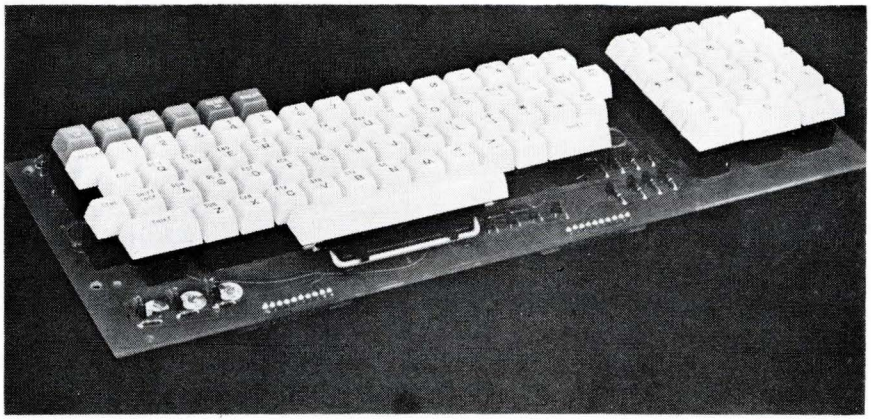
Capacitive key enters data

Coding scheme requires only 13 junction FETs



Contactless keys. No mechanical closure is involved in new keyboard. Depressing a key increases capacitance, driving junction FET into conduction.

A simple mechanical key and an unusual coding scheme have been united in a new data entry keyboard. The coding arrangement for an 87-key assembly with eight bits per key requires only 23 junction field effect transistors, rather than 360 diodes necessary in most coding matrices. The key is capacitive, so that closure causes a change in capacitance to the coding circuit, resulting in an electrostatic impulse to the logic. And it's reliable: "We've tested our keys to 18 million closures and they're still going strong," says Walter Pound, product marketing manager at Colorado Instruments Inc., which developed the keyboard. It will be introduced at the Fall Joint Computer Conference.

The mechanical keys are based on the principle of a toy "cricket" that produces an audible snap when squeezed. With this human engineering feature, the keyboard user feels the snap-back in his finger.

The main elements of the key are a circular ceramic conductor and a dome spring, which together make an electrical capacitor. Depressing the key causes the dome to buckle, increasing the capacitance sharply and driving a J-FET into conduction. For alphanumeric keys, this yields a 0.5 microsecond pulse to the logic circuitry. What's more, a succession of characters can be generated while previously struck keys are still depressed, similar to N-key rollover.

In the control and shift modes, where the key must produce an output until it's released, a balanced-bridge approach is used. The key's static capacitance balances the bridge; when the key is struck, the bridge unbalances and a steady signal is delivered to the logic. When the key is released, the bridge becomes balanced and the signal stops.

The coding scheme defines each alphanumeric key in terms of its X, Y, and Z address coordinates, each of which represents portions of the outgoing bit pattern generated by the key. Its circular ceramic conductor is divided into three sectors, each assigned to one of the coordinate lines on a printed circuit board. This approach requires only a few transistors for a large number of keys. For example, only 13 J-FETs are required in a 90-key American Standard Code for Information Interchange (ASCII) coded keyboard.

Thanks to the J-FETs' low impedance output, the keyboard is compatible with diode-transistor and transistor-transistor logic. The full 87-key unit with logic draws less than 1 watt total power and can be operated at temperatures from 0 to 70°C.

A full 87-key unit, without logic, is priced at less than $100 when purchased in quantity. Delivery time is 6-8 weeks.

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