"His Master's Voice"

SERVICE MANUAL

for

FOUR VALVE

BROADCAST BATTERY OPERATED MODEL 51

BROADCAST VIBRATOR OPERATED MODEL 61

DUAL-WAVE BATTERY OPERATED MODEL 52

DUAL-WAVE VIBRATOR OPERATED MODEL 62

TECHNICAL SPECIFICATION

BATTERIES

Model	"A" Supply	"B" Supply
51	Air-Cell or 2-volt 110 amp. hr. Accumulator	2 x 45-volt Heavy Duty Batteries
52	do.	2 x 45-volt Superdyne Batteries
61	2-volt 190 amp. hr. Accumulator	Vibrator
62	do.	do.

The accumulator, where supplied with the receiver, is already fully charged.

This battery should be recharged at least every two months, 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 1.8 volts.

CONSUMPTION

Model	"A" Supply	"B" Supply
51 and 52 ..	0.34 amp.	12 ma.
61 and 62 ..	1.7 amp.	

SPEECH OUTPUT

270 milliwatts undistorted (plate circuit).

WAVE-LENGTH RANGE

Models 51 & 61: 200-545 metres (1500-550 kc.).
" 52 & 62: 200-545 metres (1500-550 kc.).
16.5-49 metres (18.17-6.12 mc.)

DIMENSIONS

Height 15" Width 11" Depth8"

WEIGHT

	Net	Gross
Model 51	17 lbs.	21 lbs.
" with Batteries	51 lbs.	62 lbs.
Model 52	18 lbs.	22 lbs.
" with Batteries	59 lbs.	70 lbs.
Model 61	25 lbs.	29 lbs.
" with Battery ..	50 lbs.	58 lbs.
Model 62	26 Ins.	30 lbs.
" with Battery ..	51 lbs.	59 lbs.

VALVES

1C7G Converter.
1D5G I.F.
1F7G Demodulator. A.V.C. and 1st A.F.
1Q5G Power.

LOUDSPEAKER

The speaker used is of the permanent magnet dynamic type. It is a 6-inch model with a voice coil impedance at 400 cycles of 3.5 ohms.

CIRCUIT DESCRIPTION

These models employ a 4-valve superheterodyne chassis comprising a Pantagrid converter followed by an I.F. amplifier. Demodulation is effected and A.V.C. voltage is obtained in the diode circuits of the following valve, which is a duo-diode-pentode; the pentode section of this valve functions as an audio amplifier and is resistance-capacity coupled to the output valve, which is of the beam tetrode type.

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

The I.F. transformers are permeability tuned and employ Litz-wound coils with sliding iron cores.

Full A.V.C. voltage is applied to the converter and I.F. valves whilst partial A.V.C. is taken to the audio valve; no A.V.C. voltage is applied to the S.W. converter grid.

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 dielectric type, using a robust plunger type construction, which is entirely immune to change of capacity or detrimental atmospheric influences.

When the chassis is operated with a vibrator unit, the bias on the power valve grid is obtained from the voltage drop across the smoothing choke in the H.T. negative lead.

When operated with battery H.T., this bias is derived from a voltage drop across a resistor in the H.T. negative lead.

This change of circuit connections is automatically accomplished by plugging the appropriate cable into the proper battery socket on the chassis.

By this means it is possible to convert Models 51 and 52 into Models 61 and 62 respectively by merely plugging in a vibrator unit cable in place of the battery cable.

A suitable resistor of 0.83 ohms. is provided in the receiver to reduce the voltage of the Air-Cell to the correct value, and this resistor is automatically brought into circuit by the use of the correct Air-Cell battery connection cable; when the accumulator type battery cable is in use, this resistor is removed from circuit.

CAUTION

It is not advisable to alter the length of any of the battery connection cables, because their resistance forms part of the total series resistance introduced to obtain correct filament voltages.

WAVE BAND SWITCHING (Models 52 and 62)

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

In the first position of the switch (anti-clockwise) the receiver is adjusted for short-wave reception and in the second position for broadcast reception

TONE MONITOR (Combined with Battery Switch)

The tone is controlled by a four-position two-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 speaker transformer primary.

DIAL LAMP (2.5v. 0.3amp.)

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 a station. When released, this button will extinguish the dial lighting, thus saving unnecessary drain on the battery.

