

Philips version of twin-track cassette recorders which are styled in black polystyrene cabinets with brushed aluminium trim. ST9112AT includes mains supply unit and pilot lamp

PHILIPS EL3303A STELLA ST474, ST9112AT TAPE RECORDERS

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PORTABLE twin-track battery operated tape recorders using the Philips compact cassette system. Model ST9112 incorporates a mains supply unit.

Batteries. $6 \times 1\frac{1}{2}$ V, U2 or equivalent.

Mains. (Model ST9112 only) 110, 117, and 200-250V AC, 50-60c/s.

Transistors. TR1, TR2 and TR3 AF amplifier AC125; TR4 AF amplifier AC126; TR5 driver AC126; TR6 output AC188; TR7 output AC187; TR8 meter rectifier AC125; TR9 motor control AC127; TR10 motor control AC128; TR11 (ST9112) power supply AD149; TR12 (ST9112) power supply AC127.

Diodes. D1, D2, D3 BA114; D5 (ST9112) BA114; D6 (ST9112) BZY88; D7 (ST9112) BY126.

Thermistor. (Some sets only) stabilising NTC.

Pilot lamp. (ST9112) LP1 8-10V, 50mA. Fuse. (ST9112) FS1 630mA surge-proof.

Output. 750mW.

Speaker. EL3303 and ST474 4in. diameter, ST9112 5in. diameter.

Tracks. Twin-track monophonic, left to right.

Tape speed. $1\frac{1}{2}$ in. per second.

Tape width. 0.15in.

Playing time. 2×30 minutes with a C60 cassette, or 2×45 minutes with a C90 cassette.

Fast wind time. Approximately 70 seconds for a C60 cassette.

Frequency response. 80-10,000c/s within 6dB.

Signal to noise ratio. Better than 45dB.

Wow and Flutter. ± 0.4 per cent.

Tape position indicator. Scale on cassette.

Record level/battery indicator. VU meter.

Input/output sockets. SK1: microphone input, 0.3mV to pins 1/4 and 2 across 2Kohms; radio/pickup input, 225mV to pins 1/4 and 2 via 1M5 resistor incor-

porated in connecting lead supplied; line output, 0.5V across 20Kohms from pins 3/5 and 2. SK2: remote stop/start control, pins 5 and 1/2; external mains supply, pins 3 and 1/2; monitoring output (not ST9112), 200mV across 1.5Kohms from pins 4 and 1/2. SK3: extension speaker. 8ohm impedance.

Dimensions. EL3303 and ST 474, $11\frac{1}{4} \times 9\frac{1}{2} \times 2\frac{3}{4}$ in., ST9112 $12\frac{1}{2} \times 8\frac{1}{2} \times 3\frac{1}{8}$ in.

