Hall Effect Keyboards
1000SD Keyswitch Modules

FEATURES

- Module design conserves behind panel space
- Metal plate grid mounting panel simplifies keyboard design
- High reliability and long life
- Time-proven Hall effect solid state switching
- Level and pulsed current sinking outputs
- Logic scan modules

TYPICAL APPLICATIONS

- Keyboard building blocks for:
    - Point-of-sale products
    - Personal computers
    - Word processing equipment
    - Interactive display applications
    - Intelligent terminals

- Discrete pushbuttons for:
    - Control panels
    - Error indication
    - Push-to-test signal
    - Multiplex ready signal
    - Circuit status symbol
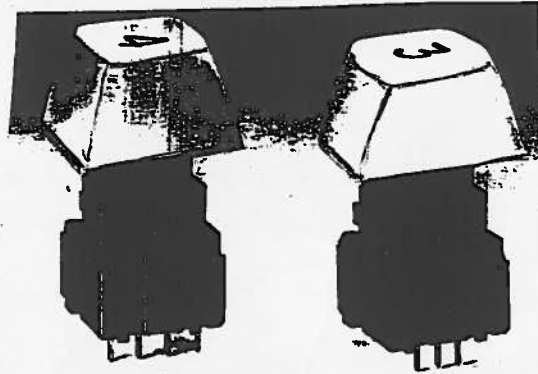
MICRO SWITCH SD keyswitch modules are the answer for direct control of solid state logic (such as TTL and CMOS) with no special buffering or electronic circuitry required. The heart of every module is a magnetically-actuated Hall effect transducer. The transducer is a combination of a Hall element, trigger circuit and amplifier integrated on one silicon chip, approximately forty thousandth of an inch square. Operation is produced by an integral magnet mounted on the plunger. Laboratory testing on SD modules indicates mechanical life of 100 million operations.

SD modules are panel-mounted. A simple metal plate grid supports the switch modules and is designed to ensure good keytop alignment between stations and rows.

Whether the application calls for a single pushbutton, a control panel or a complete keyboard, SD modules will meet the requirements. MICRO SWITCH offers over 30,000 legends in more than 20 languages, 161 keytop shapes, 70 outside (shell) colors, and 23 legend colors

MICRO SWITCH has the engineering, manufacturing, and service expertise to meet your production requirements. Sales and marketing support is available worldwide through your local MICRO SWITCH representatives.
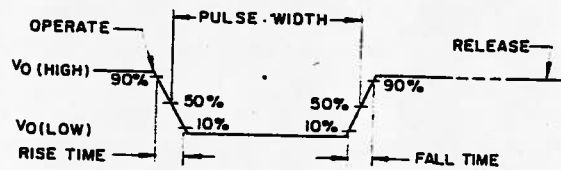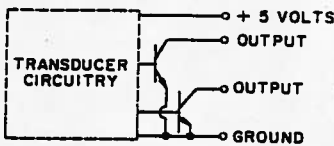
MICRO SWITCH
a Honeywell Division

FOUR-TERMINAL OUTPUTS
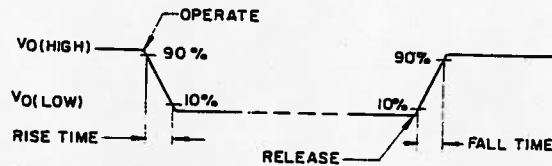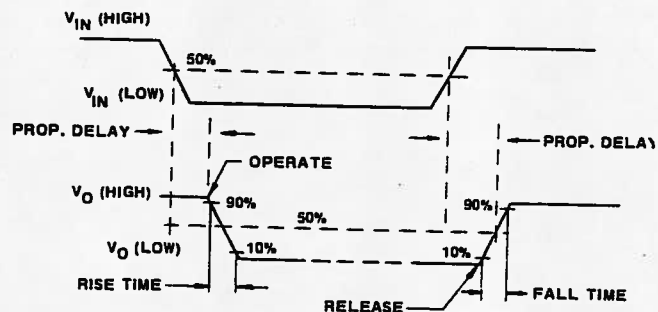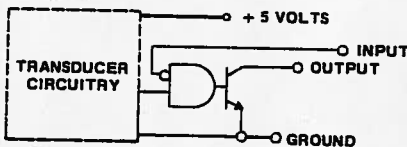
- Pulse Switch Output

- Level Switch Output
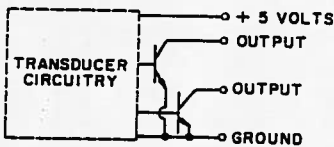
- Logic Scan Output

Three types of switch outputs are available (see illustrations above) from four-terminal Hall effect modules.

