



ISSUED JAN., 1958

SERVICE DATA

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SPECIFICATION

The NRP II is a portable gramophone designed for the playing of 7-inch 45 r.p.m. records. The power is supplied from a $7\frac{1}{2}$ -volt dry battery, the motor requiring $4\frac{1}{2}$ volts and the transistor amplifier $7\frac{1}{2}$ volts. The turntable unit is a Garrard BAI and the loudspeaker a 3-ohm, 7 in. \times 4 in. elliptical.

VOLTAGE RATING : Motor— $4\frac{1}{2}$ volts.

Amplifier—Nominally $7\frac{1}{2}$ volts, but it is designed to work down to 5 volts.

POWER CONSUMPTION : Motor—Approximately 70 mA at $4\frac{1}{2}$ V. 315 mW.

Amplifier—Approximately 16 mA at $7\frac{1}{2}$ V. with no signal. 120 mW.

CONTROLS : Volume.
Tone.
Speed.

TRANSISTOR COMPLEMENT :

Mullard OC71 Driver.
Mullard OC72 } Output.
Mullard OC72 }

DIMENSIONS : Height $4\frac{5}{8}$ inches.

Width $8\frac{7}{8}$ inches.

Depth $11\frac{3}{4}$ inches.

GENERAL INFORMATION

The gramophone unit is a Garrard BAI with a crystal pickup and a $4\frac{1}{2}$ -volt motor. The speed of the motor is adjusted by R1, a 100Ω potentiometer, against fall in battery voltage. The level of adjustment is entirely aural, as this must be the final criterion for the person playing a record.

Three transistors are used in the amplifier, one Mullard OC71 in the driver stage and two matched Mullard OC72's in the push-pull output stage. The wiring is printed and this factor, coupled with the robustness of the transistors, should make for great reliability in the amplifier.

The speaker is a 3-ohm, 7-in. \times 4-in. elliptical moving coil type with a high flux permanent magnet.

The pickup cartridge is a Cosmocord GP69.

It is advisable to replace the stylus after about 60 hours' playing, i.e. whenever a new battery is required. If the stylus is used for a longer period, no audible distortion will result for some time but the records are liable to be damaged. The replacement needle is Cosmocord Type SK2.

OPERATING PROCEDURE

Place the gramophone on a flat surface and lift the lid. The spindle of the turntable has been lengthened so that six records may be stored during transportation ; these are held in place by a plastic press grip. It is necessary, however, to have only the desired record on the turntable during actual playing time.

Lift the pickup arm from its rest and move it towards the record ; this automatically switches on the amplifier and the motor. By the very nature of transistors, the amplifier is ready for instantaneous use but it is advisable to wait about ten seconds before placing the pickup head on the record, in order to allow time for the motor to gain its correct speed. When the record is playing, the speed may be adjusted by means of the speed control which is set on the motor base board. The desired level of sound may be obtained by adjusting the volume and tone controls.

When the record is finished, lift the pickup arm and return it to the rest. This action will switch off the motor and the amplifier, thus saving the battery when the gramophone is inoperative.

Before transportation, the pickup arm should be pressed firmly on to the rest, which is a spring clip. This ensures its retention during transportation.

CIRCUIT DESCRIPTION

The amplifier is fed from the $7\frac{1}{2}$ -volt battery but it is designed to operate down to 5 volts H.T. with, of course, reduced output at the lower level. For the same amount of distortion, the output at 5 volts H.T. will be approximately two-thirds that at $7\frac{1}{2}$ volts H.T.

The transistors used are of the p-n-p alloy junction type and are used in the grounded emitter configuration. The H.T. is negative, i.e. the positive is the earthy side of the amplifier.

The output from the crystal pickup is fed into the matching transformer via the tone control R3 and volume control R4. The transformer matches the pickup, with an impedance of approximately 250 K Ω , into the base of the OC71 driver transistor, with an impedance of approximately 2 K Ω .

