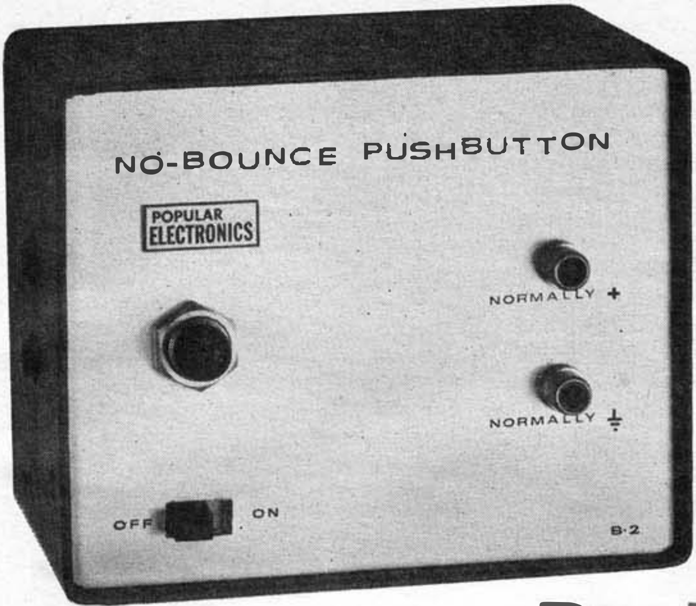

Build the No-Bounce Pushbutton

BY DON LANCASTER

INPUT TRIGGER SOURCE FOR DIGITAL CIRCUITS

RESISTOR-TRANSISTOR-LOGIC (RTL) circuits, such as those used in many projects in previous issues of POPULAR ELECTRONICS, are designed to "count" the input (trigger) signal each time it changes state. (In the case of a JK flip-flop, for example, the input is counted each time it goes from positive to negative.) When the input signal is derived from an electronic source, special signal conditioning circuits are usually included to "refine" any oddly shaped pulses so that they have sharp, rapid rise and fall times.

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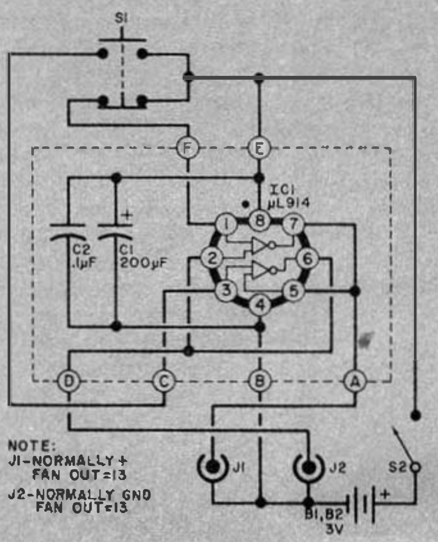
Sometimes, however, the input trigger is derived from a mechanical switch of one type or another (often a necessity if it is desired to trigger the system slowly to observe circuit operation); and here the shape of the pulse created by the switch can create problems.

Because of the spring action required in most mechanical switches, the contacts do not make just one closure for a single operation. Instead, they bounce one or more times before settling down. Unfortunately, the logic system is not aware that a mechanical switch is bouncing and it considers each bounce to be an input pulse. In such cases, something must be done to "clean up" the pulse; and the usual solution is to add a simple electronic circuit to the switch to provide a single, noise-free trigger pulse. This function is achieved neatly and inexpensively in the "No-Bounce Pushbutton." It consists (see Fig. 1) of a mechanical pushbutton switch, whose output is converted by a single integrated circuit to



PARTS LIST

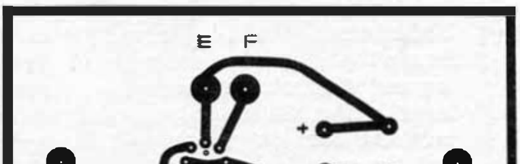
B1,B2—1.5-volt "D" cell
C1—200-μF, 6-volt electrolytic capacitor
C2—0.1-μF, 10-volt disc capacitor
IC1—RTL dual two-input gate (Fairchild μL914 or Motorola HEP584)
J1,J2—phono jack
S1—S.p.d.t. snap-action pushbutton switch
S2—S.p.s.t. slide or toggle switch
Misc.—Battery holder (Keystone 176 or similar), mounting hardware, etc.
Note—The following are available from Southwest Technical Products Corp., Box 16297, San Antonio, Texas 78216: etched and drilled PC board, $1.00; complete kit of parts, including prepunched vinyl-clad case, less batteries, $4.90; postpaid in continental U.S.A.

