Open and short circuits, switches

Open

Short

Ideal switch

Open position (OFF)

Closed position (ON)

Actual switches have limitations

- Maximum current
- Maximum voltage
- Mechanical actuation (pressure, force)
- Operating cycles
controlled switches
computer controlled switches

RELAY

electrical control input
ANALOG SWITCH

MULTIPLEXER (MUX)

switch model with finite ON resistance

switch model with finite OFF resistance
IDEAL SOURCES

Ideal current source \( i(t) = i_s \), \( v \) = any value

\[ \begin{array}{c}
I_o, i_s \\
\downarrow \\
\uparrow \\
\rightarrow \\
\rightarrow \\
\end{array} \]

\( I_o, \) constant current source

i_s, time varying current source

Ideal voltage source

\[ \begin{array}{c}
V_s \\
\downarrow \\
\uparrow \\
\rightarrow \\
\rightarrow \\
\end{array} \]

\[ \begin{array}{c}
V_o \\
\downarrow \\
\uparrow \\
\rightarrow \\
\rightarrow \\
\end{array} \]

Time-varying voltage source

Constant voltage source

Output from a time varying source is called a forcing function or a driving function
2-2 Connection constraints

- circuit - interconnection of electrical devices
- node - electrical junction of two or more devices
- loop - closed path formed by tracing through an ordered sequence of nodes without passing through any node more than once

This circuit has three nodes. We always number the ground node 0.

There are many possible loops. Four are shown.

symbols

electrical connection

no electrical connection

plug and jack

control line