

Philips N4200/91

1972

Battery operated portable tape recorder

(Mechanical operation and adjustments)

Introduction

The N4200/91 is a twin-track, battery operated, portable tape recorder employing nine transistors and four diodes.

Recordings can be made from microphone, radio or gram inputs and playback is provided from the internal loudspeaker, headphones or via an external amplifier. A meter type recording level/battery state indicator is used.

This *Service Sheet* covers the mechanical aspect of the machine. Further notes and the electronics are covered in *Service Sheet 1973*. The two sheets are complementary and should be filed together.

Mechanical description

Playback (see Fig. 17). – When the Play button is depressed, play strip 90 moves brake slide 87 to the right which, in turn, moves brake bracket 33 and 82 to the right, releasing the brakes. Bracket 103 pushes friction pad assembly 79 away from the right-hand turntable hub. At

the same time, slide 87 closes motor switch **S6** (position 61) and the arm on play strip 90 closes line output switch **S2** (position 63), amplifier switch **S4** (63a) and opens fast wind switch **S7** (60) and loudspeaker switch **S3** (62).

Motor 41 drives flywheel 72 via idler wheel 55. Operating lever 73 is pushed backward by play strip 90 and moves carriage bracket 69, together with pressure arm 49, towards the heads, spring 68 pulling pressure roller 48 against the capstan. Tension spring 46 holds the felt pad on pressure plate assembly 45 against the record/playback head (**K1**). The felt pad mounted on pressure arm 49 bears against drive belt 25, imposing drag on the left-hand turntable. In moving backward, carriage bracket 69 releases bracket 103, on which is mounted clutch assembly 100. Playwheel 100a is pulled into contact with flywheel 72 by spring 102 and imparts drive through friction coupling to pulley 100b, which drives right-hand turntable 86.

To avoid accidental erasure of the tape

during playback, a tongue on bracket 303 locks the record button in the upper position.

On releasing the play button, the complete carriage assembly and brake slide 87 are returned to rest by springs 42 and 34 respectively.

Record. – To record, the record button is held down whilst the play button is depressed. The tongue on plate 303, referred to above, now locks the record button in the lower (record) position. Depressing the record button moves switch **S1** to the 'Record' position and closes amplifier switch **S5** (105).

The remainder of the mechanical operations are the same as for 'Playback'.

Forward wind. – When the Forward wind button is depressed, wind strip 91 moves brake slide 87 to the right, releasing the brakes as described above. Fast-wind switch **S7** is not opened, however, thus the motor control circuit is bypassed and the motor, connected directly across the 9 volt power supply, is driven faster. As forward wind strip 91 is pushed down, operating bracket 101 which bears against it, is drawn forward by spring 75. Mounting bracket 99 is

Fig. 1

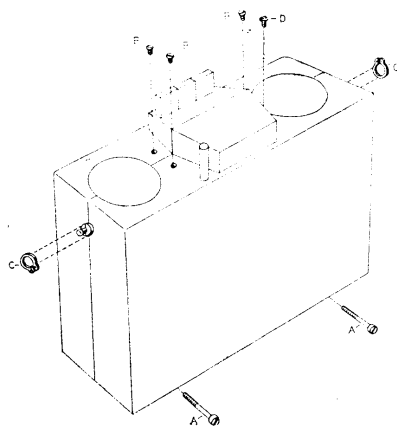


Fig. 2

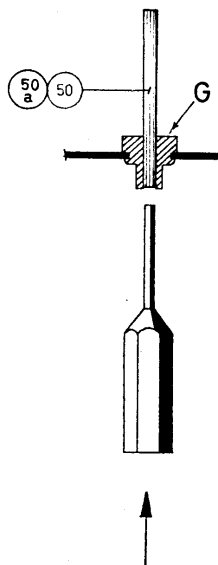
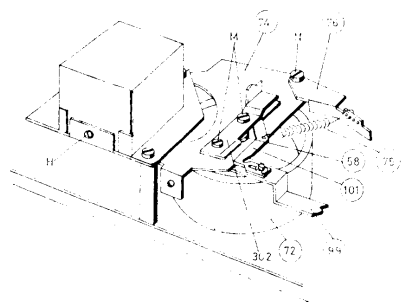


Fig. 3



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then moved forward so that forward wind roller 96 comes into contact with and transmits drive from flywheel 72 to right-hand turntable 86.

Rewind. – When the rewind button is depressed the turntable brakes are released and, as S7 remains closed, the motor runs fast. Brake slide 87 does not move to the right as for forward wind, however, so bracket 82 does not lift friction pad assembly 79 completely away from the right-hand turntable hub. The small amount of remaining friction imposes drag and ensures that the tape is rewound with an even tension. As rewind strip 89 is pushed downwards, torsion spring 39 moves rewind pulley bracket 37 backwards so that rewind pulley 36 comes into contact with flywheel 72 and transmits drive to the left-hand turntable via belt 25.

Dismantling

Case removal (see Fig. 1). – Remove the transparent lid, carrying handle, microphone and batteries. Remove two screws A, three screws B and two circlips C. Do not remove screw D. Place the recorder on its back, lift off the front case section and remove the complete chassis from the rear section. Re-assemble in the reverse order.

Mechanical replacements and adjustments

Replacements

Turntable spindles 50 and 50a (see Fig. 2). – Lift off the turntables and remove either the printed panel or loudspeaker, depending on which spindle requires replacement. With the chassis suitably supported upside-down, tap the spindle from its fixing bush G with the aid of a punch. If the spindle is difficult to remove, the operation may be facilitated by applying heat to the fixing bush.

Fit the replacement spindle into the bush and gently tap it into position, using a block of wood to protect its polished end, which should be uppermost. Refit the turntable and adjust its height.

Motor (see Fig. 3). – Remove single fixing screw H and unsolder the two motor connecting leads at the ends remote from the motor. The complete motor assembly may now be lifted from the chassis. To remove the motor from its housing, slide the two ferroxcube beads F1 and F2 from the connecting

leads, pull the motor retaining spring from the housing with a pair of pliers, then lift out the motor. Re-assemble in the reverse order.

Flywheel 72 (see Figs. 3 and 17).

– Detach springs 93, 94 and 95 from control strips 89, 90 and 91 respectively (since these springs differ from each other, note their respective positions) then remove the nylon switch operating lever from play strip 90. Remove the motor (with housing) and motor mounting plate (three screws) from the chassis. Detach spring 38 and remove switch mounting plate 302 (two screws M and spacers). Withdraw the flywheel lower bearing 58, then detach spring 75. Remove the complete forward wind pulley assembly 99 and 101 by withdrawing the two screws securing mounting bracket 99 to leaf spring 97, and dis-engaging the end of arm 101 from chassis plate 74. Remove stop bracket 76 (one screw N), after which chassis plate 74 can be drawn away from the top mounting plate 301. This operation may be made easier by moving pressure roller 48 towards the heads. The flywheel can now be withdrawn from its upper bearing.

Re-assemble in the reverse order. The refitting of chassis plate 74 and the flywheel can be facilitated by holding them together while sliding them towards mounting plate 301, with the pressure roller held as for dismantling. Care should be taken to ensure that operating lever 73 enters the correct slot in the mounting plate.

