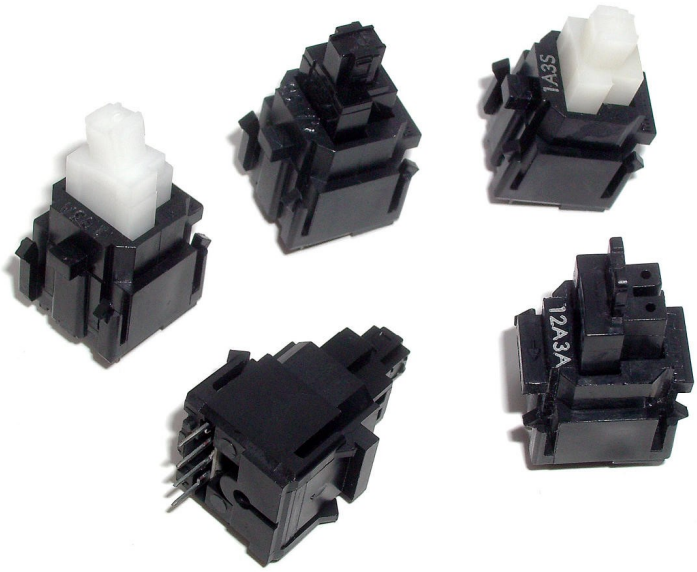
Micro Switch SD Series

Contents



Overview

SD Series is Micro Switch's second generation of Hall effect keyboards and keyboard switches, that followed on from SW Series. The series provided a wide range of standard and customer-specific options including multiple keycap mounts, plunger-mounted illumination, alternate action, secretarial shift and tactile feedback, as well as a comprehensive range of Hall effect circuit options. This page covers only the keyswitch modules. Honeywell were kindly able to locate a series of charts that have shed a huge amount of light on the series, so many thanks go to them for making this possible.

SD Series was intended to offer solid-state keyboards at pricing that was to be competitive with mechanical keyboards, at the anticipated 1975 prices. The new design also brought with it a significant reduction in height, with the distance between the top of a keycap and the top of the PCB reduced from 1.80 inches to 1.15 inches, or just under two thirds the height of SW Series; this was said to be "ideal for modern compact terminal needs." Micro Switch reported in their initial advertisements that they 'coupled [their] unique Hall effect switch with an advanced "flip chip" ceramic mounting technique to further increase the reliability of [their] solid-state keyboards.'

Components in SD series have part numbers in the form SD-*nnnnn*. Switches fall under subseries 1001SD, while keyboards use a prefix indicating the number of keys. For example, 12-key keypads will have a catalogue listing number beginning 12SD, while model 125SD12-1 indicates that it has 125 keys.

1SW switches were clip mounted into metal rails, while 101SN and 201SN switches were affixed using self-adhesive strips prior to soldering. 1001SD switches are primarily plate mount, but a hole in the centre allows them to be secured to the PCB from below using a screw.

Just as with 1SW switches, the Hall sensor module can be pulled out of the switch from below. This allows the plunger assembly to be swapped in the field without needing to desolder the Hall sensor. While SW Series sensors were fully-encosed plastic packages, SD Series sensors are a bare substrate (possibly a printed circuit board) with three or four terminals soldered to it, and a Hall sensor enclosed in some kind of resin. The Hall sensor faces away from the magnet.

Each switch is marked with an arrow; with stepped switches, this arrow faces the front of the switch. This is not to be confused with the arrow on Clare/Pendar reed switches, where the arrow seems to point to the terminals for the primary switch contacts, which can be either at the front (short reed switches) or the back (tall reed switches). The terminals in SD Series switches are on the left-hand side.

While SW keyboards were designed for two-of-N encoding using dual-output sensors, SD keyboards are more commonly matrix scanned using single-output sensors. SW was designed to avoid the expense and complexity of matrix scanning, but by the time SD was introduced, matrix scanning was a normal approach.

History

The oldest-known advertisement for SD Series was placed in Electronics and Electronic Design magazines in December 1973. In the advertisement, Micro Switch stated that they were "ready to

talk prototypes now, with production in late 1974." The advertisement also noted, "It makes MICRO SWITCH solid-state prices (based on 1975 delivery) competitive with less reliable mechanical-contact keyboards." Another Micro Switch advertisement, from Electronic Design magazine in June 1974, mentions SD again, but does not indicate the readiness status of the new series. Engineering Keyboard Prototype unit 52SD5-1 (with serial number "A") has an encoder chip dated week 43 1974 (October). The SD Series drawings provided by Honeywell date back to September–October 1975. The oldest non-prototype keyboard model discovered to date, 125SD12-1 made for Univac, was manufactured in 1976.

One of the keyboards photographed for the 1973 and 1974 advertisements is identical in layout and markings to Jacob Alexander's 26SD1-2-H from 1990, while the PCB layout is different.

The series is known to have been in production until at least 1999, when the Honeywell website is last demonstrated to have listed them; beyond this point, the Wayback Machine was unable to gather data on them.

Prior to discovery of the series name, these switches were referred to by keyboard enthusiasts as "Honeywell Hall Effect". Although Micro Switch was already owned by Honeywell before the series was instigated, these switches are all branded "MICRO USA" and all the charts are from Micro Switch.

Intelligent keyboards

Micro Switch were one of the original companies to offer so-called "intelligent keyboards": keyboards that made use of a microprocessor (specifically a microcontroller) to handle the key detection and encoding, instead of MOS LSI chips or TTL circuitry. IMSAI and Micro Switch both introduced intelligent keyboards in 1977. In December 1977 and January 1978, Micro Switch placed advertisements for keyboard model 103SD24-1, which appears to be the same model advertised in October 1977. As advertised, the use of a microcontroller allowed keyboards to gain significantly more features without incurring the cost of additional chips as would be needed otherwise. Micro Switch advertised "Pin for pin compatible EPROM for faster design turnaround", suggesting the use of an EPROM-based microcontroller (as existed in the MCS-48 series).

Microcontroller chips found on SD Series keyboards include Intel P8048 (SD-23593; 70SD30-2, circa 1980), NEC D8049C (112SD34-1, 1983) and AMD AM8049DC (SD-23595; 87SD30-29, 1984). All three discovered examples are either from or second-sourced from Intel's MCS-48 series, widely used in keyboards. IMSAI's IKB-1, also from 1977, used a ROM-less Intel 8035, again from MCS-48 series.

Prior to this, SD Series keyboards offered MOS LSI logic using SW Series encoders.

Specifications

The switch specifications differed between switch models, and little official literature is known for SD Series switches. (Someone at Deskthority obtained a comprehensive keyboard designer's

guide to SD Series and promised to scan it in, and then promptly vanished.) The following details are given in the SD16 Keyswitch Modules catalogue pages:

Total travel	4.1±0.51 mm (0.160±0.020″)
Operating force travel	2.3 mm (0.090″) nominal
Operating point	1.5–3.0 mm (0.06–0.12″)
Release point	1.0 mm (0.04″) minimum

Two separate travel figures are given for switch operation. The operating force corresponds to a distance of 2.3 mm, while the operating point (when the Hall sensor registers a keystroke) has a larger range of 1.5–3 mm. The Hall sensors provide electronic hysteresis of at least 1 mm. The electrical characteristics of both the logic scan and three-terminal sensors are given in the same document, but they are presented separately and not in a way that is directly comparable or clear as to what is intended.