Pulsed DC output. When coupled with one character memory in the encoder, this output (generated on the down-stroke only) provides the "N" key rollover electrical interlock when using static MOS encoders.

Level DC output. The level remains ON as long as they key is depressed. This output is used when two-key rollover is needed; it is also effective for non-encoded function keys, repeat keys, and shift keys.

Logic scan DC output. The function of a scan module is to provide an interface between the Hall chip (transducer) and a microprocessor or scanning encoder. An output signal is valid when the input interrogation signal (clock pulse) is low and the key is depressed.

The input signal (when at ground) will enable a logic gate; the output will reflect the normal performance of a level sinking output. When the input is at a high level, the output is inhibited by forcing the output transistor into the OFF state.

FOUR-TERMINAL MODULE ORDER GUIDE

Prefix/Action		Plunger Type		Operating Force (Nom.) Spring Force		Output	
1001SD4	Momentary	A	Sloped	1	1.3 oz./0.36 N	A	Sinking level
1001SD5	Alternate Action	B	Stepped	2	2.0 oz./0.56 N	B	Sinking pulse
1001SD6	Support			3	2.5 oz./0.7 N	D	None (support)
				6	6.0 oz./1.67 N	S	Scan

Example:
1001SD4A3B is a momentary action, four-terminal pulse module with sloped plunger and type 3 return spring.

SPECIFICATIONS
FOUR-TERMINAL MODULE ELECTRICAL DATA

Current sinking and pulse modules each have two discrete outputs. They are open collector TTL compatible.

The level output remains low as long as the module's plunger is depressed.

The pulsed output is generated only by the down stroke of the plunger.

Current Sinking Level Power Requirements	4.5 to 5.5 VDC, 3.5 mA max. standby current
Output	Unoperated: 10 μA leakage to ground at 10.0 VDC
	Operated: 0.4 VDC max., while sinking; 4 mA max.
Rise and Fall Time	1.0 μsec max. R_L = 1.5 (kilohms); C_L = 50 pf
Current Sinking Pulse Power Requirements	4.5 to 5.5 VDC, 4.5 mA max. standby current
Output	Unoperated (and with keytop released after pulse): 1 μA max. (collector leakage to ground)
	Operated (during pulse): 0.4 VDC max. (reference to minus supply), sinking 4 mA per output; 8 mA with outputs paralleled
	Pulse width: 25 to 95 μsec, 50% points of V_{cs}-V_{OL}
Rise and Fall Time	1.0 μsec max.
Logic Scan Power Requirements	4.5 to 5.5 VDC, 3.5 mA max. standby current
Input High	Voltage: 2.0 VDC min. Current: .050 mA max. at 2.4 VDC
Low	Voltage: 0.8 VDC max. Current: 10 μA max. at 0.4 VDC
Output	Unoperated and/or Input High: 1.0 μA max., leakage to ground at 10.0 VDC
	Operated (Input Low): 0.4 VDC max., while sinking 4.0 mA max.
Rise and Fall Time	1.0 μsec
Propagation Delay*	1.1 μsec R_L = 1.5 kilohms; C_L = 50 picofarads

THREE-TERMINAL MODULE ELECTRICAL DATA

Power Requirements	+5 VDC regulated ±5% @ 3.0 mA typical 4.8 mA max. power supply current drain with input at 0.0 VDC
Input Current	-2.5 mA typical, -3.8 mA max. Input at Logic "0" (0.6 VDC max.)
Output	Voltage/Logic "1" (high), 2.4 VDC min., 3.7 VDC typical at 5 mA current sourcing
	Leakage/Logic "0" (low), 1.0 μA max.
Rise and Fall Time	Rise time: 0.1 μsec typical, 1.5 μsec max.
	Fall time: 0.4 μsec typical, 1.5 μsec max.
Propagation Delay*	0.5 μsec typical, 2.5 μsec max.