The two OC72 output transistors are in push-pull and are driven from the inter-stage transformer. Temperature stabilisation is obtained by inserting a common 10-ohm resistor between the emitter and ground. Thus, when the temperature rises, the collector current through the resistor will rise, thus reducing the base-emitter voltage and tending to stabilise the collector current. At 50° C. the output is approximately the same as that at 25° C. but the distortion level is a little higher.

The 390-ohm resistor R13 and the 0.1 μ F. condenser C3 are connected in series between the collectors of the output transistors for high frequency stabilisation.

Negative feedback is applied from the secondary of the output transformer to the emitter of the OC71 via R12 and R8.

The On/Off switch is incorporated in the pickup arm pivot.

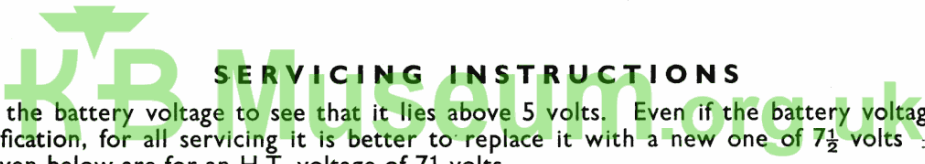
TO REPLACE THE BATTERY

Lift the underside cover after unscrewing the two coin slot captive screws. The battery is held in place by the cover, so replacement is effected by inserting the new battery and replacing the plug. The battery used is either Ever Ready AD42 or Vidor L5058.

REMOVAL OF CHASSIS

1. Remove knobs.
2. Remove cover under knobs ; this reveals the chassis.
3. Remove the screws holding the chassis in place.
4. Remove chassis.

The speaker is bolted to the front of the gramophone but two flying leads enable the chassis to be withdrawn without removing the speaker.



SERVICING INSTRUCTIONS

Test the battery voltage to see that it lies above 5 volts. Even if the battery voltage is within the specification, for all servicing it is better to replace it with a new one of 7½ volts ±5%. The figures given below are for an H.T. voltage of 7½ volts.

DRIVER STAGE (OC71)

The collector-emitter voltage should be 4.75 volts ±10%.

The voltage across the bottom half of the bias chain, R6, should fall between 280 and 400 mV. The current in the collector of the OC71 should lie between 2.0 and 5.0 mA.

OUTPUT STAGE (OC72)

The collector-emitter voltage of each OC72 should be approximately the H.T. voltage. Owing to the Class B connection, the collector currents of the OC72's rise considerably as the output is increased. The following measurements should be made with zero output.

The voltage across the emitter resistance R11 should lie between 20 and 90 mV. If it is impossible to measure the voltage across R11, then the collector currents in the OC72 should be measured.

The current in an OC72 is extremely sensitive to temperature and, therefore, quite a wide spread is tolerable. However, the individual collector currents should lie between 1 mA and 6 mA.

The voltage across the bottom half of the bias chain, R9, should lie between 180 and 270 mV. In both the driver and output stage, if the bias voltages are correct when the emitter-resistor voltage or emitter-collector voltage is incorrect, then the transistor is suspect. If this is so, measure the D.C. resistance of the base to emitter and base to collector with an Avometer or similar instrument. With the Avometer switches on resistance and ohms, place the lead from the positive terminal of the Avometer on the base and the lead from the negative terminal first on to the collector and then on to the emitter. Both the resistances measured should be in the region of 100 to 200 ohms. If the Avometer connections were reversed, the resistances would be of the order of 250 KΩ.

