

## General Information

Your specific application, the operating environment in which this switch will be exposed, and the perceived usage all play a major part in the materials and construction best suited to meet your requirements. The Hall Company is most willing to offer suggestions concerning materials considered operationally correct for your applications. Please feel free to contact our customer service department should questions arise.

### 1. Customer Part Number

For our reference please indicate the identifying part or reference number of the component to be quoted.

### 2. Dimensions of Component

Identify all dimensions such as length, width, and overall assembly thickness restrictions, if any. Detailed drawings, similar to the examples herein, provide the clarity needed to produce an assembly to your exact requirements.

### Tolerances

In most instances the components which make up a membrane switch assembly are cut with steel rule dies. Length and width tolerances can be held to  $\pm 0.015$  inches.

Through-holes are cut with standard  $\frac{1}{4}$ " increment round punches with hole to hole tolerances of .010". Rectangular cutouts can be held to  $\pm .010$  also. All through-holes and cutouts should be at least .125 from each outer edge.

### 3. Circuit Configuration

The Hall Company prefers to utilize a two-layer switch design rather than a fold-over construction due to potential cosmetic and functional problems which could occur with the latter. Indicate whether an XY matrix, a common bus circuit arrangement or other special

circuit design is required. (**XY matrix** — column and row interconnect, **Common Bus** — individual key traces)

### 4. Operating Environment

Indicate whether this switch assembly will be used indoors or outdoors, and whether it will face unusual humidity or chemical exposure conditions. With this knowledge we can recommend special materials and coatings needed to assure proper graphic and electrical stability.

### 5. Type of Assembly

The Hall Company can provide three types of constructions:

- A. Flexible Film Assembly with Adhesive Backing
- B. Printed Circuit Board Backed Assemblies
- C. Flexible Film Assembly with Aluminum Backing

Please refer to the sample backplate drawing herein. Be certain to identify and dimension all holes and cutouts, as well as the number of studs, standoffs, and PEM nuts required, and their lengths. State the required thickness of the panel, and whether it is to be painted, anodized, or chemically treated in any other way.

### Tolerances

Registration of the backplate to the switch assembly is typically  $\pm 0.030$  inches. The switch may be registered to a reference edge or a through-cut hole, but not both. Window openings (rectangular or square cuts) in the backplate should be at least  $\frac{1}{2}$ " larger on all 4 sides than the corresponding opening in the switch assembly.

### 6. Tail Exit Location and Length

The term "TAIL" refers to the extension of the circuit layer which carries the conductive traces to the termination point. This "TAIL" extension is not usually restricted to one exit

point on the assembly, and is left to the customer's discretion as to the specific area best suited to his requirements. It is critical for quotation purposes to know this location — and the **length** of the tail assembly, including connector.

Standard conductive ink traces are 0.060 inches wide on 0.100 inch centers. The exit position **cannot** be located within the switch array. Remember, tail length is extended an additional 0.300 inches (approximate) by the addition of a male or female crimp-on connector such as Dupont's (Berg) #65801 Clincher series.

### 7. Type of Switch Termination

The Hall Company is equipped to provide several types of terminations dependent upon your requirements. Both male and female crimp connectors, as well as solder tabs are available for flexible switch constructions. PC Board terminations are numerous, and should be identified by manufacturer and part number on your drawings. The Hall Company typically installs Dupont's Berg, and AMP connectors.

### 8. Pinouts

The Hall Company would prefer to determine the switch trace (pinout) locations. In most instances we are faced with minimal space, and are able to properly design the most feasible and cost effective configurations. If you do elect to specify the pinout, it is critical that you identify the location of Pin #1 on your drawing.



## 9. Shielding Requirements

ESD (Electrostatic Discharge)

EMI (Electromagnetic Interference)

RFI (Radio Frequency Interference)

Shielding methods most commonly used are:

### A. Metalized Polyester

Aluminum clad polyester placed beneath the graphic layer can be grounded by extending a separate tail for this purpose, or by channeling two aluminum traces through pin locations in the connector. Another option is electrically connecting the shield tail to the backplate. (Meets all requirements.)

### B. Printed Silver

By printing silver ink either in solid or grid form on the top surface of the upper switch layer, an effective barrier can be accomplished against both ESD and EMI.

### C. Printed Carbon Inks

In place of silver inks, carbon inks can also be an effective shield against ESD.

If there is any question concerning the need for shielding, we highly recommend that you incorporate shielding into your design.

## 10. Actuation Force Requirements

The decision to create a tactile feedback or non-tactile switch assembly should be determined by the perceived end user's requirements. If, for instance, the user is wearing gloves to enter commands, or a visual or audible feedback indicates closure of the circuit, you may elect to create a non-tactile assembly. Tactile feedback may be deemed necessary where visual/audible indicators are absent, or the user is accustomed to a touch response when entering a command.

The Hall Company manufactures its own stainless steel tactile domes in three distinct sizes for varied applications.

1. .350" Circular Dimple Dome
2. .410" Triangular Dimple Dome
3. .500" Circular Dimple Dome

The .410" Triangular Dimple Dome is available in two different trip forces — 8 oz. and 12 oz. A triangular dome provides the space necessary to use an LED lamp in the corner of a key — if required.