VIBRATOR CIRCUIT DESCRIPTION (Models 61 and 62)

The circuit of the vibrator unit is indicated on page 6. This unit includes the vibrator cartridge, 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 vibrator socket is arranged with a sponge rubber mounting so as to ensure a minimum of mechanical noise being transmitted to the cabinet.

The remainder of the unit consists of the necessary transformers and filters.

Important Note.—It is essential that the resistance of the 5-amp. fuse in the vibrator positive L.T. circuit should not exceed 0.01 of an ohm, otherwise the performance and battery life will suffer. Use only Australux 5-amp. fuse, type 1AG.

PRELIMINARY TESTS

1. Check over battery connections in accordance with the diagram on page 6.
2. Check over battery voltages as specified in paragraph headed "Batteries."
3. Remove fuse from A+ vibrator lead and check for continuity in the fuse (Models 61 and 62).
4. Switch the receiver on by means of the combined battery and Tone Monitor switch, and, having removed the earth wire and turned the volume control to the maximum position, touch the finger to the grid of the 1F7G valve (1st AF). 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 valves or associate circuits ahead of this position. Should no hum be heard, the fault will have developed between the first audio and output stage.
5. Check all valves for filament continuity and freedom from internal shorts.
6. To determine if the fault lies in the loudspeaker, connect a high-impedance A.C. voltmeter or output meter, with a range of approximately 0.3 volts, across the voice coil terminals on the speaker. With the receiver switched on and adjusted for the broadcast band, turn the volume control fully on and rotate the tuning control. If no deflection is given by 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 from the cabinet and compare voltages with the voltage table given on page 7.

DISMANTLING

REMOVAL OF CHASSIS

1. Turn tuning control so that gang condenser plates are fully meshed.
2. Remove knobs.
3. Disconnect loudspeaker and battery plug.
4. Remove rear cabinet support bar.
5. Loosen nut on pilot lamp switch and remove.
6. Remove four fixing screws from underside of cabinet; the chassis is now free.

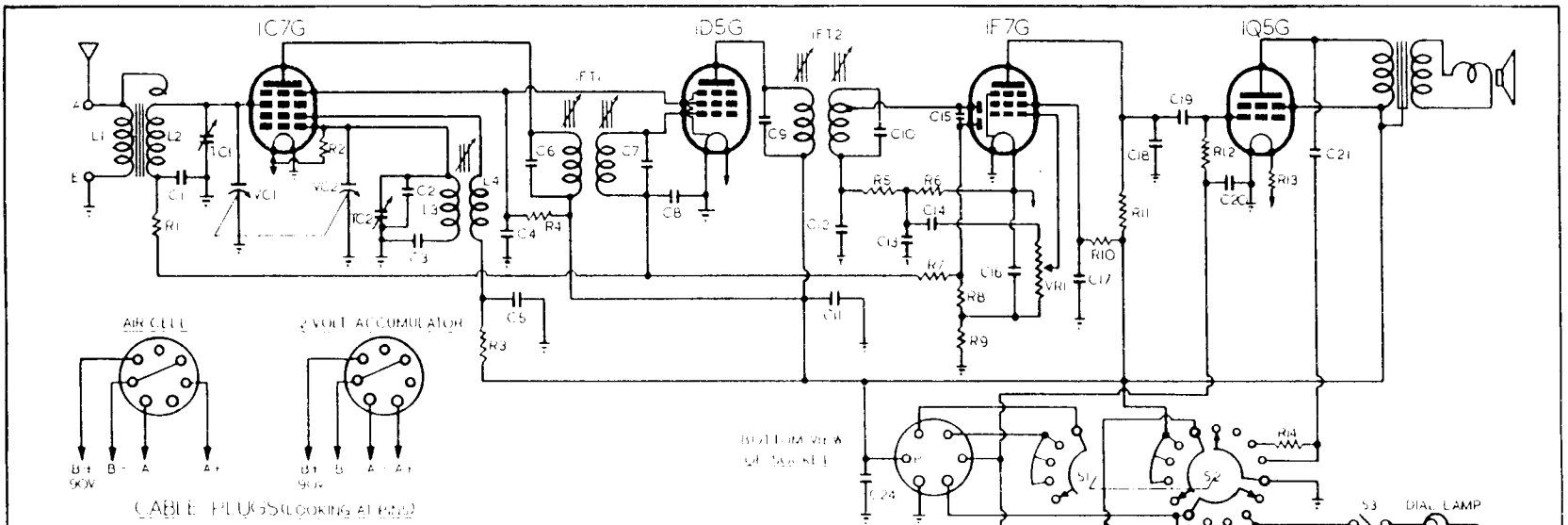
REMOVAL OF VIBRATOR UNIT (Models 61 and 62)

(**Note.**—Replacement of the vibrator cartridge may be effected at any time without removal of the entire unit from the cabinet. This may be accomplished by removing the nine screws which hold the vibrator unit cover in place; on lifting this cover plate all vibrator components will be accessible.)

