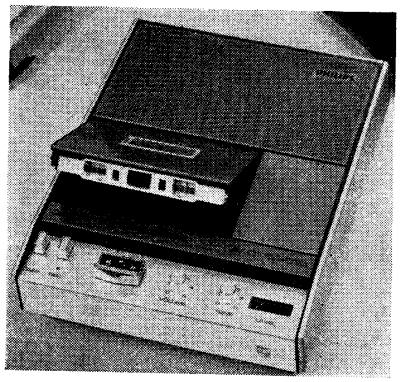
E R T SERVICE CHART 1861



PHILIPS N2204

Mains/battery operated cassette tape recorder

FULLY TROPICALISED and suitable for both battery or mains operation, the N2204 is a portable, cassette type tape recorder.

Twelve transistors and ten semiconductor diodes are employed in a circuit that features automatic control of recording level and motor speed.

Mains. 110-130/220-240V 50 or 60Hz.

Battery. 9V. Six 1·5V cells type SP11 or equivalent.

Consumption. Mains—approximately 3W Battery—approximate total current recorder operating without cassette: Record 110mA; Playback 83mA; Forward wind and rewind 120mA.

Transistors. TR404 AC187/01, TR426 BC149B, TR427 BC148B or BC149B, TR428 BC148C, TR429 BC148A, TR430 AC187, TR431 BC148A, TR432 BC148C, TR433a AC187/01, TR433b AC188/01, TR437 AC127, TR438 AC128.

Diodes. D434 OF162, D435 OF162, D436 OF156, D437 OF173, D441 OF162 or BA114, D442 OF162 or BA114, D451 OF160, D452 BY126, D453 BZY/88C10, D454 BY164.

Tape speed. 1⅞in./sec.

Tracks. Two.

Frequency response. 60Hz-10kHz within 6dB and according to DIN 45511.

Signal/noise ratio. Better than 45dB according to DIN 45405.

Wow and flutter. Less than 0·4 per cent, DIN weighted.

Cassette. Philips compact cassette.

Output. 600mW.

Speaker. 3in. diameter, 8ohm impedance.

Bias frequency. Approximately 54kHz.

Erase. AC.

Recording level/battery indicator. Moving coil meter. Automatic recording level control.

Rewind time. Not greater than 70 seconds for a C-60 cassette.

Microphone. N8209. Moving coil, with integral start/stop switch.

Input/output sockets. Skt. 1 5 pole 180deg DIN—Input: Microphone 0·2mV/2Kohm pins 1, 4 and 2 (earth). Gramophone and radio 100mV/1Mohm. pins 3, 5 and 2 (earth). Output: To Amplifier and radio 0·5V/20Kohm pins 3, 5 and 2 (earth), Measuring point MP1 pin 6 (models coded AH01). Measuring point MP2 pin 6 (models coded AH02 and higher) Skt. 2 6 pole 240deg DIN—Remote stop-start switch pins 1 and 5, headphone connection pins 2 and 4. Skt. 3 2 pole DIN—Speaker socket 600mW/8ohm. Skt. 4 2 pin non-reversible—Mains input and mechanical link to Switch 6.

