"His Master's Voice"

SERVICE MANUAL

for

FIVE-VALVE VIBRATOR POWERED BATTERY RECEIVERS

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Dual-Wave - - - Model 329

Broadcast - - - Model 359

TECHNICAL SPECIFICATION

BATTERY

The battery required for the operation of this receiver is as follows:

One 6-volt 150-amp. hour accumulator.

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 this model is approximately 1.0 amp. in normal operation.

SPEECH OUTPUT

Approximately 0.75 watts undistorted.

WAVE-LENGTH RANGE

187.5–545 metres (1600–550kc.).
*13.9–47 metres (21.57–6.38mc.).

*Model 329 only.

DIMENSIONS

Height	Width	Depth
35¾"	29½"	13½"

WEIGHT

	Without Battery	With Battery
Nett	71 lbs.	—
Gross	82 lbs.	136 lbs.

VALVES

1C7G Converter.
1D5G 1st I.F.
1F7G 2nd I.F. and Demodulator.
1F7G 1st AF and AVC.
1G5G Power.

LOUDSPEAKER

The loudspeaker used is of the permanent magnetic type. It is a 10-inch model with a voice coil impedance at 400 cycles of 3.3 ohms.

CIRCUIT DESCRIPTION

This model embodies a 5-valve superheterodyne chassis comprising a Pentagrid converter followed by a two-stage I.F. amplifier. Demodulation is effected in the diode circuit at the last I.F. valve; the demodulated signal is then amplified by a duo-diode-pentode, one of the diodes of which supplies the AVC voltage ; this valve is resistance-capacity coupled to a pentode which functions as output stage.

The valve filaments are connected in a series-parallel arrangement.

A split reed synchronous vibrator is used in the vibrator power supply circuit; this enables the output valve to be adequately biassed by means of a resistor in the negative high tension lead; all other bias voltages are obtained from the filament circuits.

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

The three I.F. transformers are permeability tuned and employ Litz wound coils with sliding iron cores. The AVC voltage is applied to the converter and I.F. valves. No AVC voltage is applied to the S.W. converter grid. Optimum delay voltage is provided for the AVC diode by means of filament voltage drop so that adequate power output may be obtained before the AVC system takes control.

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 S.W. 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 influence.

WAVE BAND SWITCHING (Model 329)

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.

The first position of the switch (anti-clockwise) connects the short-wave coils and associate components in circuit, whilst the second position does the same with the broadcast band components.

TONE MONITOR

This is a four-position, single-deck switch, used as a combined tone control and battery switch.

1st Position.—Receiver switched off.

2nd Position (Normal).—Receiver on, maximum treble and bass note reproduction.

3rd Position (Bass).—Receiver on, high audio-frequency cut introduced.

4th Position (Speech).—Receiver on, low audio-frequency cut introduced.

DIAL LAMPS (6.3v. 0.15 amp.)

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 station. 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 this model is indicated on pages 4 & 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 on page 6.
2. Check over battery voltage as specified in paragraph headed "Batteries."
3. Remove fuse from A+ vibrator lead and check for continuity in the fuse.
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 second 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 and loudspeaker from the cabinet and compare voltages with the voltage table given below.

DISMANTLING

REMOVAL OF CHASSIS

1. Remove knobs.
2. Disconnect loudspeaker and battery plugs.
3. Remove the two leads from the pilot lamp switch on the side of the cabinet.
4. Remove two fixing bolts from underside of the shelf; the chassis is now free.