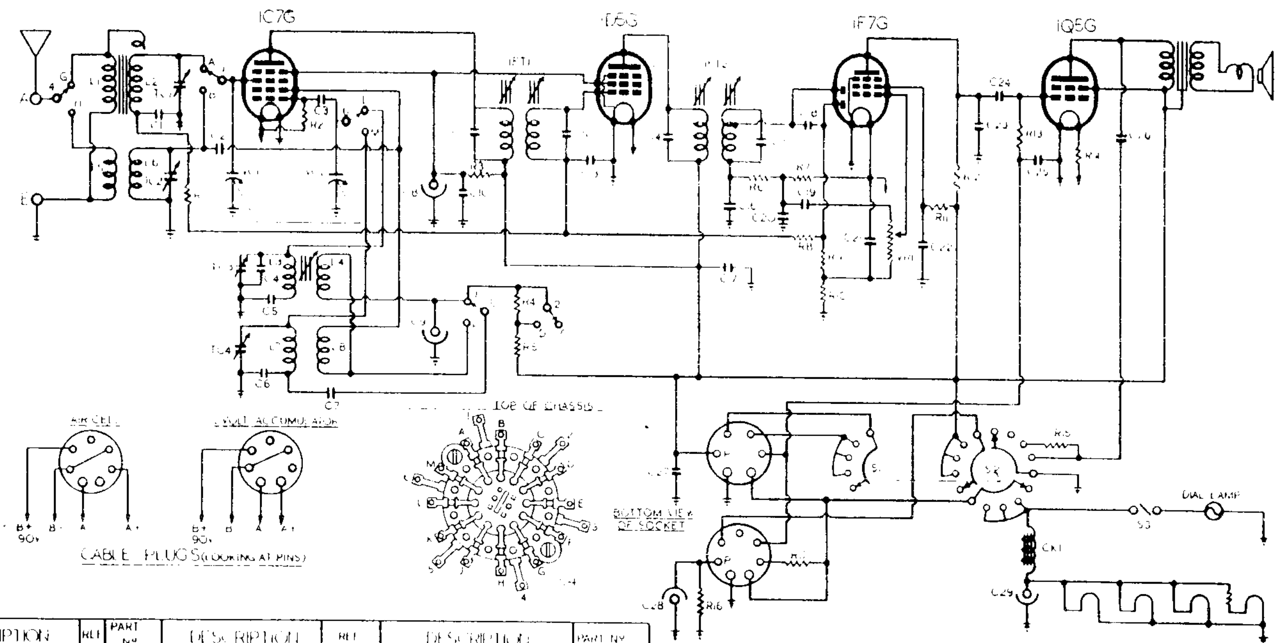
1. Remove rear cabinet support bar.
2. Disconnect cable plug from chassis.
3. Remove the two screws at the top rear of cabinet.
4. Remove the two screws holding unit to speaker support bar; the unit is now free and may be withdrawn from the cabinet.

REMOVAL OF LOUDSPEAKER

1. Remove vibrator unit (Models 61 and 62 only).
2. Disconnect speaker leads from jacks.
3. Remove screws at each end of speaker support bar.
4. Remove four nuts holding speaker chassis and remove speaker.



