

momentary pushbutton push on.

You've got at least 99,999 make-or-break cycles to go with the C&K subminiature pushbutton switch. And this tiny pushbutton switch is rugged: 1,000 volts rms of dielectric strength at sea level, and an electrical life of 60,000 cycles minimum at full load. So, whatever kind of manual switching requirements you have, count on the dependability of the new C&K pushbutton again, and again... call or write today for more information.

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CIRCLE NO. 53 ON INQUIRY CARD

## A New Waterproof Series MINIATURE 1/2" DIA. Rotary Switches



'O' ring on shaft and bushing. Terminal portion sealed with superior adhesive bonding cement. Withstands water submersion test 9.8 ft. Non-shorting, 36° spacing, 1/8" dia. shaft. Available in One, Two, Three and Four Pole configurations. 1/2" dia. body. Non-adjustable. 500 ma @ 125 VAC.

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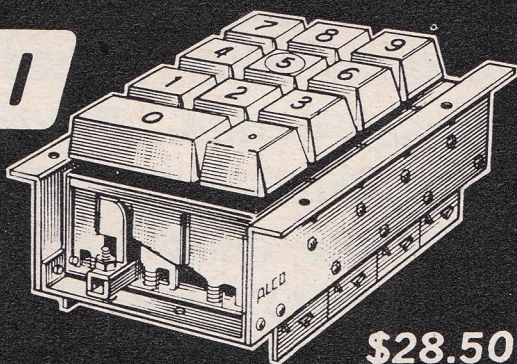
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CIRCLE NO. 54 ON INQUIRY CARD

## Reliable — Reed KEYBOARD SWITCH BANKS

FIRST time available for researchers or customer manufacturers, a reliable keyboard using highly efficient open circuit reed switches. Short strokes provide smooth operation of the switch plunger. Designed for light pressure, operator's convenience, and positive input of data with long-life under heavy use. Buttons have an industry standard 0-9 marking and placement along with a period. Size 3 3/8" x 2 1/8" x 1 5/8" depth below the panel. Quantity quotations on specials, on request.



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CIRCLE NO. 55 ON INQUIRY CARD