* Input change to output stable level

SD MODULE PERFORMANCE DATA

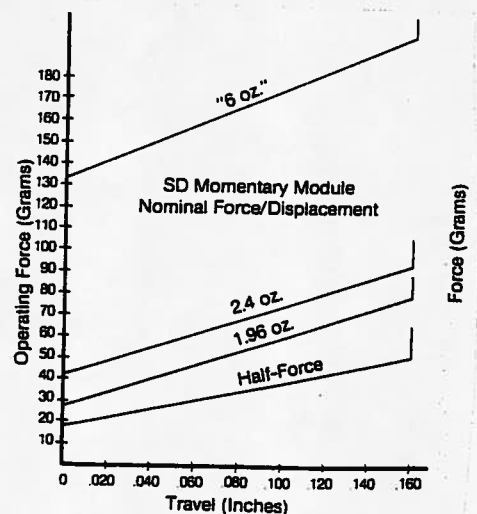|	
Electrical/ Mechanical life	Laboratory testing on SD modules indicates mechanical life of 100 million operations
Temperature Storage	-40° to 150°F (-40° to 66°C)
Operating	-32° to 125°F (0° to 52°C)
Humidity	Up to 90% RH
Vibration (Non-operating)	10 to 59 Hz at .005 in. (0,13 mm) displacement, 56 to 500 Hz at 5 Gs
Mech. Shock (Non-operating)	15 Gs, 11 mA duration

THREE-TERMINAL INTERFACE MODES
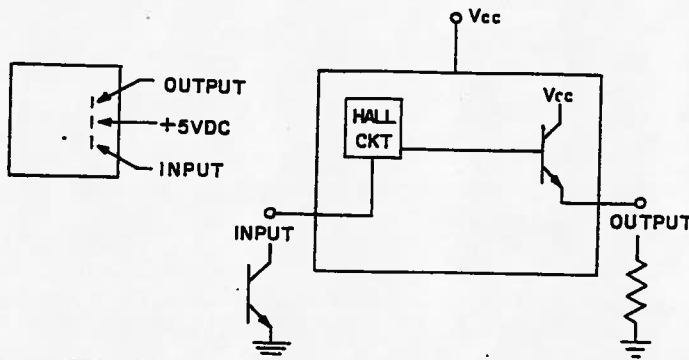
Three-terminal Hall effect modules can interface directly with a port expander and microprocessor to operate either in a scanned mode or in a level sourcing mode as a function switch. The function mode is similar to any level switching four-terminal SD module with the normal performance of a level sourcing signal (emitter follower).

The operate point, full overtravel and release point are virtually the same as any four-terminal module.

In the scanned mode, the negative supply connection becomes the scanning input connection. When the input is high, the module is de-energized and does not consume power. When the scan input is low, the module will draw current as it normally does when energized. If the plunger is depressed when the scan input is low, the output will be high. The output will remain low if the plunger is not depressed during the scan cycle.

This scanning technique significantly reduces the total power supply requirements when used in a scan matrix since the module requires power only during the period of time it is being strobed in the scan sequence.

THREE-TERMINAL ORDER GUIDE

Prefix/Action		Plunger Type		Operating Force (Nom.) Spring Force		Output	
1003SD4	Momentary	A	Sloped	1	1.3 oz./0.36 N	E	Scan
1003SD5	Alternate Action	B	Stepped	2	2.0 oz./0.56 N		
1003SD6	Support			3	2.5 oz./0.7 N		
				4	No spring		
				5	3.5 oz./0.97 N		
				6	6.0 oz./1.67 N		
				8	8.0 oz./2.2 N		

Example:
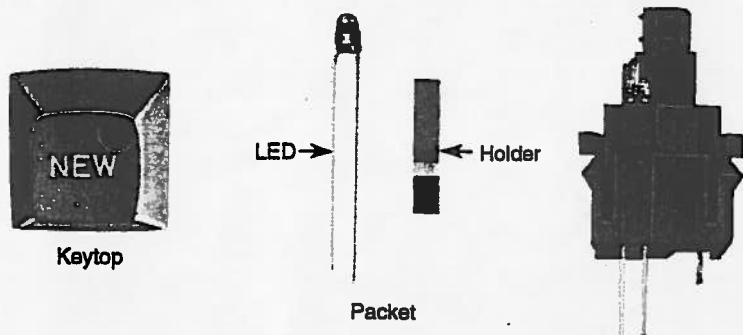1003SD4A3E is a momentary action three-terminal scan module with sloped plunger and type 3 return spring.

