



# **“His Master’s Voice”**

## **SERVICE MANUAL**

*for*

### **FOUR-VALVE CONSOLE RECEIVERS**

**Broadcast Battery Operated Model 171**

**Broadcast Vibrator Operated Model 181**

**Dual-Wave Battery Operated Model 172**

**Dual-Wave Vibrator Operated Model 182**

# TECHNICAL SPECIFICATION

## BATTERIES

Model	"A" Supply	"B" Supply
171 & 172	2-volt 110 amp. hr. Accumulator.	1x45-volt & 1x60-volt Superdyne Battery.
181 & 182	2-volt 190 amp. hr. Accumulator.	Vibrator.

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
171 and 172	.. 0.37 amp.	11.4 ma.
181 and 182	.. 2.2 amp.	

## INTERMEDIATE FREQUENCY

457.5 kc.

## SPEECH OUTPUT

135 milliwatts into voice coil.

## WAVE-LENGTH RANGE

Models 171, 181: 187-545 metres (1600-550 kc.).  
 .. 172, 182: 187-545 metres (1600-550 kc.).  
 13.9-47 metres (21.57-6.38 mc.).

## DIMENSIONS

Height, 35½ in.; width, 30½ in.; depth, 14 in.

## WEIGHT

		Net	Gross
Model 171	.. .. .	59 lbs.	71 lbs.
" "	"A" Battery ..	17½ "	20 "
" "	"B" " ..	26½ "	28 "
Model 172	.. .. .	61 "	73 "
" "	"A" Battery ..	17½ "	20 "
" "	"B" " ..	26½ "	28 "
Model 181	.. .. .	68 "	80 "
" "	"A" Battery ..	25 "	28 "
Model 182	.. .. .	68 "	80 "
" "	"A" Battery ..	25 "	28 "

## VALVES

1C7G Converter.

1D5GP I.F.

1F7G Demodulator, A.V.C. and 1st A.F.

KL4G Power.

## LOUDSPEAKER

The speaker used is of the permanent magnet dynamic type. It is a 8-inch model with a voice coil impedance at 400 cycles of 2.4 ohms.

## CIRCUIT DESCRIPTION

These models employ a 4-valve superheterodyne chassis comprising a Pentagrid 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 pentode type.

Coupling to the aerial on the broadcast band is effected through an iron-cored transformer having the normal tuned secondary and added capacity between the high potential ends of primary and 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. valve 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 is effected by adjustment of the oscillator secondary inductance by means of an adjustable iron core, in conjunction with a fixed padding condenser. No padding adjustment is required on the S.W. band.

All R.F. trimmers are of the air dielectric type, using a robust plunger type construction, which is entirely immune to change of capacity by 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 171 and 172 into Models 181 and 182 respectively by merely plugging in a vibrator unit cable in place of the battery cable.

Pick-up connection is provided for by two pin-jacks. Insertion of pick-up in circuit automatically shorts out the diode load, thus preventing interference from broadcast signals.

## 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 172 and 182)

This is carried out by means of a two-position switch. The oscillator primary coils are connected in series, as are the aerial primaries, 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 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 (2.5-volt, 0.3-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 a station. When released, this button will extinguish the dial lighting, thus saving unnecessary drain on the battery.

## **VIBRATOR CIRCUIT DESCRIPTION (Models 181 and 182)**

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, 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 ohm, otherwise the performance and battery life will suffer. Use only Australux 5-amp. fuse, type IAG.

# **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 181 and 182).
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 short circuits.
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 2 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 either in the receiver chassis or the output transformer. 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.