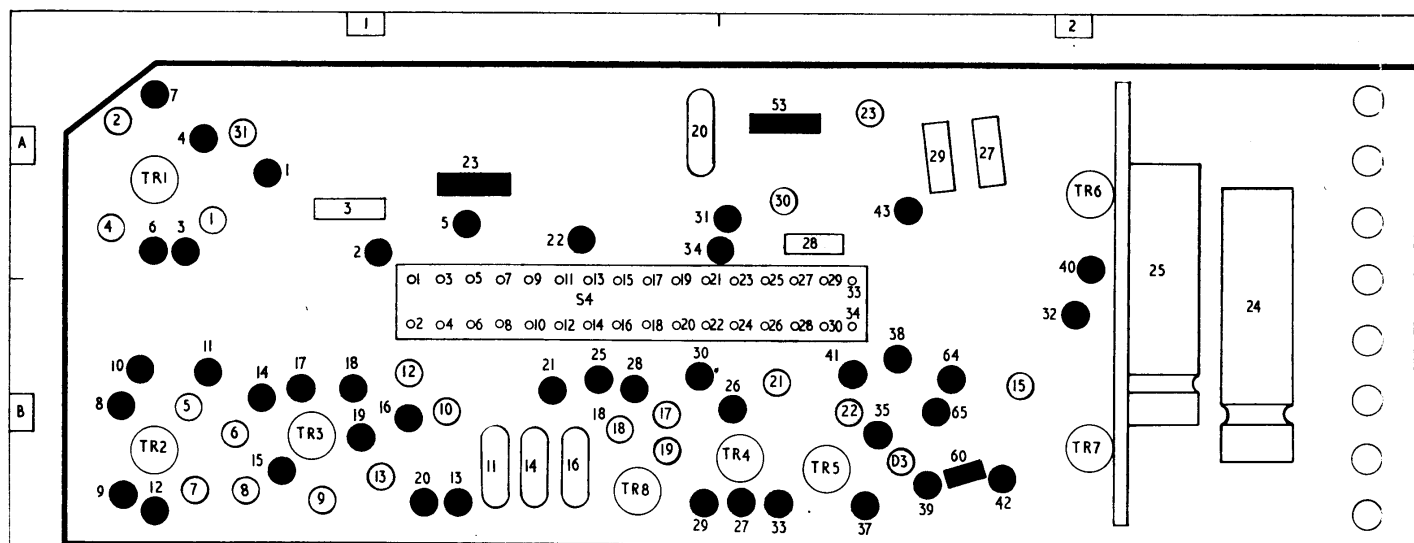
Weight. Including batteries, EL3303 and ST474 5lbs, ST9112 6lbs.

Manufacturer. Philips Electrical Ltd.

Service Department. Combined Electronic Services Ltd, Waddon Factory Estate, Croydon, CR9 4DR. Tel: spare parts, 01-686 7311; service enquiries, 01-688 7722. After hours recorded messages on both lines.

DISMANTLING

Cabinet base. Take out batteries and remove storage compartment cover. Release five screws securing base to cabinet. Lift base clear and disconnect



Component layout on main printed circuit board viewed from component side. Early versions of EL3303A and ST474 show slight differences

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PHILIPS EL3303A, STELLA ST474, ST9112AT

two leads from battery compartment if necessary.

Power unit (ST9112). Remove two 3mm screws from chassis on either side of TR11. Power unit may now be lifted out leaving only DC output leads connected.

Chassis. With cabinet base removed, take out countersunk screw from centre of cassette compartment, and pull off tape transport knob (make sure that recorder is switched to "Off" position). Withdraw 3mm screw from corner of chassis adjacent to motor control panel and remove spring clip from modulation meter. Pull off three control knobs and lift out control panel from the "level" control end. Chassis together with moulded socket panel, control panel and meter may then be removed. Reassemble in reverse order.

Amplifier panel. Remove small screw from tape transport end of panel, and screw which secures output transistor's mounting bracket to chassis. Release support bracket from edge of panel and disconnect leads. Reassemble in reverse order, watching that switch lever engages slider of record/playback switch.