SD MODULE OPERATING CHARACTERISTICS

	Half Force*	Standard
Total Travel	.160 in. ±.020 in. 4,1 mm ± 0,51 mm	.160 in. ±.020 in. 4,1 ±0,51 mm
Force at .090 in. (2.3 mm) Travel, nom.	0,38 N 1.3 oz.	0,69 N 2.5 oz.
Force at Full Travel	0,42 N 1.5 oz.	0,83 N 3.0 oz.
Release Point, min.	1,0 mm .04 in.	1,0 mm .04 in.

*For use under multi-station keytops.

TYPICAL FORCE DISPLACEMENT CURVES FOR SD MODULES

## STATIONARY LED KEYTOP

Keytop

LED →

← Holder

Packet

INSTALLATION
You can convert a four-terminal SD module (with the exception of the mechanical secretary shift) to provide visual operator feedback, indicate system status, or provide operator directions (or any combination) by simply installing an LED.

All you will need is a special keytop, which includes a molded-in lens and a light pipe for high intrinsic illumination; an LED and holder, and the correct PC board termination (see illustration below).

PC BOARD TERMINATION
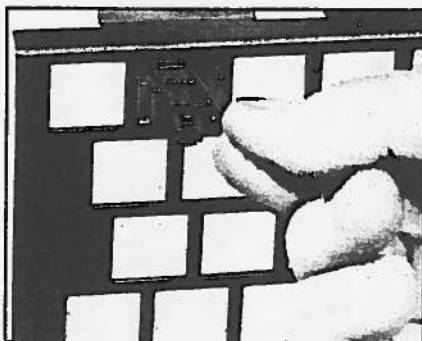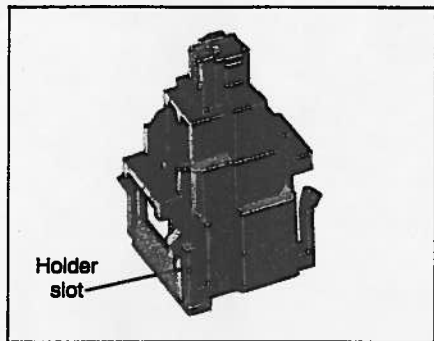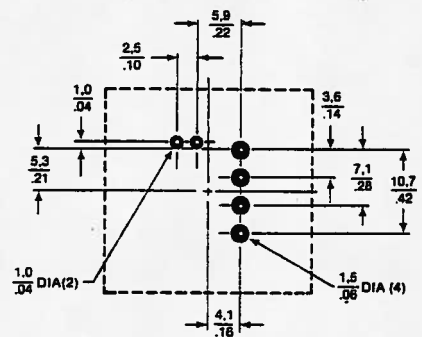
Fig. 1
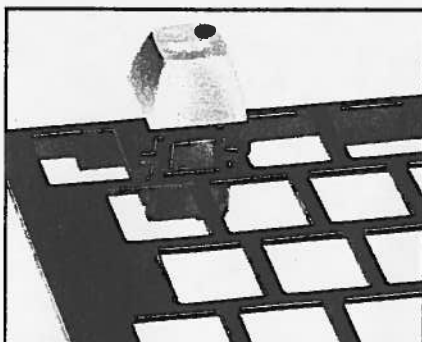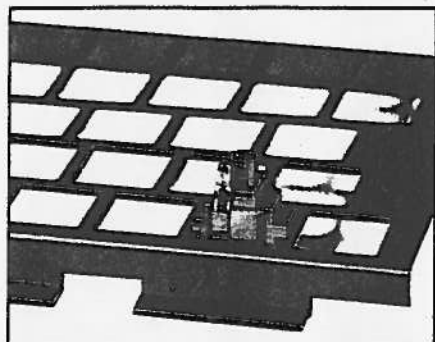SD Module with LED keyholder slot.

Holder slot

Fig. 2
LED holder being slipped into module slot.

Fig. 3
LED inserted between module and holder.

Fig. 4
LED keytop installed on module.

LED POWER REQUIREMENTS
(In addition to switch)
Typical forward voltage drop:
2.2 VDC @ 20 mA max.

LED KEYTOP ORDER GUIDE

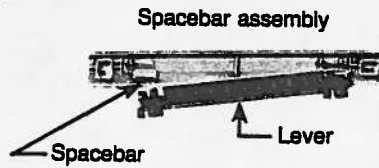| Description	Catalog Listing
Keytop Blank	3SD451
Keytop Legend	3SD453
Packet (Holder & red LED)	500SD3-1

Hall Effect Keyboards
1000SD Keyswitch Modules

500SD "TRAPEZE STYLE" SPACEBAR ASSEMBLY

Lever pivots on these
edges of panel cutouts

Spacebar assembly

Spacebar — Lever

This assembly consists of a 6, 8, or 9-unit spacebar and a plastic lever (assembled).