After replacing the flywheel, it may be necessary to re-adjust the following:

Forward wind pulley 96, clutch assembly 100 and stop bracket 76.

Adjustments

Height of turntables 27, 86 (see Fig. 4). – The distance between the top edges of the turntables and chassis plate should be 14 ± 0.2 mm. It can be adjusted by means of screw 26.

Height of moulded tape guide 28 (see Fig. 17). – The height of moulded tape guide 28 should be adjusted by repositioning the spacer washers 35, so that the tape passes through its jaws and those of the erase head without catching or twisting.

L.H. turntable brake (see Fig. 5). – With

the Rewind button depressed, the brake block on brake bracket 33 should be spaced at least 0.3mm from turntable 27. Adjust by re-positioning bracket 33 on brake slide 87.

R.H. turntable brake (see Fig. 6). – With the Rewind button depressed, the distance between the edge of the brake block and the right-hand side of the turntable spindle should be 26mm, measured as shown. Adjust by repositioning bracket 82 on brake slide 87.

Friction pad spring 79 (see Fig. 7). – To carry out adjustments to this assembly, a metal bush with the same inner and outer diameters as the hub of the turntable is required.

With the rewind button depressed, the friction pad should bear against the turntable hub and the clearance between the 'free' end of the spring and the lip of brake bracket 82 should be 0.3mm. This can be adjusted by bending the lip of bracket 82.

The pressure of the friction pad against the turntable hub should be 60-80gm. Adjustment may be made by slackening screw P and moving the friction pad assembly a small amount at a time until the required pressure is obtained.

Clutch assembly 100 (see Figs. 8 and 9). – With the Play button depressed, clutch pulley 100b should press against right-hand turntable with a force of 25-30gm. To adjust, check that the adjustment of stop bracket 76 is correct,

Fig. 4

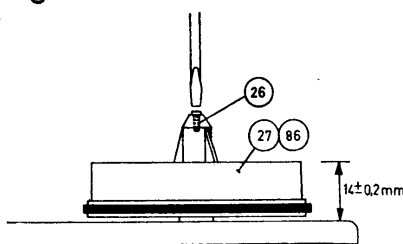


Fig. 5

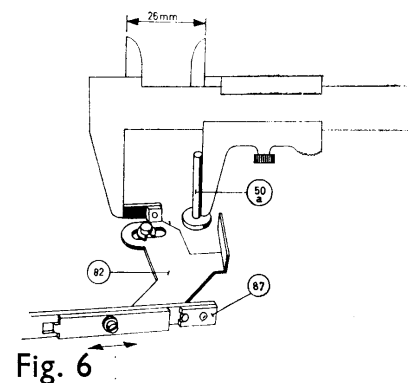
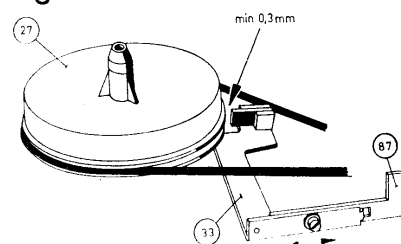
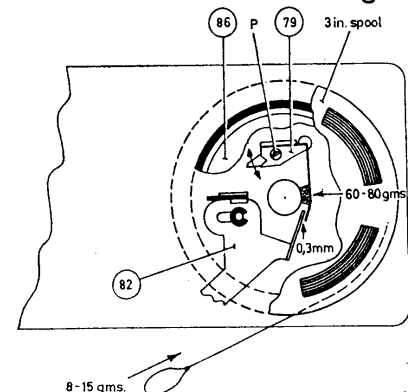


Fig. 6

Fig. 7



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then fit the end of spring 102 into any one of the five holes in bracket 103.

The force necessary to overcome the friction in the clutch assembly should lie between 8-15gm. This force should be measured with a full 3in reel of tape placed on the right-hand turntable and a tension gauge. If necessary, check the clutch pulley pressure of 25-30gm, given above. If the clutch assembly is defective, it should be replaced.

Stop bracket 76 (see Figs. 9 and 17). – If carriage bracket 69 is moved towards the heads until pulleys 100a and 100b touch the flywheel and turntable 86 respectively, the clearance between stop bracket 76 and the clutch spindle bush of bracket 103 should be 0.5-1mm. Adjust by bending stop bracket 76.

Carriage bracket 69 (see Fig. 10). – The amount of movement of carriage bracket 69 is adjusted as follows: Depress the play button, remove spring 68 and slacken screw Q. Then, pushing the carriage bracket towards the heads as far as possible, move lever 73 towards the play button as far as possible. Move plate 304 towards lever 73 until the clearance between them, at point S, is 0.5-1.0mm, then tighten screw Q. Refit spring 68.

To adjust the locking down of the record button, depress the play button and slacken the two screws R. Slide bracket 303 backwards until its end is under the record button, which is prevented from being pushed down, then re-tighten screws R.

Pressure arm assembly 49 (see Fig. 11). – In the 'Play' position, the clearance between lug T on bracket 303 and lug U on pressure arm 49 should be 0.3-1.5mm. Adjust by bending lug T. The tension exerted by spring 68 in holding the pressure roller against the capstan should be 275-325gm. Adjust by bending the spring anchoring lug on bracket 303.

Pressure plate assembly 45 (see Fig. 12). – In the 'Play' position, the tension exerted by spring 46 in holding pressure plate 45 against the record/playback head should be 8-12gm. Adjust by bending lug W.

A clearance of 0.5-1.0mm should exist between the end of pressure plate 45 and lug V. Adjust by bending lug V. (Continued overleaf col. 1)

Fig. 8

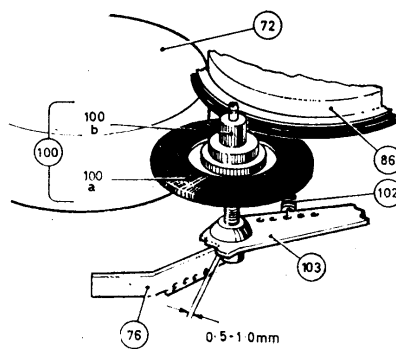
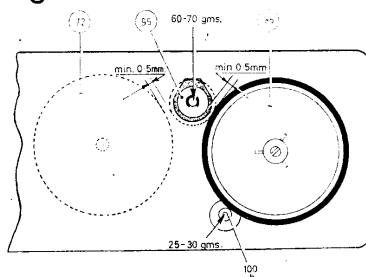


