



The Innovative Switch Company

GLOSSARY

Terms and Definitions

The following glossary contains definitions of characteristics, options, and esoteric terms applicable to rotary switches. It is in alphabetical order for ease of reference, and can be useful to the designer in establishing specifications to meet unique applications.

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Term	Definition																																																																																																							
Add-A-Pot	Add-A-Pot rotary switches include a Potentiometer as part of the assembly. Concentric shafts allow independent actuation of the switch and the potentiometer. Add-A-Pot is a popular custom modification available on many of our switch lines.																																																																																																							
Adjustable Stops	Adjustable stops are holes beneath the panel seal. Stop Pins are special pins inserted in these holes, and act as position stops.† Stop pins allow the user to pre-select switch positions where the range of motion stops.																																																																																																							
Angle of Throw	The angular degrees between positions. <table border="1" data-bbox="548 737 1252 1146"> <thead> <tr> <th>Number of Positions</th> <th>Degrees between Positions</th> </tr> </thead> <tbody> <tr><td>4</td><td>90°</td></tr> <tr><td>6</td><td>60°</td></tr> <tr><td>8</td><td>45°</td></tr> <tr><td>10</td><td>36°</td></tr> <tr><td>12</td><td>30°</td></tr> <tr><td>16</td><td>22.5°</td></tr> <tr><td>25</td><td>14.4°</td></tr> <tr><td>48</td><td>7.5°</td></tr> <tr><td>50</td><td>7.2°</td></tr> <tr><td>100</td><td>3.6°</td></tr> </tbody> </table>	Number of Positions	Degrees between Positions	4	90°	6	60°	8	45°	10	36°	12	30°	16	22.5°	25	14.4°	48	7.5°	50	7.2°	100	3.6°																																																																																	
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Coded Switches	Rotary switches that convert positions into a binary number: <ul style="list-style-type: none"> •BCD (Binary Coded Decimal) •Binary Base 2 •Octal (Base 8) •Hexadecimal (Base 16) •Gray Code The most popular binary codings available are: Standard Binary to 4 Pins <table border="1" data-bbox="500 1495 1385 1719"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="16">Position</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> </thead> <tbody> <tr> <th rowspan="4">Pin</th> <th>1</th> <td></td><td>•</td><td></td><td>•</td><td></td><td>•</td><td></td><td>•</td><td></td><td>•</td><td></td><td>•</td><td></td><td>•</td><td></td><td>•</td> </tr> <tr> <th>2</th> <td></td><td></td><td>•</td><td>•</td><td></td><td></td><td>•</td><td>•</td><td></td><td></td><td>•</td><td>•</td><td></td><td></td><td>•</td><td>•</td> </tr> <tr> <th>4</th> <td></td><td></td><td></td><td></td><td>•</td><td>•</td><td>•</td><td>•</td><td></td><td></td><td></td><td></td><td>•</td><td>•</td><td>•</td><td>•</td> </tr> <tr> <th>8</th> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td> </tr> </tbody> </table>			Position																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Pin	1		•		•		•		•		•		•		•		•	2			•	•			•	•			•	•			•	•	4					•	•	•	•					•	•	•	•	8									•	•	•	•	•	•	•	•
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Common	<p>The common is one of the switches' terminals, and is the terminal that is always part of the switch circuit regardless of position.† The common connects to the different circuits via the individual stator terminals as the shaft rotates from position to position.</p> <p>Also called the pole.</p>																																																																																																																																																																																																										
Concentric Shafts	<p>Concentric shafts are two shafts on a common axis that are independently actuated, performing separate switching functions on the same assembly.</p>																																																																																																																																																																																																										