Notes

1. The voltages are measured with a voltmeter with 20,000 ohms/volt impedance.
2. The fluctuations in collector current from hour to hour are normally due to the temperature sensitivity of the transistor and not to its failure.
3. It is very important to store transistors in a cool atmosphere. They have a maximum storage temperature of 65° C. and should, therefore, be stored well away from any sources of heat.
4. Transistors are inherently sensitive to incident light ; it is very important, therefore, that the external coating should not be damaged.
5. The H.T. supply to the amplifier must be switched off before any replacements are effected in the circuit. Even though the H.T. voltage is normally low, it is most important that work should not be carried out while it is switched on, as sudden surges may damage the transistors.
6. Great care should be exercised whilst soldering the transistors into a circuit, in order to ensure that they are not damaged by excessive heat. If possible, a heat shunt should be used ; an effective one is to hold the transistor leads between the bulb and the soldering point with a pair of pliers.

COIL AND TRANSFORMER DATA

Pickup Transformer 500/90

D.C. Resistance of Primary	...	...	...	...	...	...	...	...	...	6,000 ohms
D.C. Resistance of Secondary	...	...	...	...	...	...	...	...	...	250 ohms

Interstage Transformer 500/96

D.C. Resistance of Primary	...	...	...	...	...	...	...	...	...	650 ohms
D.C. Resistance of 1st Half of Secondary	...	...	...	...	...	...	...	...	...	75 ohms
D.C. Resistance of 2nd Half of Secondary	...	...	...	...	...	...	...	...	...	80 ohms

Output Transformer 500/95

D.C. Resistance of 1st Half of Primary	...	...	...	...	...	...	...	...	...	11 ohms
D.C. Resistance of 2nd Half of Primary	...	...	...	...	...	...	...	...	...	12 ohms
D.C. Resistance of Secondary	...	...	...	...	...	...	...	...	...	less than 1 ohm



VOLTAGE MEASUREMENTS

These measurements are for a battery voltage of 7.5 V. and an ambient temperature of 25° C.

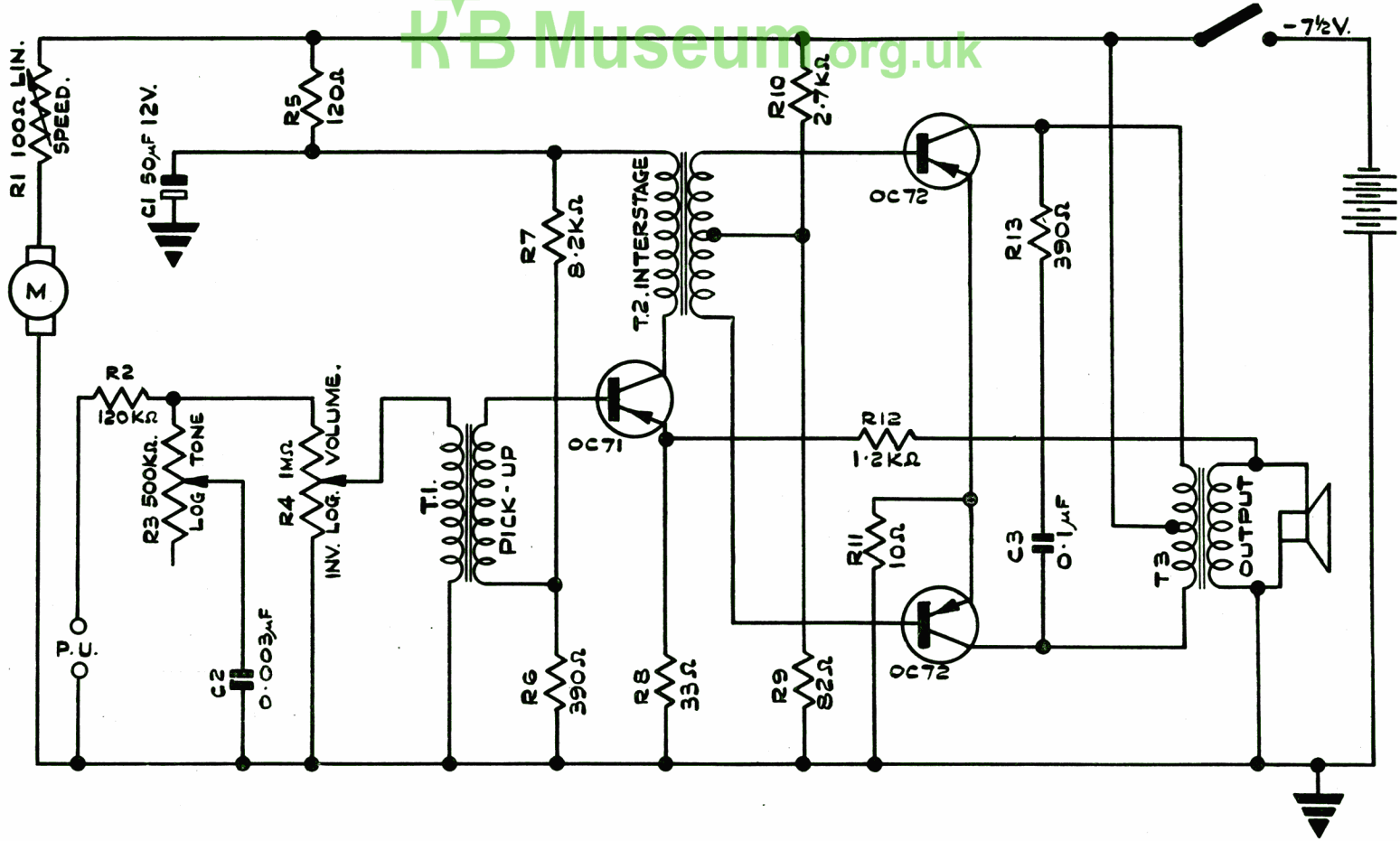
D.C. Measurements (No signal).

