

SWITCH



Electrical switches. Top, left to right: circuit breaker, mercury switch, wafer switch, DIP switch, surface mount switch, reed switch. Bottom, left to right: wall switch (U.S. style), miniature toggle switch, in-line switch, push-button switch, rocker switch, micro switch.

A switch is a device for changing the course (or flow) of a circuit. The term "switch" typically refers to electrical power or electronic telecommunication circuits.

In applications where multiple switching options are required, (i.e. a telephone service) mechanical switches have long been replaced by electronic variants which can be intelligently controlled and automated.

Prototype

The prototypical model is a mechanical device (for example a railroad switch) which can be disconnected from one course and connected to another.

Different areas

In electronics

The switch is referred to as a "gate" when abstracted to mathematical form. In the philosophy of logic, operational arguments are represented as logic gates. The use of electronic gates to function as a system of logical gates is the fundamental basis for the computer —ie. a computer is a system of electronic switches which function as logical gates.

In mechanical engineering

Construction

In the simplest case, a switch has two pieces of metal[[1]] called contacts that touch to make a circuit, and separate to break the circuit. The contact material is chosen for its resistance to corrosion, because most metals form insulator[[2]] oxides[[3]] that would prevent the switch from working. Sometimes the contacts are plated with noble metals[[4]]. They may be designed to wipe against each other to clean off any contamination.

Nonmetallic conductors, such as conductive plastic[[5]], are sometimes used. The moving part that applies the operating force to the contacts is called the actuator, and may be a toggle or dolly, a rocker, a push-button or any type of mechanical linkage (see photo).



Triple Pole Single Throw (TPST) switch used to short the windings of a 3 phase wind turbine for braking purposes. Here the switch is shown in the open position.

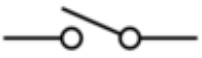
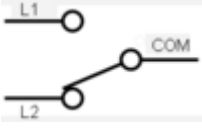
A pair of contacts is said to be 'closed' when there is no space between them, allowing electricity to flow from one to the other. When the contacts are separated by a space, they are said to be 'open', and no electricity can flow.

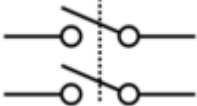
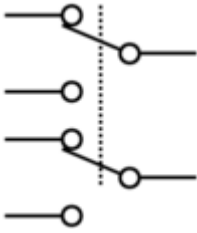
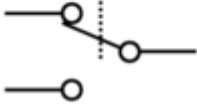
Classification

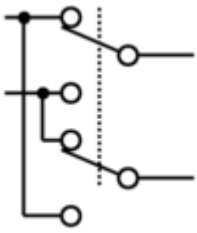
Switches can be classified according to the arrangement of their contacts.

Some contacts are normally open until closed by operation of the switch, while others are normally closed and opened by the switch action. A switch with both types of contact is called a changeover switch.

The terms pole and throw are used to describe switch contacts. A pole is a set of contacts that belong to a single circuit. A throw is one of two or more positions that the switch can adopt. In mains wiring names generally involving the word way are used; however, these terms differ between British English[[6]] and American English[[7]]. The terms two way and three way are used in both with different meanings.

Electronics abbreviation	Expansion of abbreviation	British mains wiring name	American mains wiring name	Description	Symbol
SPST	Single pole, single throw	One way	Two way	A simple on-off switch: The two terminals are either connected together or not connected to anything. An example is a light switch.	
SPDT	Single pole, double throw	Two way	Three way	A simple changeover switch: C (Common) is connected to L1 or	

				to L2.	
SPCO	Single pole changeover or Single pole, centre off			Equivalent to SPDT. Some suppliers use SPCO for switches with a stable off position in the centre and SPDT for those without.	
DPST	Double pole, single throw	Double pole	Double pole	Equivalent to two SPST switches controlled by a single mechanism	
DPDT	Double pole, double throw			Equivalent to two SPDT switches controlled by a single mechanism: A is connected to B and D to E, or B is connected to C and E to F.	
DPCO	Double pole changeover or Double pole, centre off			Equivalent to DPDT. Some suppliers use DPCO for switches with a stable off position in the centre and DPDT for those without.	

		Intermediate switch	4-way switch	<p>DPDT switch internally wired for polarity-reversal applications: only four rather than six wires are brought outside the switch housing; with the above, B is connected to F and C to E; hence A is connected to B and D to C, or A is connected to C and D to B.</p>	
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Switches with larger numbers of poles or throws can be described by replacing the "S" or "D" with a number or in some cases the letter T (for triple). In the rest of this article the terms SPST SPDT and intermediate will be used to avoid the ambiguity in the use of the word "way".

Make-before-break, break-before-make

In a multi-throw switch, there are two possible transient behaviors as you move from one position to another. In some switch designs, the new contact is made before the old contact is broken. This is known as make-before-break, and ensures that the moving contact never sees an open circuit. The alternative is break-before-make, where the old contact is broken before the new one is made. This ensures

that the two contacts are never shorted to each other. Both types of design are in common use, for different applications.

Biased switches

A biased switch is one containing a spring that returns the actuator to a certain position. The "on-off" notation can be modified by placing parentheses around all positions other than the resting position. For example, an (on)-off-(on) switch can be switched on by moving the actuator in either direction away from the centre, but returns to the central off position when the actuator is released.

The momentary push-button switch is a type of biased switch. The most common type is a push-to-make switch, which makes contact when the button is pressed and breaks when the button is released. A push-to-break switch, on the other hand, breaks contact when the button is pressed and makes contact when it is released.

An example of a push-to-break switch is a button used to release a door held open by an electromagnet. Changeover push button switches do exist but are even less common.

Source: <http://engineering.wikia.com/wiki/Switch>