The operating force is dependent on the model of switch module, and this is detailed separately under operating force below.

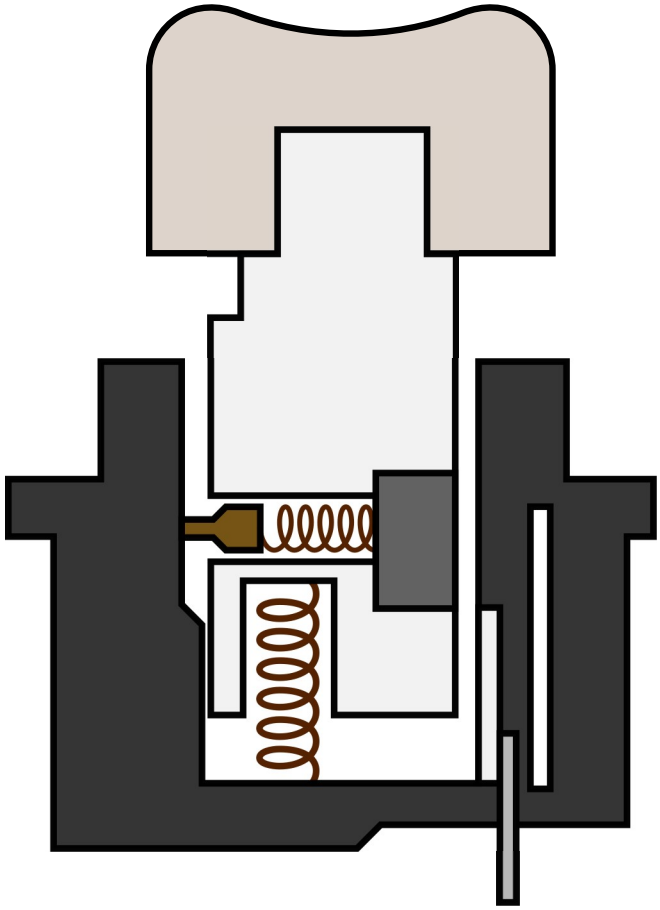
In their 1983 advertisement in Electronic Engineers Master, keyboard model 104SD30 is listed as having a life of 100 million operations and a 20 billion mean cycles between failures.

Options overview

There are over 60 different switch models identified to date, based on charts, discovered keyboards and surplus part listings on the Internet. The number of possible combinations of options exceeds a thousand, but most of the possible variations were likely never produced.

Tactility

Tactile feedback uses a mechanism very similar to that of the alternate action switch. This was crudely illustrated in Fujitsu magazine, volume 27 number 7, November 1976 on page 1299:



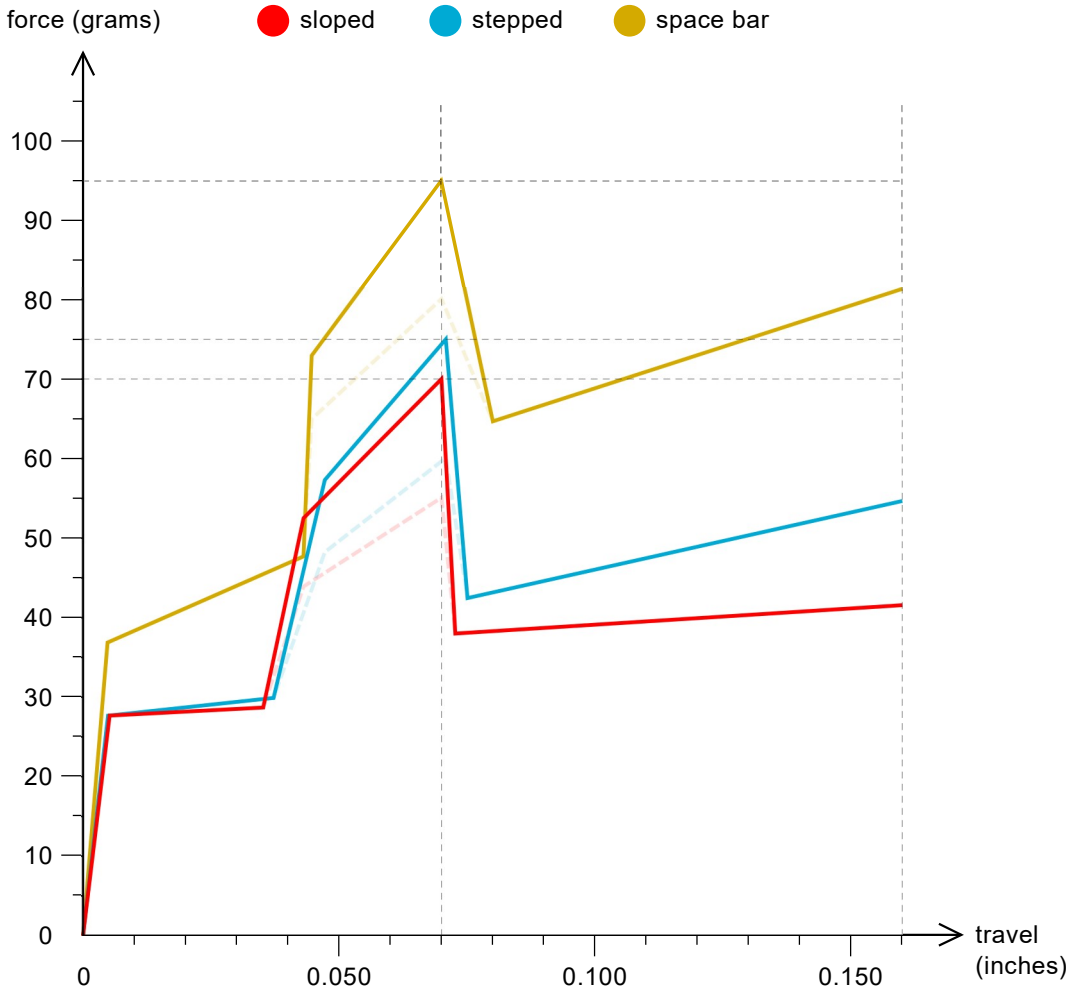
The above illustration has been cleaned up a little and coloured; the truly bizarre keycap has however been left as-is! A small pin suspended on a spring projects outwards from the plunger. As the plunger is depressed, this pin encounters an obstruction; compressing the pin's spring to clear the obstacle increases the stiffness of the switch momentarily. Curiously, the drawing was published in November 1976, not long after the SD8 chart in September 1976.

Disassembly of model 1001SD11A1A shows that the plastic pin is 3.7 mm long and 1.6 mm in diameter (1.2 mm diameter at the end that engages with the shell), and the spring supporting it is 3.1 mm long and 1.55 mm in diameter. The "A" chart for the alternate action type shows that this uses a sprung follower pin, very similar to that of RAFI full-travel keyswitches, and it may well be that the alternate action provided inspiration for the tactile design. Hi-Tek Series 725 is similar, in that the click mechanism appears to be based on the alternate action design. Tactile SD switches do produce a faint click when released, caused by the pin being pushed outwards rapidly.