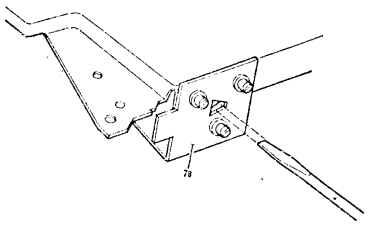
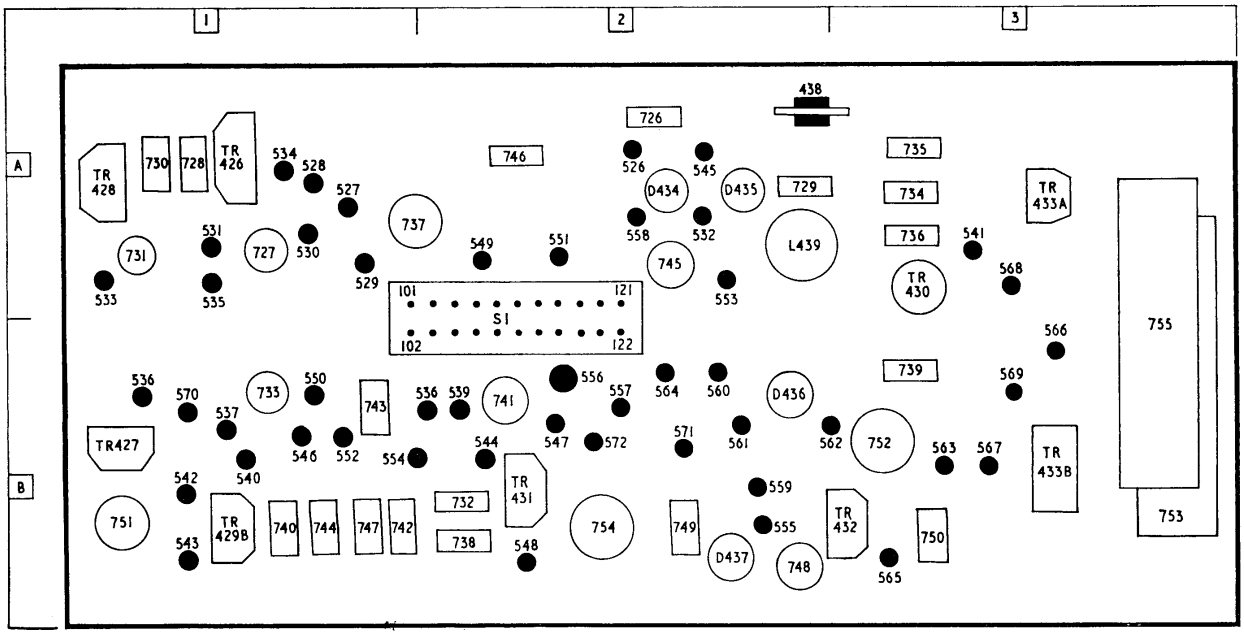
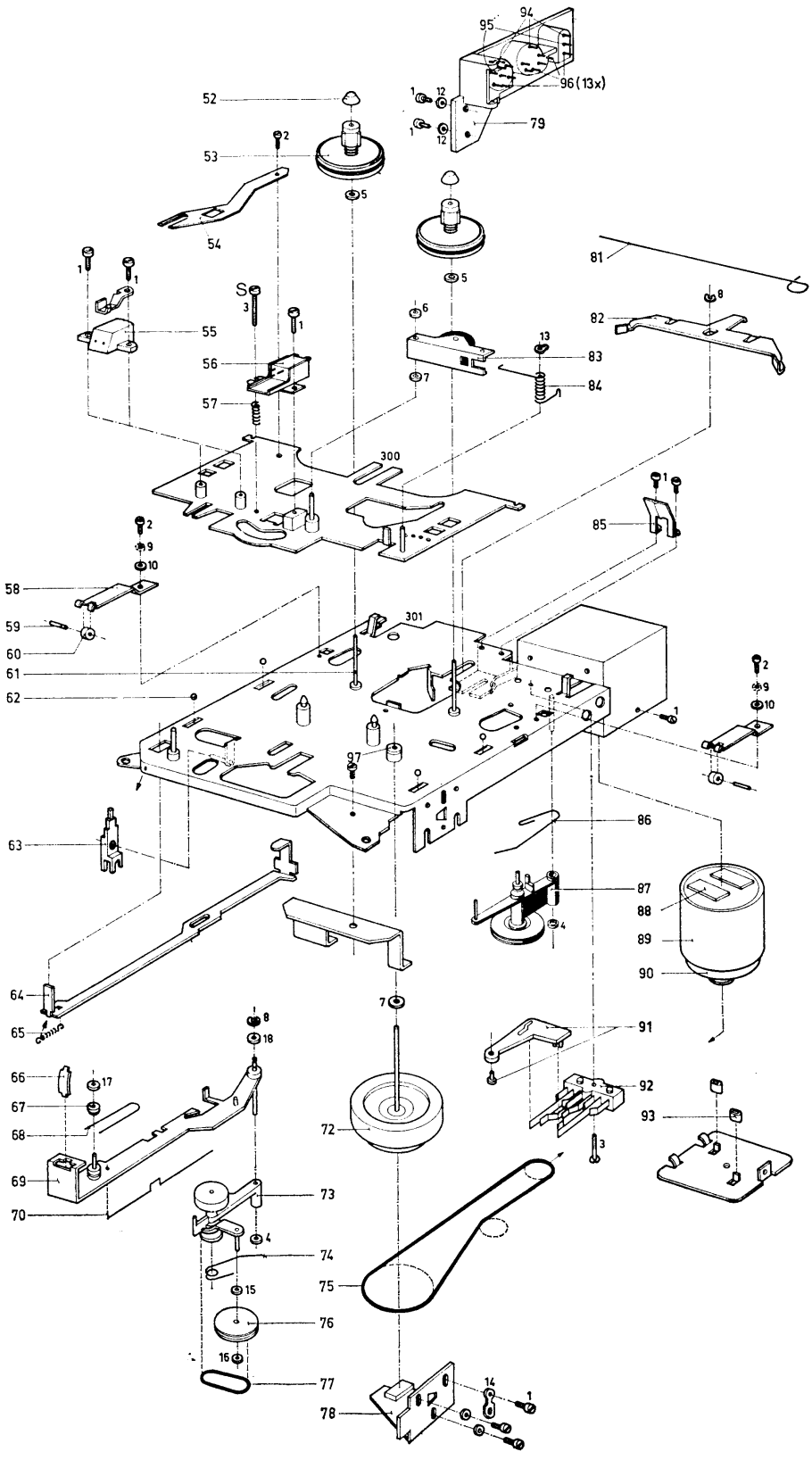


