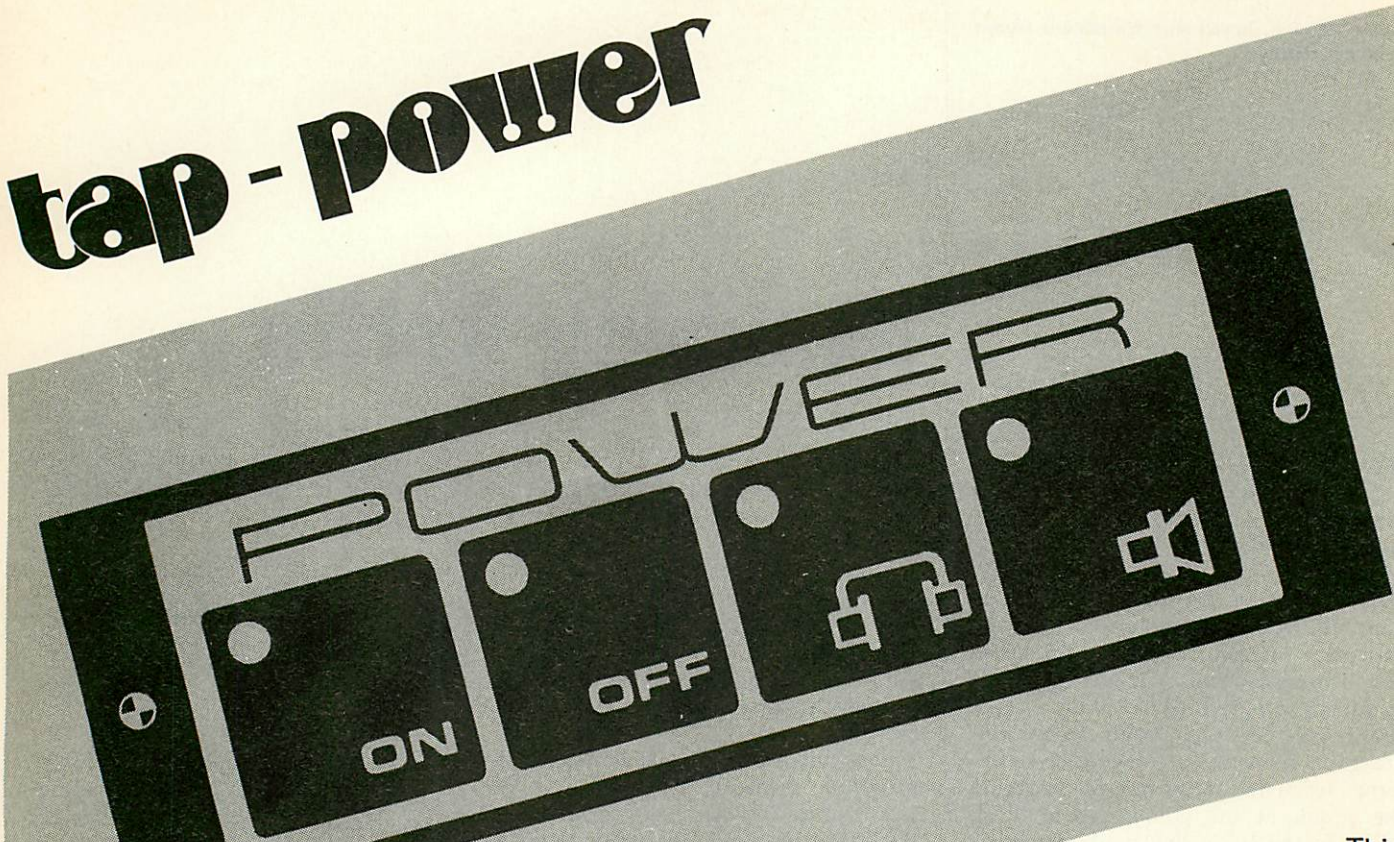
tap-power



This 'TAP-power' circuit has been specially designed for the TAP preamp system. It includes touch-controlled switches for turning the whole equipment on or off and for selecting the main power amplifiers or the headphone amplifiers, a power supply for the TAP pre-amp, simple headphone amplifiers and a disc preamplifier.

NAND gates N1, N2 and N3, N4 (IC_4 = CD4001) make up two touch switches. Four LEDs are used to indicate the condition in which the system has been set; D2 = ON, D3 = OFF, D6 = headphones and D5 = power amplifier.

Because of the difference between this circuitry and the rest of the TAP system, construction is much simpler: instead of a diode matrix only two flip-flops are used here.

