

*Hardened plastic membranes and a proprietary conductor ink system give a membrane keyboard the feel of a spring-loaded keyswitch.*

## Membrane-based keyboard keeps life up, cost down

Full-travel alphanumeric keyboards from Oak Technology, Inc., let users enjoy all the cost benefits of membranes, along with the high reliability and tactile feel of a spring-loaded keyswitch.

The Full Travel Membrane (FTM) keyboard consists of a series of spring-loaded keycaps mounted on a flat membrane switch plate. The keycap springs provide 0.160-in. of travel, communicating strong tactile feedback to the operator. The keyboards are well-suited to computer terminals, word-processing machines, or point-of-sale terminals.

In the full travel membrane, the substrate is kept from flexing under stress because Oak has replaced the traditional polyester membrane with a plastic hardened by refractory-material fillers. A proprietary process for making conductor inks blends 20- $\Omega$ /sq carbon with 20-m $\Omega$ /sq silver to provide good adhesion at low cost. Finally, the membrane switch plate is sealed against humidity, cleaning fluids, spills, and other environmental contaminants, and is mounted on an aluminum base plate which keeps the membrane from stretching.

As a result, life expectancy per key is about 100-million cycles, or



It looks like a regular keyboard and feels like one, too. But Oak's Full Travel Membrane (FTM) unit is actually based on membrane-switch technology. Spring-loaded keycaps let it provide tactile feedback.

better than five years for the entire keyboard. The storage temperature for the FTM keyboard is specified as  $-40$  to  $+85^{\circ}\text{C}$  (operating temperature from  $0$  to  $65^{\circ}\text{C}$ ), and the keyboards will easily pass the Method 106 test of MIL-STD 202 for 95% relative humidity.

The membrane-switch contacts provide an overall contact resistance of  $85\ \Omega$  typical and  $100\ \Omega$  maximum. These switch contacts can handle from  $250\ \mu\text{W}$  to  $0.5\ \text{W}$  with resistive loads, or voltages from  $1$  to  $30\ \text{V}$  and currents from  $50\ \mu\text{A}$  to  $20\ \text{mA}$ .

With the spring-load key caps, the momentary-on membrane switches can operate under just 3 oz of pressure; the force is adjustable to user specifications.

The key plungers can be straight or stepped up to 11 degrees. The total plunger travel is a nominal  $0.160$  in., the pretravel is approximately  $0.060$  in., and the resultant contact bounce is less than  $0.5$  ms. Because membrane contacts are flat, the keyboard is low—less than  $1.2$  in., with keycaps.

Using computer-aided design and manufacturing, Oak can turn around membrane keyboard layouts with 52 to 180 keyswitches within eight weeks. A typical 59-key unencoded keyboard will cost \$20 to \$30 in OEM quantities. Samples are available.

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