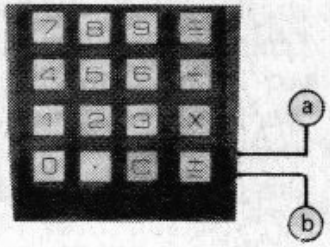
49

F. Schaeffer

calculator doubles as stop-watch



Many pocket calculators have a constant factor memory. If a 1 is stored in this memory, depressing the ± key adds 1 to the number already displayed.
If the original number displayed is 0 and the ± key is depressed at regular intervals, the number displayed at any given time is equal to the number of times the key has been depressed, which in turn is proportional to time. This means that the calculator can be used as a stopwatch.
Figure 1 shows a practical circuit. It can be built as a separate unit, so that surgery on the calculator can be reduced to a minimum: all that is needed is an external connection to the contacts of the ± key (figure 2).
The stopwatch adapter itself is simply a standard frequency generator that can be switched on and off. The frequency is derived from the 50 Hz mains: the output from the bridge rectifier (100 Hz) is divided by 10. The resulta: 10 Hz signal is fed to gate N3; depending on the state of the set/reset flip-flop (N1/N2) it can be passed on to the output transistor. This transistor car be used to drive a (reed) relay; the relay contacts are connected in parallel with the ± key.
Of course, if enough is known about the calculator circuit the relay can usually be omitted. For instance, if the ± key connects a positive voltage to supply common, the relay is omitted, the output transistor can be a TUN, and its collector is connected directly to the positive terminal of the ± key. The supply commons are interconnected.