Fig. 9

Fig. 10

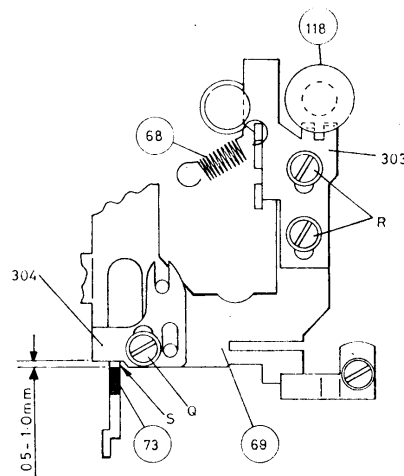


Fig. 11

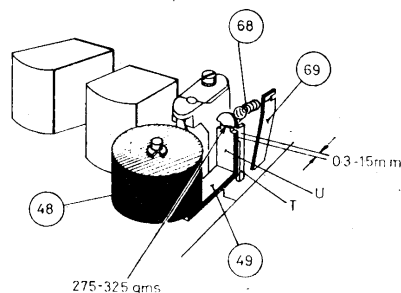


Fig. 12

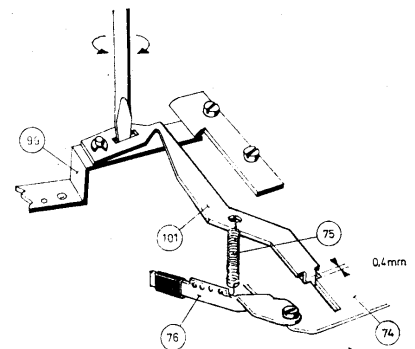
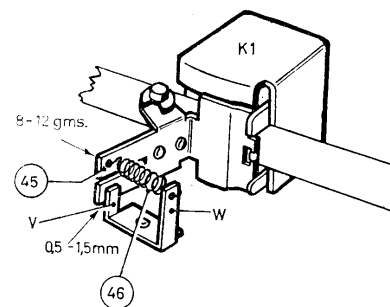


Fig. 13

Fig. 14

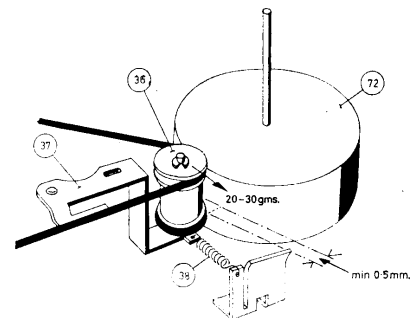


Fig. 15

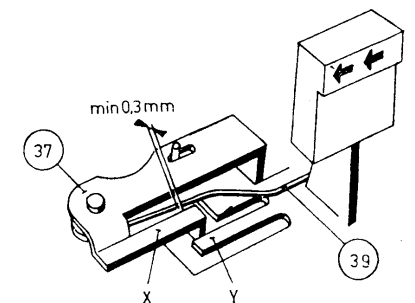
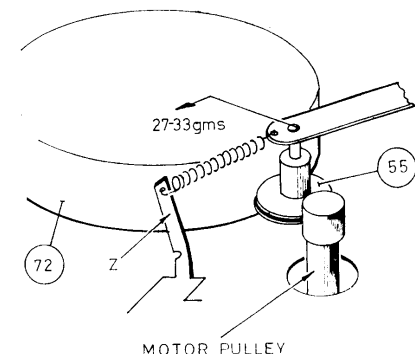


Fig. 16



1972

Philips N4200/91

Continued from overleaf—

Forward wind pulley 96 (see Figs. 8 and 13). — In the 'Off' position, forward wind pulley 96 should be spaced at least 0.5mm from both flywheel 72 and right-hand turntable 86. Adjust by bending arm 101, but ensure that the clearance between the end of arm 101 and chassis plate 74 is at least 0.4mm when the forward wind button is depressed. In the forward wind position, pulley 96 should bear against the flywheel and right-hand turntable with a force of 60-70gm. Adjust by fitting the end of spring 75 into any of the holes in stop bracket 76.

Rewind pulley 36 (see Figs. 14 and 15). — In the 'Off' position, the clearance between rewind pulley 36 and flywheel 72 should be at least 0.5mm. Adjust by bending tongue Y on the top of mounting plate 301. When the rewind button is depressed, the clearance between tongue X of bracket 37 and torsion spring 39 should then be at least 0.3mm. If necessary, bend tongue X and re-adjust tongue Y.

In the 'Off' position, rewind pulley 36 should be held away from the turntable with a tension of 20-30gm. Adjust by bending the anchoring tongue of spring 38.

Idler wheel 55 (see Fig. 16). — In the 'Play' position, idler wheel 55 should press against flywheel 72 and the motor pulley with a force of 27-33gm. Adjust by bending spring anchoring tongue Z.

Tape speed. — The speed of the tape past the record/playback head during playback or record should be 1½in/sec (4.75cm/sec). It may be checked as follows:

Measure off a 15ft length of tape and mark each end. In the play position, the time taken for this length of tape to pass a given point should be between 93 and 101 seconds. If the time is less than 93 seconds, the speed is too high, and if more than 101 seconds, the speed is too low. An alternative method of measuring the tape speed is to use a tape stroboscope. The indicated speed should be 1½in/sec ± 3 per cent.

If the speed is incorrect, and is not caused by any mechanical fault, the motor speed can be corrected by adjusting **R581** on the motor control panel. After adjustment, lock the slider with a suitable sealing compound.

Cleaning and lubrication

Cleaning

Record and erase heads, etc. — The magnetic heads, tape guides and capstan should be cleaned at regular intervals, if

optimum performance is to be maintained. Remove the two covers for access to these parts, which should be cleaned with a soft cloth wrapped around a wooden stick and moistened with methylated spirit or industrial alcohol. Metal objects should not be allowed to come into contact with the magnetic head faces.

General. — After approximately 500 hours of service, it is advisable to clean the following parts with methylated spirit or industrial alcohol: Magnetic head faces, tape guides, capstan and pressure roller, drive belt and grooves in pulleys, flywheel, all friction drive surfaces, brake blocks and braking surfaces of turntables.

Clean felt pads on pressure plate 45 and spring 79 (see Fig. 17) with a soft, dry brush.

Lubrication

All machines are fully lubricated during manufacture and further attention should normally be required only after a long period of service. If this is the case, or upon replacement of any mechanical components, lubrication may be applied *sparingly* as indicated below. It is emphasized that excessive lubricant will hinder rather than help the operation of the instrument, particularly if grease or oil is accidentally deposited on any driving surface.

The motor must not be lubricated, as the penetration of oil between brushes and commutator will considerably reduce its life.

A light graphite oil (indicated by ●, Fig. 17) may be applied to the following points:

- Turntable spindles 50, 50a (ensure that oil does not reach the friction pad of spring 79)
- Spindle of pressure roller 48
- Spindle of forward wind pulley 96
- Spindle of rewind pulley 36
- Spindle of rewind pulley bracket 37
- Spindle of clutch 100
- Spindle of idler wheel assembly 55
- Spindle of pressure arm assembly 49
- Flywheel upper bearing 80

A light grease, preferably containing graphite (indicated by ▲, Fig. 17) may be applied to the following points:

- Left-hand tongue of bracket 303
- Carriage bracket guide 51
- Guide 70
- Slots in chassis bracket 74
- Pivot and roller of lever 73
- Grease cup of pressure roller 48
- Flywheel lower bearing 58
- Sliding surfaces of carriage bracket 69
- Sliding surfaces of brake brackets, 33, 82
- Sliding surfaces of bracket 103 with mounting plate 301
- Sliding surfaces of arm 101 with chassis bracket 74
- Sliding surfaces of mounting plate 99 with chassis bracket 74

Specification

(As supplied by the manufacturer)