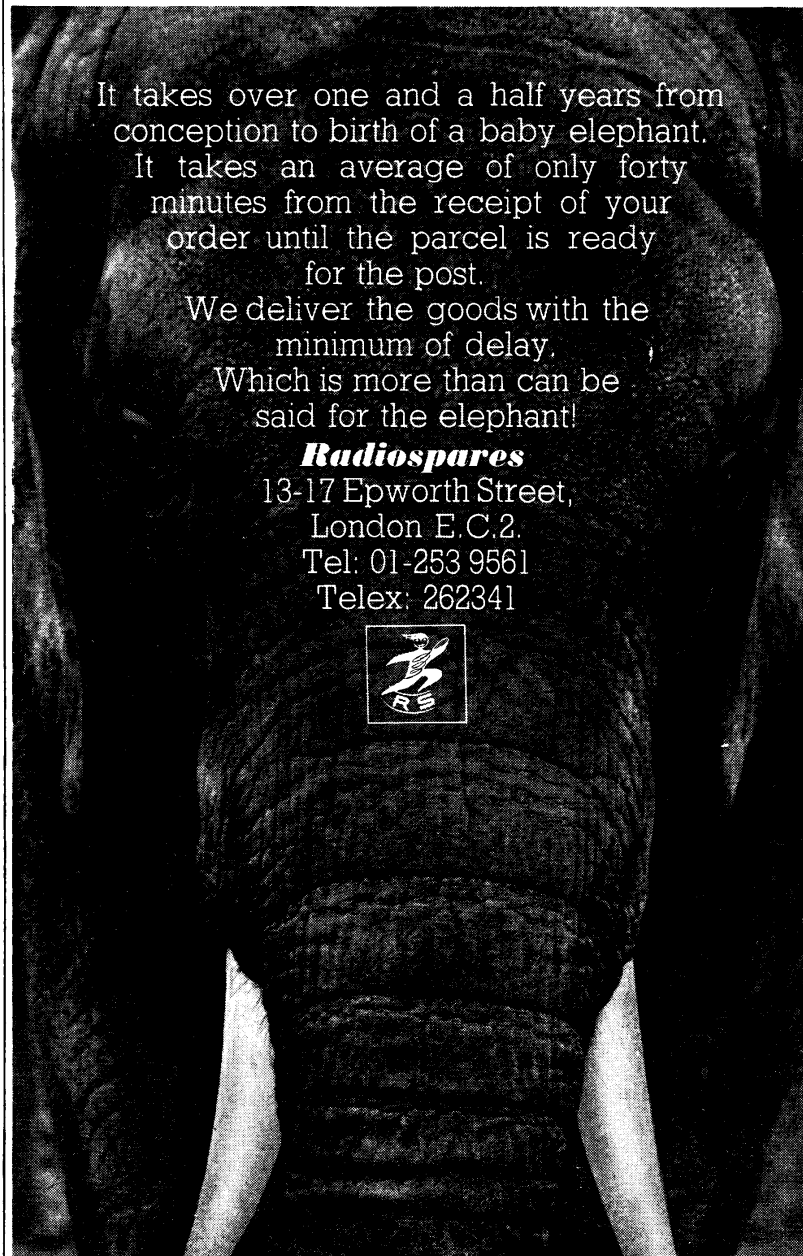
Motor control panel. With chassis removed as described above, disconnect three leads from control panel. Remove screw securing panel mounting bracket to chassis. After replacing or servicing panel, speed must be checked as described in Service Notes.

SERVICE NOTES

Pressure roller. In "Playback" position, force required to pull roller away from capstan should be 150–190 grams. Some adjustment is possible by fitting torsion spring end into any one of four locating holes.

Clutch. To check internal friction drive of clutch, switch to "Playback" Turn level control R51 to minimum and measure the current consumption. Stop right hand turntable rotating and note increase in current which should be 7–13mA. If not, check pressure of clutch pulley against right hand turntable. This should be 70–100 grams, adjustment being made by bending hairpin spring. If clutch friction is still not correct clutch should be replaced.


Motor speed. Remove one side of a standard cassette with a small knife, removing burrs with a file. Insert cassette and pull loop of tape from opened side. Hold suitable tape stroboscope inside this loop and adjust R54 to obtain correct



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speed as shown by stroboscope viewed under a 50c/s light source. It is essential to use a set of good batteries for this adjustment.

Motor switch. In the "Off" position a small clearance should exist between all contacts of switch S1. If necessary bend angled contact arms slightly.

Head azimuth. Uncase machine. Connect valve voltmeter to pins 2 and 3 of SK1 and fit test tape with 5kc/s tone prerecorded, into machine. Switch to "Playback" and turn azimuth adjusting screw to get maximum output. Seal position of adjusting screw with locking paint.

Bias adjustment. In "Record" position, with modulation level control at minimum, an AC voltage of 10-25mV should be obtained between pins 6 and 2 of SK2. Adjust R53 mounted on main printed panel if necessary.