Fig. 1



EXPLODED VIEW OF MECHANICAL ASSEMBLY



Dimensions. $8\frac{1}{2} \times 6\frac{3}{4} \times 2\frac{3}{8}$in.

Weight. Approximately 4lb.—includes carrying case and battery.

Price. £29·10.

Manufacturer. Philip Electrical Ltd.

Service department. Combined Electronic Services Ltd. 604 Purley Way, Waddon, Croydon CR9 4DR. Tel: 01-686 0505. Recorded messages after business hours. Telex: 262308.

DISMANTLING

Case removal. Remove the cassette, pull off knobs then turn the recorder upside down on a protective surface.

Remove battery cover, withdraw the batteries, remove screws, and lift away base cover the front securing lugs of which should be disengaged as the base cover moves clear.

To release the mains transformer/voltage selector/mains input socket assembly, together with the power supply panel, release and remove two screws, and threaded pillar after which the complete assembly may be listed from the cabinet captive only by its connecting leads.

To release the main mechanical assembly complete with printed panels, remove screws holding unit, ease off the clip connected loudspeaker leads, and lift the completed assembly from the case captive only by its connecting leads.

To release the volume control, tone control, and recording level meter mounting plate, remove screws.

To release the amplifier panel, remove fixing screws. The printed panel may now be turned through 90deg, giving sufficient access to the component side of the panel to enable repairs to be carried out, or it may be removed by unsoldering the various connecting leads.

When refitting the panel, ensure that the lower end of switch lever 63 engages with the slider of switch 1.

MECHANICAL REPLACEMENTS AND ADJUSTMENTS

Main drive belt. Uncase the mechanical assembly. Remove flywheel lower bearing bracket 78 (three screws), and motor retaining plate 90a (one screw). Drive belt 75 can now be removed. Replace in the reverse order.

Note: When refitting flywheel lower bearing bracket 78, ensure that the axial play of flywheel 72 is not less than 0·1-0·2mm. This adjustment is effected by inserting a screwdriver into the triangular slot in the lower bearing bracket and easing the bracket up or down as required **(see Fig. 1).** Tighten the three securing screws firmly after making this adjustment.

Flywheel 72 and clutch assembly 87. Uncase the mechanical assembly. Remove flywheel lower bearing bracket 78 and free drive belt 75 from flywheel 72. Remove the motor control panel complete with support bracket (one screw above chassis plate). Ease off nylon circlip 4 retaining clutch assembly 87. Both flywheel and clutch may now be removed together. Re-assemble in the reverse order, ensuring that the actuating peg on clutch assembly 87 engages in the loop of spring 86. Adjust the flywheel axial play.

Motor 90. Remove motor retaining plate 90a, withdraw motor 90 from its screen, disconnect motor supply leads (red and blue) from switch S3, and remove two ferrite beads from the leads. Replace in the reverse order.

Note: After replacing the motor, its speed should be checked as described later.
To minimise electrical interference from the motor, the two ferrite beads should be fitted as close as possible to the point where the motor leads enter the motor, additionally the leads must be positioned correctly in the motor screen.

Turntables 53. Pull off either top cap 52 as necessary and lift the respective turntable from its spindle.

Idler wheel bracket assembly 73. Remove flywheel 72 and clutch assembly 87. Remove circlip 17 and roller 67, then retaining circlip 8 and brake bracket 82 complete with spring 81. Finally remove retaining circlip 8 and washer 18 from bracket assembly 69, which may now be withdrawn from chassis plate 301. Ease off nylon circlip 4 retaining idler wheel assembly bracket 73, and slide the assembly free from bracket 69. Re-assemble in the reverse order and adjust flywheel axial play.