The power supply is split up into three sections: one for the touch switches, one for the rest of the TAP preamp and one for the disc preamplifier.

The supply for the touch switches must stay in operation even in the 'OFF' condition, because it would not otherwise be possible to start the whole outfit with the 'ON' touch switch. For this reason, the switch supply is drawn directly from the unstabilised supply via series resistor R15 and zener diode D1.

Integrated voltage stabiliser IC_3 stabilises the 10-V supply needed for the TAP pre-amp. This can be accurately adjusted with preset potentiometer P1.

As the maximum output current of this IC is only 150 mA, the external power transistor T1 is added. When the supply voltage is switched on with the 'ON' touch switch, the logic state prevailing at the output of gate N1 is '1', while it is '0' at the output of N2. Transistors T2 and T3 are therefore cut off, and the supply voltage becomes available at output C.

When the 'OFF' panel is touched, logic levels at the outputs of N1 and N2 are reversed, with the result that T2 and T3 turn on. The potential at pin 13 of IC3 is therefore pulled down almost to zero, so that the internal output transistors in the IC are cut off. The voltage at output C drops to 0 and the TAP preamp is turned off.

The flip-flop formed by N3 and N4 provides a changeover between headphones and the main power amplifier. When the output of N3 is at logic '1', transistors T5 and T6 turn on, switching on the headphone amplifier built around T7 and T8. This amplifier, including the associated components within the dashed rectangle in figure 1, is duplicated on the board for the left-hand headphone channel. Both amplifiers derive their supply from the collector of T6.The output of N4 is at logic'0'. Transistor T4 is cut off and relay Re is not energised. The relay contacts,

Figure 1. Circuit of the main power supply the TAP switches for on/off switching an loudspeaker/headphone selection, and one o the headphone amplifiers.

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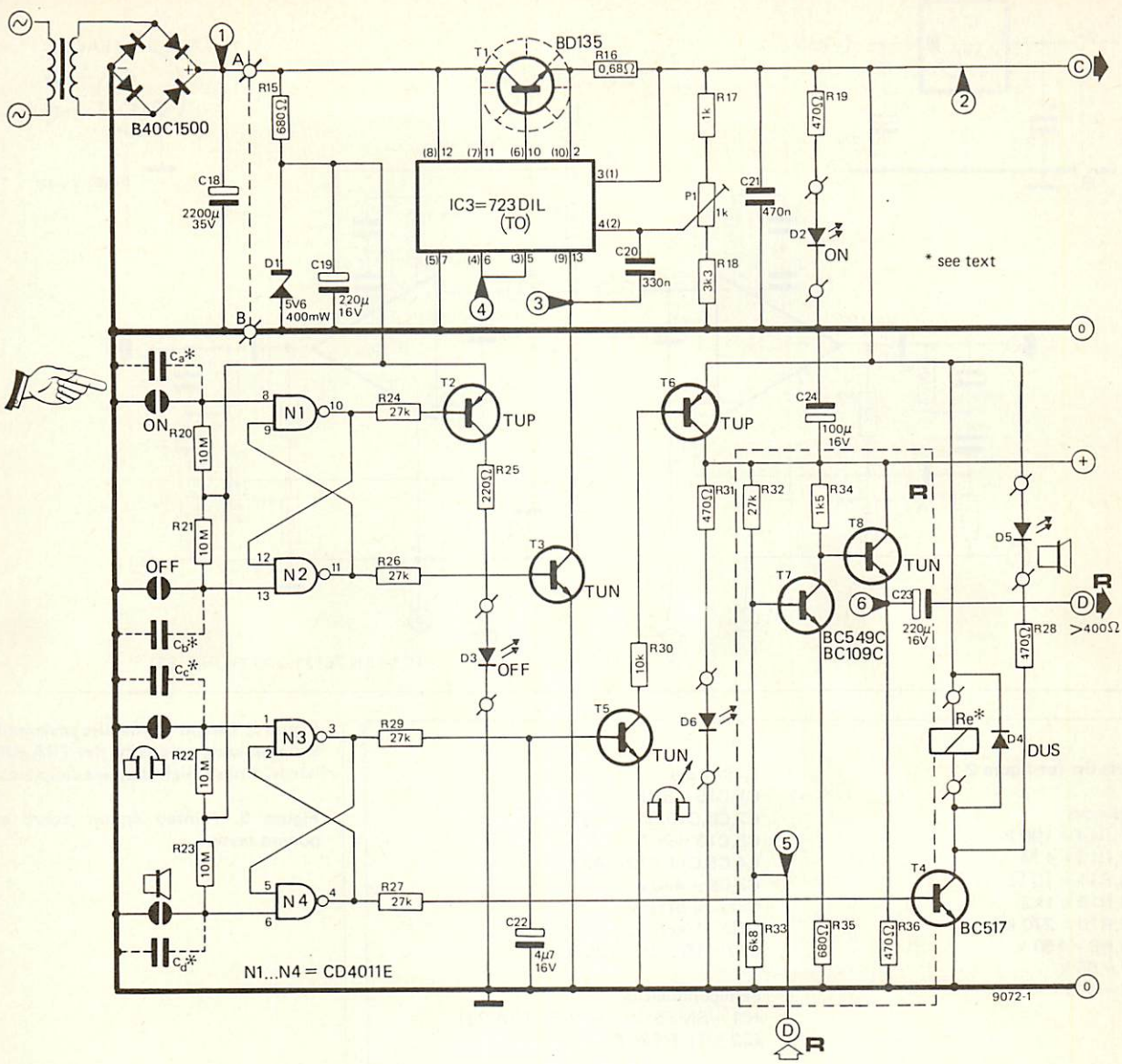