Playback sensitivity. Connect 22K resistor to Pin 6 of SK2. Apply 1kc/s signal of 30mV to free end of resistor and Pin 2 of SK2. Set volume and tone controls to maximum and switch to "Playback". Using AC millivoltmeter the following voltages with respect to chassis should be obtained at the points indicated, $\pm 2\text{dB}$.

	Emitter	Collector
TR1	—	0.028mV
TR2	—	2mV
TR3	—	54mV
TR4	30mV	—
TR5	—	800mV
Pin 3, SK1	—	50mV

Record sensitivity. Apply 1kc/s signal of 110mV to pins 2 and 3 of SK1. Stop bias oscillator by shorting C29. Switch to "Record" and set modulation level control to maximum. Using AC milli-

voltmeter the following voltages with respect to chassis should be obtained at the points indicated, $\pm 2\text{dB}$:

	Base	Emitter	Collector
TR1	0.15mV	—	3.4mV
TR2	—	—	14mV
TR3	—	—	320mV
TR4	—	300mV	—
Pin 6, SK2	—	—	4mV

Remove short circuit from C29.

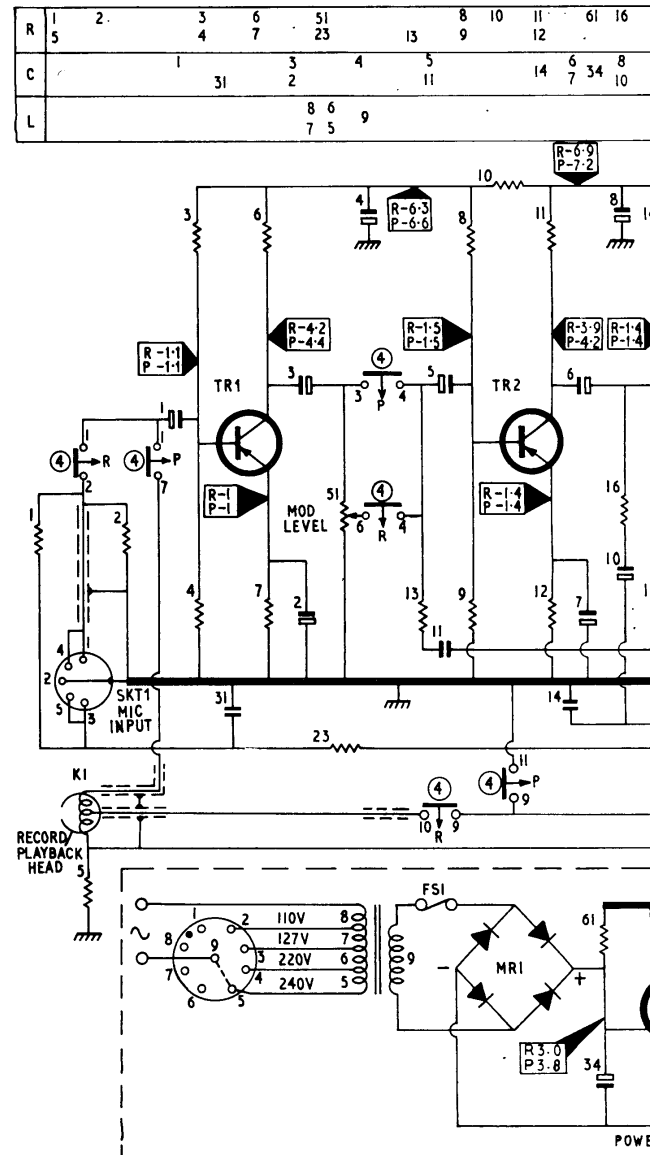
Frequency response. Connect AF signal generator to Pins 1 and 2 of SK1 via 1.5M resistor. Turn modulation level control to maximum and set generator output to 10mV. Maintaining output voltage constant, record frequencies of 80c/s, 1kc/s, 5kc/s and 10kc/s. Connect millivoltmeter to pins 2 and 3 of SK1 and set volume and tone controls to maximum. Switch to "Playback" and note output voltage for each of recorded frequencies. Difference between highest and lowest readings should not be greater than 6dB. If difference is greater than 6dB adjust recording bias within limits

given above. Reducing bias will increase treble response and vice versa. If after adjustment bias falls outside limits given, defective Record/Playback head or amplifier circuitry should be suspected.