REF	PART N°	DESCRIPTION		PART N°	DESCRIPTION	REF	DESCRIPTION	PART N°
R 1	J1X	100,000 OHMS 1/4 WATT	C 1	0013/M	0·05MFD 200V	VC1&VC2	380MMFD 2 GANG CONDENSER	APC0057/A
R 2	H1X	50,000 OHMS 1/4 WATT	C 2	0243/BF	15MMFD	VR1	1MEGOHM POTENTIOMETER	APD0877/B
R 3	B0IX	12,500 OHMS 1/4 WATT	C 3	0243/AM	400 MMFD	IFT1	1ST IF TRANSFORMER	APD1450
R 4	A0IX	25,000 OHMS 1/4 WATT	C 4	0013/Q	0·1MFD 200V	IFT2	2ND IF TRANSFORMER	APD1451
R 5	H1X	50000 OHMS 1/4 WATT	C 5	0013/Q	0·1MFD 200V	L1 & L2	B/C AERIAL COIL	APD0896
R 6	O1X	500,000 OHMS 1/4 WATT	C 6	0243/BL	100MMFD	L3&L4	B/C OSCILLATOR COIL	APC0085/A
R 7	A4IX	2MEGOHMS 1/4 WATT	C 7	0243/AZ	50 MMFD	S1 & S2	BATTERY & TONE CONTROL SWITCH	APD1435
R 8	A4IX	2MEGOHMS 1/4 WATT	C 8	0013/K	0·02MFD 300V	S3	PUSH BUTTON SWITCH	APD1361/A
R 9	A4IX	2MEGOHMS 1/4 WATT	C 9	0243/BL	100MMFD	CK1	LT CHOKE	APD1452
R10	B8IX	600,000 OHMS 1/4 WATT	C10	0243/BL	100MMFD	TC1&TC2	AIR TRIMMER	APD0786
R11	N1X	250,000 OHMS 1/4 WATT	C11	0013/L	0·5MFD 200V		6" PERMAG SPEAKER	APD1475
R12	P1X	1 MEGOHM 1/4 WATT	C12	0243/AE	100MMFD		DIAL LAMP 2·5V 0·3AMP	
R13	1474/B	4·87 OHMS WIRE WOUND	C13	0243/AE	100MMFD			
R14	F1X	10,000 OHMS 1/4 WATT	C14	0013/N	0·01MFD 600V			
R15	1474/A	0·83 OHMS WIRE WOUND	C15	0243/Q	50MMFD			
R16	BCW	550 OHMS 3 WATT	C16	0013/L	0·5MFD 200V			
			C17	0013/Q	0·1MFD 200V			
			C18	0243/O	250MMFD			
			C19	0013/N	0·01MFD 600V			
			C20	0013/P	0·25MFD 200V			
			C21	0013/S	0·02MFD 600V			
			C22	0014/S	10MFD 25V ELECTROLYTIC			
			C23	0014/AH	1000 MFD 12V ELECTRO			
			C24	0243/AB	100MMFD			