REMOVAL OF LOUDSPEAKER

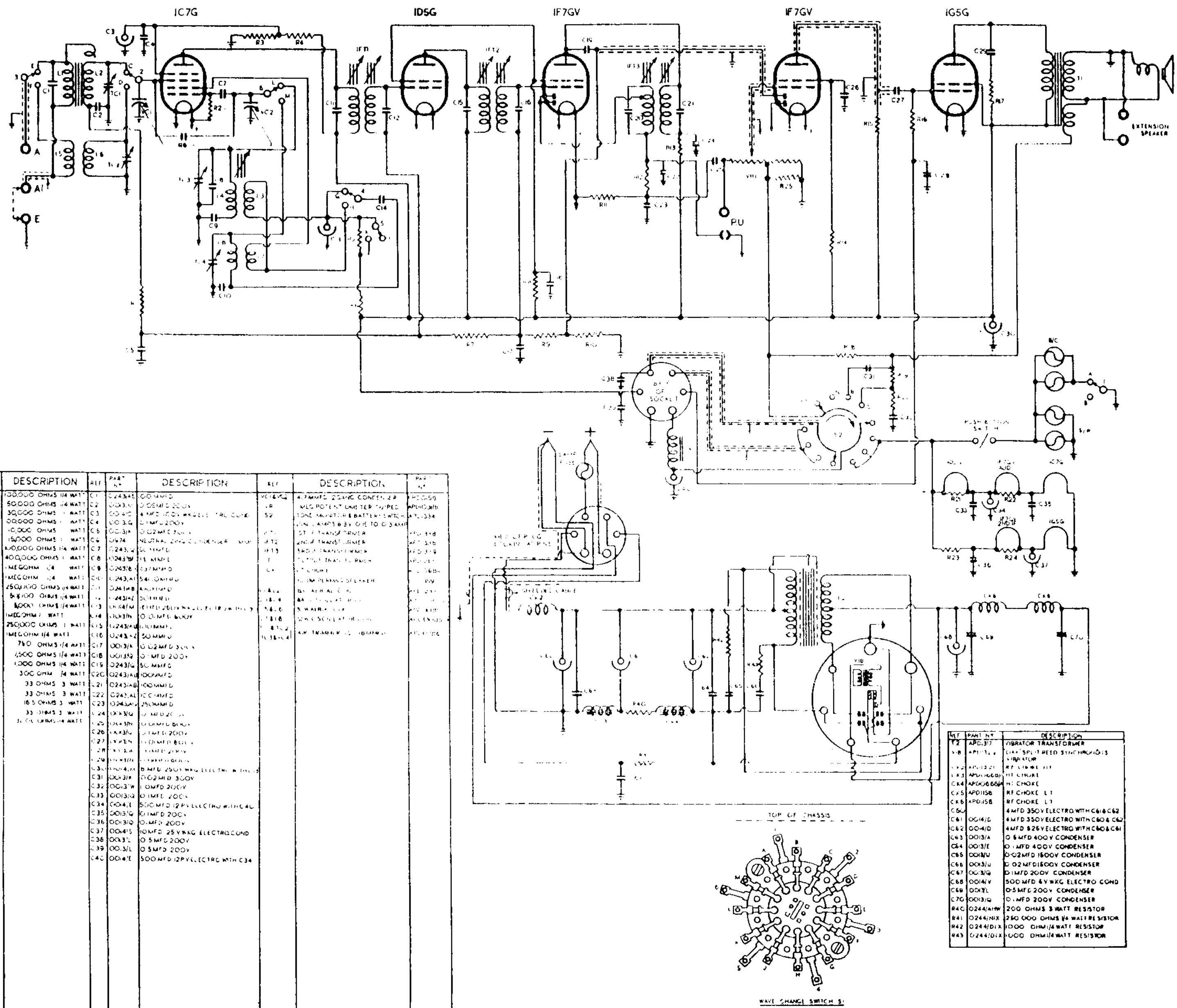
1. Remove speaker plug from receiver chassis.
2. Remove four screws holding speaker chassis and remove speaker.

VOLTAGE TABLE

Values given are ± 10% with receiver tuned to a point of no reception and a low tension battery voltage of 6 volts. Bias voltages are measured between the negative side of filament and chassis. Note that the 1G5G valve (V.5) bias of 14 volts is obtained from the voltage drop across the two smoothing chokes and 200 ohm resistor connected in series in the negative side of the high-tension circuit. Since this bias voltage is decoupled by means of a ¼ megohm resistor in the vibrator chassis it is not possible to measure it at the receiver, but only at the vibrator unit.

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.

	V1 1C7G	V2 1D5G	V3 1F7GV	V4 1F7GV	V5 1G5G
Plate to Chassis Volts	140	140	138	42	136
Screen to Chassis Volts	28	42	42	30	140
Oscillator Plate to Chassis Volts	BC 95 SW 110	—	—	—	—
Bias Voltage	0	4	2	2	14
Filament Voltages	2	2	2	2	2