Collector	...	Emitter	...	Voltage of 1st Transistor (OC71)	...	...	...	4.75 V.
Base	...	Ground	...	Voltage of 1st Transistor (OC71)	...	...	...	340 mV.
Emitter	...	Ground	...	Voltage of 1st Transistor (OC71)	...	...	...	100 mV.
Collector	...	Emitter	...	Voltage of Output Transistors (OC72)	...	...	...	7.5 V.
Base	...	Ground	...	Voltage of Output Transistors (OC72)	...	...	...	225 mV.
Emitter	...	Ground	...	Voltage of Output Transistors (OC72)	...	...	...	60 mV.
Collector Current of 1st Transistor	...	...	...	...	...	...	...	3.5 mA.
Collector Current of Each Output Transistor	...	...	...	...	...	...	...	3.5 mA.
Motor Current with R1 adjusted to give 4.5 V. across motor terminals	...	...	...	...	...	...	...	75 mA.

Performance (Output load 3Ω resistive. Frequency 1,000 c/s.).

Sensitivity—Input voltage between pickup end of R2 and ground for 50 mW. output	...	...	...	...	...	...	...	0.3 V.
Power output for 10% distortion	200 mW.
Forced power output	300 mW.

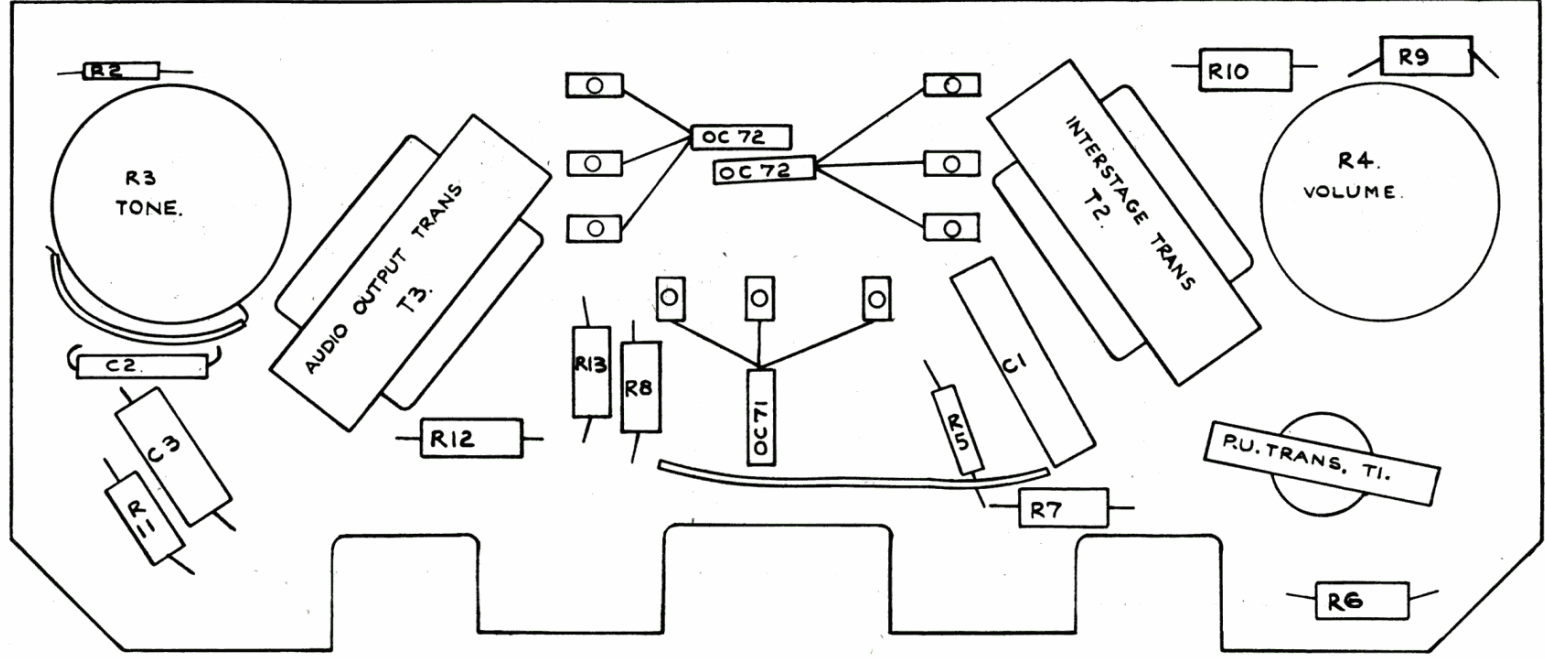
CIRCUIT DIAGRAM

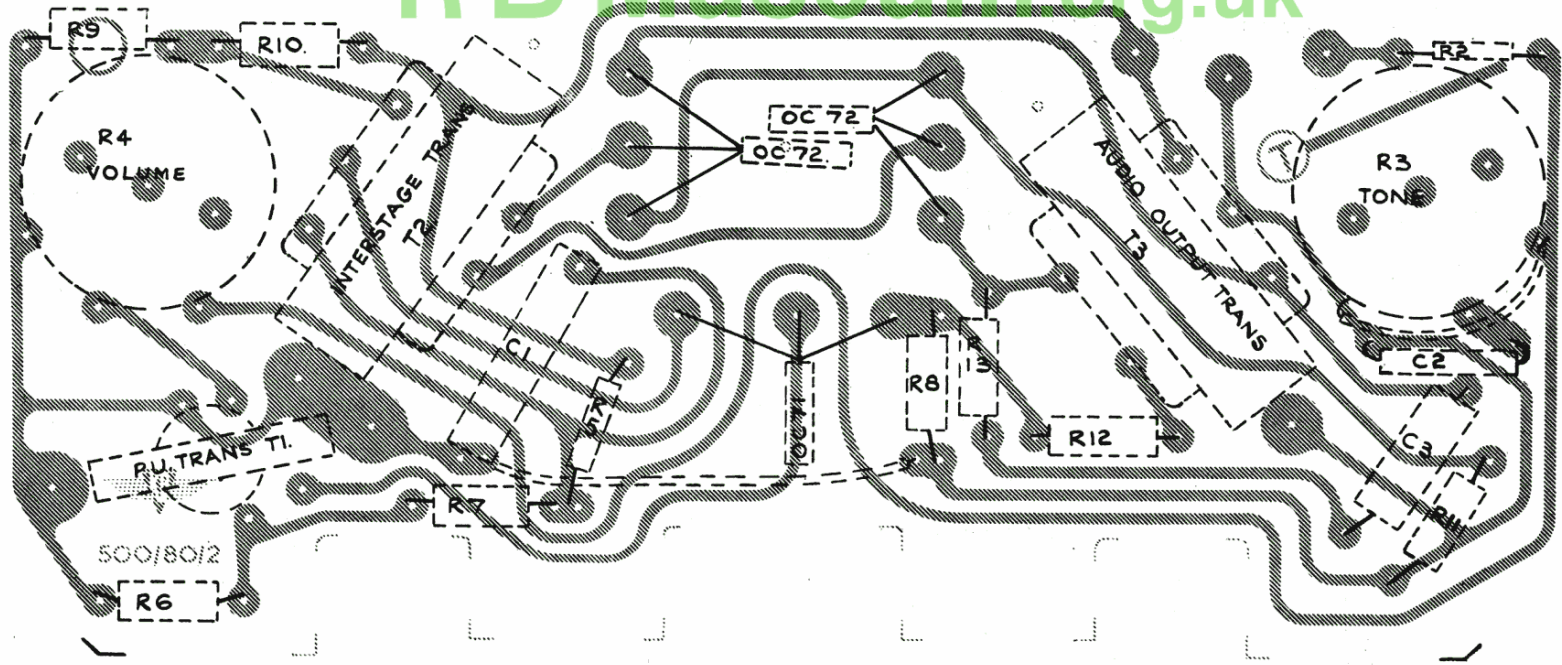


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VIEW OF CHASSIS







SPARES LIST

Prices are subject to alteration without notice.

Component	Colour Code	Circuit Ref.	Part No.	Price
Cabinet	521/220 ...	50/-
Cover Assembly (Top)	500/131 ...	22/6
Cover Assembly (Bottom)	500/133 ...	19/6
Handle, Formed	500/184/1 ...	4/6
Handle Brackets	500/184/2 ...	-/6
Knob (Speed Control)	500/132 ...	-/6
Knob	500/194 ...	1/3