Record/Playback system

Tape speed

Maximum reel diameter

Maximum playing time

Fast wind time

Modulation level/battery

state indicator

Microphone

Frequency response

Signal to noise ratio

Wow and flutter

Input/Output sockets

Input: Skt. 1 — Microphone
Skt. 1 — Radio/gram

Skt. 2 — Remote stop/
start switch

Skt. 2 — Mains power
supply unit

Output: Skt. 1 — External amp
(line output)

Skt. 2 — Headphone

Output power

Loudspeaker

Battery supply

Battery life

Weight

Dimensions

Monophonic, twin-track, left to right
1½in (4.75cm/s)
3in (7.5cm) with lid on
4in (10cm) with lid removed
3in reel of D.P. tape — 2 x 32 min
4in reel of T.P. tape — 2 x 96 min
100 seconds approx. for 300ft

Moving coil meter
EL3755/50 — electro-dynamic
80-8,000Hz within 6dB
better than 45dB
less than ± 0.4 per cent

Pins 1/4 and 2 — 0.3mV into 2
Pins 3/5 and 2 — 100mV into
EL3768/03 connecting lead —

Pins 5 and 1

Pins 1 (+ve) and 2/3 (—ve)

Pins 3/5 and 2 — 0.5V across ;
Pins 4 and 2 — 200mV into 1:5
500mW
4in diameter, 8Ω impedance
6 x 1.5V cells (9V) — U2 or eq
40hr approx. with high power
8lb (including batteries)
11½ x 3½ x 8½in

Mechanical assembly

25	Rewind drive belt	68	Tension spring
26	Nylon bearing screw	69	Carriage bracket
27	Left hand turntable	70	Guide for pulley
28	Moulded tape guide	72	Flywheel
33	Brake bracket	73	Operating lever
34	Tension spring for above	74	Chassis plate
35	P.V.C. washer	75	Tension spring
36	Rewind pulley	76	Stop bracket
37	Rewind pulley bracket assembly	77	Retaining pin
38	Tension spring for above	78	Leaf spring
39	Torsion spring for pos. 37	79	Friction plate
41	Motor assembly	80	Flywheel bracket
42	Tension spring for carriage bracket	81	Securing bracket
43	Mounting spring — short	82	Brake bracket
44	Erase head K2	83	Retaining screw
45	Pressure plate assembly — record head	84	Record button
46	Tension spring for above	85	Bowden plate
48	Pressure roller	86	Right hand
49	Pressure arm assembly	87	Brake slide
50	Spindle for turntable L.H.	88	Control button
50A	Spindle for turntable R.H.	89	Rewind strip
51	Guide for carriage bracket	90	Play strip
52	Stud for brake brackets (2)	91	Forward wind
53	Stud for pos. 37	93	Tension spring
54	Tension spring for idler wheel bracket	94	Tension spring
55	Idler wheel assembly	95	Tension spring
58	Lower bearing for flywheel	96	Forward wind
59	Bearing plate	97	Leaf spring
60	Switch S7	99	Mounting tab
61	Switch S6	100	Clutch assembly
62	Switch S3	101	Operating lever
63	Switch S2	102	Tension spring
63A	Switch S4	103	Mounting tab
65	Record head K1	104	P.V.C. washer
66	Mounting spring — long	105	Switch S5

Manufacturer's Service Department

COMBINED ELECTRONIC SERVICE:

604 Purley Way, Waddon, Croydon, C1

Tel: 01-686 0505

(Recorded messages after business hours)

Monophonic, twin-track, left to right
 1 1/4 in (4.75cm/s)
 3 in (7.5cm) with lid on
 4 in (10cm) with lid removed
 3 in reel of D.P. tape - 2 x 32 min.
 4 in reel of T.P. tape - 2 x 96 min.
 100 seconds approx. for 300ft of tape

Moving coil meter
 EL3755/50 - electro-dynamic type
 80-8,000Hz within 6dB
 better than 45dB
 less than ± 0.4 per cent

Pins 1/4 and 2 - 0.3mV into 2k Ω
 Pins 3/5 and 2 - 100mV into 1M Ω or via red conductor of EL3768/03 connecting lead - 200mV into 1.5M Ω

Pins 5 and 1

Pins 1 (+ve) and 2/3 (-ve)

Pins 3/5 and 2 - 0.5V across 20k Ω
 Pins 4 and 2 - 200mV into 1.5k Ω
 500mW
 4 in diameter, 8 Ω impedance
 6 x 1.5V cells (9V) - U2 or equivalent
 40hr approx. with high power batteries
 8lb (including batteries)
 11 1/2 x 3 1/4 x 8 1/4 in

- | | |
|-----|--|
| 68 | Tension spring for pos. 49 |
| 69 | Carriage bracket |
| 70 | Guide for pos. 303 |
| 72 | Flywheel |
| 73 | Operating lever for pos. 69 |
| 74 | Chassis plate |
| 75 | Tension spring for pos. 101 |
| 76 | Stop bracket |
| 77 | Retaining plate for flywheel bearing - upper |
| 78 | Leaf spring for flywheel |
| 79 | Friction pad assembly |
| 80 | Flywheel bearing - upper |
| 81 | Securing bracket for case sections |
| 82 | Brake bracket R.H. |
| 83 | Retaining spring for pos. 81 |
| 84 | Record button |
| 85 | Bowden plate assembly |
| 86 | Right hand turntable |
| 87 | Brake slide |
| 88 | Control buttons (set of 3) |
| 89 | Rewind strip |
| 90 | Play strip |
| 91 | Forward wind strip |
| 93 | Tension spring for pos. 89 |
| 94 | Tension spring for pos. 90 |
| 95 | Tension spring for pos. 91 |
| 96 | Forward wind pulley |
| 97 | Leaf spring assembly |
| 99 | Mounting bracket for pos. 96 |
| 100 | Clutch assembly |
| 101 | Operating arm for pos. 99 |
| 102 | Tension spring for below |
| 103 | Mounting bracket for pos. 100 |
| 104 | P.V.C. washer |
| 105 | Switch S5 |