Pressure roller bracket 83 (see Fig. 2). Switch to "Playback." The force required to pull the pressure roller away from the capstan should be 150-190 gms. Adjust by fitting the end of torsion spring 84 into any of the four adjacent locating holes provided.

Clutch assembly 87. To check the internal friction of clutch assembly 87, switch to "Playback" (do not fit a cassette), turn the volume control to minimum, then measure the total current consumption of the machine by inserting a suitable DC milliameter in the supply line between pin 1 Skt. 2, and SW3 contact 304. Prevent the RH turntable from rotating and note the increase in current, which should lie between 8-16mA.
If this is not the case, check the adjustment and measure the increase in current again. If still outside the stated limits, clutch assembly 87 should be replaced.

Clutch spring 86 (see Fig. 2). The force required at point "L" to pull the clutch pulley away from the RH turntable should lie between 70-100 gms. Adjust by slightly bending spring 86.

Switch 3. In the "Off" position a small clearance should exist between all of the switch contacts. Adjust by repositioning the switch about its securing screw, and by slightly bending the contacts.

Idler wheel bracket 73 (see Fig. 3). Switch to "Playback." Lug B should just clear projection D; afjust by bending lug B. Spring 74 should be just clear of bracket 73; adjust by bending lug C. The distance between drive pulley 76, and flywheel 72 should be 1-2mm.; adjust by bending lug E. In position "Rewind" spring 70 should just clear lug F; in position "Forward wind" spring 70 should just clear bracket 73. Both of these requirements may be met by slightly bending spring 70.

Motor speed adjustment. The motor speed may be checked by either of two methods, using the special tape cassette (Philips code number 8945 600 11501), or with the use of a suitable stroboscope.

Using test cassette. Test cassette 8945 600 11501 has an 800Hz signal modulated at every 4·75 metres. Insert the cassette into the recorder and switch to "Playback." The time between any two successive 800Hz signals should be between 95-103 seconds.

Using stroboscope. To enable this method to be adopted one side of a standard cassette must be removed. This may be done with the aid of a suitable knife, the burrs being removed with a small file. The motor speed is checked by pulling a loop from the side of the cassette, and placing within the loop a suitable stroboscope. A tape speed of 1⅞in./sec, should be indicated. If the speed is incorrect and no obvious mechanical fault exists, adjust R580 (on the motor control panel) to obtain the correct speed.

ELECTRICAL CHECKS AND ADJUSTMENTS

Notes: For the following checks the recorder must be powered from the mains, or a fresh set of batteries.
On all N2204 recorders bearing Factory Code AH02 and higher, the connections to test points MP1 and MP2 have been interchanged.
Test point MP2, connected to the base of TR428, is used for checks only during manufacture.

Record/playback head (K1) Azimuth adjustment. Remove snap-in head cover 102 by fitting at its rear edge, and place a test cassette pre-recorded with a 6300Hz tone (code number 8945 600 11501) into the recorder. Connect a suitable AC