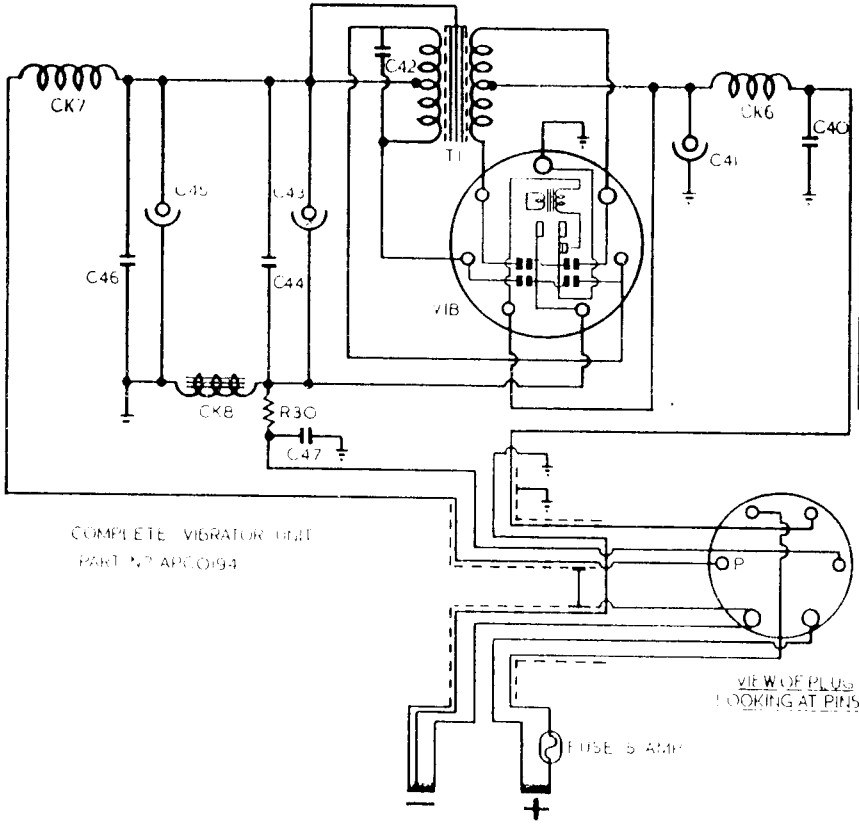


REF	PART Nº	DESCRIPTION
R 1	JIX	100,000 OHMS 1/4 WATT
R 2	HIX	60,000 OHMS 1/4 WATT
R 3	ALIX	25,000 OHMS 1/4 WATT
R 4	XIX	5,000 OHMS 1/4 WATT
R 5	ARIX	7,500 OHMS 1/4 WATT
R 6	HIX	50,000 OHMS 1/4 WATT
R 7	OIX	500,000 OHMS 1/4 WATT
R 8	AAIX	2 MEGOHMS 1/4 WATT
R 9	AAIX	2 MEGOHMS 1/4 WATT
R10	AAIX	2 MEGOHMS 1/4 WATT
R11	BBIX	600,000 OHMS 1/4 WATT
R12	NIX	250,000 OHMS 1/4 WATT
R13	PIX	1 MEGOHM 1/4 WATT
R14	14/A/G	4.87 OHMS WIRE WOUND
R15	FIX	10,000 OHMS 1/4 WATT
R16	BCW	550 OHMS 3 WATT
R17	14/4/A	0.83 OHMS WIRE WOUND

REF	PART Nº	DESCRIPTION
C 1	0013/M	0.05 MFD 200V
C 2	1471	NEUTRALIZING CONDENSER
C 3	0243/AW	50 MMFD
C 4	0243/BF	15 MMFD
C 5	0243/AM	400 MMFD
C 6	0243/AN	3250 MMFD
C 7	0013/N	0.01 MFD 600V
C 8	0014/M	8 MFD 250V ELECT WITH C9
C 9	0014/M	16 MFD 250V ELECT WITH C8
C10	0013/Q	0.1 MFD 200V
C11	0243/BL	100 MMFD
C12	0243/AZ	50 MMFD
C13	0013/K	0.02 MFD [illegible]
C14	0243/BL	100 MMFD
C15	0243/BL	100 MMFD
C16	0243/AE	100 MMFD
C17	0013/L	0.5 MFD 200V
C18	0243/[illegible]	50 MMFD
C19	0013/N	0.01 MFD 600V
C20	0243/AE	100 MMFD
C21	0013/L	0.5 MFD 200V
C22	0013/Q	0.1 MFD 200V
C23	0243/O	250 MMFD
C24	0013/N	0.01 MFD 600V
C25	0013/P	0.25 MFD 200V
C26	0013/S	0.02 MFD 600V
C27	0243/AB	100 MMFD
C28	0014/S	10 MFD 25V ELECTROLYTIC
C29	0014/AH	1000 MFD 12V ELECTRO

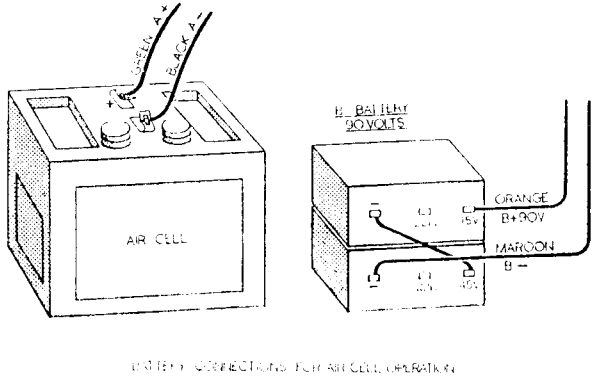
REF	DESCRIPTION	PART Nº
VC1 & VC2	380 MMFD 2 GANG CONDENSER	APC0057/A
VR1	1 MEGOHM POTENTIOMETER	APD0877/B
IFT1	1ST IF TRANSFORMER	APD1450
IFT2	2ND IF TRANSFORMER	APD1451
L1 & L2	B/C AERIAL COIL	APD0856
L3 & L4	B/C OSCILLATOR COIL	APC0085/A
L5 & L6	S/W AERIAL COIL	APC0085/B
L7 & L8	S/W OSCILLATOR COIL	APC0085/C
S1 & S2	BATTERY & TONE CONTROL SWITCH	APD1435
S3	PUSH BUTTON SWITCH	APD1361/A
S4	WAVE CHANGE SWITCH	APD0860
CK1	LF CHOKE	APD1452
TC1 & TC2, TC3 & TC4	AIR TRIMMER	APD0766
	6" PERMAG SPEAKER	APD1475
	DIAL LAMP [illegible]	