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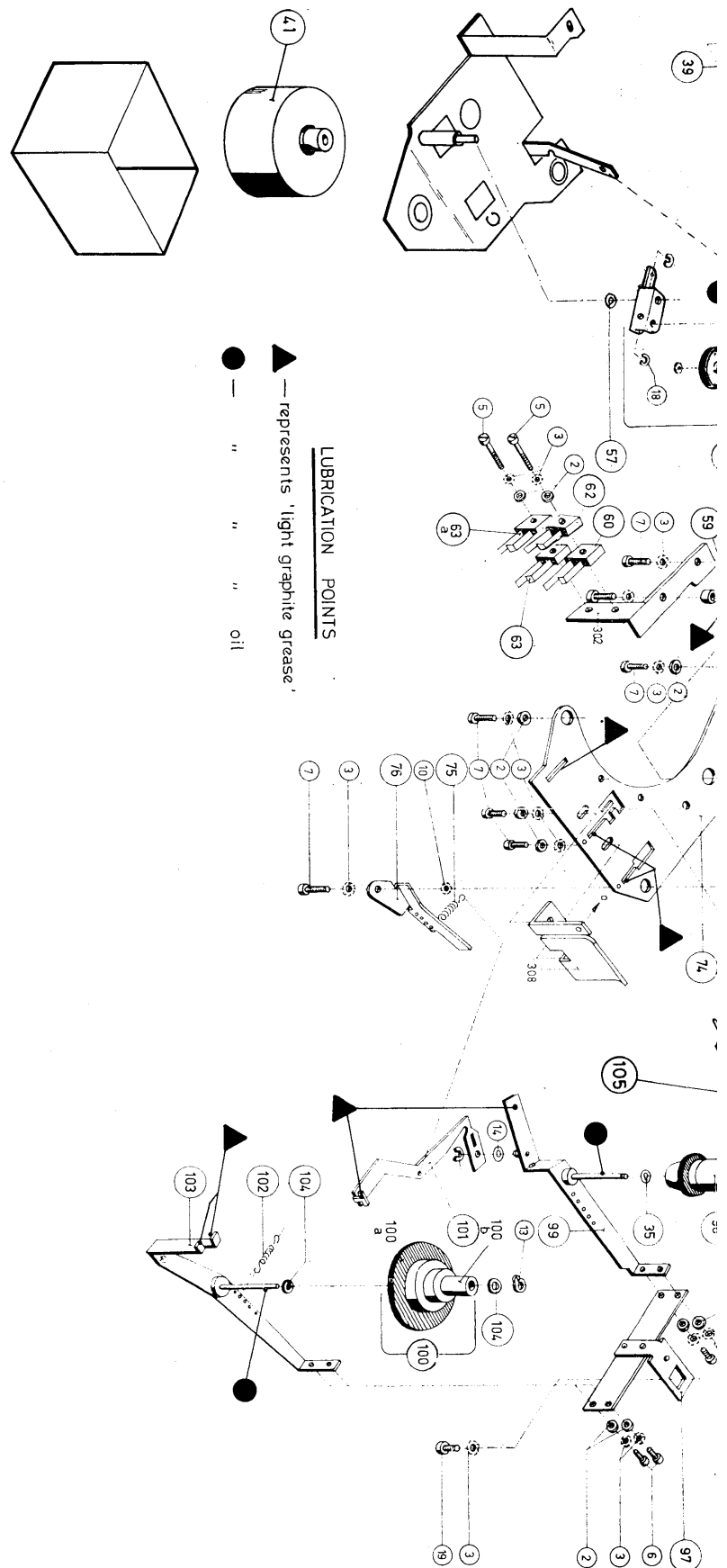
ELECTRONIC SERVICES LTD.

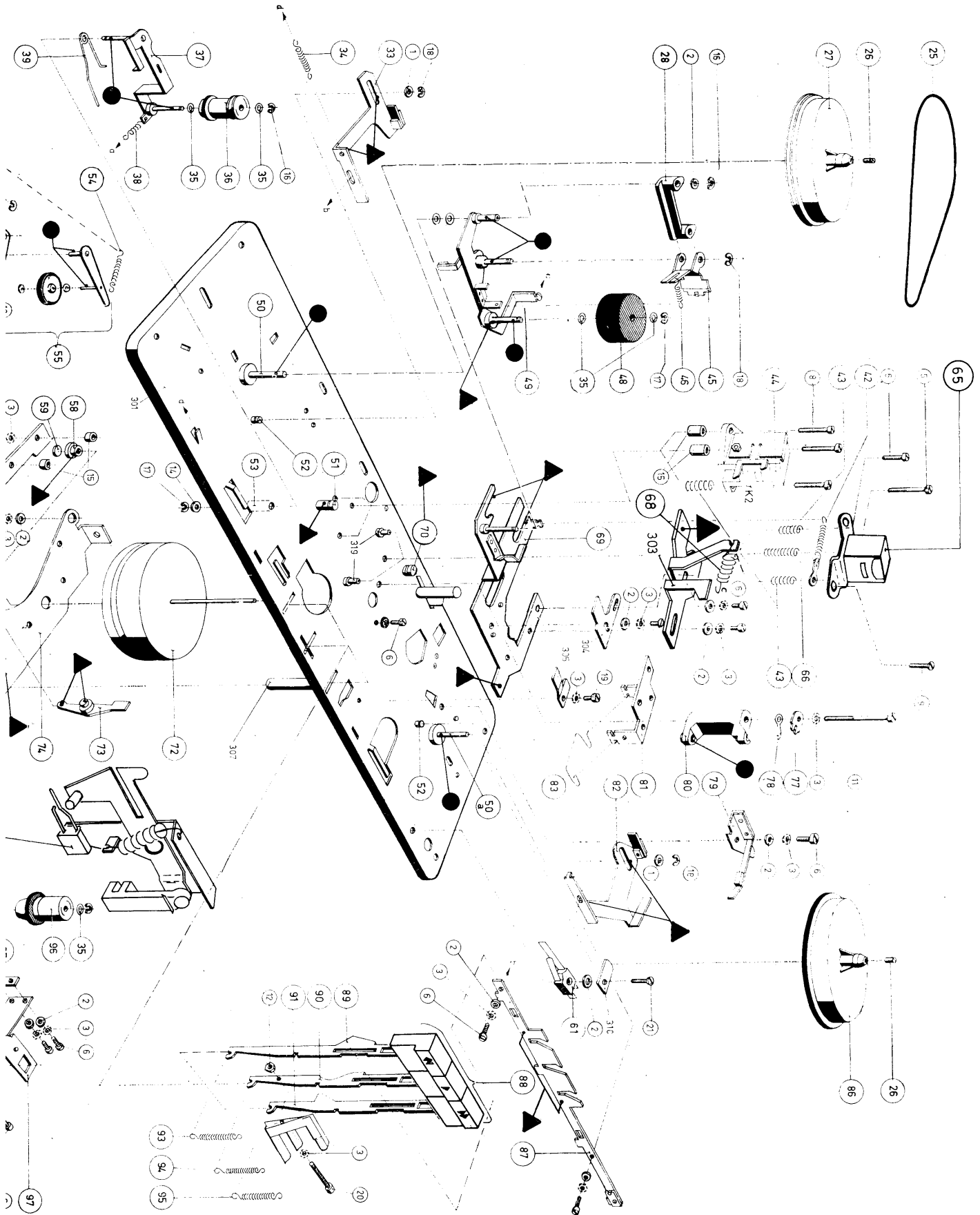
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Tel: 01-686 0505

essages after business hours)

Fig. 17 Exploded view of tape deck





Philips N4200/91

1973

Battery operated portable tape recorder

Introduction

Covering the electrical and electronic details of the Philips N4200/91 this *Service Sheet* should be used in conjunction with *Service Sheet* 1972 which contains the information relating to mechanical operations and adjustments. Figure numbers, where they occur, also refer to illustrations on *Service Sheet* 1972.

Electrical Description of the motor control circuit

The motor control circuit serves to stabilize the speed of the motor under variations of: (i) supply voltage;

(ii) mechanical load.

