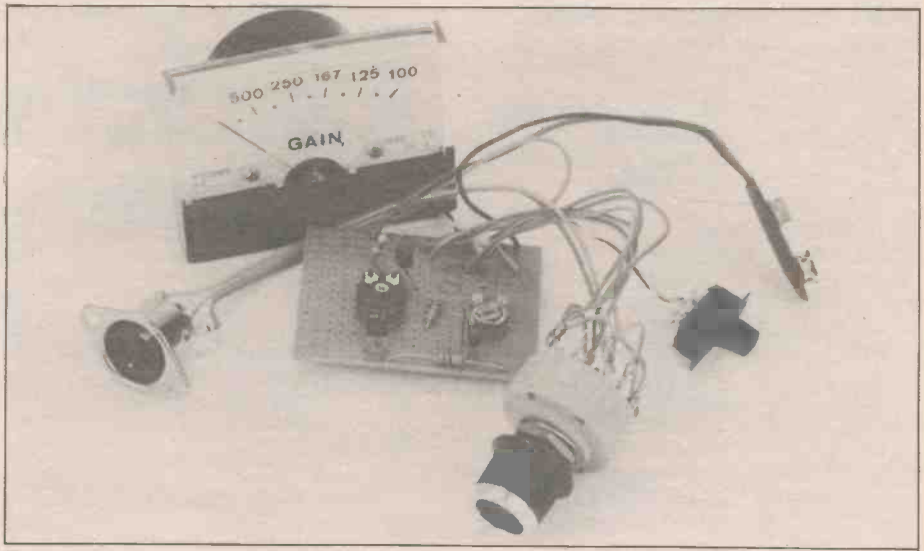
Transistor Tester

A conventional transistor tester operates by feeding a fixed base current to the test device and then measuring the collector current. The higher the gain of the device under test, the higher the current registered on the meter. The meter can therefore be easily calibrated in terms of current gain, and the collector current is in fact proportional to the gain of the test transistor. In practice this type of tester is very quick and easy to use, but is does have one slight flaw. This is that transistors are tested for gain at an unpredictable collector current, and the gain of most devices varies considerably with changes in collector current. What generally happens is that high gain devices produce a large collector current that means that are tested under good conditions, whereas low gaih devices are tested at low currents where they perform relatively badly. This tends to exaggerate the differences between transistors, with slightly above average gain devices showing up as having very high gains. Perhaps of greater importance, transistors with fairly low gains can tend to show up as having inadequate current gains, where they are in fact up to specification in this respect.

This transistor tester was designed to be as easy to use as the conventional tester of the type outlined above, but to operate at a constant collector current so that more reliable results are obtained. Results with the device have been encouraging, and it seems to give what are more accurate results than those obtained with other ultra-simple testers.

The basic method of operation is to feed the collector and emitter terminals from a constant current source. The base terminal is fed from the same source but via a sensitive current meter. With this arrangement the collector current is always equal to the figure set by the current source (or something very close to this figure if we allow for the small amount of current tapped off through the base circuit). The base current is the amount needed to produce this collector current, and therefore decreases as the level of current gain increases. The meter reading can therefore be translated into a measure of current gain. A minor drawback of this arrangement is that it gives a reverse reading and non-linear scale, which is less convenient in use than the forward reading linear type of a conventional tester. However, taking readings from this tester is no more difficult than taking readings from the similar scale of an analogue multimeter's resistance ranges.

There is little more to the circuit than the constant current generator based on TR1 and TR2. RV2 is adjusted to give an output current of 5 milliamps, which is a