Parts list for figure 1

Resistors:
R15,R35 = 680 Ω
R16 = 0.68 Ω
R17 = 1 k
R18 = 3k3
R19,R28,R31,R36 = 470 Ω
R20,R21,R22,R23 = 10 M
R24,R26,R27,R29,R32 = 27 k
R25 = 220 Ω
R30 = 10 k
R33 = 6k8
R34 = 1k5
P1 = 1 k

Capacitors:
C18 = 2200 μ/35 V
C19,C23 = 220 μ/16 V
C20 = 330 n
C21 = 470 n
C22 = 4μ7/16 V
C24 = 100 μ/26 V

Sundries:
Transformer = 240 V/16 V, 1 A (see text)
Bridge rectifier = B40C 1500
Relay Re = 10 V, 300 Ω (see text)

Semiconductors:
D1 = 5V6/400 mW
D2,D3,D5,D6 = LED
D4 = DUS
T1 = BD 135 (cooled)
T2,T6 = BC 177 (possib. TUP)
T3,T5,T8 = BC 107 (possib. TUN)
T4 = BC 517
T7 = BC 549 C, BC 109 C
IC3 = μA 723
IC4 = CD 4011

which switch the supply for the main power amplifiers on and off at the primary of the mains transformer for these amplifiers, stay open.

When the loudspeaker touch panel is touched the relay contacts close and the power amplifier is turned on: the headphone amplifier no longer gets a power supply because the logic '0' at the output of gate N3 cuts off transistors T5 and T6.