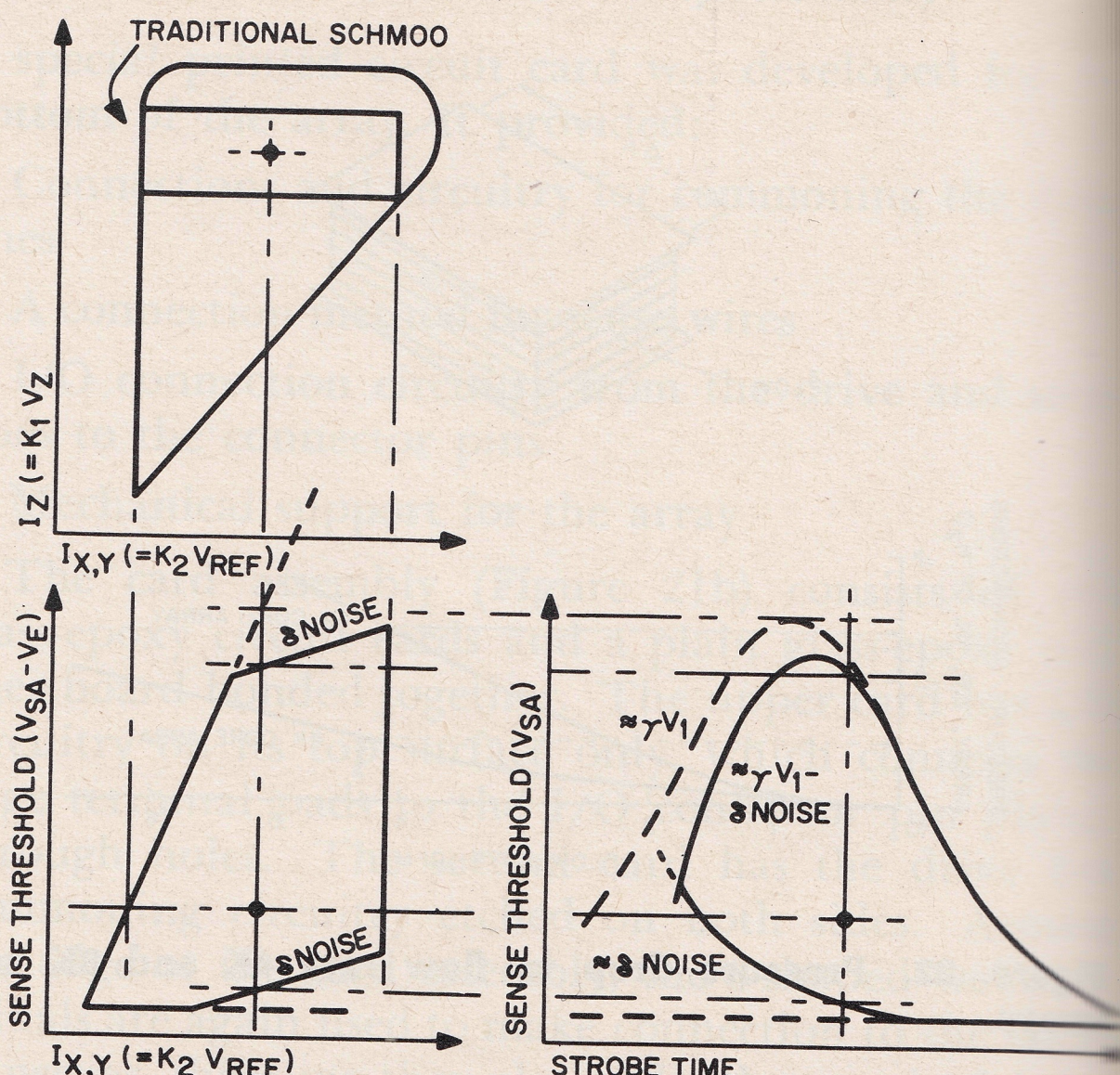


Figure 24. Relationship between SCHMOOs on  $I_z/I_{x,y}$  plot and  $V_{sa}/t_{strobe}$  plot.

the traditional SCHMOO. It may be seen from Figure 24 that lowering the  $V_{sa}$  operating point or moving the  $t_{strobe}$  operating point left will cause the left margin on the  $I_z/I_{x,y}$  SCHMOO to move left. Thus the largest traditional SCHMOO will be achieved when  $V_{sa}$  is just above its margin. Obviously then, any slight change in either  $V_{sa}$  or  $t_{strobe}$  can cause an error (i.e. cause the SCHMOO to collapse completely).

It should be possible for the designer to calculate or measure the stability and repeatability of the operating points for the four critical parameters:

- (1)  $I_{x,y}$
- (2)  $I_z$
- (3)  $V_{sa}$
- (4)  $t_{strobe}$

He should then decide what margins he realistically needs in the  $I_z/I_{x,y}$  and the  $V_{sa}/t_{strobe}$  planes.

A process of trial-and-error iterations can be used to zero-in on an operating point that meets the margin requirements on both SCHMOO's. It should again be stressed that this will not be the largest possible traditional SCHMOO. It will, however, yield the most reliable operation overall.

## SIDEBAR 2

### Statistical Design Program Using Monte Carlo Methods

The design program assigned values to all components, calculated the input signal required to produce a "ONE" at the output, stored the results, and repeated. Each time through, new component values were chosen randomly. After 1000 such runs, the cumulative results were plotted as a histogram which closely approximated the Normal Density Function. The  $3\sigma$  points were taken as the limits of the "gray area." In other words, any input smaller than the lower  $3\sigma$  point is a guaranteed "zero," any input greater than the upper  $3\sigma$  point is a guaranteed "one," and any input between is indeterminate (see Figure