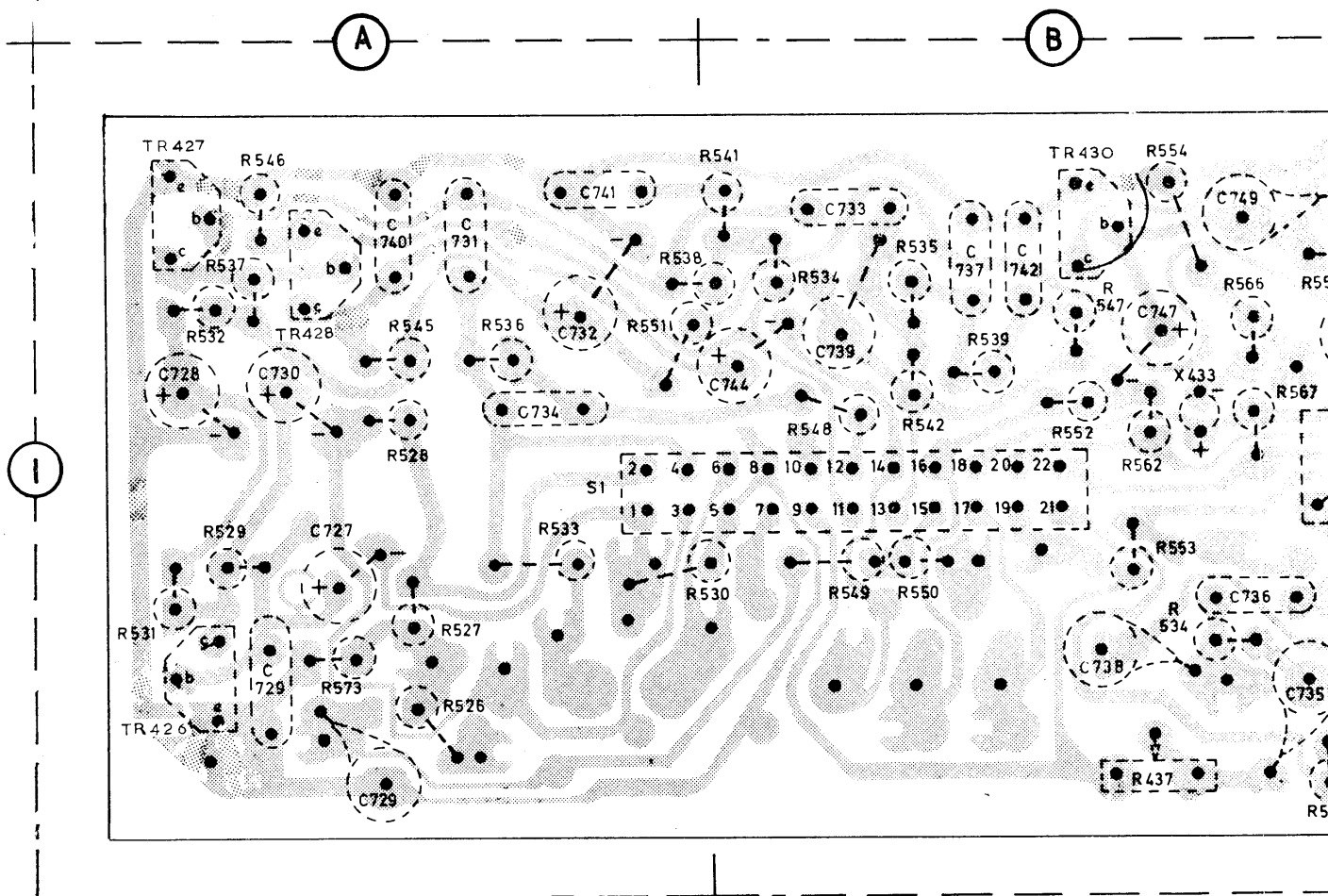
(i) A reduction (say) of supply voltage will initially cause a reduction of potential at the junction of **R548/R585/D440**. This reduction will appear in full at the emitter of **TR443** because the diodes, **D440, D441**, tend to maintain a constant voltage across them. However, only a fraction of this change will appear at the base of **TR443**, due to the potential divider action of **R584/R585, L4, R581** and **R582**. The result is to increase the forward bias on **TR443** which in turn increases the forward bias on **TR442**. Hence the effective series resistance of **TR442** is reduced and the voltage at the junction of **R584/R585/D440**, and

therefore across the motor, is increased, so counteracting the original decrease.

A change in supply voltage in the other direction will have the opposite effect to that described above.

(ii) A change in mechanical load on the motor, causing a speed variation, will initially affect the current drawn by the motor. This change in current will change the voltage developed across **R584/R585** and, therefore, the potential at the junction of **D440/R584/R585**. Hence, by the same action as in (i) above, the supply voltage to the motor will change, allowing the motor speed to

Component locations as viewed through circuit panel from foil side



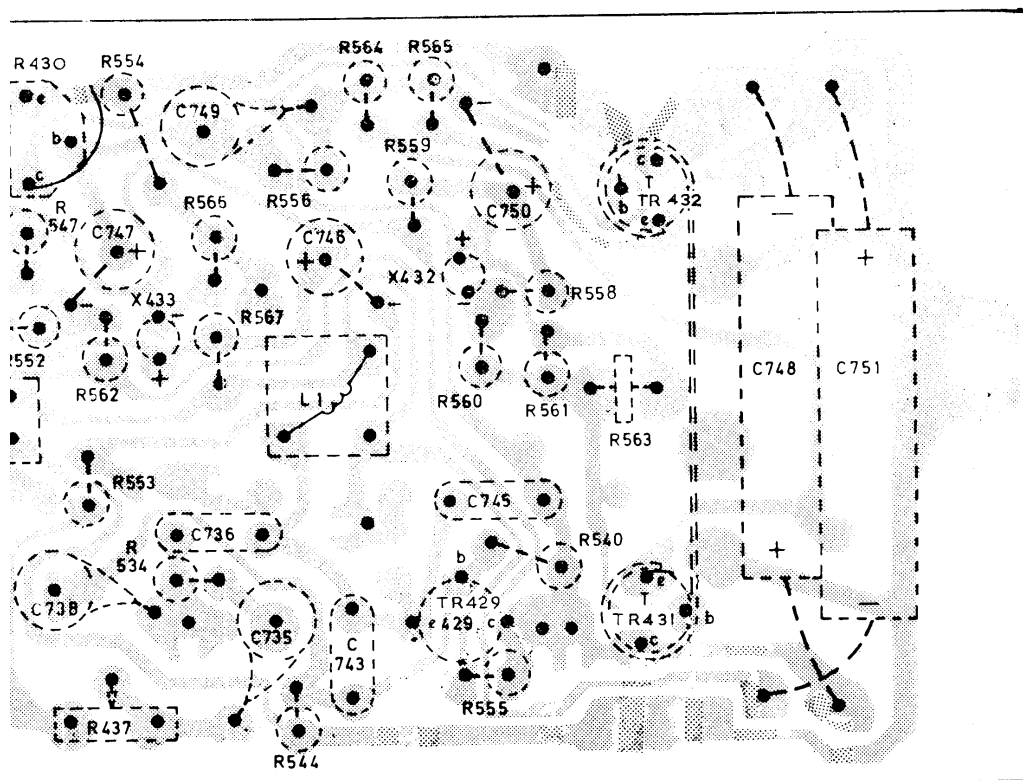
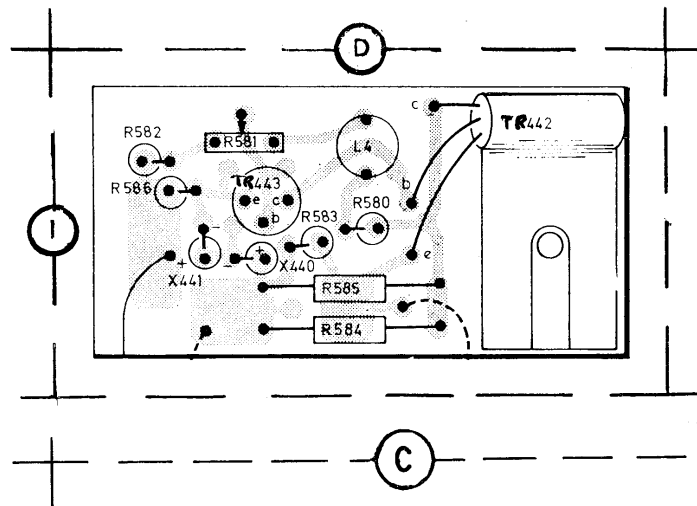
alter to compensate for the original change in load.