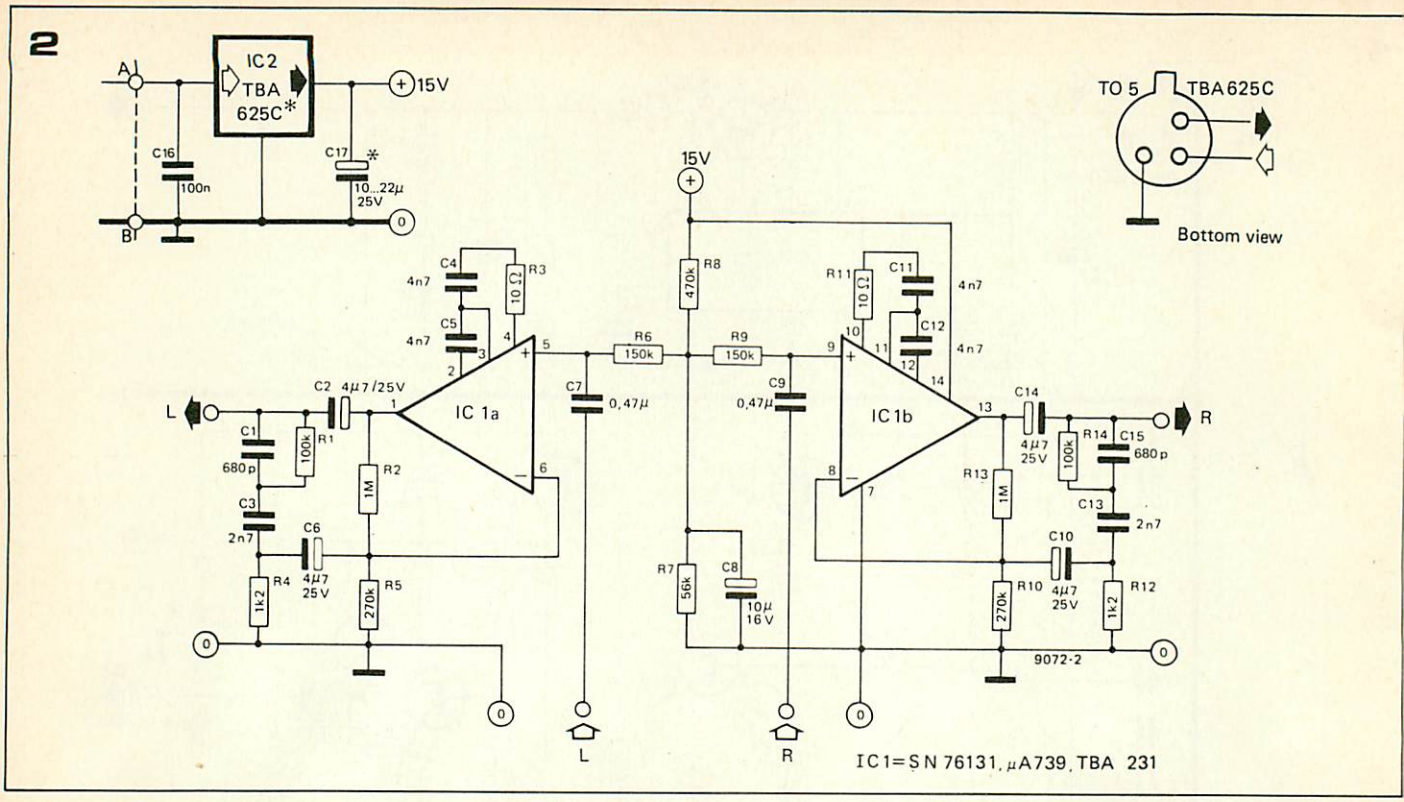
The disc preamplifier (figure 2) is the same as was described in the April 1975 issue of Elektor. Power supply for the preamplifier is provided by the integrated stabiliser IC_2. Points A and B are connected to the corresponding points in figure 1.

Construction

Current consumption of the touch-switching circuit is about 30 mA in the 'OFF' position. In the switched-on state, the maximum consumption with headphone listening is about 100 mA (not counting the TAP preamplifier, of course!). Including the TAP preamplifier, the maximum current consumption is 320 mA when the headphone amplifiers are on and the volume control is at maximum.

Figure 1 shows six points at which the D.C. voltage can be checked. With the transformer secondary delivering 16 volts RMS and the TAP preamp not connected, the voltages at these points should be 20 V, 10 V, 12 V, 6.8 V, 1.8 V and 6 V respectively.

The headphone amplifier delivers 2 V R.M.S. with the maximum input signal of 850 mV. Headphones with an impedance of 400 ohms or higher can be



