One-button controller issues step, run, and halt commands

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The logic signals to step, run, and halt a computer or other appropriate digital device or system may be generated by this circuit, which is operated by just a single push button. The only active devices used are a dual one-shot and a dual flip-flop.

The step command is generated each time the push button is depressed momentarily. The run command occurs if the button is held down for a time exceeding about 180 milliseconds. This time represents an excellent compromise between circuit speed and accuracy. A much shorter duration means the circuit may fail to differentiate between the step and run commands and may generate the run command when the step command is desired, or vice versa. Also, repeatedly pressing the button rapidly to initiate step functions will generate the run command if the duration is set for much more than 180 ms. Finally, the computer will be halted if the push button is depressed momentarily when the circuit is in the run mode.

As shown in the figure, A_1 acts as an effective switch debouncer for the push button. For a step command,

poking the button quickly will cause the Q output of A_1 to go high and fire A_2, the run-and-stop one-shot. A_1 is also fed to A_3, the D input of the run-and-idle latch. At the same time, the $\overline{Q}$ output of A_1, which moves low, will fire the step one-shot A_4, yielding the step function.

The sequence of events just discussed also describes the initial portion of the run command, whereby the step pulse is used to manually advance the computer's program counter by one. The run pulse then commands the computer to rapidly execute succeeding steps automatically. The $\overline{Q}$ output of A_2 moves high 180 ms after the push button is depressed. The positive-going, or trailing, edge of this pulse then clocks the state of the push button (as detected by A_1) into A_3.

If the button has been released before time-out, a zero appears at the Q output of A_3. But if the button is activated, A_3 moves high and the run command is executed by the computer.

A press of the button will cause the circuit to halt the machine if it is in the run mode, by clocking in a logic 0 to the run-and-idle latch. Note that the step pulse generated at the start of the halt sequence, as shown in the timing diagram, is of no consequence, since when the step is received, the machine is already in the run mode and will override that command. □

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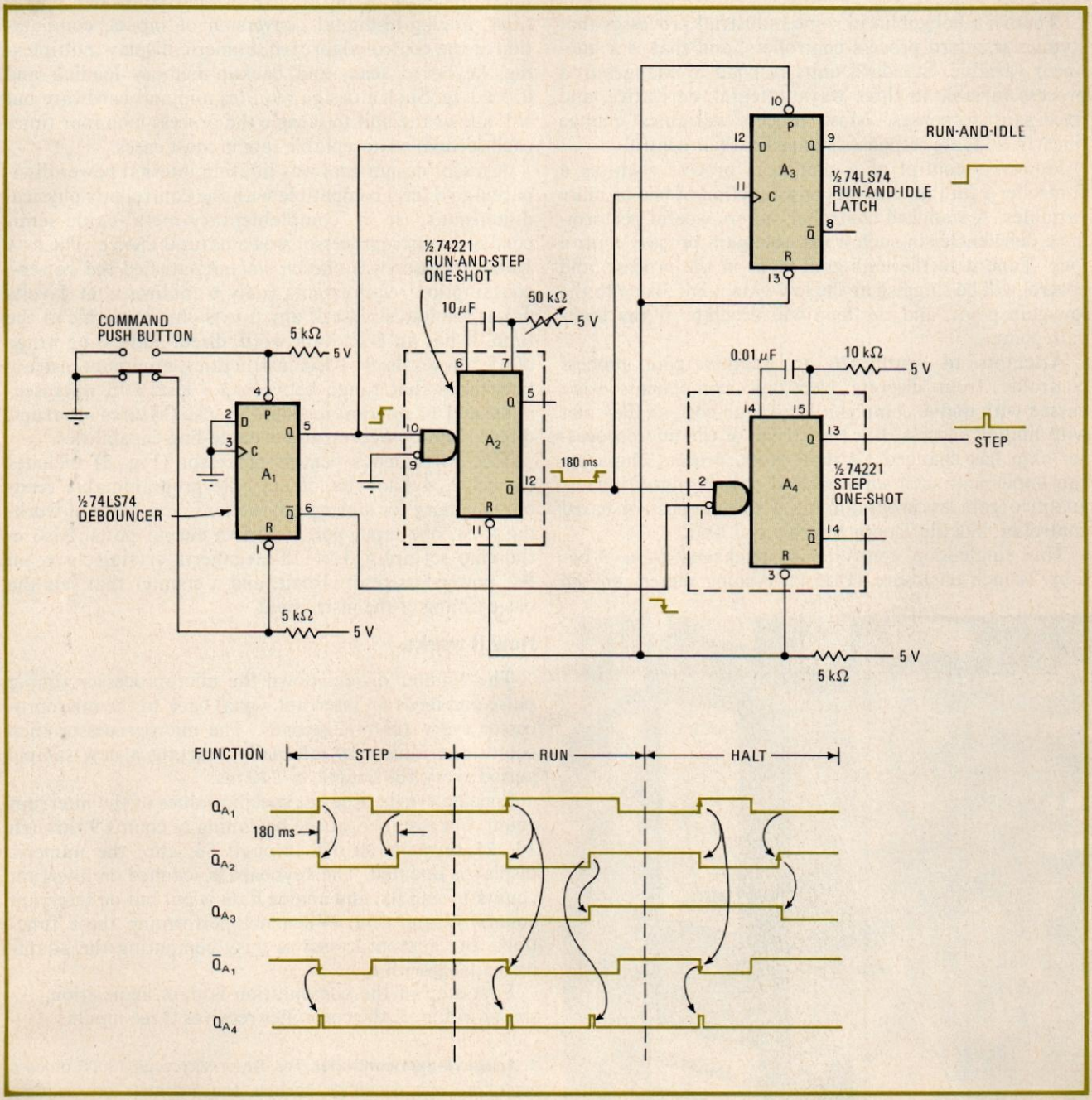

Touch control. One push button and two ICs single-step a computer's program counter or control run and halt operations. Button-depression time and present mode of controller determine the command generated. Timing diagram details circuit operation.