REF	PART Nº	DESCRIPTION	REF	PART Nº	DESCRIPTION	REF	DESCRIPTION	PART Nº
R1	J1X	100,000 OHMS 1/4 WATT	C1	0243/AE	100 MMFD	VC1 & VC2	4.7 MMFD 2 GANG CONDENSER	[illegible]
R2	H1X	50,000 OHMS 1/4 WATT	C2	0013/[illegible]	0.05 MFD 200V	[illegible]	MEG POTENTIOMETER TAPPED	[illegible]
R3	W3X	30,000 OHMS [illegible] WATT	C3	0014/C	4 MFD 100V WKG ELECTRO COND	S2	TONE MONITOR & BATTERY SWITCH	APD334
R4	J3X	[illegible]00,000 OHMS [illegible] WATT	C4	0013/G	0.1 MFD 200V		DIAL LAMPS 6.3V 0.15 TO 0.3 AMP	
R5	Y3X	10,000 OHMS [illegible] WATT	C5	0013/A	0.02 MFD 300V	IFT1	1ST IF TRANSFORMER	APD 318
R6	AD3X	15,000 OHMS [illegible] WATT	C6	0674	NEUTRALIZING CONDENSER [illegible]	IFT2	2ND IF TRANSFORMER	[illegible]
R7	J1X	100,000 OHMS 1/4 WATT	C7	0243/[illegible]	50 MMFD	IFT3	3RD IF TRANSFORMER	APD 319
R8	AU3X	400,000 OHMS [illegible] WATT	C8	0243/BF	15 MMFD	T1	OUTPUT TRANSFORMER	[illegible]
R9	P1X	1 MEGOHM 1/4 WATT	C9	0243/B	437 MMFD	CH	[illegible] CHOKE	[illegible]
R10	P1X	1 MEGOHM 1/4 WATT	C10	0243/AT	540 MMFD		[illegible] PERMAG SPEAKER	[illegible]
R11	[illegible]	250,000 OHMS 1/4 WATT	C11	0243/HB	[illegible] MMFD	L1 & L2	B/C AERIAL COIL	[illegible]
R12	H1X	50,000 OHMS 1/4 WATT	C12	0243/AZ	50 MMFD	L3 & L4	B/C OSCILLATOR COIL	[illegible]
R13	X1X	5,000 OHMS 1/4 WATT	C13	0014/M	8 MFD 250V WKG ELECTRO [illegible]	L5 & L6	S/W AERIAL COIL	[illegible]
R14	P3X	1 MEGOHM [illegible] WATT	C14	0013/N	0.01 MFD 600V	L7 & L8	S/W OSCILLATOR COIL	[illegible]
R15	N3X	250,000 OHMS 1 WATT	C15	0243/AU	100 MMFD	TC1 & TC2, TC3 & TC4	AIR TRIMMER [illegible]	[illegible]
R16	P1X	1 MEGOHM 1/4 WATT	C16	0243/AZ	50 MMFD			
R17	K1X	750 OHMS 1/4 WATT	C17	0013/A	0.02 MFD 300V			
R18	AR1X	2,500 OHMS 1/4 WATT	C18	0013/Q	0.1 MFD 200V			
R19	D1X	1,000 OHMS 1/4 WATT	C19	0243/G	50 MMFD			
R20	A1X	300 OHM 1/4 WATT	C20	0243/AD	100 MMFD			
R21	AYW	33 OHMS 3 WATT	C21	0243/AB	100 MMFD			
R22	AYW	33 OHMS 3 WATT	C22	0243/AL	100 MMFD			
R23	AWW	16.5 OHMS 3 WATT	C23	0243/AU	250 MMFD			
R24	AYW	33 OHMS 3 WATT	C24	0013/G	0.1 MFD 200V			
R25	AF1X	[illegible] OHMS 1/4 WATT	C25	0013/N	0.01 MFD 600V			
			C26	0013/Q	0.1 MFD 200V			
			C27	0013/N	0.01 MFD 600V			
			C28	[illegible]	0.1 MFD 200V			
			C29	[illegible]	[illegible]			
			C30	0014/A	8 MFD 250V WKG ELECTRO [illegible]			
			C31	0013/A	0.02 MFD 300V			
			C32	0013/W	1.0 MFD 200V			
			C33	0013/Q	0.1 MFD 200V			
			C34	0014/E	500 MFD 12PV ELECTRO WITH C40			
			C35	0013/Q	0.1 MFD 200V			
			C36	0013/Q	0.1 MFD 200V			
			C37	0014/S	10 MFD 25V WKG ELECTRO COND			
			C38	0013/L	0.5 MFD 200V			
			C39	0013/L	0.5 MFD 200V			
			C40	0014/E	500 MFD 12PV ELECTRO WITH C34			