The trapeze style mechanism incorporates two integral pivots as part of the molded spacebar. A plastic lever snaps onto the spacebar and pivots on the edge of two standard .620 in. (15.7 mm) square SD panel holes (see photo, left).

The spacebar is mounted on two switch modules, one active and one inactive, located at the outer ends of the spacebar. The active switch may be used at either end.

500SD SPACEBAR ORDER GUIDE

| Units	Style	Dim. A[1]	Dim. B Ref.	Dim. C Ref.	Plunger Type	Catalog Listing[2]
6	B	113,15 mm 4.455 in.	57,2 mm 2.25 in.	95,3 mm 3.75 in.	Stepped Sloped	500SD312 500SD313
8	B	151,26 mm 5.955 in.	95,3 mm 3.75 in.	133,10 mm 5.25 in.	Stepped Sloped	500SD310 500SD311
9 (8-Unit Mount)	A	168,91 mm 6.650 in.	95,3 mm 3.75 in.	133,10 mm 5.25 in.	Stepped Sloped	500SD314 500SD315
9	B	170,31 mm 6.705 in.	114,3 mm 4.50 in.	152,4 mm 6.00 in.	Stepped Sloped	500SD316 500SD317
9	C	170,31 mm 6.705 in.	114,3 mm 4.50 in.	152,4 mm 6.00 in.	Stepped Sloped	500SD318 500SD319

[1]Dimensions ±0.51 mm (.020 in.). [2]Add color suffix to complete catalog listing.

Colors: standard gray = -9 black = -7; white = -6. For example, 500SD312-7 is a black spacebar. Many other colors are available; please contact your nearest MICRO SWITCH sales office for details.
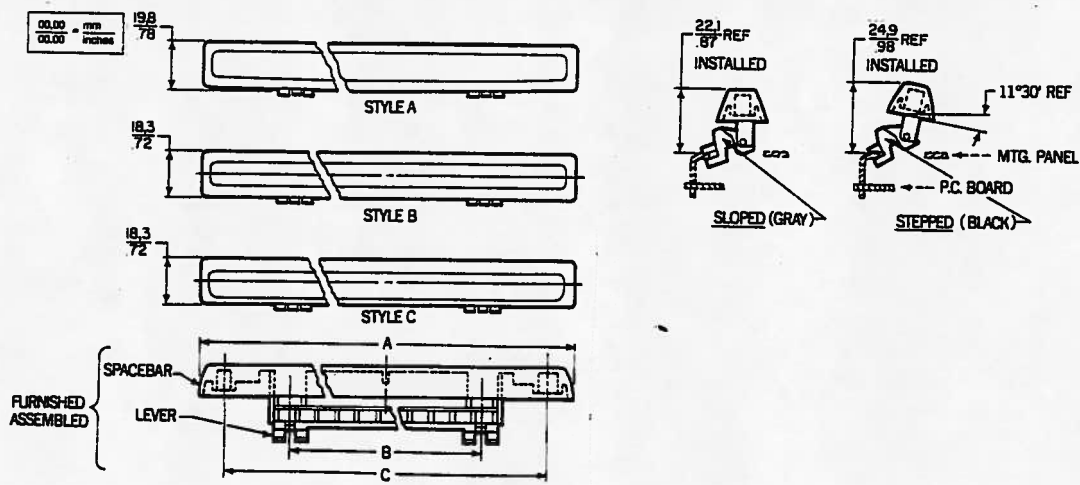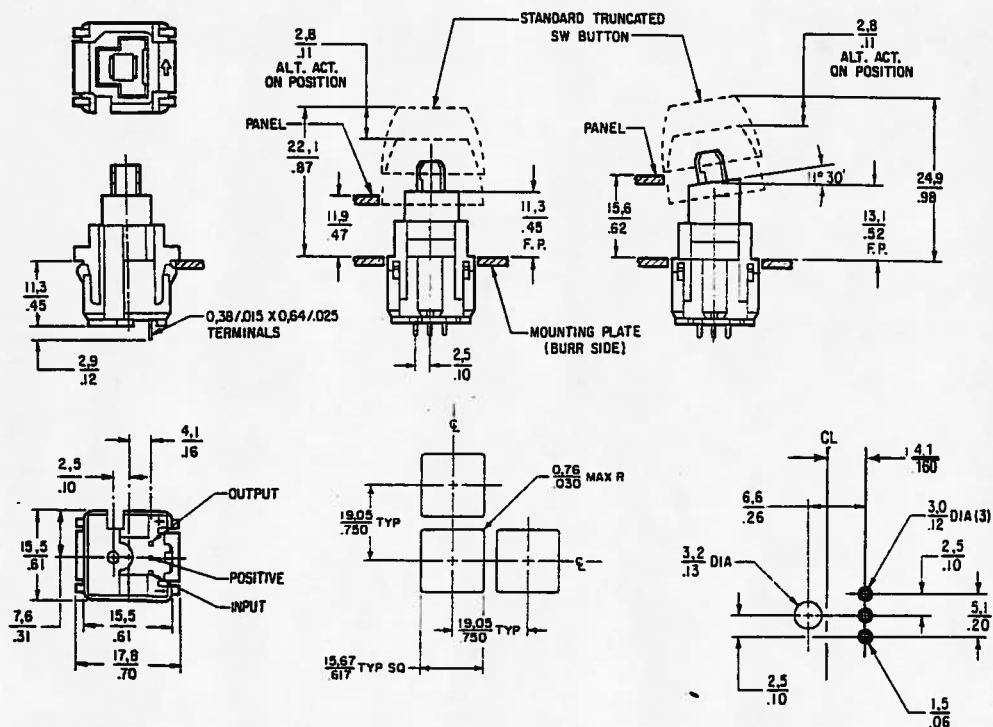
MOUNTING DIMENSIONS (For reference only)
Four-terminal SD Module
(Level, Pulse, Logic Scan)