Parts list for figure 2

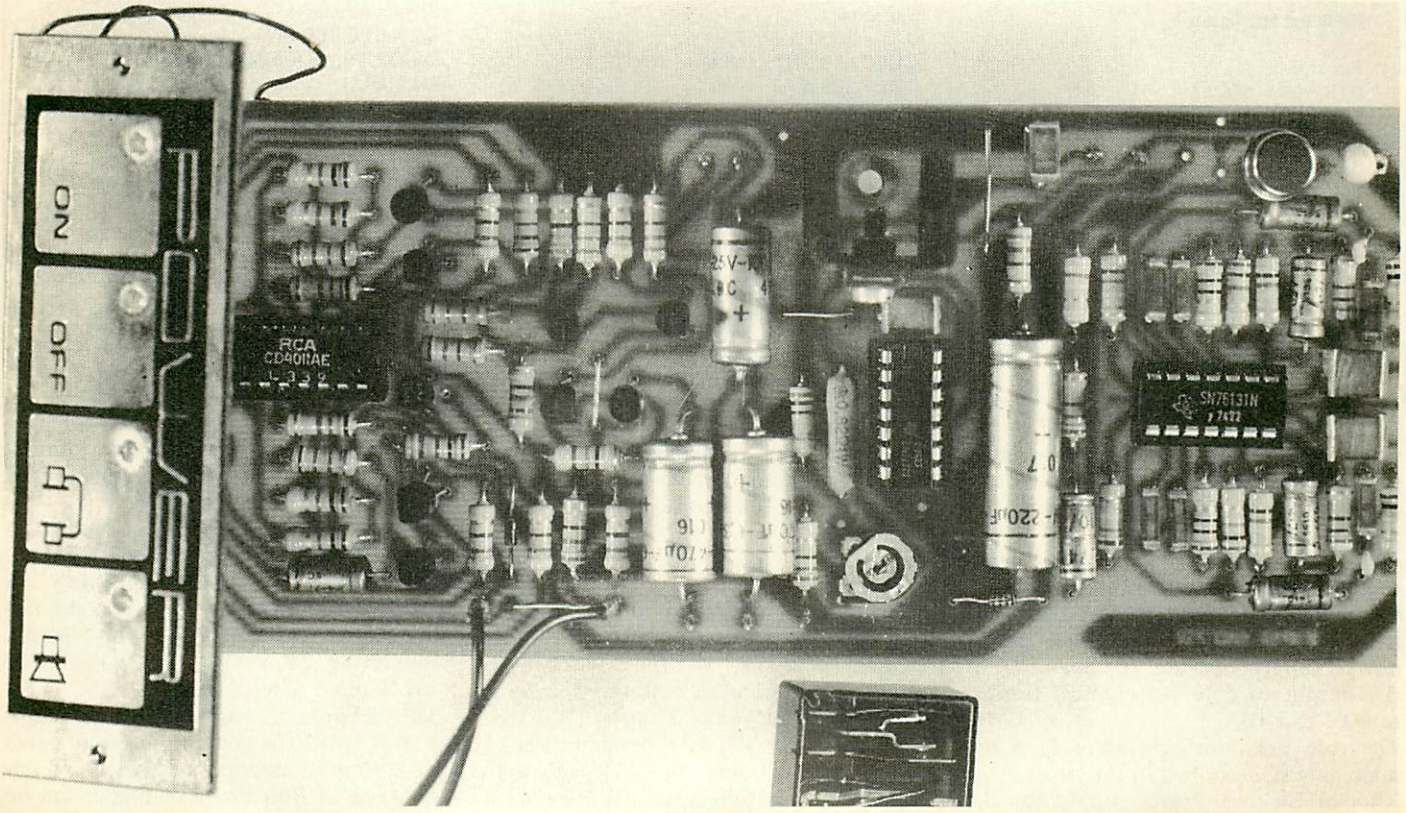
Resistors:
R1,R14 = 100 k
R2,R13 = 1 M
R3,R11 = 10 Ω
R4,R12 = 1k2
R5,R10 = 270 k
R6,R9 = 150 k
R7 = 56 k
R8 = 470 k

Capacitors:
C1,C15 = 680 p
C2,C6,C10,C14 = 4µ7/25 V
C3,C13 = 2n7
C4,C5,C11,C12 = 4n7
C7,C9 = 470 n
C8 = 10 µ/16 V
C16 = 100 n
C17 = 10 ... 22 µ/25 V

Semiconductors:
IC1 = SN 76131, µA 739, TBA 231
IC2 = TBA 625 C

Figure 2. Circuit of the disc preamplifiers, and external connections to the TBA 625C stabiliser IC from which they are supplied.

Figure 3. Printed circuit board and component layout.



connected to the output D. The value of capacitor C23 is calculated for headphones with an impedance of 2 k.
Transistor T1 must be adequately cooled; the power dissipation – and hence the dimensions of the heatsink needed – depends on the transformer secondary voltage:

Transformer secondary voltage (V RMS)	Heatsink area (cm^2)
16	50
18	80

It is often a good solution to use the case as a heat sink, with the transistor mounted on the outside.
The pull-in voltage for relay Re is about 10 V. The contacts must be rated to make and break at least 250 V, and a current depending on the maximum drawn by the power amplifiers. For two 100 W amplifiers driving 4-ohm loads a relay with 8 A contacts is suitable.

To avoid relay chatter when a number of touch panels are operated at the same time, it is advisable to connect 1 n capacitors C_a to C_d across each pair of touch contacts.
A 100 n/400 V capacitor can be connected across the relay to prevent contact burning.

The TBA 625C stabiliser IC delivers an output of 15 V. As this is the minimum acceptable voltage for the disc preamplifier, it is essential that a Type C stabiliser be used. A heat sink is not absolutely necessary. A tantalum electrolytic capacitor should be used for C17 to forestall any possible tendency to oscillation.
Figure 3 shows the printed circuit board and the component layout for the TAP-power circuit. Except for the mains transformer, bridge rectifier, smoothing capacitor C18 and relay, all the components are accomodated on one board.

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