1001SD Series Chart 13 A shows that SD18 switches still use the exact same mechanism.

Tactile SD switches make use of the lower return spring weights, using the 1.3 oz spring for normal keys, and the 2.0 oz spring for space bars. Overlaid onto this is the tactile feedback, which provides switches with their normal operating force.

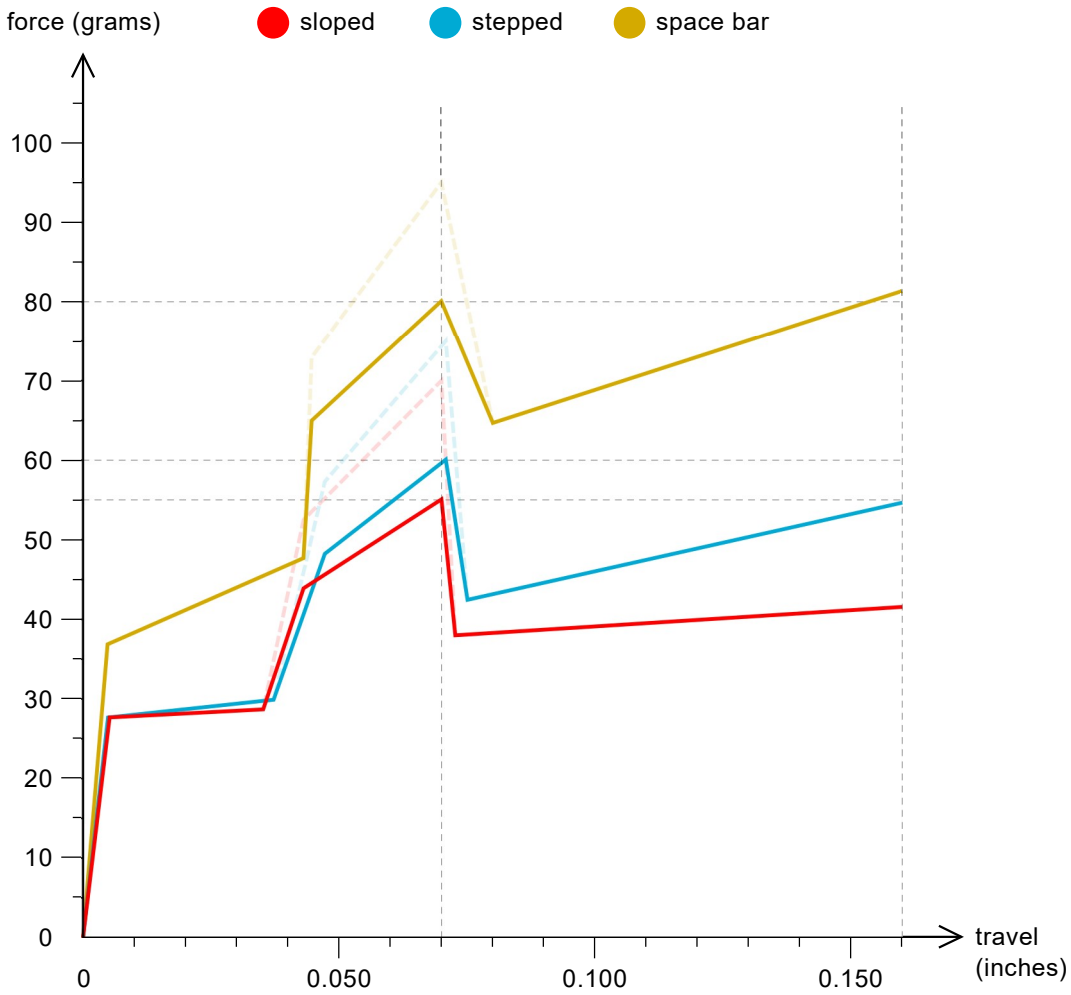
The force curves for standard weight tactile switches are given in 1001SD Series charts 8 and 9. Curiously, stepped switches have a higher tactile force than sloped switches.



Micro Switch SD standard tactile
(taken from 1001SD Series charts 8 and 9)

As indicated by the force curves, the tactility is pronounced, with a clear lead-in period. Testing with two 11A1A standard weight tactile switches does reveal a significant variation in force, with one being much easier to press than the other; the stiffer of the two feels like it borders on the edge of practicality, while the other feels fairly soft. The tactile feel is not that dissimilar from the sample tactile Datanetics DC-60 switch from Meryl Miller, but not as smooth.

1001SD Chart 10 gives the tactile forces for the soft tactile switches, but does not depict the force curves. While the SD16 catalogue entry shows the force curves for the linear types, the graph is substantially at odds with the published figures. The published figures correspond much more closely with the tactile graphs than the linear graphs do. Thus, the following hypothetical graph for the soft tactile switches assumes that the underlying curve is the same as for standard weight tactile switches, and that the tactile forces are all that differs. Disassembly of the standard weight tactile switches suggests that this is true, because the tactile peak magnitude is set using a separate, perpendicular spring and should thus be entirely separate from the main force.



Micro Switch SD soft tactile
(hypothetical, projected from 1001SD Series chart 10)

Illumination

There are at least two designs of illuminated switch. Older switches have the LED placed directly into the plunger, providing centre illumination. To make space for this, the normally square section keystem is replaced with a “blade” stem similar to the “straight” stem of Cherry M5/M6/M7 switches. On these switches, the LED moves with the keycap, providing a constant level of illumination. This approach was taken with several other brands including Alps (with KCC series) and Omron (with B2H, B2R and B2C).

The 16B3E switches found in the Sun 32SD38-4-E keypad instead use a stationary LED that is fitted into a recess in the side of the switch, providing corner illumination. A cover is placed into the recess to retain the LED. This approach is simpler and does not require special keycaps but has the disadvantage that the light level differs as the key is pressed and released. The switches in 32SD38-4-E do not have special part numbers, so it would appear that the retaining covers were a separate part ordered separately from the switch. This corner illumination option can also be seen in Sperry/Univac keyboard.

Sensor output

Micro Switch offered a variety of output options. Sink level, sink pulse, source level, logic scan and timed repeat were all available with SW and SN Series and are explained on that page, as well as briefly below. (It is possible that logic scan was introduced with SD and then adapted for SW; the sequence of events is not yet known.) One additional output types was introduced with SD Series—three-terminal—covered on this page below.

Sink level
: Sink level switches draw current when active, and remain active while the key is held. The Hall sensor has dual isolated outputs suitable for two-of-N encoding.

Sink pulse
: Sink pulse is similar to sink level, but current is only passed momentarily (in the range of 10–100 µs). Switch actuation is signalled, but release is not. The Hall sensor has dual isolated outputs.

Source level
: Source level switches supply current when active, and remain active while the key is held. The Hall sensor has dual isolated outputs.

Logic scan
: Logic scan switches provide the ability to use matrix scanning. One of the output terminals is replaced with an input terminal to enable the single output transistor. Logic scan switches are sink level when active.