Modulation/battery indicator. Fit new batteries and switch to "Playback." Pointer should deflect to right hand half of green sector. Inject 1kc/s signal of 110mV to Pins 2 and 3 of SK1 and switch to "Record." Turn modulation control to maximum. Pointer should deflect almost to separation line between black and red sectors.

Main controls. Later versions of EL3303 and ST474 have flats on control spindles rotated 90 degrees relative to earlier versions and indication on knobs correspondingly rotated. Consequently, earlier and later control knobs and spindles are not interchangeable. To identify type of control fitted, pull off knob and rotate control fully clockwise. In early types flat will appear parallel to side of cabinet, in later types it will appear parallel to front of cabinet.

Circuit diagram showing mains power supply included in ST9112AT only. Feedback circuit A replaces circuit B in some sets. R39 is 100ohms in sets where R60 is deleted. All sockets are viewed on solder tags. Voltages shown taken with respect to chassis using 100K ohm/V meter with no signal input. Supply: EL3303A and ST474, new batteries; ST9112AT, 240V AC into 240V tap



CAPACITORS					
C1	2.5mF	A1	R17	470	B1
C2	40mF	A1	R18	2K7	B1
C3	2.5mF	A1	R19	820	B1
C4	25mF/32mF	A1	R20	33	B1
C5	2.5mF	B1	R21	820	B1
C6	2.5mF	B1	R22	1K5	A1
C7	40mF	B1	R23	18K	A1
C8	25mF/32mF	B1	R24*	2K2	—
C9	330pF	B1	R25	820	B1
C10	640KpF	B1	R26	15K	B2
C11	82KpF	B1	R27	10K	B2
C12	2.5mF	B1	R28	330/270	B1
C13	40mF	B1	R29	680	B1
C14	18KpF	B1	R30	470/220	B1
C15	200mF	B2	R31	1K5	A2
C16	47KpF	B1	R32	150	B2
C17	2.5mF	B1	R33	4K7/1K8	B2
C18	25mF	B1	R34	22K/18K/20K	A2
C19	40mF	B1	R35	18K/4K7	B2
C20	100KpF	A1	R36*	18K	—
C21	2.5mF/8mF	B2	R37	18/47	B2
C22	64mF	B2	R38	150	B2
C23	64mF	A2	R39	100/270	B2
C24	400mF	A/B2	R40	4*7	B2
C25	320mF/800mF	A/B2	R41	270/330	B2
C26*	64mF	—	R42	18K/5K6	B2
C27	100KpF	A2	R43	330/390	A2
C28	100KpF	A2	R44	560	C1
C29	100KpF	A2	R45	750	C1
C30	10KpF	A2	R48	10	C1
C31	220mF	A1	R49	18	C1
C32	150KpF	—	R50	820	C1
C33	100KpF	—	R51	5+17K	—
C34	640mF	D1	R52	5+17K	—
RESISTORS					
R1	1M5	A1	R53	10K	A2
R2	3K9	A1	R54	220	C1
R3	56K	A1	R55	330	C1
R4	10K	A1	R56	820	—
R5	22	A1	R57	5+17K	C1
R6	4K7	A1	R58*	100	—
R7	2K2	A1	R60*	NTC	B2
R8	56K	B1	R61	2K2	D1
R9	15K	B1	R62	560	D1
R10	1K	B1	R63*	330	D1
R11	3K9	B1	R64*	1	B2
R12	1K8	B1	R65*	1	B2
R13	1K8	B1	Components * are included in some sets only. C34, R61, R62 and R63 appear in ST9112 only. Where two values are given, second one relates to later type of set.		
R14	33K	B1			
R15	8K2	B1			
R16	3K9	B1			

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