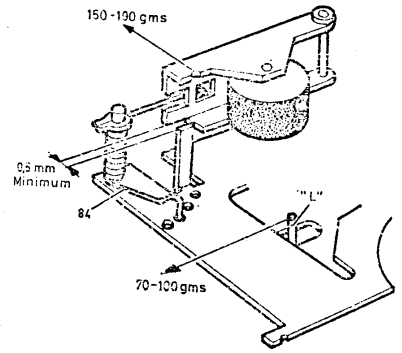


Fig. 2

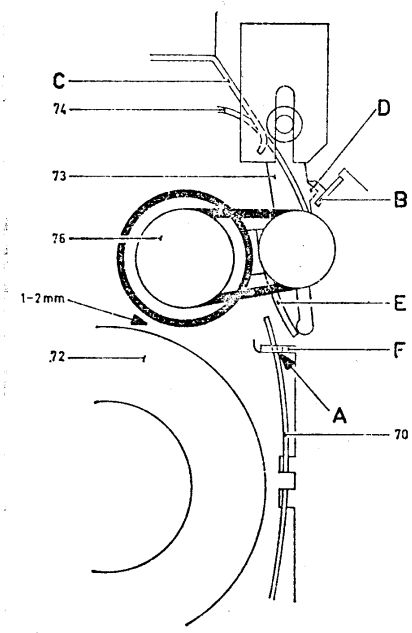
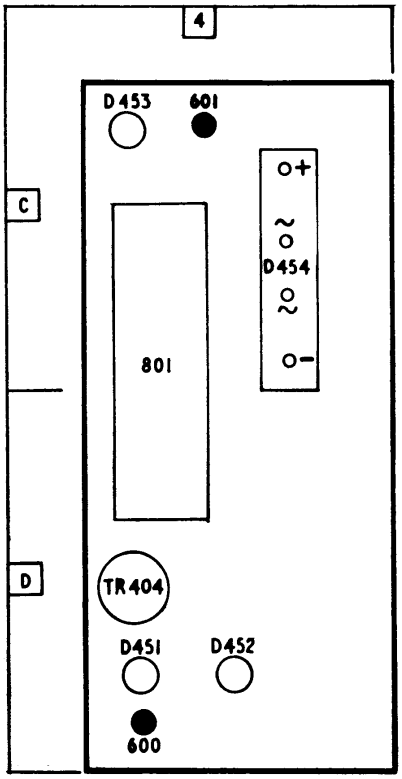
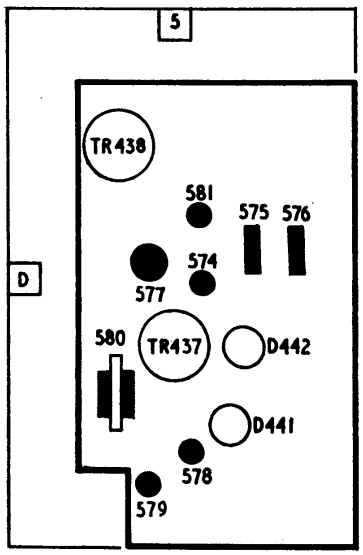


Fig. 3





Above: Motor control circuit panel

Left: Power supply panel

E R T SERVICE CHART 1861 PHILIPS N2204

millivoltmeter between pins 2 and 3 of Skt.1. Switch to "Playback," and adjust screw "S" (exploded view) for maximum voltage output. Seal screw "S" with a suitable locking paint.

Adjustment of R438 (recording bias). The amplitude of the recording bias current should be such that the specified frequency response, consistent with minimum distortion is obtained. A low bias will result in distortion at high modulation levels, and a high bias will excessively attenuate the treble frequencies.

This current is checked by measuring the voltage drop across R529, which should be approximately 25mV AC. Switch to "Record," connect an AC millivoltmeter between test point MP1 and pin 2 (earth) of Skt.1, then adjust R438 to obtain the correct voltage. Small deviations from thi- voltage are permissible to satisfy the requirements stated in the previous paragraph.

The voltage across erase head K2, measured with a 20Kohm/V meter should be approximately 14V AC, at a frequency between the limits 48 to 58kHz.

Checking "Playback" sensitivity. Remove speaker leads from the speaker, and terminate the leads with an 8ohm, 1 Watt resistor. Switch to "Playback," then turn the volume and tone controls to maximum.

To produce an output of 630mV across the 8ohm resistor, a generator output signal of 1kHz at an amplitude of 58mV±2dB applied via a 22Kohm resistor to test point MP1 should be required.

Checking automatic recording level control circuit. Prevent the oscillator from functioning by fitting a suitable wire link between the base and emitter of TR430.

Connect a suitable AC millivoltmeter between test point MP1 and pin 2 (earth) on Skt.1, and switch to " Record." A generator output of 1kHz at an amplitude of approximately 80mV, applied to pin 1 of Skt.1 through a 1Mohm resistor should be required for a meter indication of 4mV. Should this be the case, an increase of x10 in generator output voltage should be required to increase the meter indication to approximately 4·5mV.

Reduce the generator output voltage to its previous level, which should cause the meter indication to fall rapidly to 1·8mV, followed by a progressive rise to 2·8mV over a period of 15 seconds.

ELECTRICAL DESCRIPTION

Motor control circuit. A reduction of supply voltage or increase in motor load will initially cause a reduction of potential at the junction of D442/R575/576. The tendency of diodes D441 and D442 to maintain a constant voltage across themselves causes this reduction in voltage to appear approximately in full at the emitter of TR437. Only a small proportion of the initial voltage reduction across the motor will appear at TR437 base, owing to the potential divider action of R575/R576, R581, R577, R580, and R579. The increase in forward bias on TR437 thus effected results in a forward bias increase on TR438, reducing its effective series resistance. The voltage across the motor therefore increases to counteract the original decrease.