Timed repeat
: Assuming that the behaviour is the same as with SW Series, this is as with sink pulse, except that one output sits at an intermediate voltage until the key is released, allowing special circuitry to detect that a key is held, without knowing which key it is. Presumably the last-detected key is latched.

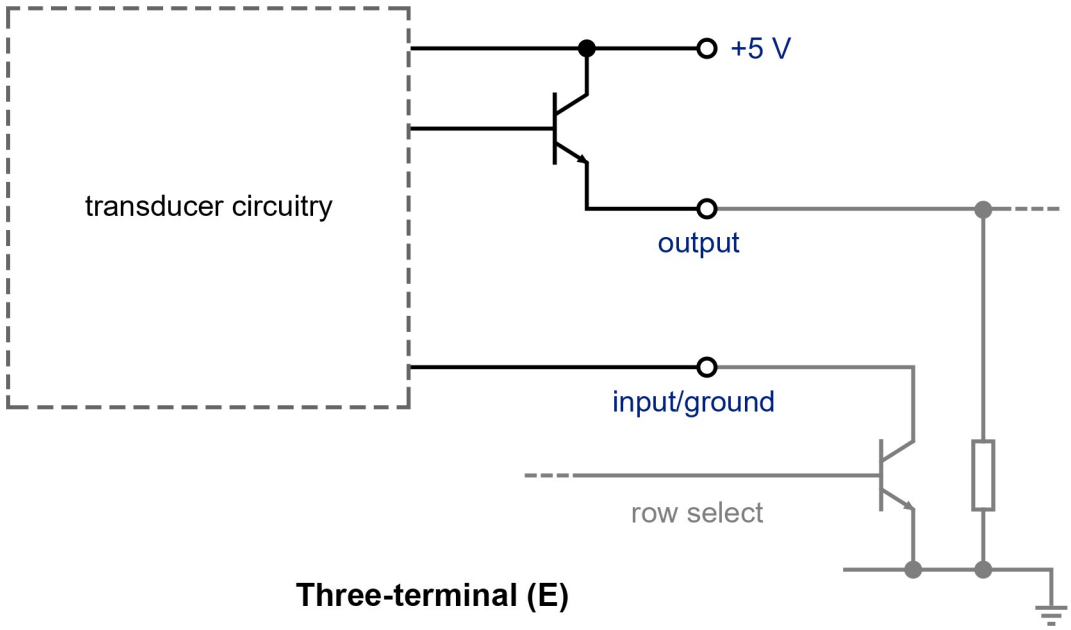
Three-terminal

Three-terminal switches date to around 1979 and are a special adaptation of the logic scan type that is designed to greatly reduce the power consumption of a keyboard. They function either as source level or logic scan. The ground terminal is renamed “input”, and when the input is high or disconnected, there is no potential difference across the switch and it is inoperative. When the input is pulled low, the switch powers up and the output reflects the key state (low when inactive, high when active). If input is hard-wired to ground, the switch functions as a source level type. When input and output are connected into a matrix, the switches are only powered up when their row is active. A standard logic scan switch requires 3.5 mA current when idle, and for 100 switches there would be a total of 350 mA of idle current. The ability for switches in active matrix rows to be powered off saves a considerable amount of power. There is only one output on these sensors, as they are targeted at matrix keyboards, while the original sensors are designed for two-of-N wired encoding which requires dual outputs per switch

The Focus on Keyboards article in Electronic Design magazine from 24th May 1979 notes the following:

> Keyboards featuring a Hall-effect device, magnet and plunger in each keyswitch position (Fig. 1) are available from Honeywell's Microswitch Division, which recently introduced a three-terminal Hall-effect module that helps reduce power consumption by a reported 60%. The module's "scan" input shares a pin with the negative power supply, so deselected modules draw no current. An on-board µP activates only eight keys at a time. The modules themselves come individually or in completely built, intelligent keyboards.

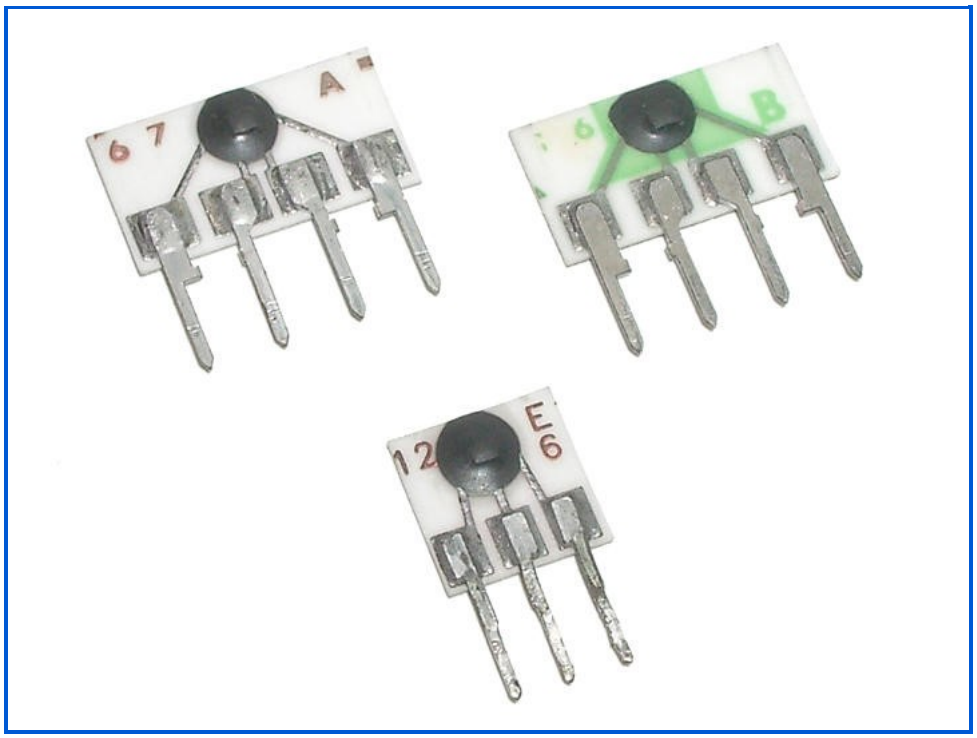
Although figure 1 depicts SW Series, SD Series is implied here (as three-terminal SW is not known), and this gives a rough idea of when the three-terminal types were introduced. The diagram below shows how the switches operate:



Three-terminal (E)

The diagram above is not an official Micro Switch diagram, but rather a traditional SW Series diagram adapted to depict a three-terminal sensor, for consistency with the SW-era diagrams. The faint portion on the right shows how the switch is wired into the surrounding circuit to form the logic scan arrangement; without this portion, it is a single-output source level sensor.