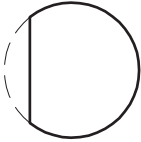
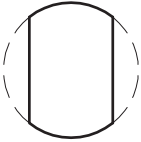
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<p>Concentric Shaft Switches</p>	<p>A concentric shaft switch is one that has a shaft within a shaft.† For example, an outside hollow shaft of .250" diameter with a .125" shaft inside it. Each shaft works independently, actuating one or more decks, each deck having different throw angles and number of positions. In effect, it is like having two separate switches in one panel location.</p> 
<p>Conformal Coat</p>	<p>A sealant used on † switch seams or terminal bases to safeguard against caustic acidic, or corrosive contamination by foreign substances.</p> <p>Looking for protection against Flux Contamination, Liquid Immersion?† Cole can provide a rugged switch for your demanding application!</p>
<p>Contact Chatter</p>	<p>Contact discontinuity (open circuit) experienced when a switch is subjected to physical vibration or rotated to a new position.</p> <p>Also called contact bounce.</p>
<p>Contact Resistance</p>	<p>The Ohmic resistance of the switch contact points, usually measured in milliohms.</p> <p>This is particularly significant in "Dry Circuit" or low level applications, since the resistance varies significantly at the micro-amp level with current variations.</p>
<p>Decks</p>	<p>Multi-Deck switches have sections, each performing separate functions, that are axially stacked around a common actuating shaft.</p>
<p>Detent</p>	<p>A mechanism that holds the switch in a given position after the actuating torque is removed.† It also prevents the switch from changing positions unless a minimum specified actuating torque is applied to the shaft.</p> <p>You can depend on Cole to design and economically manufacture a rugged switch with a precision detent of your exact specification.</p>
<p>Detent Torque</p>	<p>The peak actuating force required to turn the rotary switch through its detented positions, measured in inch-ounces or inch-pounds.</p> <p>Also called Operating Torque.</p>

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D-Flat Double-D	<p>Terms describing the switch mounting bushing (ferrule) or shaft physical configuration. "D-Flat" describes one flat surface while Double-D describes two parallel flat surfaces on the periphery of a shaft or bushing</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;">D-FLAT DOUBLE-D</p>
Dielectric Withstanding Voltage	<p>This is the maximum voltage that can be applied between open switch terminals and the switch housing or mounting bushing (ground) without arcing or flashover.† Arcing or flashover indicates a breakdown of the insulating material.† A typical maximum voltage is 250 to 1500 Vrms, depending upon the size of the switch. See also Insulation Resistance.</p>
Dry Circuit	<p>A term indicating switch contacts designed for operation at currents less than 10 milliamps and at voltages less than 30 millivolts DC. Also known as Low Level.</p>
EMI/RFI Shield	<p>A special grounding technique that guards the switch from being affected by ambient Electro-Magnetic Interference (EMI), or Radio Frequency Interference (RFI).† EMI or RFI may negatively affect circuit functions.† These undesirable energy transients usually come through the wiring (conducted), or the shaft (radiated). Tests specified by MIL-S-3786 measure how these transients are shunted to ground.</p>
Epoxy Seal	<p>A sealant used on a switch assembly to safeguard against solder flux, cleaning solvents, or other contaminants from entering the inside working portion of the switch. Looking for protection against Flux Contamination, Liquid Immersion?†Cole can provide a rugged switch for your demanding application!</p>
Explosion Proof	<p>A design feature that allows switch actuation of electrical energy, without causing ignition, while immersed in an enclosed area having a combustible atmosphere.</p>
Flux-Proof	<p>A switches' ability to withstand contamination by flux used in the soldering process. † The flux is prevented from entering the internal mechanism Also see Conformal Coat, Epoxy Seal.</p>

