHMS 1/4 WATT
R6	P1XX	1 MEGOHM 1/4 WATT
R7	P1XX	1 MEGOHM 1/4 WATT
R8	AG2X	350000 OHMS 1/2 WATT
R9	P1XX	1 MEGOHM 1/4 WATT
R10	J1XX	100000 OHMS 1/4 WATT
R11	J1X	100000 OHMS 1/4 WATT
R12	N1X	250000 OHMS 1/4 WATT
R13	O1X	0·5 MEGOHMS 1/4 WATT
R14	F2XX	10000 OHMS 1/2 WATT
R15	X1XX	5000 OHMS 1/4 WATT
R16	O724/F	16·6 OHM RESISTOR
R17	O724/E	8·0 OHM RESISTOR

REF	PART No	DESCRIPTION
C	0013/M	0·05 MFD 200V CONDENSER
C2	0013/Q	0·1 MFD 200V
C3	0243/AB	100 MMFD
C4	0243/AM	400 MMFD
C5	0243/AN	3250 MMFD
C6	0975	NEUTRALIZING CONDENSER
C7	0013/J	0·01 MFD 400V
C8	0014/M	16 MFD 250V ELECTRO WITH C10
C9	0243/AB	100 MMFD
C10	0014/M	8 MFD 250V ELECTRO WITH C8
C11	0013/Q	0·1 MFD 200V
C12	0243/AB	100 MMFD
C13	0243/Q	50 MMFD
C14	0243/AB	100 MMFD
C15	0013/A	0·5 MFD 400V
C16	0243/AB	100 MMFD
C17	0243/O	250 MMFD
C18	0013/P	0·25 MFD 200V
C19	0013/J	0·01 MFD 400V
C20	0243/AB	100 MMFD
C21	0243/O	250 MMFD
C22	0243/AB	100 MMFD
C23	0243/AL	400 MMFD
C24	0013/J	0·01 MFD 400V
C25	0013/L	0·5 MFD 200V
C26	0013/O	0·002 MFD 600V
C27	0013/O	0·002 MFD 600V
C28	0013/H	0·05 MFD 300V
C29	0013/L	0·5 MFD 200V
C30	0014/N	500 MFD 12 P.V.
C31	0013/Q	0·1 MFD 200V
C32	0014/N	500 MFD 12 P.V.
C33	0013/L	0·5 MFD 200V

REF	DESCRIPTION	PART No
VC1 & VC2	380 MMFD 2 GANG CONDENSER	APC0057/A
TC1 TC2, TC3 & TC4	AIR CONDENSER	APD0786
TS1	FIXED TRIMMER SHUNT 7·0 MMFD	APD0910
TS2	FIXED TRIMMER SHUNT 1·0 MMFD	APD0914
VR1	1 MEGOHM POTENTIOMETER	APD0877
	DIAL LAMPS 6·3V ·15 TO ·3 AMP	
	6" DIA PERMAG SPEAKER FOR MODEL 99	APC0106
	8" DIA PERMAG SPEAKER FOR MODEL 325	APC0091
CK1	L.T. CHOKE	APD0684/A
T1	DRIVER TRANSFORMER	APD0941
L1 & L2	BROADCAST AERIAL COIL	APD0896
L3 & L4	SHORT WAVE OSCILLATOR COIL	APC0085/C
L5 & L6	SHORT WAVE AERIAL COIL	APC0085/B
L7 & L8	BROADCAST OSCILLATOR COIL	APC0085/A
IFT1	1ST IF TRANSFORMER	APD0968
IFT2	2ND IF TRANSFORMER	APD0969
IFT3	3RD IF TRANSFORMER	APD0970

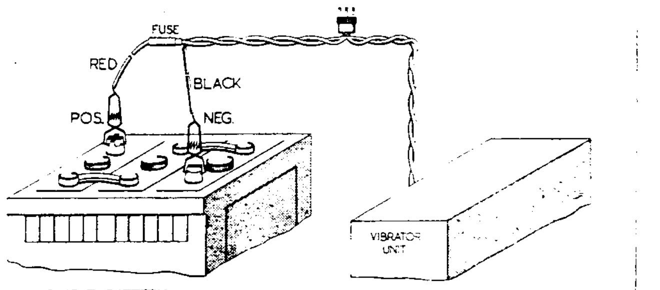


TOP CHASSIS



WAVE CHANGE SWITCH S1.
PT No. APD0860

S2 TONE CONTROL &
BATTERY SWITCH APD0833



6 VOLT BATTERY