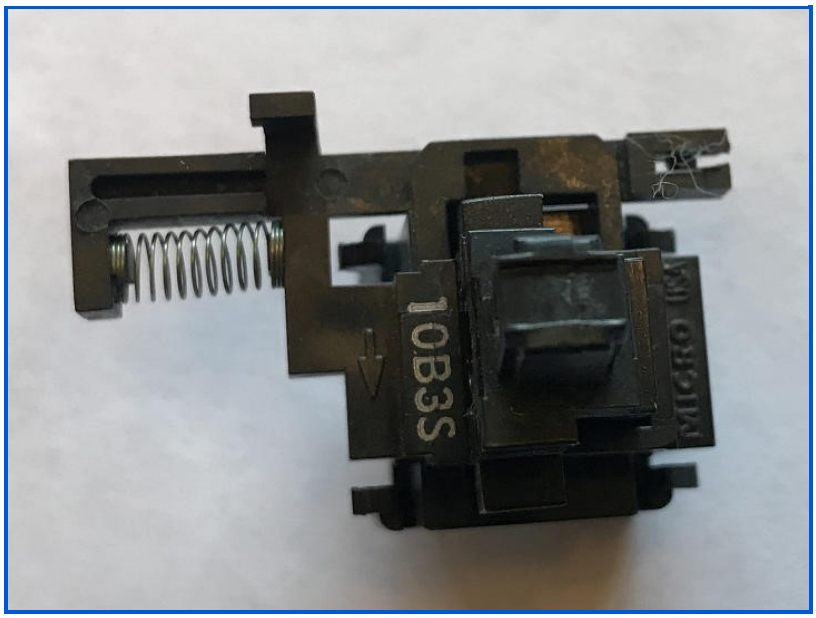
Three-terminal sensors are physically smaller and have tighter pin spacing, and cannot be swapped with any other SD sensor type:



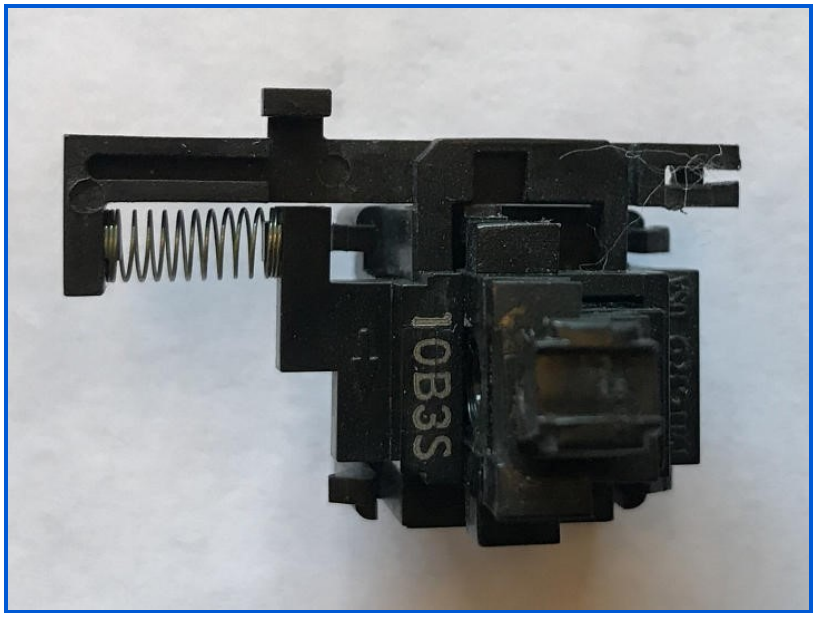
Micro Switch sink level (A), sink pulse (B) and three-terminal (E) Hall sensors (the last one has seen better days)

Secretarial shift

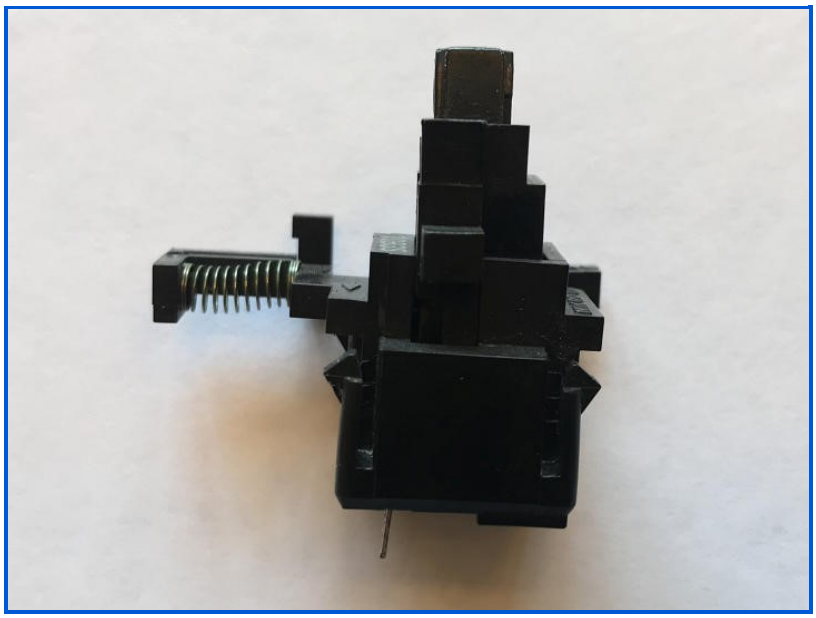
Secretarial shift was included in the series. The exact nature of the mechanism is not documented, but the workings can be understood from a combination of photos from Deepak Kandepet of part of the mechanism, and dork_vader_exe's photos of an 112SD12-2. The three switch positions (left Shift, right Shift, and Lock) require only a single switch type, SD7 (classic) or SD10 (0.05″ taller plunger). This switch is used in conjunction with additional parts to form a complete secretarial shift assembly. Switch 10B3S together with the left-hand side mechanism is shown below in photos provided by Deepak:



