Multiplexer scans keyboard for reliable binary encoding

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The myriad keypad-coded requirements in point-of-sale and other data-entry applications require a reliable, bounceless binary encoder. This inherently bounceless complementary-MOS circuit encodes up to 16 inputs and latches each BCD number for stable output.

As shown in the figure, the keypad is scanned by an RCA CD4067 16-channel analog multiplexer. Each of the inputs has a 1-megohm pull-up resistor. When a key is depressed, the appropriate channel is driven low. A clock source, which can be derived from the device using the keypad, drives a CD4029 4-bit binary counter. Scanning occurs as the counter addresses the multiplexer.

When the counter has addressed an input to the multiplexer that is low, the common-out pin of the multiplexer goes low for one clock cycle. A differentiating network changes this pulse into a negative spike used to strobe the counter data (the binary representation of the particular key input) into the CD4042 quad latch. The binary word remains in the latch until another key is depressed, providing a stable output.

The circuit is inherently bounceless, since a noisy input will latch itself on its first negative transition and remain stable until another input is selected. The scan rate is not critical, but the clock frequency should be greater than 200 hertz for a normal key-entry rate.

In some cases, the processing equipment to which the circuit is connected will require a data-valid strobe. This can be accomplished by gating the clock with the carry-out pin of the counter. A two-input NOR gate, such as in a CD4001 quad package, provides a data-valid strobe one half a clock pulse before the beginning of every scan cycle. □

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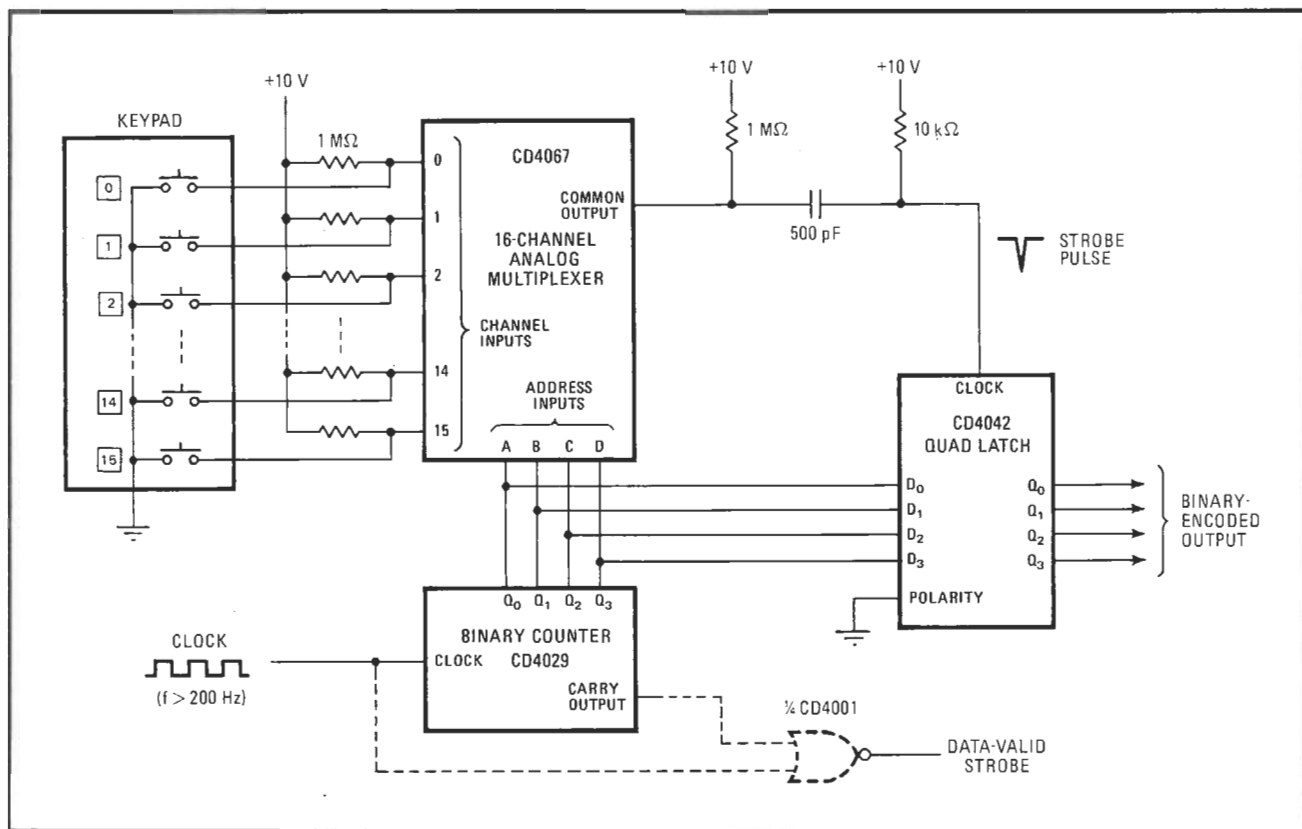
Keypad encoder. By using a CD4067 multiplexer to scan a keypad, switches need not be debounced for binary encoding. Quad latch at right holds digit encoded until next digit is entered. A NOR gate may be added as shown for data-valid strobe.