A rise in supply voltage or reduction in motor load will have the opposite effect to that described above.

Automatic record level circuit. In the "Record" position, R.555 forms a resistive load for TR433a and TR433b. Voltage developed across R555 is distributed as follows:

(1) Via R559 to the recording level indicator circuit.
(2) Via C745 to the recording level control circuit.

During the negative half-cycles of voltage across R555, D435 conducts and charges C745 to the peak value of this voltage. During the positive half-cycles D434 conducts, and charges C737 to the peak value of this voltage, plus the voltage of the charge already present on C745. C737 is therefore charged to approximately the peak to peak voltage appearing across

MECHANICAL ASSEMBLY

4	Nylon circlip	
5	Nylon washer	
6	Nylon circlip	
7	Nylon washer	
8	Circlip	2·3mm.
9	Lockwasher	2·2mm.
10	Washer	2·2mm.
12	Washer	3·1mm.
13	Circlip	3mm.
14	Washer	2·8mm.
15	Washer	
16	Nylon circlip	
17	Circlip	1·5mm.
18	Washer	3·2mm.
52	Cap over turntable	
53	Turntable	
54	Leaf spring	
55	Erase head	
56	Recording/playback head	
57	Compression spring	
58	Leaf spring	
59	Spindle	
60	Roller	
61	Spindle	
62	Ball (4)	
63	Nylon lever	
64	Locking bracket	
65	Tension spring	
66	Leaf spring	
67	Roller	
68	Wire spring	
69	Bracket assembly	
70	Wire spring	
72	Flywheel	
73	Idler wheel bracket and spring assembly	
75	Drive belt (Main)	
76	Pulley	
77	Drive belt (Secondary)	
78	Flywheel bearing bracket	
79	Socket plate assembly	
81	Wire spring	
82	Brake bracket	
83	Pressure roller bracket assembly	
84	Torsion spring	
85	Leaf spring	
86	Wire spring	
87	Friction clutch assembly	
88	Pad under motor	
89	Rubber sleeve round motor	
90	Motor	
90a	Motor retaining plate	
91	Switch plate and rivet	
92	Switch S3	
93	Rubber buffer	
94	Contact spring (3)	
95	Contact spring (2)	
96	Contact spring (13)	
97	Bearing bush	
300	Carriage plate	

peak to peak voltage appearing across R555. This positive voltage is fed to the base of TR428, which becomes conductive, causing a current to flow through the base/emitter junction of TR427, effecting a change of impedance between TR427 collector and emitter.

The degree of attenuation of signals passing from TR426 to TR429 depends upon the potential divider consisting of, in its upper limb R537, and in its lower limb the collector/emitter impedance of TR427.

Thus a means is provided for preventing signals fed from R555 via R558 to head K1 exceeding a pre-determined level.

Should a high level signal be followed by a low level signal, C737 discharges through R545 to a value proportional to the new low level signal. Switching the recorder to "Stop" causes any charge on C737 to be rapidly discharged through R549, hence each time recording is commenced, the recorder is at maximum sensitivity.