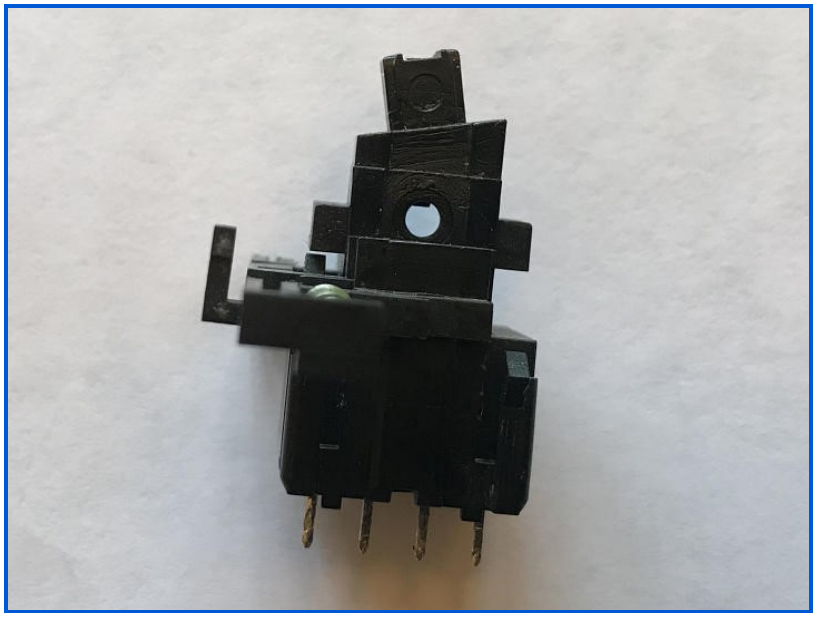
Top



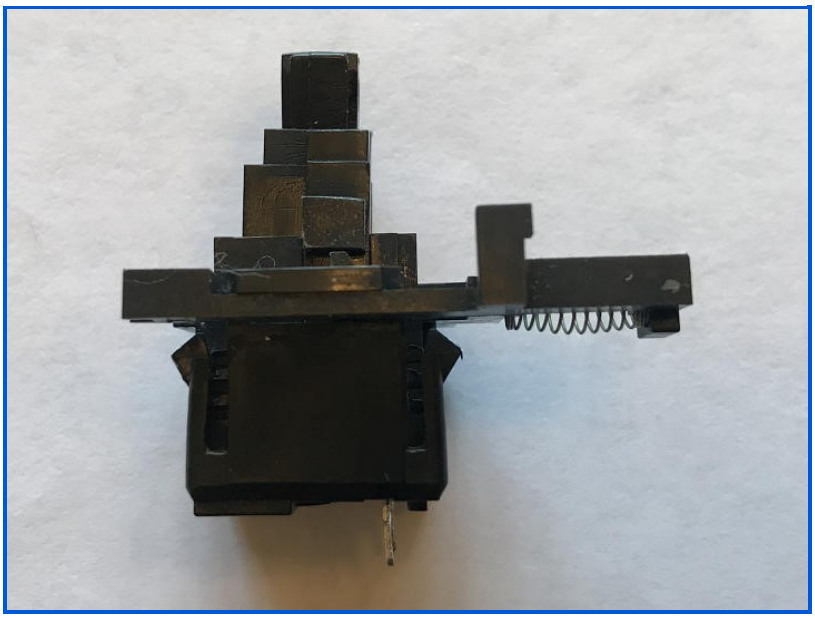
Top



Front



Left side



Back

The basic switch contains the means to slide a bar to the right, used for releasing the Lock key. In addition, the plunger contains a protruding block at the front. The switches under the two Shift keys have left-hand and right-hand sliding bars attached, which between them hold the connecting rod. The left-hand sliding bar has a raised post that rests against the block on the Lock key plunger. As the Lock key is pressed, the spring within the left-hand mechanism pulls the bar leftwards, and the post on the bar hooks the Lock key plunger block and holds it down. Pressing either Shift key pushes the bar to the right, releasing the Lock key.

Key lock out

Some SD Series switches have a round hole on one side of the plunger. The presence or absence of the hole seems to have no bearing on the part number stamped onto the switch. Such a hole has been used in for a lock-out collar and this may be the sole purpose for this hole. Some Cherry M7 switches have a smaller hole in the plunger for the same purpose; those have only been seen with a small rod placed through the hole.

Product groupings

Product and part numbers are divided into two main groupings. Components use catalogue listings of the form “SD-” followed by five digits. This grouping includes magnets, shells, plungers, “spacers” (pry tools), PCBs, sensors etc. Switches, keycaps and complete keyboards have catalogue listings where “SD” is prefixed by a number.

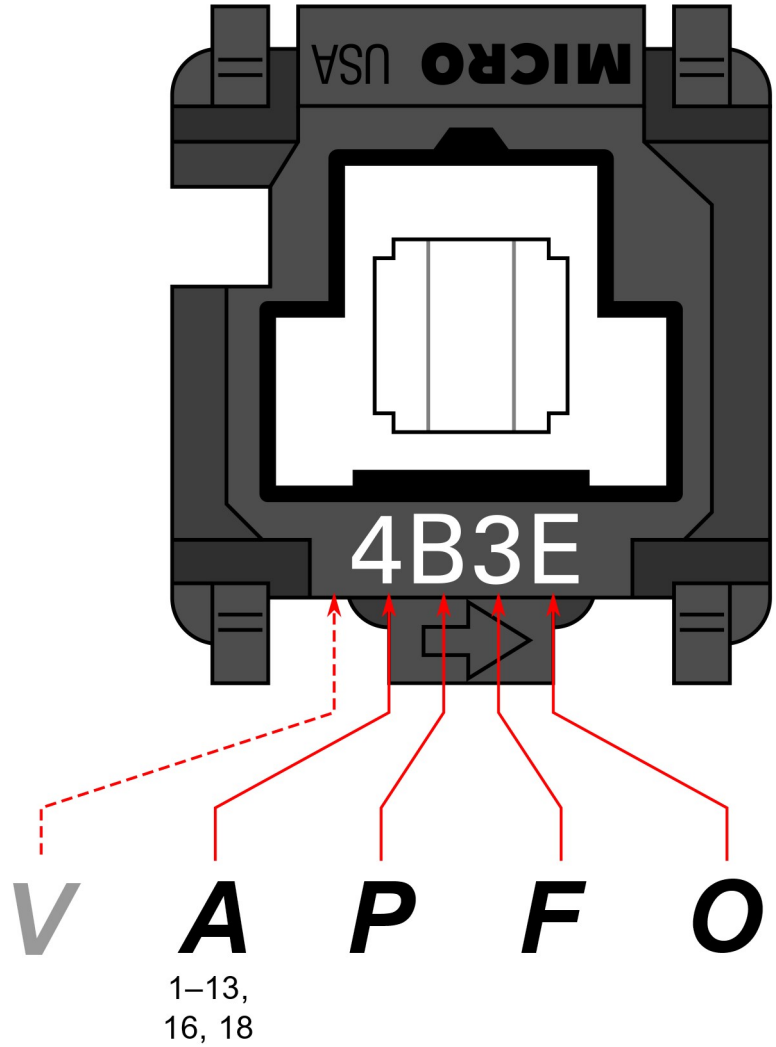
Grouping	Usage
1SD…	Found on a single switch; unexplained

2SD…	Keycaps, possibly SD-specific (normal keycaps are 2SW series)
1001SD…	Switches
Other *n*SD…	Keyboards, where *n* denotes the number of keys
SD-*nnnnn*	Components

Switches

Part schema

The part number schema for SD Series switches in most cases is as follows:



1001SD(*V*)*APFO*

“1001”
: Prefix for keyswitch modules

“SD”
: Series name

V
: This prefix letter is found on some switches and it indicates the variant of the switch, including Hall sensor variants. See switch variants below.

A
: Nominally this field denotes the action, but each action has a separate code within each subseries. The choice of linear versus tactile is also encoded in this position. See action below. The options are: momentary (linear, tactile and reduced-force tactile), alternate action, support, secretarial shift and illuminated.

P
: Plunger type: **A** = sloped, **B** = stepped, **C**/**D**/**H** = custom blade types for NCR, **F** = flat top, **G** = flat top, **K** = special blade type, **N** = flat stepped, **S** = sloped (variant), **T** = stepped (variant), **U** = cruciform stem, **V** = unknown (stepped); see plunger types below.

F
: Nominal operating force (at pretravel); see operating force below.

O
: Output: **A** = sink level, **B** = sink pulse, **C** = source level, **D** = none (dummy), **E** = three-terminal, **K** = timed repeat, **S** = logic scan

Abbreviated identification codes

Some keyboards have abbreviated identification codes marked on the switches. Normally, the identification code omits only the constant characters (“1001SD”), but in some cases the identification code is the last two characters of the model number, followed by a letter of unspecified meaning. These codes are therefore ambiguous. For example, 1001SD chart 7 gives both 1001SD1C3A (momentary) and 1001SD2C3A (alternate action) as having identification code “3A S”. All the switches in chart 7 are custom types produced for NCR.

