

LCD switches ease design woes

For today's applications, these devices improve functionality and user interface

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For designers in markets such as medical equipment, gaming, military, consumer electronic products, white goods and industrial markets, designing a user-friendly control panel can be a daunting task. As technology continues to advance, designers continue to include more and more options in their product lines.

As the functionality of these new products increases, engineers are forced to find new, innovative ways to interface with the operator. To date, the two most common input devices used are dedicated function keys and touchscreens. However, an emerging new technology offers engineers another option to consider: LCD switches.

Touchscreens and function keys

A majority of control panels in the marketplace incorporate dedicated function keys. Looking around any workplace or home office, you can find computer keyboards, telephones, fax machines, and test instrumentation all using dedicated function keys as input devices. Buttons are engraved with appropriate letters, numbers, or symbols and are assigned specific functions.

However, dedicated function keys have their limitations. As the number of new options increases, so do

the number of function keys.

Complex equipment tends to become littered with dedicated function keys. In addition, the size of the equipment grows as support hardware is added.

Touchscreens have become a popular method of operator input. They give users easy access to vast amounts of information.

Users are guided through a series of choices with a simple touch of a screen. Control panels incorporating touchscreens tend to be smaller in scale and more user friendly than dedicated function keys.

The drawback to touchscreens is the lack of tactile feedback and inadvertent input errors. Occasionally, users are uncertain if contact has been made with a touchscreen.

In addition, users often inadvertently touch the screen where they didn't intend. This incidental contact and uncertainty about positive contact increases user reluctance toward touchscreens.

LCD switches

Programmable LCD switches, however, simplify a designer's ability to create a properly functioning control panel without the worry of inadvertent input errors. An LCD key cap with a switch base has all advantages of a programmable LCD



LCD switches meet ever-changing user-interface needs and requirements.


while the base provides the functionality of a switch.

As a function key, an LCD switch can be programmed to perform many specific functions. The image on the LCD can be presented in text or graphics depending on the application. Unlike a dedicated function key, an LCD switch can be labeled with and perform numerous operations.

As an example, a hydropower plant application required 1,600 different switch functions from a control panel. The company chose to incorporate a panel of 116 LCD switches.

The panel has five rows of switches: 16 in the top row and 25 in the bottom four rows. The 16 switches on the top row are assigned and labeled with specific functions. Pressing any one of these 16 switches changes the lettering (or graphic) of the 100 switches below. Each of the 100 switches can send a signal to perform the function shown on the key cap. With this arrangement, operators can access more than the required 1,600 control options in only two keystrokes.

Not only can LCD switches decrease the overall size of a control panel, they can also reduce the number of switches per panel. Moreover, since each of the switches eliminated from the above design likely had a unique part number, us-



ing LCD switches also simplifies a company's inventory by reducing part numbers.

Smaller LCD-switch applications can be just as effective. A concept computer design uses only one programmable LCD switch per panel. The LCD switch indicates critical CPU characteristics quickly and conveniently.

As the operator pushes the switch, the LCD key cap indicates CPU temperature, processor speed, hard-drive space, and critical errors. This compact design uses only one switch yet performs many functions.

Programmable functionality

Beyond displaying text and graphics, the LCD switch can be programmed to show different colors of backlighting. LED backlighting options include red, green, amber, blue, yellow, purple, violet, and white.

Each of these color combinations can be used to create an attractive front-panel display. The backlight-

ing can also be programmed to blink on and off. In certain applications, a blinking switch can be an effective way to get an operator's attention.

Aligned in a matrix pattern, LCD switches can be programmed to resemble the operation of a touchscreen. Various designs can be incorporated depending on the application.

For example, a 2 x 2 switch matrix design might read (from top to bottom, left to right): English-Spanish-French-German. Pressing the switch labeled English would change the message on all four key caps to: Start/Stop/Forward/Back. Now, pressing one of these options would affect the outcome of a specific process. Had the operator chosen the button labeled Spanish, the switches would have read: Empe-sar/Alto/Continuar/Atras. From this point forward, all text would have been in Spanish.

One control panel can be reprogrammed in many different lan-

guages, giving designers the option of selling a single product line worldwide. If an upgrade in the product takes place, users can upgrade via software rather than replacing an entire control panel.

Flight-simulator manufacturers have long used LCD switches in their control panels. As a final example, a 6 x 3 matrix of switches is used to control the instruments inside a simulated airplane cockpit.

The operator advances through the switches until the desired test effect is found. Once the effect has been located, a simple push of the switch launches the function and initiates a change in the flight instruments. Operators have access to more than 100 different simulation conditions in a single 6 x 3 switch control panel.

Designs like these are fast becoming a viable option for engineers. The ability to perform several functions from a single switch improves functionality while reducing panel size. ■