REF	PART Nº	DESCRIPTION
T2	APD.317	VIBRATOR TRANSFORMER
VIB	[illegible]	OAK SPLIT REED SYNCHRONOUS VIBRATOR
CK2	[illegible]	RF CHOKE [illegible]
CK3	APD0668A	HF CHOKE
CK4	APD0668A	HF CHOKE
CK5	APD115B	RF CHOKE L.T.
CK6	APD115B	RF CHOKE L.T.
C60		4 MFD 350V ELECTRO WITH C61 & C62
C61	0014/D	4 MFD 350V ELECTRO WITH C60 & C62
C62	0014/D	4 MFD 525V ELECTRO WITH C60 & C61
C63	0013/A	0.5 MFD 400V CONDENSER
C64	0013/E	0.1 MFD 400V CONDENSER
C65	0013/U	0.02 MFD 1500V CONDENSER
C66	0013/U	0.02 MFD 1500V CONDENSER
C67	0013/G	0.1 MFD 200V CONDENSER
C68	0014/V	500 MFD 6V WKG ELECTRO COND
C69	0013/L	0.5 MFD 200V CONDENSER
C70	0013/Q	0.1 MFD 200V CONDENSER
R40	0244/AHW	200 OHMS 3 WATT RESISTOR
R41	0244/NIX	250 000 OHMS 1/4 WATT RESISTOR
R42	0244/D1X	1000 OHM 1/4 WATT RESISTOR
R43	0244/D1X	1000 OHM 1/4 WATT RESISTOR

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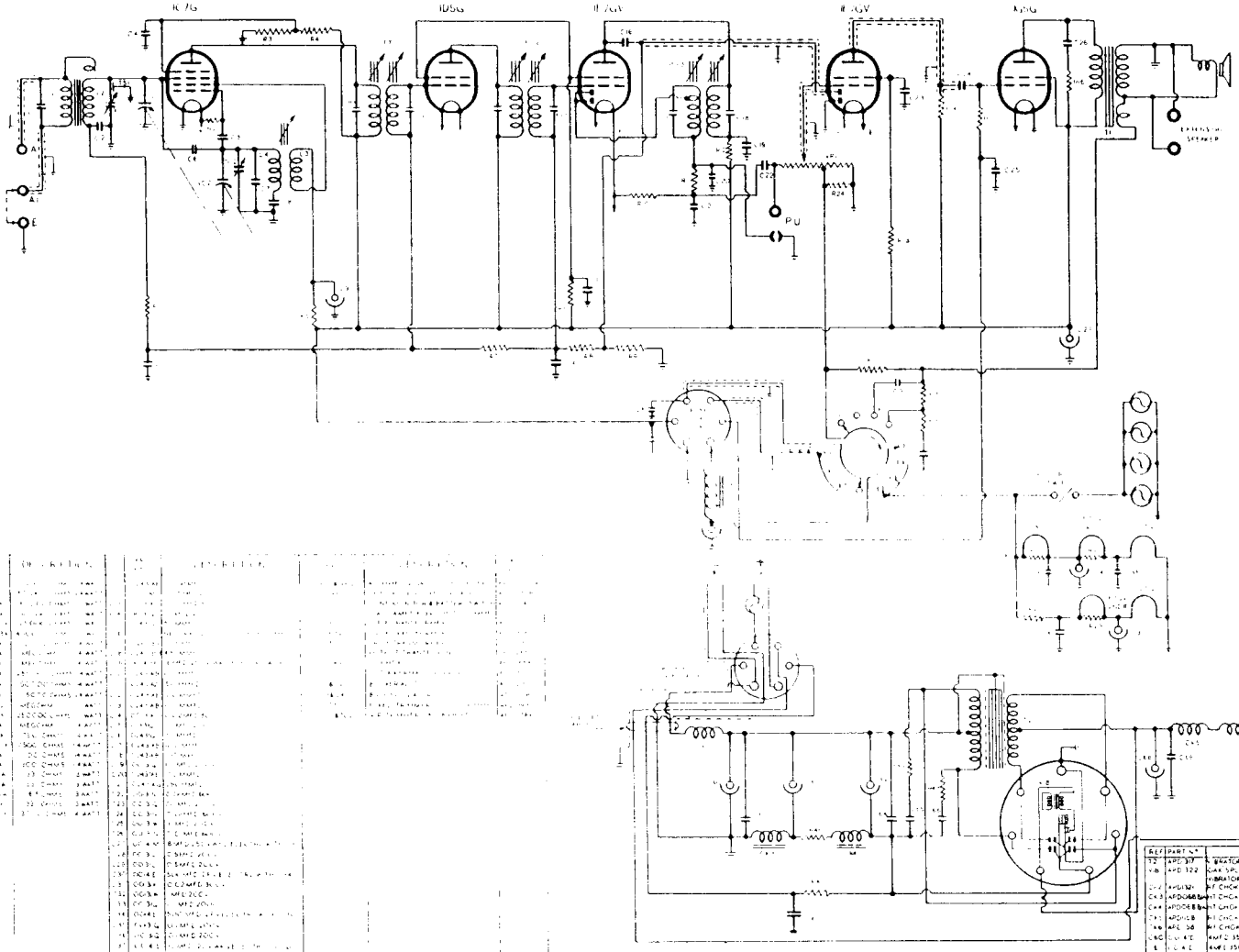


