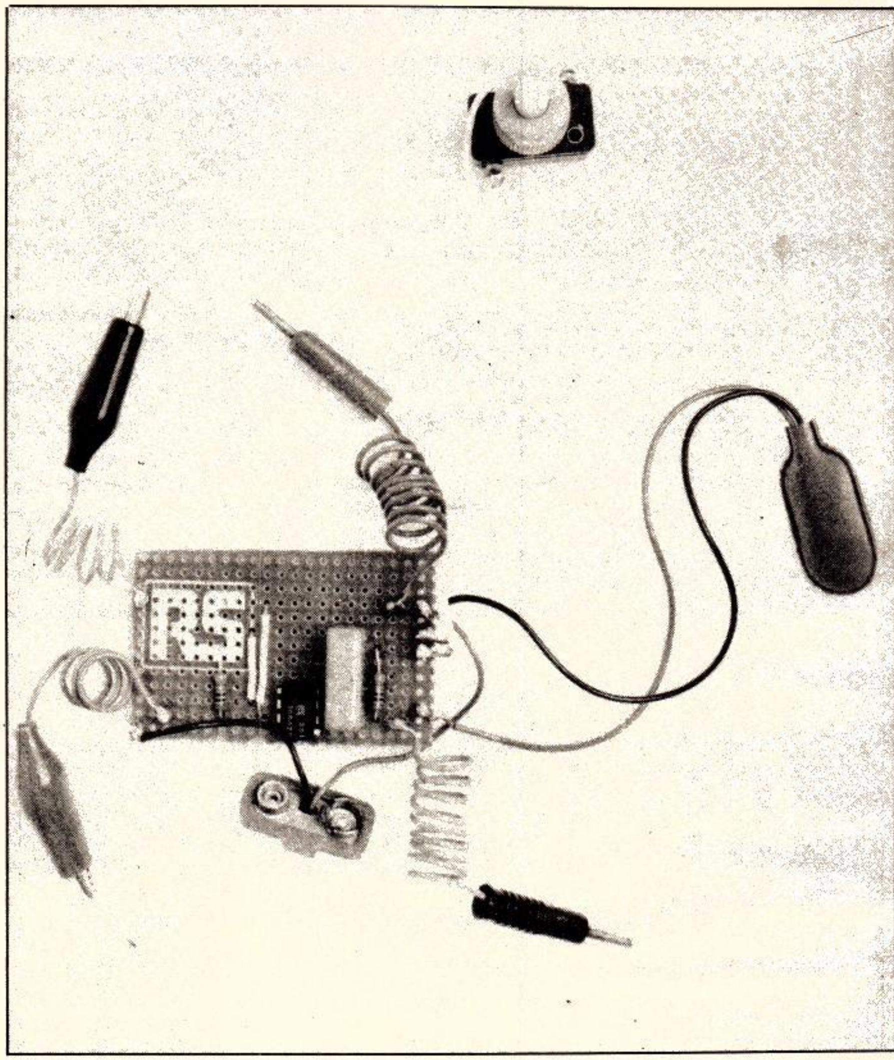
No. 2: Voltage Follow-and-Hold Circuit

ONCE in a while, and probably more often, it is necessary to measure a voltage which is changing rapidly — but trying to follow the needle of the voltmeter by eye and read it at *just* the right instant is tension-generating, to say the least! And if your eye cannot follow the needle, it is likely that the needle cannot follow the rapidly changing input voltage either, so whatever reading you have struggled to obtain will be doubly in error. This circuit, however, gives your eye *and* the needle a breathing-space in which to catch up with the changing voltage. Pressing the button, it takes a sample of the input voltage at any instant; the circuit then holds the sampled voltage while the needle of the meter comes to rest, and your eye has time to take the scale reading with all the accuracy you need.

The Circuit

The output of the circuit (Figure 5) follows the input voltage as long as the button is held pressed. When the button is released, the output remains constant at whatever value it had at the instant of release. When the button is pressed again, the output immediately becomes the same as the input voltage. The operation of the circuit is diagrammed in Figure 6.

The op-amp is connected as an inverting amplifier with unity gain and with the button pressed, output follows input except that it is inverted. Now an op-amp is stable when there is no potential difference between its two input terminals, but since the non-inverting (+ve) input is wired to 0 V, the inverting input must also be at 0 V if the circuit is to be stable. So given an input of, say +2 V, a current of 200 uA flows toward the inverting input, by way of the input resistor R1. The amplifier input has extremely high resistance so almost no current enters it, but instead, flows on through R2 and *into* pin 6 of the op-amp. Since R1 has the same



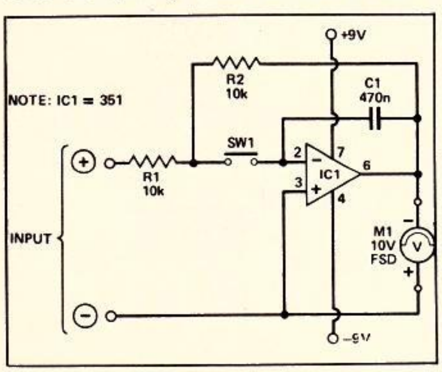


Fig. 5. The follow-and-hold circuit.