**NOTE** — When a tactile stainless steel dome is utilized the snap-through and return of the dome, when depressed, does not provide a 100% reliable indication that the switch circuit has been closed. Should a break occur in the circuit path anywhere in the flexible switch or circuit board, closure may not be complete. Also, although highly infrequent, a tactile dome may be "teased" until it snaps without actually closing the switch contacts.

## 11. Circuit Resistance

Please identify the maximum allowable resistance this switch can withstand.

## 12. Graphic Overlay Materials

There are two basic types of materials available for graphic overlays:

### Polycarbonate

If exposure to chemicals is not critical, we recommend the use of polycarbonate films due to their inherent resistance to scratching (due to hardness) and the availability of textured surfaces (LEXAN® — VELVET and SUEDE textures).

### Polyester

This material has high chemical resistance, but is softer and more easily scratched. Polyester is not available in manufacturer

applied textured surfaces (MYLAR® — Standard clear polyester).

Selectively textured overlays can be created through screen-printing techniques at The Hall Company. This allows for certain areas to remain clear to enhance the readability of LED/LCD displays.

Samples of either material (Polycarbonate or Polyester) and selectively textured graphics can be provided for your test purposes.

## 13. Color Matching

Color Matching Systems such as the PANTONE MATCHING SYSTEM swatches will, over time and exposure to light, vary from book to book. If feasible, and where specific matches are critical, we recommend that you provide a specific color chip. Also, the specific lighting which affects this product in its normal operating environment should be identified. As part of the color mixing/matching process a MacBeth light booth which simulates varied lighting will be used, as well as **natural** lighting to achieve an exacting color match. When using textured materials, or screen printed textured treatments, a slight visual loss of color will occur.

## 14. Graphic Embossing

Embossing of the graphic layer can perform three functions:

- A. Creates a locator for each individual key by touch.
- B. Allows a tactile dome more freedom of movement.
- C. Visually enhances the appearance of the switch assembly.

Two types of embossing are available:

**Perimeter Key Emboss** — raising the border around each key.

**Full Pillow Emboss** — raising the entire key cap (recommended when using



tactile stainless steel domes).

### **Tolerances**

The Hall Company recommends an emboss width of .032 inches or greater (Perimeter Key Emboss). Spacing between each individual key should be a minimum of .250 inches to assure adequate adhesion to the mating switch surface.

The height of the emboss should not exceed 150% of the thickness of the material. In most instances we are utilizing 0.007 inch thick material with an emboss height of 0.010 inch.

### **15. Display Windows**

If an LED or LCD display is to be incorporated in the switch assembly, please indicate your preference as to clear or color tinted windows. Also, indicate whether discrete LED indicator lights are to be used, and whether a through-hole is to be cut in the graphic. If a through-hole is not required, indicate whether the graphic area in front of the indicator is to be left clear or printed with a color tint.

**Deadfronts** are areas on the graphic overlay where words — messages or critical instructions are concealed until backlit. The process to conceal these hidden areas is the screening of transparent or neutral shades of gray or black. Dark colors achieve the best deadfront effect, but should be pretested with the actual lighting apparatus to be used prior to production.

### **16. Varilite™ Color Displays**

The Hall Company is a contracted supplier of TALIQ CORPORATION's VARILITE displays. These displays reflect ambient room light creating a brightness without backlights. Wafer-thin, and mountable to standard membrane switch layers and overlays, these displays provide a large rich color response. Contact our

Customer Service Department for more information.

### **17. "Big Switch"**

In instances where a larger than normal key is required, the Hall Company can offer a construction which allows an individual key to be as much as 5 ft. square if needed. Such keys are being utilized as emergency stop devices, input devices for the physically impaired, and security applications. At time of manufacture the actuation force requirement can be adjusted from several ounces to several pounds — dependent upon your needs.

### **18. Backplates/Supporting Devices**

Flexible membrane switch assemblies must be mounted to flat — rigid surfaces to ascertain proper switching operation. If the mating surface where the switch is to be mounted is not flat, a separate supporting backplate is required. The Hall Company has in-house aluminum/steel fabrication capabilities. In most instances aluminum is the preferred material. A chemical finish e.g. anodizing or **iridite** can be provided. Backplates must be specified separately from membrane switch dimensions due to mounting tolerances and tolerance stacks. All support panel hardware, including studs and standoffs, must be specified.

### **Tolerances**

Registration of the backplate panel to the membrane switch is typically  $\pm 0.030$  inches. The switch may be registered to a reference edge or a through-cut hole, but not both. Through-cut holes in the backplate should be at least 0.050 inches larger than corresponding holes in the membrane switch. If backplate edges are required to be invisible from the front, the backplate dimensions must be at least

0.030 inches less than the switch dimensions.

### **19. Changeable Graphic Inserts**

The graphic layer of the switch assembly can be fabricated to allow an insertable legend. A "pocket" is formed beneath the graphic layer to allow such changes, and is accessed from the outer edge of the switch assembly, in most cases. (Special constructions have been produced where legend entry was made through the backplate).

### **20. Quantities**

Please indicate the number of prototypes required. Our production of prototypes is the same as a standard production run which requires the set-up of all equipment within our facilities. For this reason the cost to produce 5 units vs. only 1 may be of little consequence. The average prototype run is usually 5-10 units.

Also, be certain to indicate the number of production units you wish us to quote. The Hall Company is willing to work on a blanket order basis over a period of 12 months if quantities and customer credit history is sufficient.

Indicate the individual to whom the quotation should be directed, and verify that you have given us your proper address and phone number.