Codes 1AS, 1DS, 3AS, 3BS, 6AS and N3AS also appear on a 1976 Univac keyboard (125SD12-1), which are all standard switches (plunger type B or T). The switches in 125SD12-1 all appear to be stepped, while 1001SD chart 7 lists sloped switches; both sets of switches have “S” as the final letter. No meaning is ascribed to that letter.

1SD

Model 1001SD1C1A also exists as a replacement part with model 1SD1C1A-R. This part number is in the general format used with SW switches: a prefix of “1” (single key) and a suffix of “-R” for replacement. The year of manufacture is not included. No explanation is known for this anomaly.

Subseries

The only subseries for which documentation has been recovered, is SD16, which is officially

documented as “SD16 Keyswitch Modules” within SD Series. Other variants are named in this pattern here for convenience.

SD1–3, SD7–9

These are standard keyboard switches. The distance between the top of the mounting plate and the top of the plunger body is 10 mm (0.395″). These all appear to have clear plungers. Only a single tactile weighting is known to be offered (SD8).

SD4–6, SD10–13

These switches differ from the above types by having a plunger body that extends an extra 0.05″ in height to 11.3 mm (0.445″). The plunger is black in all observed models. Additionally, there is a lower-weight tactile model (SD13) in addition to standard weight tactile (SD11).

These are seen with additional ridges and bumps on the keystem to afford greater grip on the keycap. It is not clear whether this is specific to these taller versions as insufficient data exists to be sure; photos of SD1–3 are not clear enough to be sure that they do not have this characteristic.

Where SD1 has plunger is type S or T, the shell design is slightly different, with a ridge around the plunger aperture; this ridge seems to be the 0.05″ taller bearing surface described in chart 12 A.

SD16 and SD18

SD16 switches are described in the SD16 Keyswitch Modules catalogue excerpt. These take CT Series keycaps (as found on ST and SC keyboards); this may be a way to reduce the height of SD Series keyboards. SD16 is momentary, and SD18 is the corresponding tactile version. Sadly, the rated lifetime was not included in the specifications. All SD16 and SD18 switches are stepped, but with a reduced tilt angle of 4° (not documented; derived from the drawing) versus the 11° tilt of earlier models.

These switches appear in the Sun 32SD38-4-E keypad, made in 1996; the specific switch used is 1001SD16B3E (marked 16B3E).

SD16 was offered in both three and four-terminal variants, just as were some other models. Chart 13 covers SD16 and SD18, and they are depicted as four-terminal; output type E is not included.

Documentation for the tactile force of SD18 has not been recovered yet.

Characteristics

The charts from Micro Switch cite all of the following possibilities:

Action	Plunger type	Operating force	Output
1, 2, 3	A, B, C, F, G	1, 2, 3, 4, 5, 6, 8	A, B, C, D, K, S

1, 2	K	1, 2, 3, 4, 6, 8	A, B, C, D, K, S
4, 5, 6	A, B, G, H, S, T	1, 2, 3, 4, 5, 6, 8	A, B, C, D, K, S
7, 10	A, B	1, 2, 3, 6, 8	A, C, K, S
8	A, B	1, 2	A, B, C, D, K, S
9, 12	A, B	3	A, B, C, D, K, S
11	A, B, G	1, 2	A, B, C, D, K, S
13	A, B	1, 2	A, B, C, D, K, S
16, 18	B	1, 2, 3, 4, 5, 6, 8	A, B, C, D, K, S

Additional types exist for which documentation has yet to be recovered. Three-terminal types are not included in any of the charts.

Action

Schema position: 1001SD(*V*)***A****PFO*

The following items are arranged in subseries order:

Code	Action/type	Subseries	Colour	Chart date
1	Momentary, linear	Standard	Clear	1975-09-25
2	Alternate action			
3	Support		*(not observed)*	
7	Secretarial shift			1975-09-24
8	Momentary, tactile			1976-09-20
9	Illuminated		Clear	1975-09-23
4	Momentary, linear	0.05″ taller plunger	Black	1975-09-25
5	Alternate action			
6	Support			
10	Secretarial shift			1976-01-13
11	Momentary, tactile			1976-10-07
12	Illuminated			1976-03-11
13	Momentary, tactile, lower tactile force		*(not observed)*	1978-02-03
16	Momentary, linear	Slot mount, lower profile	Black	1985-12-04
18	Momentary, tactile		*(not observed)*	

The charts for SD1–3 and SD4–6 have the same drawn and checked dates. This may explain why the plunger dimensions differ but the shapes are the same (the extra 0.05″ plunger height is not

shown), yet this makes it even harder to understand why that extra 0.05″ was offered, since it was clearly not a later revision.

Plunger types

Schema position: 1001SD(*V*)*APFO*

Plunger type	Name	Description
A	Sloped	This indicates that the standard keycap mount is used (cuboid in most cases, blade for illuminated switches, and slot for SD16 and SD18), and that the mount is upright.
B	Stepped	This indicates that the standard keycap mount is used, and that it has an 11° tilt. Perhaps to maintain proper clearance for the keycap, the base of the keystem is 1.83 mm (0.72″) higher than on a sloped switch. Strangely, stepped switches with tactile feedback use 5 gf extra tactile force than their sloped counterparts. Note that SD16 and SD18 have only around 4° of tilt, and are slot mount.
C	Special (NCR)	This looks like the same keystem used on integral illuminated switches, as though NCR wanted to use a single keystem for all switches on a keyboard. This is not confirmed, as the keystem dimensions for illuminated switches are not given.
D	Special (NCR)	This is either a very tall custom keystem with a hybrid Micro/tee mount, or a strange kind of blade stem. Chart 4 A is not clear which is which; the other will be H.
F	Flat top	This is a switch with no keystem. It has been observed in the UGC-74 Keyboard. This plunger type is also used—fitted with a pompom—for dummy switches of the support type (SD3 and SD6).
G	Flat top	This has not been observed.
H	Special (NCR)	See D above.
K	Special blade	This has been found in a Bunker Ramo keyboard. It is similar to plunger type C, but narrower.
N	Flat-stepped	This has been observed in a Honeywell terminal keyboard in switch type 4N1E where it is fitted with a pompom and used alongside a dummy switch with a regular B plunger. This seems to be the stepped equivalent of plunger type F.
S	Sloped	The plunger appears to be the same as A. The plunger aperture has a ridge around it, and the plunger has a different internal part number. These switches so far have been found (as per the drawing) to lack the vertical channel used by the tactile mechanism.
T	Stepped	T is to B, as S (above) is to A.
U		This is not in the charts. It is a custom cruciform stem, seen in 76SD30-2. It is not clear from the photos whether these are stepped or sloped switches.

V	*(unknown)*	This is not in the charts. It appears to be the same as B. It is found in a Sperry/Univac keyboard.

Operating force

Schema position: 1001SD(*V*)*APFO*

Micro Switch used newtons, but the SI figures are represented here as centinewtons to match common industry practice of using centinewtons and grams force (1 cN is approximately equal to 1 gf).

