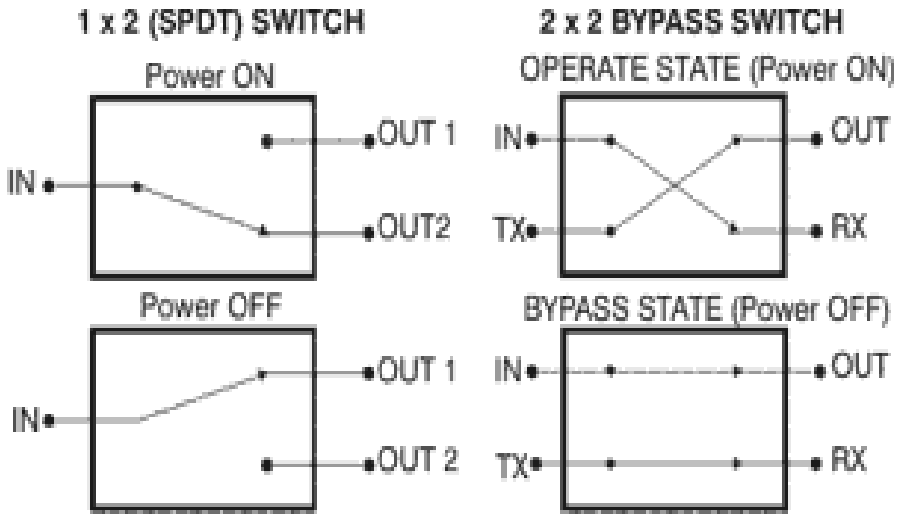
Switches

Many optical networks incorporate optical switches. Networks that require protection switching (switching between redundant paths), where key attributes must operate reliably after a long period in one position, system monitoring, and diagnosis commonly feature these devises. Speed is not a crucial parameter for these applications, as speed as high as tens of milliseconds are acceptable. However in the future, dynamic optical routing will require much faster switching speeds. Figure 1 below illustrates common switch configurations.

Figure 1 - Typical Switch Configuration



Opto-mechanical Switches

Opto-mechanical switches are the oldest type of optical switch and the most widely deployed at the time. These devices achieve switching by moving fiber or other bulk optic elements by means of stepper motors or relay arms. This causes them to be relatively slow with switching times in the 10-100 ms range. They can achieve excellent reliability, insertion loss, and crosstalk. Usually, opto-mechanical optical switches collimate the optical beam from each input and output fiber and move these collimated beams around inside the device. This allows for low optical loss, and allows distance between the input and output fiber without deleterious effects. These devices have more bulk compared to other alternatives, although new micro-mechanical devices overcome this.

Thermo-optic Switches

Thermo-optic switches are normally based on waveguides made in polymers or silica. For operation, they rely on the change ofrefractive index with temperature created by a resistive heater placed above the waveguide. Their slowness does not limit them in current applications.

Electro-optic Switches

These are typically semiconductor-based, and their operation depends on the change of refractive index with electric field. This characteristic makes them intrinsically high-speed devices with low power consumption. However, neither the electro-optic nor thermo-optic optical switches can yet match the insertion loss, backreflection, and long-term stability of opto-mechanical optical switches. The latest technology incorporates all-optical switches that can cross-connect fibers without translating the signal into the electrical domain. This greatly increases switching speed, allowing today's telcos and networks to increase data rates. However, this technology is only now in development, and deployed systems cost much more than systems that use traditional opto-mechanical switches.

source: http://www.fiber-optics.info/articles/component_switches