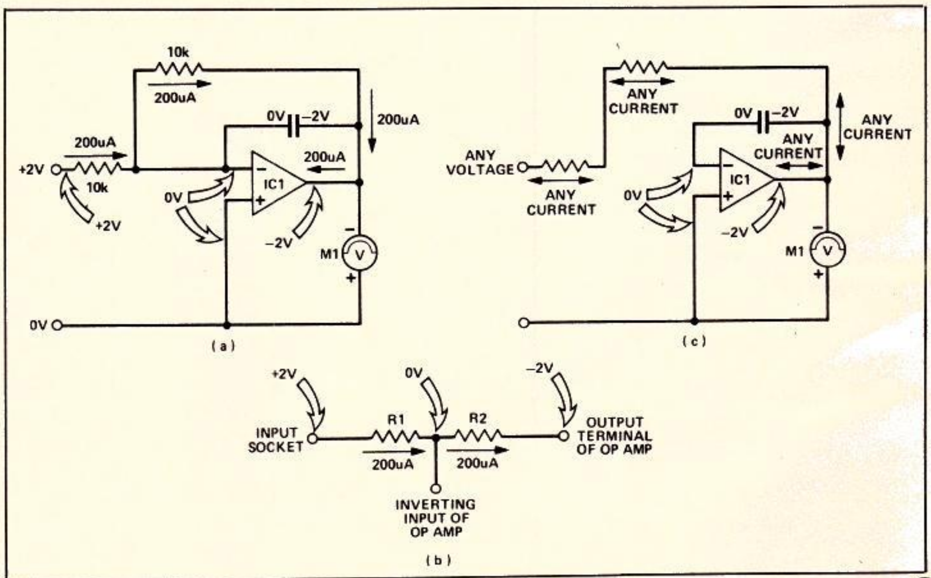
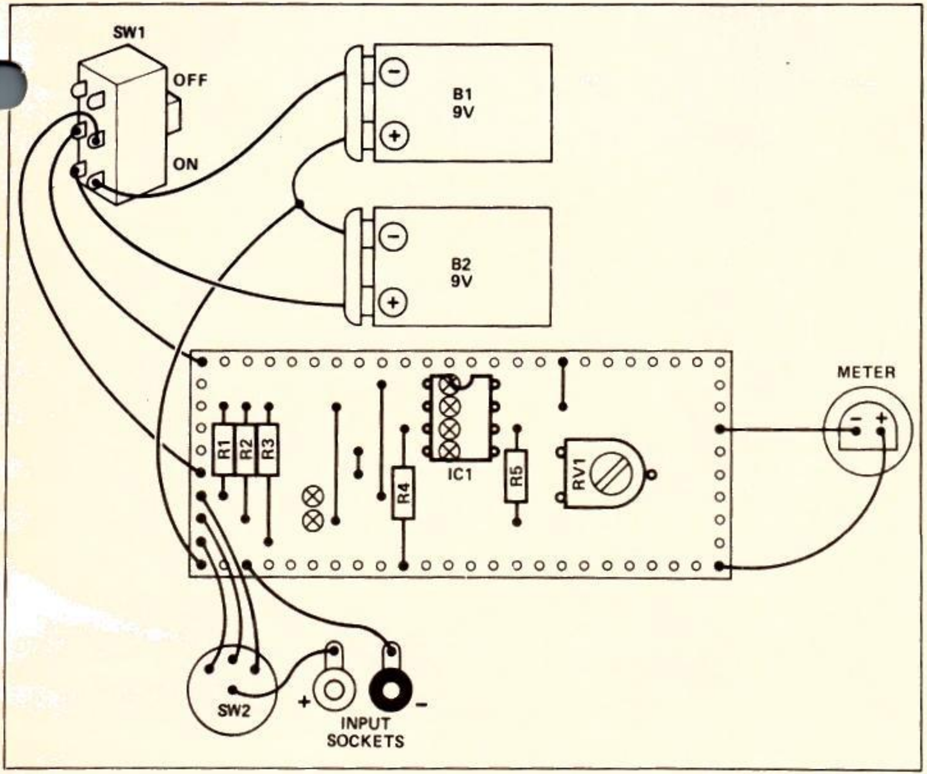


Fig. 6. (above). How it works; (a) with + 2V on the input, a current of 200 uA flows into the op-amp output pin; (b) this causes voltage drops of 2V across each resistor, so that the inverting input is at 0 V, the output at -2 V and the op-amp is stable; (c) in "hold", changes at the input cannot effect the op-amp output.



PARTS LIST

Resistors (¼ watt % metal film, except as noted)

R1	820k
R2	82k
R3	8k2
R4	1k ¼ watt 5% carbon

Potentiometers

RV1	10k min. horiz. preset

Semiconductors

IC1	741 op-amp

Miscellaneous

M1	10 V FSD meter
SW1	DPST toggle or slide switch
SW2	3-way rotary switch

Stripboard, 63 x 25 mm (24 hole x 10 strips); 2 x 9 V battery clips; 4 x 4 mm sockets; 9 x 1 mm terminal pins; wire, solder, etc.

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Fig. 10. The Millivoltmeter component layout. The track cut positions are shown viewed from the