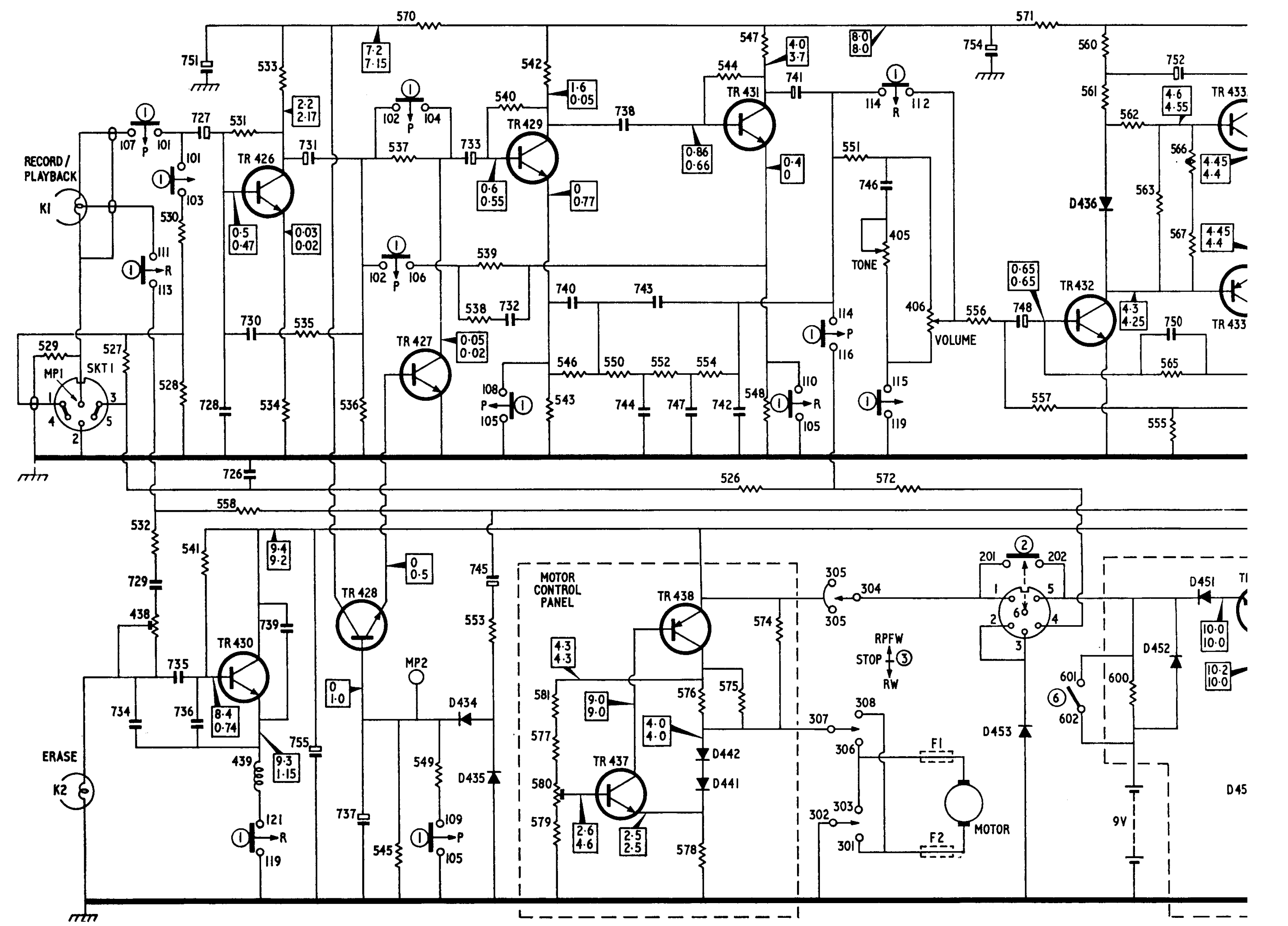
MICROPHONE AND REMOTE CONTROL SWITCH

The N8209 is an omni-directional moving coil microphone incorporating a remote control switch as an integral part. When the remote control switch connecting plug in inserted into Skt 2, switch S2 is opened, and the switch contained in the microphone case assumes an overall "On-Off" function, thus providing a remote start-stop control facility.

N8209 microphones are sealed during manufacture, and cannot be dismantled without sustaining damage. Spare parts for these microphones are not stocked.

RESISTORS							
R405	22K	—	R541	22K	A3	R560	68
R406	22K	—	R542	33K	B1	R561	150
R438	10K	—	R543	5K1	B1	R562	150
R526	18K	A2	R544	220K	B2	R563	150
R527	1M	A1	R545	1M	A2	R564	27K
R528	6K8	A1	R546	47K	B1	R565	150K
R529	22	A1	R547	1K5	B2	R566	130
R530	270	A1	R548	150	B2	R567	10
R531	820K	A1	R549	100	A2	R568	1
R532	2K7	A2	R550	2K7	B1	B569	1
R533	10K	A1	R551	4K7	A2	R570	1K5
R534	56	A1	R552	8K2	B1	R571	330
R535	180K	A1	R553	47	A2	R572	1K5
R536	100K	B2	R554	20K	B1	R574	820
R537	10K	B1	R555	100	B2	R575	13
R538	12K	A2	R556	3K3	B2	R576	13
R539	220K	B2	R557	68K	B2	R577	130
R540	680K	B1	R558	3K3	A2	R578	560
			R559	680	B2	R579	620

R	529 527 532 438 530 528 541 531 533 535 536 537 545 570 549 538 539 540 553 542 543 581 580 577 579 546 550 552 576 578 544 554 526 575 547 548 574 551 405 572 406 556 571 557 560 561 562 600 563 565 555 566 567
C	734 729 735 736 751 727 728 726 730 739 731 755 737 733 745 732 740 738 744 743 747 742 741 746 754 748 750 752
L	439