The two diodes, **D440, D441**, give a degree of temperature stabilization, in addition to their voltage stabilization function. Also, the coil, **L4**, is wound with the same material as the motor windings, and any change in the resistance of these windings, due to ambient temperature fluctuations, is compensated for by a corresponding change in the resistance of **L4**.

Printed panel removal

First remove case as described in

Motor control circuit panel viewed from component side



Service Sheet 1972. The component side of the amplifier printed panel may be made accessible by removing the two securing screws – one at either end of the panel. When re-fitting the panel, ensure that the switch operating lever engages with the lug on the end of the switch slider.

Electrical checks and adjustments

Record/Playback head (K1) (see Fig. 17) *Height.* – After the heights of both turntables and moulded tape guide 28 have been correctly adjusted, position the head with the three screws 5, 6 and 9 so that the head face is parallel to the

tape and the height is set to allow the tape to pass freely through the head guide without twisting.

Azimuth. – After **K1** has been set to the correct height, the core gap must be adjusted perpendicularly, using an azimuth test tape as follows: Place the test tape on the machine. Connect an electronic voltmeter to pin 3 of Skt. 1, switch to playback and set the tone and volume controls to maximum. Adjust screw 5 for maximum output voltage. Check that the tape still runs freely through the head guide.

A suitable test tape may be made on a twin-track machine known to be correctly adjusted, by recording a continuous tone of 6kHz at 3 $\frac{3}{4}$ in/sec or 3kHz at 1 $\frac{3}{4}$ in/sec.

Erase head (K2) (see Fig. 17) After the adjustments detailed above have been carried out, adjust screw 8 so that the erase head magnetic face is vertical to the tape and the tape passes freely through the erase head tape guide.

Recording bias adjustment

The amplitude of the bias current should be such that the overall sensitivity (see 'Sensitivity checks') consistent with minimum distortion, is obtained. A low bias current will result in distortion at high modulation levels and a high current will excessively attenuate the treble frequencies. The bias current may be measured as a voltage drop across **R530** (i.e. at TP). This voltage should lie within the limits 18-60mV. Adjustment is made by means of the pre-set potentiometer **R437**. If, after adjustment for optimum performance, the voltage lies outside these limits, a fault in the record/playback head or amplifier should be suspected.

Battery state – meter check

Connect the recorder to a low impedance (<1 Ω) variable power supply and switch to playback. Adjust the power supply so that the pointer of the meter just lies between the red and green sectors of the scale. The power supply voltage should be 6 \pm 0.3V.

Voltage and current analysis

All d.c. voltages are measured with respect to chassis using a 20k Ω /V meter, negative lead to chassis, with the recorder connected to a low impedance supply (<1 Ω) of 9V. Tone and volume controls at minimum.

Sensitivity checks

Playback. – Replace the loudspeaker with an 8 Ω , 1 watt resistor. Connect a signal generator, set to 1kHz to TP via a 22k Ω resistor and turn the tone and volume controls to maximum. Switch to 'Playback' and adjust the generator level to obtain a voltage of 630mV across the loudspeaker load.

(Continued overleaf Col. 1)

1973

Philips N4200/91

Continued from overleaf—

The generator output voltage should be $50\text{mV} \pm 2\text{dB}$.

The line output voltage (pins 3/5, Skt. 1) should be $45\text{mV} \pm 2\text{dB}$.

Record. — Disconnect the erase head. Connect a signal generator, set to 1kHz, to pin 1, Skt. 1 via a $1\text{M}\Omega$ resistor and turn the modulation level control to maximum.

Switch to 'Record' and adjust the generator level to obtain a voltage of 7.5mV at TP.

The generator output should be $70\text{mV} \pm 2\text{dB}$.

Overall. — Disconnect the erase head. Connect a signal generator, set to 1kHz, to pin 1, Skt. 1 via a $1\text{M}\Omega$ resistor and turn the modulation level control to maximum.

Switch to 'Record' and adjust the generator level to obtain a voltage of 0.75mV at TP. Note the generator output. Re-connect the erase head.

Maintaining the generator output to the level noted, record short passages of the following frequencies:

80Hz, 125Hz, 1kHz, 6.3kHz, 8kHz.

Replace the loudspeaker with an 8Ω , 1 watt resistor and turn the tone and volume controls to maximum.

Play back the recorded frequencies, noting the voltage developed across the loudspeaker load for each passage.

The voltage for the 1kHz passage should be above 50mV and all the others should lie within the limits $50\text{mV} \pm 3\text{dB}$.

If necessary, check the bias current adjustment.

Transistor analysis

Transistor voltages quoted in the table below were obtained from information supplied by the manufacturers. They are all positive with respect to chassis. They were measured under quiescent conditions with a $20\,000\Omega/\text{V}$ meter.

The battery voltage was a measured 9V on load.