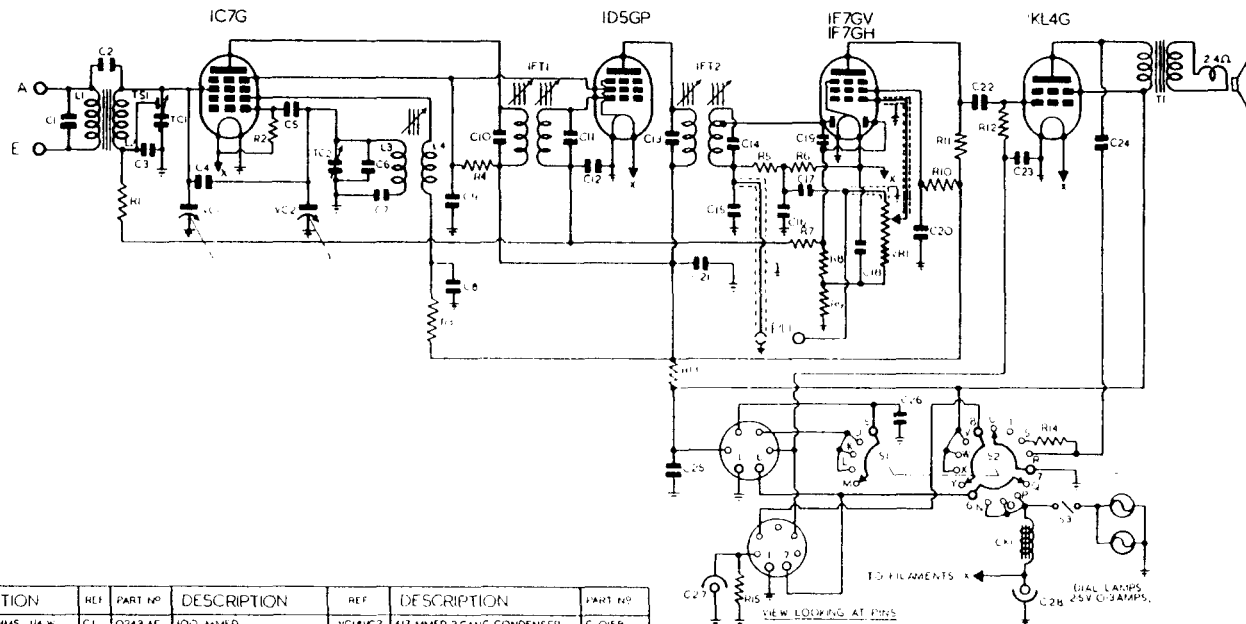
# **DISMANTLING**

## **REMOVAL OF CHASSIS**

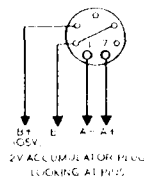
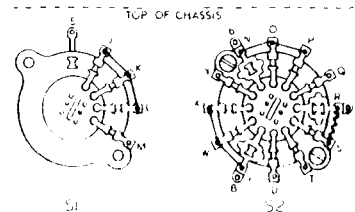
1. Remove knobs.
2. Disconnect loudspeaker and battery plug.
3. Remove the two leads from the dial lamp switch on the side of the cabinet.
4. Remove two fixing bolts from underside of the shelf; the chassis is now free.

## **REMOVAL OF LOUDSPEAKER**

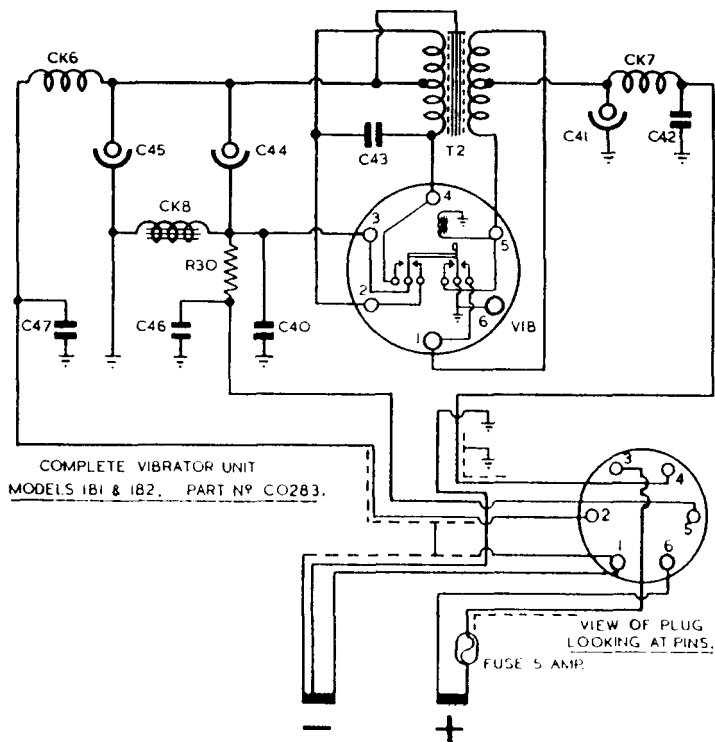
1. Remove speaker plug from receiver chassis.
2. Remove four screws holding speaker chassis and remove speaker.



