4-by-4 matrix chip encodes larger arrays

by James H. Nixon
Southwest Research Institute, San Antonio, Texas

With this circuit idea, the standard encoder for a 4-by-4–matrix keyboard can be made to handle arrays as large as 4 by 8. In fact, arrays as large as 4 by 10 can be readily accommodated if a 5-by-4-line encoder, such as Motorola's 74C923, is used. Interfacing with a microprocessor is easy and the generation of interrupts is not required.

As seen in the circuit example of a 3-by-8-line encoder, the 74C922 scans keyboard columns 1 through 4 (pins 7, 8, 10, and 11) at a rate set by its internal oscillator components and C_1. Each line is grounded in sequence until a key closure forces one of the row sense lines low, which in turn drives the data-available line high and halts the scanning process until the key is released. Meanwhile the appropriate input of the key encoder corresponding to the key pressed is brought high and the results of the row-column detection appear at the analog-to-digital outputs of the 74C922.

Each time the column 4 line is scanned, pin 7 of the key encoder moves high and clocks the 4013 flip-flop, F_1, causing the complementary-MOS 40257 data selector to switch between rows 1 to 4 and rows 5 to 8. The output from F_2 and A_6 thereby indicates which of the two row sets was accessed. The key closure line indicates if the data has been previously read and thus prevents redundant entries to the processor. □

Expansion. With multiplexer and flip-flops, standard key encoder can detect which key in a 4-by-8 matrix has been pressed. Larger arrays can be handled if the 74C923 encoder is used. No interrupt circuitry is required for interfacing with a microprocessor.