Transistor table

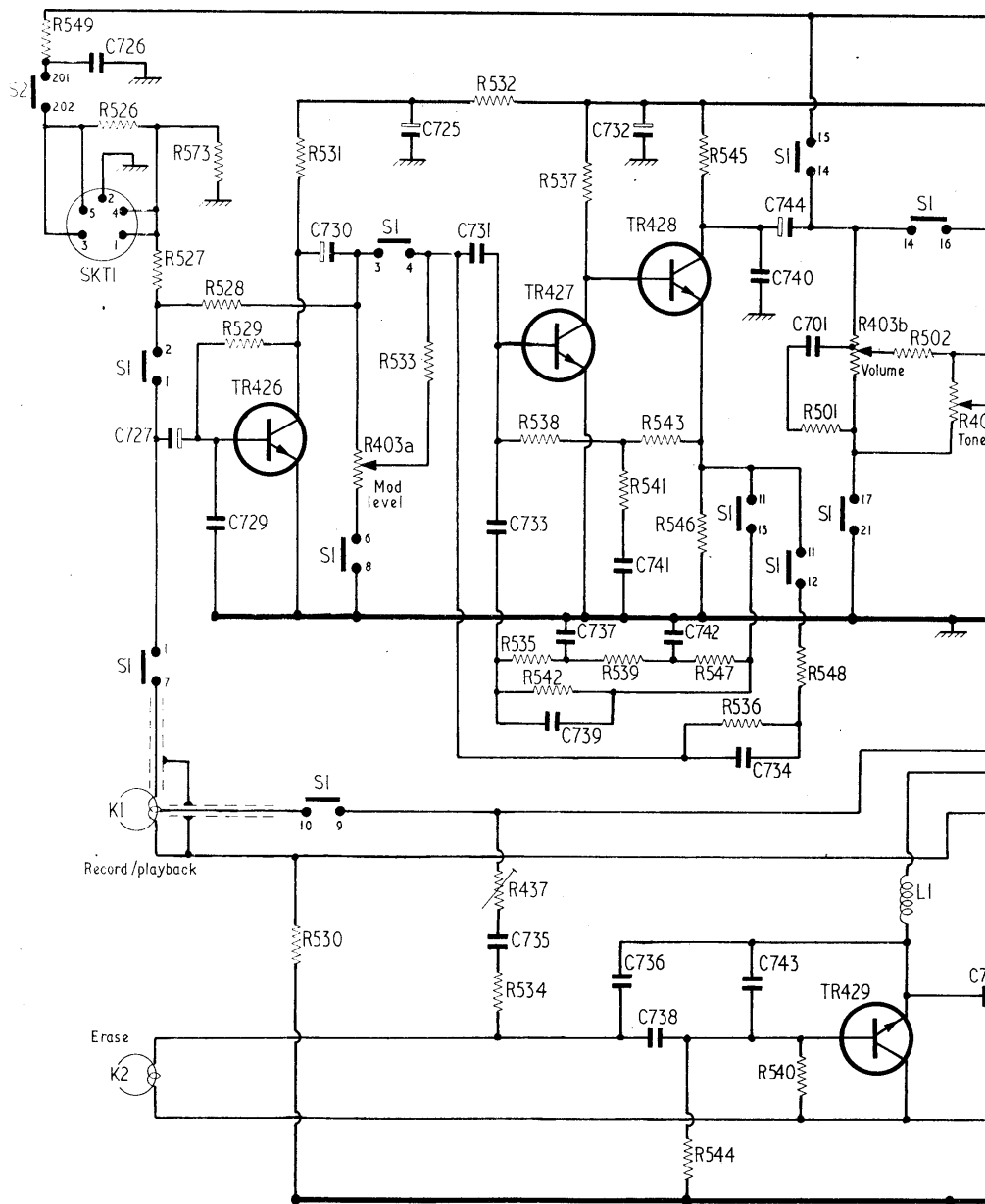
Record and Playback			
Transistor	Emitter (V)	Base (V)	Collector (V)
TR426 BC149B	0	0.4	1.3
TR427 BC148A	0	0.24	1.25
TR428 BC148A	0.65	1.25	4.4
TR430 BC148B	0	2.65	5.4
TR431 AC187	5.5	5.6	9.0
TR432 AC188	5.5	5.4	0
TR442 AC128	9.0	8.8	4.1
TR443 AC127	2.45	2.5	8
TR429 AC127	r* 0.42 p 5.9	0.09 4.3	9.0 9.0

Voltages measured across the following components: **C748** 9.0V; **C732** 7.0V; **C728** 6.5V
Quiescent current: Amplifier; 36mA record, 20mA playback. Motor; 40mA record/playback, 100mA fast wind.

*Record=r, Playback=p.

Resistors				Resistors				Resistors				Resistors			
R403a	22k Ω	—		R530	22k Ω	A1		R541	22k Ω	B1		R553	2.7k Ω	B1	R565
R403b	5 + 17k Ω	—		R531	22k Ω	A1		R542	330k Ω	B1		R554	13k Ω	B1	R566
R405	10k Ω	—		R532	1.5k Ω	A1		R543	100k Ω	B1		R555	6.8k Ω	C1	R567
R437	10k Ω	B1		R533	12k Ω	A1		R544	22k Ω	B1		R556	160k Ω	B1	R573
R501	820 Ω	—		R534	1.8k Ω	B1		R545	1.5k Ω	A1		R558	270 Ω	C1	R580
R502	1k Ω	—		R535	22k Ω	B1		R546	470 Ω	A1		R559	270 Ω	C1	R581
R526	1M Ω	A1		R536	560k Ω	A1		R547	2.7k Ω	B1		R560	100 Ω	C1	R582
R527	270 Ω	A1		R537	47k Ω	A1		R549	18k Ω	—		R561	180 Ω	C1	R583
R528	180k Ω	A1		R538	100k Ω	A1		R550	1.5k Ω	B1		R562	150k Ω	B1	R584
R529	820k Ω	A1		R539	8.2k Ω	B1		R551	1k Ω	A1		R563†	130 Ω	C1	R585
				R540	22k Ω	C1		R552	2.2k Ω	B1		R564	1 Ω	B1	R586

C	726	727	729		730	725	731	733	737	741	732	742	740	744	701	
R	549	526	527	573	528	529	531	403a	533	532	538	537	541	543	546	545
							530			437	534	535	542	539	547	544
															536	548
															540	



Circuit diagram of the N4200/91

Printed in
Stamford

7k Ω B1	R565	1 Ω C1	R548	33k Ω B1	C732	100 μ F A1	C743	0.047 μ F B1	Inductors*	D441	BA114	D1
3k Ω B1	R566	1.3k Ω B1			C733	0.033 μ F B1	C744	1.5 μ F B1	L1	47 Ω	B1	F1, F2 Ferroxcubebeads
8k Ω C1	R567	100 Ω B1	Capacitors		C734	0.047 μ F A1	C745	0.1 μ F C1	L4	138 Ω	D1	
10k Ω B1	R573	6.8k Ω A1	C701	0.15 μ F —	C735	1,000pF B1	C746	10 μ F B1	L5	7.5 Ω	—	
70 Ω C1	R580	270 Ω D1	C702	0.1 μ F —	C736	0.039 μ F B1	C747	1.5 μ F B1	K1	20 + 20 Ω	—	* Approximate d.c. resistance in ohms.
70 Ω C1	R581	100 Ω D1	C726	220pF A1	C737	3,900pF B1	C748	470 μ F C1	K2	0.7 Ω	—	† NTC.
00 Ω C1	R582	620 Ω D1	C727	10 μ F A1	C738	2,200pF B1	C749	180pF B1	Miscellaneous			
80 Ω C1	R583	820 Ω D1	C728	47 μ F A1	C739	100pF B1	C750	47 μ F C1	D432	OF156	C1	
10k Ω B1	R584	13 Ω D1	C729	6,800pF A1	C740	0.012 μ F A1	C751	680 μ F C1	D433	OF173	B1	
30 Ω C1	R585	13 Ω D1	C730	1.5 μ F A1	C741	0.068 μ F A1			D440	BA114	D1	
1 Ω B1	R586	560 Ω D1	C731	0.1 μ F A1	C742	0.01 μ F B1						

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