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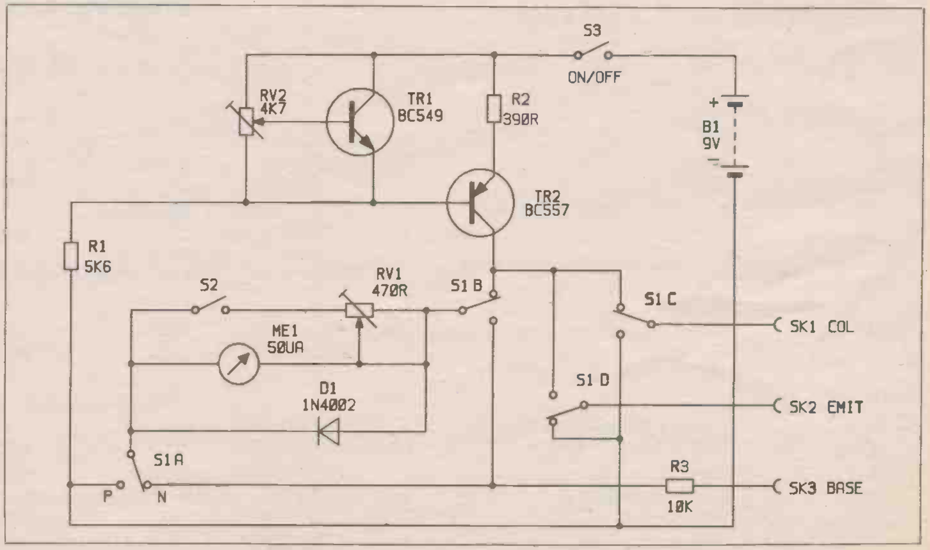

Transistor Tester Circuit.

good compromise value that suits most types of transistor. S1 switches the meter and the test sockets to suit both npn and pnp devices. The meter has a full scale value of 50 microamps, which gives a gain range of one hundred at full scale deflection to infinity at zero deflection. Closing S2 increases the full scale value of the meter to 500 microamps, and the gain range is then ten at full scale deflection, again running through to infinity at zero deflection. R3 and D1 protect the meter against severe overloads, such as would otherwise occur if the base and emitter leads of the test device are connected but the collector is not.

Construction is fairly straightforward, but take care to avoid errors in the switching. Probably the best type of switch to use for S1 is a 3 way 4 pole rotary type, with the adjustable end-stops set for 2 way operation. SK1 to SK3 can be 1 millimetre sockets grouped close together, and most transistors will then plug into these without any difficulty. Some types (especially power types) will not, and a set of test leads fitted with crocodile clips will be needed to connect these into circuit.

In order to adjust RV2 for a 5 milliamp output current, connect a multimeter switched to a d.c. current range (about 10 to 25 milliamps full scale) between the negative supply rail and the collector of TR2. Then adjust RV2 for the correct reading of 5 milliamps. To give RV1 the correct setting, close S2 and then connect the current meter across the base and emitter test sockets via a 15k resistor. Switch the multimeter to a more sensitive range (about 1 to 2.5 milliamps full scale), and then adjust RV1 to match the two readings (bearing in mind that ME1 now reads 500 microamps full scale).

It is more than a little helpful to give the meter a new scale, and this is not too difficult using rub-on transfers. Meter movements are quite delicate though, and due care needs to be taken if you decide to do this. The current gain for points on the scale is obtained by dividing 5000 by the scale value (200 at a value of 25uA for example). When the unit it switched to the lower range, gain levels will be one tenth of the indicated value.

TRANSISTOR TESTER PARTS LIST

RESISTORS: All 0.6W 1% Metal Film			
R1	5k6	1	(M5K6)
R2	390Ω	1	(M390R)
R3	10k	1	(M10K)
RV1	470Ω Sub-min Hor Preset	1	(WR54J)
RV2	4k7 Sub-min Hor Preset	1	(WR57M)
SEMICONDUCTORS			
TR1	BC549	1	(QQ15R)
TR2	BC557	1	(QQ16S)
D1	1N4002	1	(QL74R)
MISCELLANEOUS			
S1	3 way 4 pole Rotary Switch	1	(FF76H)
S2,3	SPST Ultra-min Toggle	2	(FH97F)
ME1	50uA Panel Meter	1	(FW98G)
B1	9 volt PP3 Battery	1	(FK62S)
SK1,2,3	1mm Socket	3	(WL59P)
	Battery Connector	1	(HF28F)