Codes 1 and 2 are used for both linear and tactile switches. For linear switches, they denote “half force” and light switches. For tactile switches, they represent standard weight switches (normal and space bar) as these use lower-weight springs to compensate for the tactile peak.

Code	Operating force		Tactile force (tactile models only)			
	US	**SI**	**SD8, SD11**	**SD13**	**SD18**	**Non-tactile models**
1	1.3 oz	36.1 cN	70^{+20}_{-15} gf (sloped)	55^{+15}_{-10} gf (sloped)	Unknown	N/A
			75^{+20}_{-15} gf (stepped)	60^{+15}_{-10} gf (stepped)		
2	2.0 oz	55.6 cN	95±15 gf (space bar)	80±15 gf (space bar)		
3	2.5 oz	69.5 cN	N/A			
4	None					
5	3.5 oz	97.3 cN				
6	6.0 oz	166.8 cN				
8	8.0 oz	222.4 cN				

Output

Schema position: 1001SD(*V*)*APF**O***

The letter indicating the sensor type is written on the sensor PCB. If one or more other letters are included in the markings, then the letter indicating the sensor type is written in a different colour, such as a dark grey.

Code	Output
A	Sink level

B	Sink pulse
C	Source level
D	None (dummy)
E	Three-terminal
K	Timed repeat
S	Logic scan

Switch variant

Schema position: 1001SD(***V***)*APFO*

This is an extra letter added to some switch models to indicate a variant, such as an additional part or a special sensor variant. Known letters are D, Q, R, T and U.

Code	Assignment
D	Unknown; seems to indicate sensor type
F	Category 1 chip package only (1001SDF4B3A, 1001SD Series Chart 13 A)
Q	Unknown; has matching sensor type (confirmed with model 1001SDQ4A3A, whose sensor PCB is marked “Q” instead of the expected “A”)
R	Unknown; seems to indicate sensor type
T	Unknown; seems to indicate sensor type
U	Unknown; seems to indicate sensor type
Y	SD-10181 stop fitted to the switch (appears to be some kind of damper)

Maintenance

Removing the plunger is possible, but difficult. Larry Bishop (formerly a quality control technician at Micro Switch) notes that inserting a slim blade screwdriver onto the side of the plunger adjacent to the part number and twisting will release the plunger. This is not easy, and the shell will suffer some gouging (unless there is a technique that delivers better results) but the plunger can be removed in this manner.

Avoid excessive heating of the terminals when soldering and de-soldering switches, as this risks damaging the sensor. Micro Switch 1001SD charts instruct the use of a thermostatically-controlled soldering iron with a 1/8″ diameter tip set to 500 °F (260 °C), applied to the terminals for no more than two seconds.

For examples of both problems, see this forum topic.

Keyboards

Of all the SD Series keyboards whose switch types are documented, over half use S and E sensors and are likely use matrix scanning. The other models generally use either sink level or sink pulse switches. The logic scan (S) type goes back at least as far as 1976, and it may have been specifically introduced with SD Series. The low-energy scan (E) type goes back to around 1979.

See the SD Series keyboards page for known keyboard details.

SD Series keyboards with MOS encoders typically used encoder chips within SW Series, although exceptions exist; see under other components below for SD Series encoders.

Keycaps

The Interdata Master Part Number List from the 26th of January 1979 lists the following keycaps:

- KEYTOP-BRK MICRO 2SD339 YEL
- KEYTOP-ERR MICRO 2SD339 RED
- KEYTOP-CAR-MSG MICRO 2SD339 GR

It is unlikely that these are complete part numbers. 2SD339 appears to denote the form (single-level, single-unit with integrated LED) as well as top surface texture, presence of legend, and colour of LED. The additional details (legend text, legend colour and body colour) are not part of the basic catalogue listing and would likely be encoded within a longer catalogue listing of the sorts seen for 2SW Series. The table below is all the types from 2SD Series Chart 30, the chart that contains 2SD339:

Cat. listing	Size	Legend	Finish	LED colour
2SD337	1 unit	No		Red
2SD337-M		No	Matt top surface	
2SD339		Yes		
2SD339-M		Yes	Matt top surface	
2SD345		No		Green
2SD345-M		No	Matt top surface	
2SD347		Yes		
2SD347-M		Yes	Matt top surface	
2SD349		No		Yellow
2SD349-M		No	Matt top surface	
2SD351		Yes		
2SD351-M		Yes	Matt top surface	

Until further charts are observed, one can only guess what function 2SD Series plays. As SD

switches have a number of different keycap mounts, it may be that 2SD Series contains keycaps specific to SD switches. The switch charts list the following:

Chart	Switches	Keycap type
1	SD1, SD2, SD3 (standard height)	Standard truncated SD
2	SD4, SD5, SD6 (extra 1/20″ plunger height)	Standard truncated SW
3	SD7 (secretarial shift standard height)	Standard truncated SW
4	SD9 (LED standard height)	Standard truncated SD LED
5	SD7 (secretarial shift extra 1/20″)	Standard truncated SW
6	SD12 (LED extra 1/20″)	Standard truncated SD LED
7	Plunger C	Not depicted or specified
8	SD8 (tactile standard height)	Standard truncated SD
9	SD11 (tactile extra 1/20″)	Standard truncated SW
10	SD11 (light tactile extra 1/20″)	Standard truncated SW
11	Plunger K	Not depicted or specified
13	SD16, SD18 (reduced profile)	Standard 3CT103

Other components

Cat. listing	Component
SD-10101	Switch module removal tool (unclear if single or a pair; depicted in PK 8919 2)
SD-10181	Stop; possibly some kind of damper (see the “A” charts)

The following encoders use SD Series part numbers instead of the expected SW Series:

Part	Supplier	Keyboards
SD25015K	NS	70SD22-4 (1978)

Mysteries

- What do the prefixes mean in five-part identification codes?
- What is plunger type V?
- What does “S” denote in abbreviated identification codes?

Documentation

The following official documentation has been retrieved thus far:

- Micro Switch 1001SD Series M charts 1–11, 13 (zip file of separate images) provided by Honeywell
- Micro Switch 1001SD Series A charts 1, 2, 4, 6, 8, 12 and 13 (zip file of separate images) provided by Honeywell
- SD Series, SD16 Keyswitch Modules catalogue entry (unknown source; converted to 300 DPI to make it usable: original 1200 DPI version)

The following advertisments and articles were scanned by Bitsavers unless otherwise noted.

- Micro Switch SD preliminary advertisement, Electronic Design, Vol. 21 No. 25, December 6 1973, p. 233
- Micro Switch keyboards advertisement, Electronic Design, Vol. 22 No. 12, June 7 1974, page 41
- Intelligent keyboard advertisement, Computer Design, October 1977
- Intelligent keyboard advertisement, Computer Design, December 1977 (103SD24-1)
- 103SD24-1 advertisement, Electronic Design, January 18, 1978
- 3-terminal Hall effect modules write-up, Computer Design, May 1979
- Keyboards advertisement, Electronic Engineers Master 1983–84 Volume 1

See also

- SD Series switch types
- SD Series keyboards
- SD Series on the Deskthority wiki

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