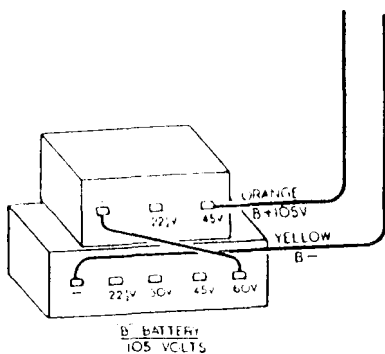
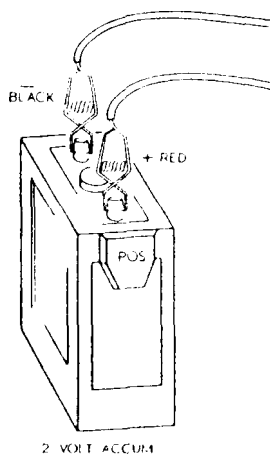
REF	PART NO	DESCRIPTION	REF	PART NO	DESCRIPTION	REF	DESCRIPTION	PART NO
R1	JX	100,000 OHMS 1/4 W	C1	0243 AE	100 MMFD	VC1VC2	417 MMFD 2 GANG CONDENSER	C 0159
R2	HLX	50,000 OHMS 1/4 W	C2	0243 BU	3 MMFD	VR1	1MEG OHM POTENTIOMETER	D 0877B
R3	AKX	12,000 OHMS 1/4 W	C3	0003 M	0.05 MFD 200V	IFT1	55 I.F. TRANSFORMER	D 1853
R4	AEIX	15,000 OHMS 1/4 W	C4	0974	NEUT. COND. 75 MFD	IFT2	2ND I.F. TRANSFORMER	D 1855
R5	HIX	50,000 OHMS 1/4 W	C5	0243 U	50 MMFD	LINE 2	B/C AERIAL COIL	D 1814 B
R6	UX	500,000 OHMS 1/4 W	C6	0243 BE	15 MMFD	LINE 4	B/C OSCILLATOR COIL	C 0085 L2
R7	AAIX	2 MEG OHMS 1/4 W	C7	0243 BH	437 MMFD	SWR52	BATTERY & TONE CONTROL SWITCH	D 4608
R8	AAIX	2 MEG OHMS 1/4 W	C8	0003 Q	0.1 MFD 200V	C8	PUSH BUTTON SWITCH	D 1361 B
R9	AAIX	2 MEG OHMS 1/4 W	C9	0003 Q	0.1 MFD 200V	C9	1.1 CHOK (0.295 L)	D 1450 A
R10	BBIX	100,000 OHMS 1/4 W	C10	0243 AE	100 MMFD	T1	CORED TRANSFORMER	D 1854 A
R11	BBIX	250,000 OHMS 1/4 W	C11	0243 AW	50 MMFD	T2	7 KIMED THIMBLE TAPPED	D 1374
R12	BBIX	100,000 OHMS 1/4 W	C12	00031	0.02 MMFD 400V	VR2	AIR TRIMMER (5.5 10 MFD)	D 1270 A
R13	BBIX	50,000 OHMS 1/4 W	C13	0243 AE	100 MMFD	VR3	B. THERMAL STABILIZER	D 1001
R14	BBIX	100,000 OHMS 1/4 W	C14	0243 AE	100 MMFD	VR4	BATTERY VOLT. & I.F. ADJUST	D 1391
R15	AAIX	2 MEG OHMS 1/4 W	C15	0243 AE	100 MMFD			
			C16	0243 AE	100 MMFD			
			C17	0003 N	0.01 MFD 500V			
			C18	0003 L	0.5 MFD 200V			
			C19	0243 U	50 MMFD			
			C20	0003 L	0.01 MFD 500V			
			C21	0003 L	0.01 MFD 500V			
			C22	0003 L	0.01 MFD 500V			
			C23	0003 L	0.01 MFD 500V			
			C24	0003 L	0.01 MFD 500V			
			C25	0003 L	0.01 MFD 500V			
			C26	0003 L	0.01 MFD 500V			
			C27	0003 L	0.01 MFD 500V			
			C28	0003 L	0.01 MFD 500V			