Circuit diagram of the Philips N2204. All voltages were measured with a 20,000 ohm/V meter and are positive with respect in the boxes are for playback. Note: The following resistor value may apply in some chassis: R532 1K8; R538

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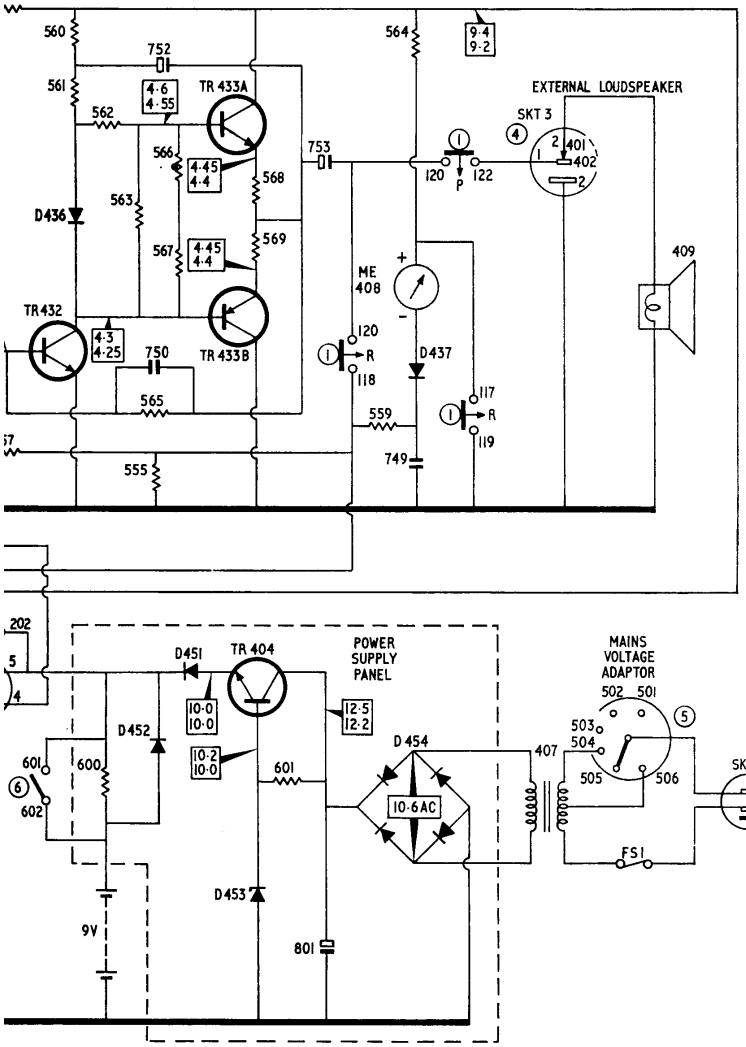
A3	R560	68	B2	R580	100	D5	C738	100KpF	B2
B1	R561	150	B2	R581	270	D5	C739	100KpF	B3
B1	R562	150	B3	R600	100	D4	C740	33KpF	B1
B2	R563	150	B3	R601	330	D4	C741	2·5µF	B2
A2	R564	27K	B2				C742	8K2pF	B1
B1	R565	150K	B2				C743	220pF	B1
B2	R566	130	B3	**CAPACITORS**			C744	6K8pF	B1
B2	R567	10	B3	C726	220pF	A2	C745	2·5µF	A2
A2	R568	1	A3	C727	10µF	A1	C746	33KpF	A2
B1	B569	1	B3	C728	4K7pF	A1	C747	2K2pF	B1
A2	R570	1K5	B1	C729	1KpF	A2	C748	2·5µF	B2
B1	R571	330	B2	C730	100KpF	A1	C749	47KpF	B2
A2	R572	1K5	B2	C731	640KpF	A1	C750	220pF	B3
B1	R574	820	D5	C732	10KpF	B2	C751	47µF	B1
B2	R575	13	D5	C733	640KpF	B1	C752	47µF	B3
B2	R576	13	D5	C734	39KpF	A3	C753	560µF	B3
B2	R577	130	D5	C735	2K2pF	A3	C754	100µF	B2
A2	R578	560	D5	C736	47KpF	A3	C775	560µF	B3
B2	R579	620	D5	C737	100µF	A1	C801	680µF	C4

560 562 563 565 566 568 601
561 600 555 567 569 559 564
750 752 801 753 749
407 409



re positive with respect to chassis. The upper voltage chassis: R532 1K8; R539 270K

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