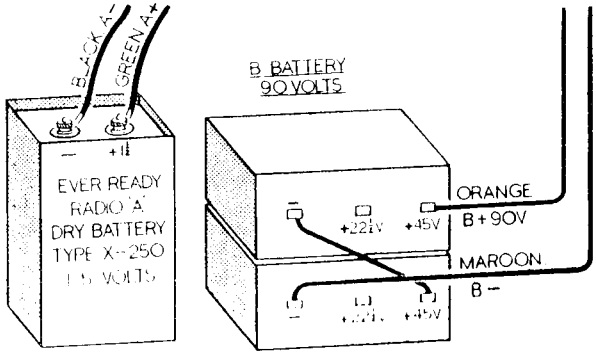
Models 52 and 62.



REF	DESCRIPTION	PART Nº
T1	VIBRATOR TRANSFORMER.	APD1421
CK6	RF CHOKE L.T	APD1438
CK7	RF CHOKE H.T	APD1425
CK8	HT CHOKE	APD1423
VIB	'OAK' 2V. SPLIT REED VIBRATOR	APD1414
C40	0·1MFD 200V. CONDENSER	0013/Q
C41	400MFD 12 P.V ELECTRO	0014/AE
C42	0·01MFD 1000V CONDENSER	0013/X
C43	8MFD 525 P.V ELECTROLYTIC	0014/AC
C44	0·1MFD 400V CONDENSER	0013/E
C45	24MFD 150 P.V ELECTROLYTIC.	0014/AD
C46	0·5MFD 200V CONDENSER	0013/L
C47	0·1MFD 200V "	0013/Q
R30	250,000 OHMS 1/4 WATT	0244/NIX
	VIBRATOR PLUG & LEAD	APD1433

Vibrator Unit Models 61 and 62.





VOLTAGE TABLE

The receiver should be tuned to a point of no reception on the BC band. Values given are ± 10% with the exception of filament voltages which are ± 5%. All voltage readings above 10 volts are taken on the 250-volt scale of a 1000 ohms per volt voltmeter. If a voltmeter with an internal resistance of less than 1000 ohms per volt is utilised, allowance must be made for the voltage drop caused by the voltmeter. Note that, with vibrator H.T. supply, it will not be possible to measure the power valve grid bias at the chassis due to the presence of a 0.25 megohm decoupling resistor in the vibrator unit; however, this voltage may be measured at the vibrator unit.

MODEL 51 AND 52 (BATTERY H.T.).

	1C7G	1D5G	1F7G	1Q5G
Plate to chassis volts	84	84	15	82
Plate current (ma)	1.2	1.4	0.3	4.5
Osc. plate to chassis volts	BC/60 SW/69	—	—	—
Osc. plate current (ma)	1.7 1.7	—	—	—
Screen to chassis volts	37	37	19	84
Screen current (ma)	1.0	0.6	0.1	0.7
Bias voltages	0	0	0	—6.3
Filament voltages— With air cell=2.33 volts / Or Accumulator=2.0 volts	1.85	1.85	1.85	1.37

MODELS 61 AND 62 (VIBRATOR H.T.)

	1C7G	1D5G	1F7G	1Q5G
Plate to chassis volts	86	86	15	84
Plate current (ma)	1.3	1.6	0.3	5.9
Osc. plate to chassis volts	BC/61 SW/70	—	—	—
Osc. plate current (ma)	1.7 1.7			
Screen to chassis volts	40	40	19	86
Screen current (ma)	1.0	0.7	0.1	0.9
Bias voltages	0	0	0	—5.8
Filament voltages Accumulator=2.0 volts.	1.85	1.85	1.85	1.37

RADIO FREQUENCY TESTS AND ADJUSTMENTS

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

To do this, the following apparatus is required:

1. An oscillator or signal generator capable of tuning to 1500 kc., 1400 kc., 600 kc., 460 kc., 16.5 metres and 17 metres, suitably screened and with an attenuator.
2. An output meter having a range of 0-2 volts A.C. approximately.