REF	DESCRIPTION	PART N°
T2	VIBRATOR TRANSFORMER	DI421A
CK6	R.F. CHOKE H.T.	DI425
CK7	R.F. CHOKE L.T.	DI43B
CK8	H.T. CHOKE (265~±5%)	DI423A
C40	0.1 MFD 400V. CONDENSER	COO13E
C41	400MFD 12 P.V. ELECTROLYTIC CON.	COO14AE
C42	0.1 MFD 200V. CONDENSER	COO13Q
C43	0.007 MFD 1000V. CONDENSER	COO13AF
C44	8 MFD 525 P.V. ELECTROLYTIC	COO14AC
C45	24 MFD 150 P.V. "	COO14AD
C46	0.1 MFD 200V. CONDENSER	COO13Q
C47	7000 MMFD "	DO243B
VIB	FERROCART 2 V. SYNCHRONOUS VIBRATOR	DI894
R30	250,000 OHMS 1/4 WATT RESISTOR	DO244NIX
	VIBRATOR PLUG & LEADS	DI899



BATTERY CONNECTIONS FOR ACCUMULATOR OPERATION.

# VOLTAGE TABLE

The receiver should be tuned to a point of no reception on the B.C. band. Values given are  $\pm 10\%$ , with the exception of filament voltages which are  $\pm 5\%$ . 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 KL4G 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.

Models 171, 172, 181 and 182

	1C7G	1D5GP	1F7G	KL4G
Plate to chassis volts .. .. .	83	83	18	100
Plate current (ma) .. .. .	0.87	1.75	0.2	4.5
Osc. plate to chassis volts .. .. .	B.C. 73 S.W. 80	—	—	—
Osc. plate current (ma) .. .. .	1.7 2.0	—	—	—
Screen to chassis volts .. .. .	37	37	20	101
Screen current (ma) .. .. .	1.1	0.63	0.1	0.82
Bias voltages .. .. .	0	0	0	—3.0
Filament voltages—With accumulator = 2.0 volts .. .. .	1.84	1.84	1.84	1.85

## 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., 600 kc., 457.5 kc., 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.

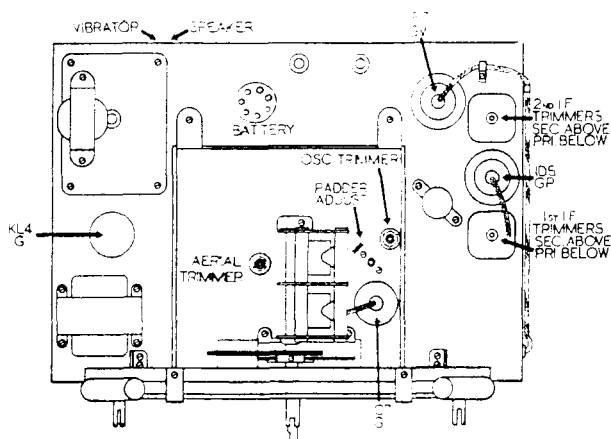
I.F. alignment should always precede R.F. alignment, and even if only one coil or one range of coils has been serviced, the whole of the realignment should be done in the order given.

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.

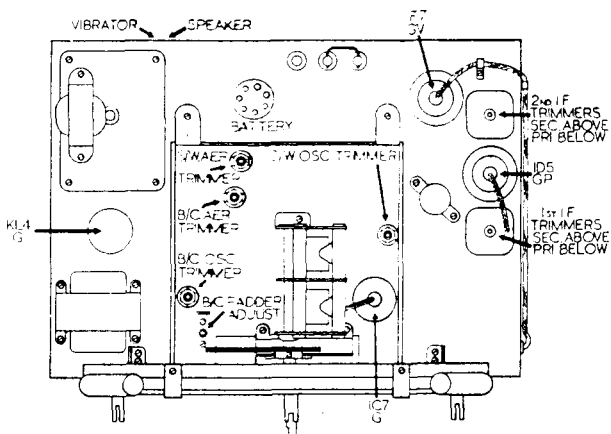
For all alignment operations, the output meter should be connected across the loudspeaker voice coil.

### I.F. ALIGNMENT

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



Models 171 and 181



Models 172 and 182



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

Rotate the Volume Control fully clockwise and make sure that the vanes of the tuning condenser are fully meshed; connect one of the output leads of the signal generator to the grid cap of the 1C7G valve through a 0.1 mfd. condenser and the other to the chassis.

(Note.—Do not disconnect the grid lead from the 1C7G grid.)

1. Tune signal generator to exactly 457.5 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 at side 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. Adjust B.C. aerial trimmer for maximum output as shown on the 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 (Models 172 and 182)

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

1. Set Wave-change Switch to S.W. 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 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 S.W. 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.