Record Retainer	500/191 ...	-/9
POTENTIOMETERS				
500 K Ω (Tone)	R3	500/134 ...	3/6
1 M Ω (Volume)	R4	500/134/1 ...	3/6
PRINTED CIRCUIT				
50 μ F. 12V.	C1	KEM 88/D ...	1/6
.1 μ F. 150V.	C3	KPM 5 ...	1/-
.003 μ F. 500V.	C2	KC 93 ...	1/-
8.2 K Ω \pm 10% W.	R7	R822FE ...	1/-
2.7 K Ω \pm 10% W.	R10	R272FE ...	1/-
1.2 K Ω \pm 10% W.	R12	R122FE ...	1/-
390 Ω \pm 10% W.	R6, R13	R391FE ...	1/-
120 Ω \pm 10% W.	R5	R121FE ...	1/-
82 Ω \pm 10% W.	R9	R820FE ...	1/-
33 Ω \pm 10% W.	R8	R330FE ...	1/-
10 Ω \pm 10% W.	R11	R100FE ...	1/-
TRANSISTORS				
...	OC71 ...	90/-
...	OC72 ...	per set
TRANSFORMERS				
Pickup	500/90 ...	12/6
Audio Output	500/95 ...	11/6
Interstage	500/96 ...	12/6
Speaker	500/251 ...	25/9
Speaker Alternative	500/250 ...	25/9