

TAKE 20

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No. 51

TOUCH-SENSITIVE SWITCH

A series of simple transistor projects, using not more than twenty components.

(rather negating the original sentiment of avoiding mechanical components!) or, better still, a logic (TTL) compatible output.

Nowadays there is a tendency to veer away from electro-mechanical switches to electronic versions which have no moving parts. The reason is twofold; first there is less likelihood of failure and secondly there is a strange fascination in setting something in motion or switching on something without any apparent mechanical intermediary. This is already happening in applications such as lift control buttons and desk calculator keying so why not in a few domestic situations, or as a replacement for the Morse operator's key?

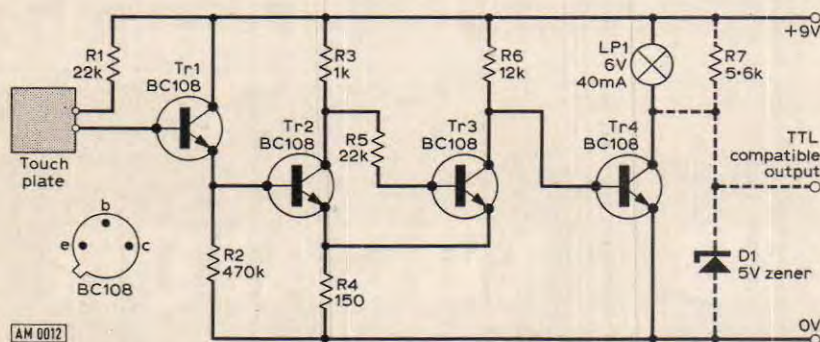
This month's circuit is a very simple way of providing touch sensitive keying and is capable of several types of output including an output that illuminates a low voltage lamp but the circuit can be quite easily modified to provide a relay drive

Operation

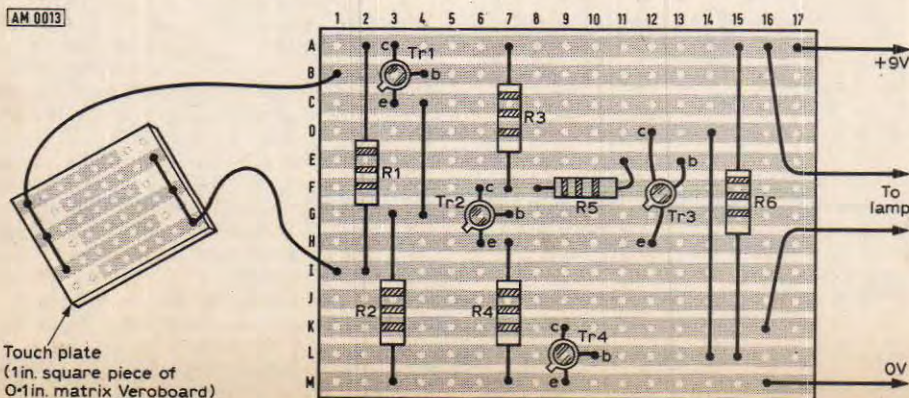
Touch sensitivity is achieved by detecting the minute current that passes through the finger when a pair of contacts is bridged by the touch of the operator. The touch transducer in the prototype was made from a 1 in. square of 0.1 in. pitch Veroboard, with alternate copper strips paralleled together to form a contact pattern.

A more attractive touch plate could be made by printed circuit techniques and if this is done it is better to use a fibre-glass base. In either case the copper contacts need some protection from corrosion and this can be effected by lightly tinning the strips with solder.

The touch plate is connected between the supply



Circuit of the touch-sensitive switch, with alternative TTL output circuit.



Layout of components on the Veroboard with details of the touch plate.

rail (through R1) and base of Tr1 which should have low leakage current (beware of cheap "reject" transistors). When the plate is touched a very small current flows in the base/emitter circuit of Tr1 and this in turn permits a much higher current to flow between collector and emitter. Tr2 and Tr3 are connected as a Schmitt Trigger circuit; the emitter current from Tr1 flows mainly into the base of Tr2 and turns it on; this causes Tr3 to turn off and the potential at its collector starts to rise until base current in Tr4 is established. When this occurs the lamp LP1 lights. Alternatively, considering the TTL version, the output level falls to "0".

★ components list

R1	22k Ω	1p
R2	470k Ω	1p
R3	1k Ω	1p
R4	150 Ω	1p
R5	22k Ω	1p
R6	12k Ω	1p
Tr1	BC108	10p
Tr2	BC108	10p
Tr3	BC108	10p
Tr4	BC108	10p
LP1	6V 40mA	10p
Veroboard		20p
		76p

No allowance is made for minimum order costs or for postage and packing and these points should be checked carefully before ordering.

Removing the finger from the touch plate causes the base current to stop flowing in Tr1; current into the base of Tr2 thus stops and the latter starts to turn off. As this occurs Tr3 starts to draw base current through R3 and R5 and begins to turn on. As this happens the potential at Tr3's emitter starts to rise slightly and this (due to the feedback inherent in a Schmitt Trigger) causes Tr2 to turn off faster. At the same time the potential at Tr3's collector falls until sufficient base current into Tr4 can no longer be maintained. Tr4 thus turns off and the lamp goes out. Alternatively the TTL output goes to a logic level "1".

TTL Output

To obtain the TTL output version R7 and zener diode D1 should be in circuit and lamp LP1 omitted. For relay operation LP1 should be replaced by a 6 volt relay. The components list has not taken the alternative versions into account.

Note

A word of warning—the touch plate should not be used out of doors or with wet fingers because droplets of moisture bridging the conductors will provide sufficient current to make the circuit switch. Possibly this problem could be overcome by carefully painting in the gaps between the strips with a good quality water repellent paint having a high gloss finish.