Fig. 1. Essentially a bistable flip-flop, the circuit delivers a clean, single output pulse for each operation of the mechanical switch.

either a normally positive pulse which goes to ground when the switch is activated or a normally ground pulse which goes positive.

How It Works. The integrated circuit used here is a dual two-input gate with both gates connected back-to-back to form a bistable multivibrator or set-reset flip-flop. Pushbutton switch *S1* keeps the flip-flop in the set condition until the switch is activated. When the normally open contact of *S1* is first closed (even if it is just a momentary contact) the multivibrator changes states and remains in the new state regardless of bounces or noise from the mechanical switch. Capacitors *C1* and *C2* are used to lower the power supply impedance. When the pushbutton is released, the multivibrator returns to its original state.

Construction. While it is not essential, the use of a printed circuit board simplified the construction and provides support for the integrated circuit. You can buy a board (see Parts List) or make your own using the foil pattern shown in Fig. 2. In installing the components, also shown in Fig. 2, note that the IC has a flat or dot at pin 8 for orientation. The pins are numbered counterclockwise



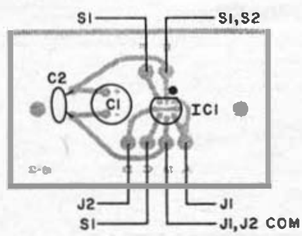
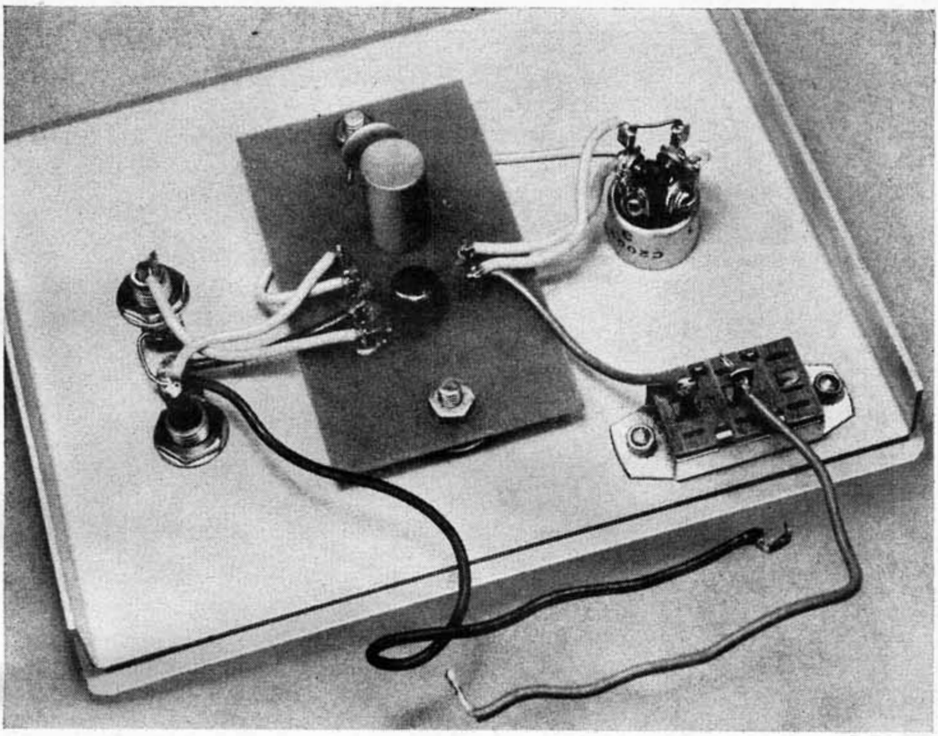


Fig. 2. Actual size printed-circuit foil pattern (left) and component installation (above) for the pushbutton.



Although any type of mounting may be used, the prototype was mounted on the metal front panel of a general-purpose utility box. The batteries can be mounted within the box in suitable holders.

viewed from the top. Use a low-power soldering iron and fine solder when installing the IC. Be sure to get the polarities of the batteries and *C1* correct also.

Almost any type of enclosure can be used to house the project. In the prototype, a 3" × 4" × 5" aluminum enclosure was used with the PC board on standoffs in the base and the batteries mounted in clips on the rear panel.

Operation. Depending on the type of logic circuit you are working with, you can use the output at either *J1* or *J2*. The output at *J1* is normally positive until the pushbotton is depressed, when it goes to ground. Output at *J2* is normally ground and goes positive when the pushbutton is depressed. The fanout of each output is 13.

Be sure that the No-Bounce Pushbutton's ground connection is made very close to the actual input point and, to reduce ground currents, do not use the test set ground return for any other piece of equipment.

If your logic circuits are not RTL, an additional transistor (with power supply) may be added to the circuit. —30—