RADIO FREQUENCY TESTS AND ADJUSTMENTS

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 H.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 1600kc., 1500kc., 600kc., 460kc., 13.9 metres and 15 metres, suitably screened and with an attenuator.
2. An output meter having a range of 0-2 volts A.C. approximately.

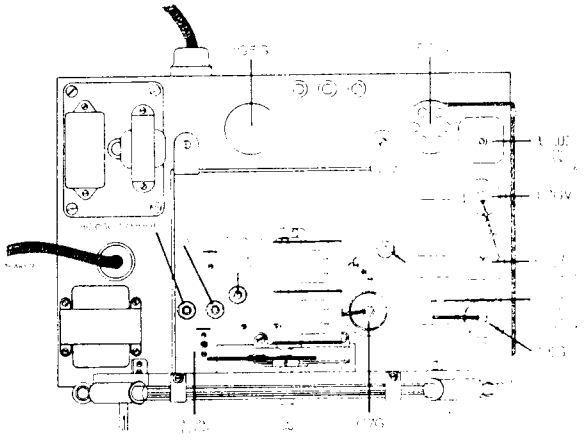
I.F. alignment should always precede H.F. alignment, and even if only one coil or one range of coils has been serviced, the whole of the realignment should be done in the order given, i.e., broadcast band first followed by short-wave band.

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 loudspeaker voice coil.

I.F. ALIGNMENT

The following sketches show the layout of all principal components and adjustments referred to in the following procedure:

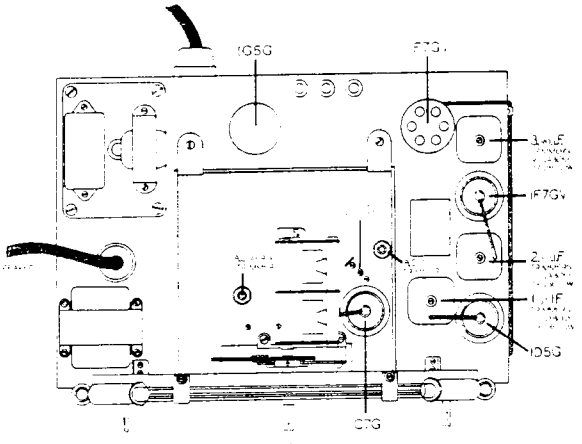


Dual-wave Model 329

Before commencing alignment, it is imperative that 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.)



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1. Tune signal generator to exactly 460kc.
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 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 mmfd. capacity to the aerial terminal 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 600kc.
2. Rotate tuning knob until pointer is exactly over 600kc. mark on scale, and by means of padding adjustment (brass screw to left of gang condenser) align receiver so that 600kc. signal is tuned in exactly on line.
3. Tune signal generator to 1600kc.

4. Set pointer exactly over 1600kc. point on scale and adjust B.C. oscillator trimmer until signal is correctly tuned in with the pointer on the 1600kc. line.
5. Tune signal generator and receiver to 1500kc.
6. Adjust aerial trimmer for maximum output as shown on the output meter.
7. Repeat operations 1–6 inclusive. THIS IS IMPORTANT. Note that any broadcast stations receivable are tuned-in correctly on calibration.

SHORT-WAVE ALIGNMENT (Model 329)

1. Set wave-change switch to SW range (fully anti-clockwise). Remove the standard dummy antenna from the output lead of the signal generator and substitute a 400-ohm non-inductive resistor; connect to aerial terminal as previously.
2. Tune signal generator to 13.9 metres (21.75mc.).
3. Rotate tuning knob until pointer is over 13.9 metres, and adjust S.W. oscillator trimmer until maximum output is obtained with pointer exactly on the 13.9 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 15 metres (20mc.).
5. Adjust the SW detector and aerial trimmers in turn 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.