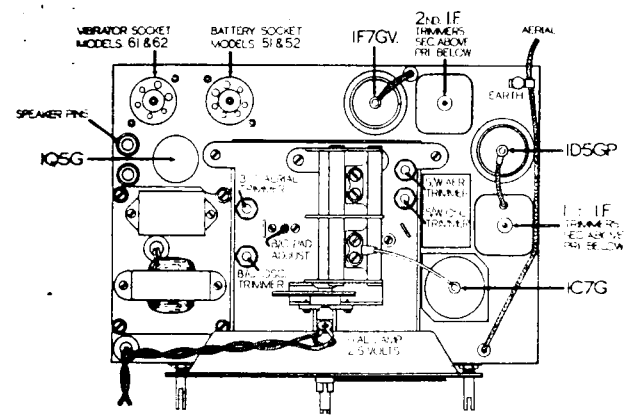
I.F. alignment should always precede R.F. alignment, and even if only one coil or one range of coils has been serviced, the whole of the realignment should be done in the order given, i.e., broadcast band first followed by short-wave band.

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.

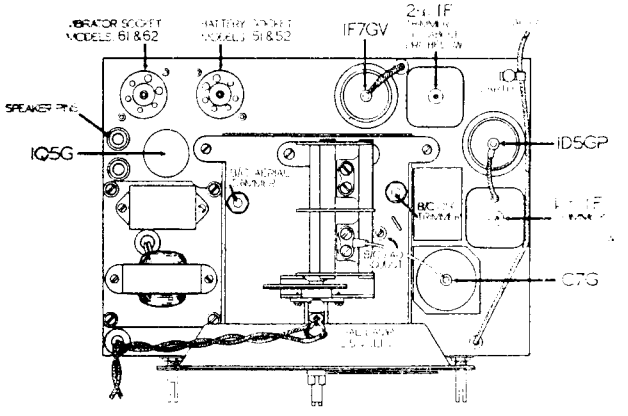
For all alignment operations, the output meter should be connected across the loudspeaker voice coil.

I.F. ALIGNMENT

The sketches on page 8 show the layout of all principal components and adjustments referred to in the procedure following.



(Models 52 and 62)



(Models 51 and 61)

Before commencing alignment, the Tone Monitor should be set to its second position, i.e., "Normal."

Rotate the volume control fully clockwise and set wave-change switch to broadcast band position; make sure that the vanes of the tuning condenser are fully meshed; 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 grid 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 both 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 may be 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.)

R.F. ALIGNMENT

With controls set as for I.F. alignment, connect the signal generator output leads through a standard dummy antenna of 200 mfd. capacity to the aerial connection and chassis.

Check that when the ganged condenser is fully meshed the pointer falls directly over the setting line marked "S" at the extreme bottom right of the scale; the pointer is a friction fit on the condenser spindle, and can be rotated to bring it to the correct setting.

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 gang condenser) align receiver so that 600 kc. signal is tuned in exactly on line.
3. Tune signal generator to 1500 kc.
4. Set pointer exactly over 1500 kc. point on scale and adjust B.C. oscillator trimmer until signal is correctly tuned in with the pointer on the 1500 kc. line.
5. Tune signal generator and receiver to 1400 kc.
6. Adjust B.C. aerial trimmer for maximum output as shown on the output meter.
7. Repeat operations 1 to 6 inclusive. THIS IS IMPORTANT. Note that any broadcast stations receivable are tuned-in correctly on calibration.

SHORT-WAVE ALIGNMENT (Models 52 and 62)

Note.—The S.W. trimmers may be distinguished by the red washers under their locknuts.

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 aerial connection as previously.
2. Tune signal generator to 16.5 metres (18.17 mc.).
3. Rotate tuning knob until pointer is over 16.5 metres, and adjust S.W. oscillator trimmer until maximum output is obtained with pointer exactly on the 16.5 metre mark. Two settings will be found at which trimmer will peak; care should be taken to see that the setting finally selected is that which gives the **lower** capacity in the trimmer (plunger further out). Failure to select the correct position will cause serious tracking error and loss of sensitivity.
4. Tune receiver and signal generator to 17 metres (17.64 mc.).
5. Adjust the SW. aerial trimmer for maximum output while "rocking" the ganged condenser to obtain the correct resonant point.
6. Check the foregoing adjustments to ensure that the correct settings have been obtained in all trimmers.

Note.—The R.F. trimmers on this model are of plunger type with air dielectric, and possess exceptionally high stability and efficiency. A special adjusting tool can be obtained from the factory incorporating a box spanner for the condenser locknut, and adjusting hook for the plunger. After loosening the large locknut 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 locknut securely.

ADDITIONAL DATA

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

(The Company reserves the right to make any modifications without notice.)