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GRAY Code	<p>A binary code that features the change of only one bit to progress in either ascending or descending sequence.</p> <p>Gray Code to 4 Pins</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="16">Position</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> </thead> <tbody> <tr> <th rowspan="4">Pin</th> <th>1</th> <td></td><td>•</td><td>•</td><td></td><td></td><td>•</td><td>•</td><td></td><td></td><td>•</td><td>•</td><td></td><td></td><td>•</td><td>•</td><td></td> </tr> <tr> <th>2</th> <td></td><td></td><td>•</td><td>•</td><td>•</td><td>•</td><td></td><td></td><td></td><td>•</td><td>•</td><td>•</td><td>•</td><td></td><td></td><td></td> </tr> <tr> <th>4</th> <td></td><td></td><td></td><td></td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>8</th> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td><td>•</td> </tr> </tbody> </table> <p>For other examples of binary codings, please see Coded Switches.</p>			Position																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Pin	1		•	•			•	•			•	•			•	•		2			•	•	•	•				•	•	•	•				4					•	•	•	•	•	•	•						8									•	•	•	•	•	•	•	•
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Guarded Position	<p>A switch position that requires a special action, such as pushing or pulling the shaft, in order to enter or leave the position.</p> <p>Also called a Locked-In or Isolated Position.</p>																																																																																																							
Insulation Resistance	<p>This is the resistance measured between open switch terminals, and between a switch terminal and ground. † The unit of measurement is usually Megohms.</p> <p>See also Dielectric Withstanding Voltage.</p>																																																																																																							
Isolated Position	See Guarded Position.																																																																																																							
Key-Lock	A security feature that prevents switch actuation without insertion of a key.																																																																																																							
Key-Pull	A feature that allows insertion or removal of the key in specified positions only.																																																																																																							
Locked-In Position	See Guarded Position.																																																																																																							
Low Level	See Dry Circuit.																																																																																																							
MIL-I-45208	A military specification that states the requirements for an inspection system.																																																																																																							
MIL-Q-9858	A military specification that states the requirements for a quality system, including downstream supplier control.																																																																																																							
MIL-S-3786	A general military specification for rotary switches.																																																																																																							
MIL-S-3786/XX	These are the specific requirements for individual types of switches that must be met before inclusion in the Qualified Products List (see QPL).																																																																																																							
MIL-STD-202F	A military standard defining test methods for electronic and electrical component parts.																																																																																																							
Momentary	A switch position that incorporates a spring return mechanism that restores the shaft to a return position upon release.																																																																																																							

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Non-Shorting Contacts	A " break-before-make " property of switch operation that opens the preceding circuit before closing the next. See also Shorting Contacts.
Operating Torque	See Detent Torque.
Panel Seal	A seal placed between the panel and switch mounting surfaces to exclude leakage past the mounting bushing. Also see Shaft Seal.
PC Terminals	Terminals on a rotary switch specifically designed for mounting on a printed circuit board. See also Terminal.
Pole	See Common.
Precision Rotary Switch	A precision rotary switch is differentiated from a plain rotary switch in that it is designed and manufactured to precise tolerances as well as meeting stringent mechanical, electrical, and environmental conditions.
QPL	An acronym for "Qualified Product List", it lists the slash numbers in the MIL-S-3786 specifications (e.g. MIL-S-3786 /04 ; /13 ; /20 ; /35 etc.) that successfully meet the criteria of the qualification tests designated therein. Having products registered in the QPL allows manufacturers to sell the specific part numbers with only a simple functional acceptance test required for approval.
Ramp-In	Ramp-In allows a specific position to be attained through normal shaft rotation.† But, after that position is reached, a push or pull action on the shaft is required to exit.
Ramp-Out	Ramp-Out requires a push or pull action on the shaft to enter a specific position.† It can be exited with a normal shaft rotation, however.
Rotor	A device inside the rotary switch, permanently affixed to the shaft, that houses the moveable contact that closes circuits through the stator terminals as it moves from position to position by normal shaft rotation.
Shaft Flat	The flat section of a round shaft provided for the purpose of preventing the knob from slipping during switch actuation.
Shaft Seal	Almost always used in conjunction with a Panel Seal, it performs the same basic function of preventing leakage past the shaft.
Shock	The impact a switch must withstand without failure.
Shorting Contacts	A " make-before-break " feature of switch actuation when going from one position to the next. This is useful in preventing arcing during position change since the next position is connected before the previous position is disconnected. See also Non-Shorting Contacts.

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Slotted Shaft	A shaft that has a transverse slot at the end, commonly used for actuation by a screwdriver .
Stator	The fixed portion of a rotary switch containing the terminals completing the circuit with the moveable contact.
Stop Strength	The maximum amount of torque that a switch can withstand at the end of its travel without breaking. † This is usually measured in inch-pounds
Tease Proof	Def. 1) † A switch feature that prevents intentional or unintentional partial rotation of the contacts between positions, after removal of operating torque Def. 2) † Prevents the switch mechanism from remaining between positions, after removal of operating torque.
Terminal	The means by which a rotary switch connects to external circuitry. † A few common styles include: <ul style="list-style-type: none">•Screw terminal•Printed circuit board terminal (PC Terminal)•Solder lug
Terminal Strength	A measure of a switch terminal's ability to withstand a pull test, usually measured in pounds.
Thermal Shock	A test that subjects the switch to rapidly changing temperature extremes .
Torque	A rotational force around an axis.