00,00 = mm
00.00 = in.
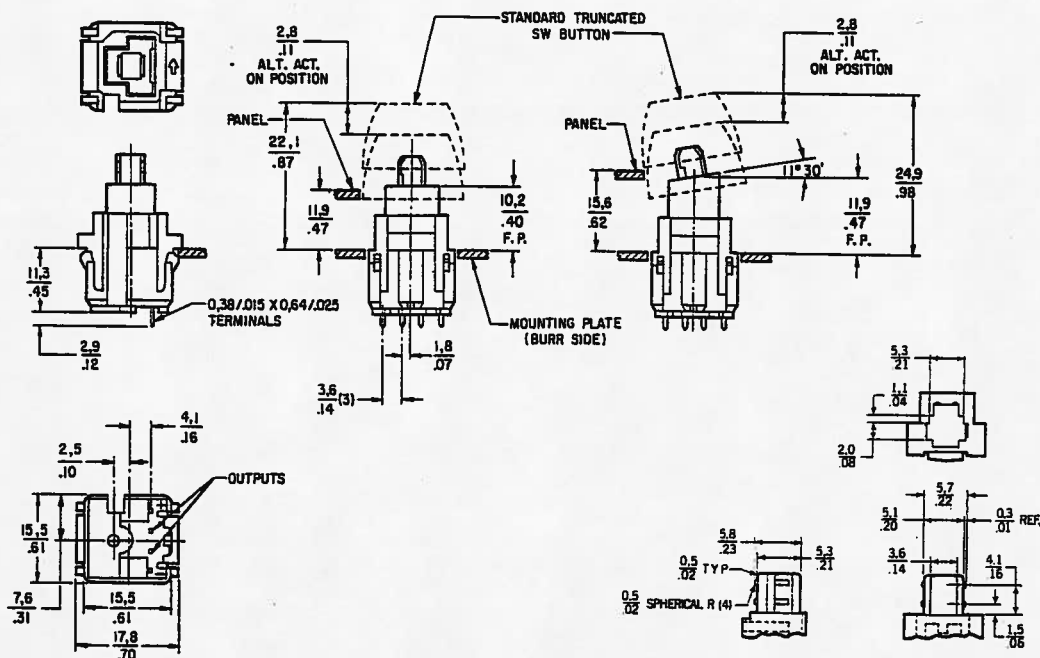
Three-terminal SD Module

The holes for mounting the modules must be .620 ±.002 in. (15,7 ±0,05 mm) square before coating and must be precisely located to assure terminals will align with the PC board.

Typical PC Board Detail View from Solder Side