TACTICAL-TECH QUICK REFERENCE GUIDE

AKA the New Speak pictionary

2nd Edition, October 2019

This publication is a compilation of several open source websites, facts and figures meant for a quick, printed out reference . This publication was not made for retail sale or distribution.

Contents

Organizations for Industry Standards

Most electrical, data and audio video connectors cables and devices are standardized by different organizations to ensure interoperability of different devices. Below are some of those organization:

- CEE – International Commission on rules for the Approval of Electrical Equipment - CEE plug and socket classifications were created to standardize the plugs and sockets being used in a wide variety of countries.
- IEC – International Electrotechnical Commission prepares and publishes international standards for all electrical, electronic and related technologies.
- NEMA – the trade association of choice for the electrical manufacturing industry for promoting positions on standards for industry
- TIA – Telephone industry Association
- EIA – Electronics Industry Association
- ANSI – American National Standards Institute
- ISO – International Standards Organization
- USOC – AT&T Labs – Universal Service Order Codes
- UL – Underwriters Lab
- IEEE - Institute of Electrical and Electronics Engineers

DescripID Preface:

This reference guide employs the DescripID item naming system (AKA the new speak dictionary) which is a way of naming each item with a system that describes it with the most relevant features of that item. It's a way of naming it so if you see the item on a list, you know exactly what it is. For example, a VGA cable usually has a connector terminated on each side of the cable and it also has an overall length. When a VGA cable is listed using the DescripID method, it utilizes those characteristics in the name resulting in the DescripID ; "Cable VGA DE-15 M, DE-15 M 6' ", which describes a 6 foot VGA cable that has a male DE-15 connector on each end. This method may be a bit anal admittedly, but it leaves anyone looking at an inventory list without questions as to the most pertanant information about the item with out having to physically see the item. The on looker will know exactly how long a cable is and whether or not it will work for what they plan to use it for. Being that each DescripID is unique to the item it represents (Cable VGA DE-15 M, DE-15 M 6' will never represent a 25' cable) it allows the inventory manager to associate restocking information (part numbers, prices) with that item. Each category of items has its own naming standard and some parts of the naming characteristics in turn has its own standard to keep from having two different DescripIDs naming the same item. An extensive item list is provided for overall guidance at the end of this book along with suggested naming standards for many different equipment categories.

Cables and Connectors

There are many different types of connectors and cables on available and they are all used for a wide variety of purposes. A cable is pretty simple: It is usually made up of individually insulated wires that share a jacket with other wires and can transmit low voltage electricity (excluding fiber which is in this chapter). While any connector and any cable can be used for just about any purpose the engineer specifies along the lines of low voltage signals, this chapter will focus on their more common uses which generally are acceptable industry practices.

This chapter gives a brief definition for the types of connectors used for cables, adapters (ADA) and couplers (COUP). It also gives information regarding cabling standards for each type and their uses

Connectors

A connector is an electro-mechanical or an optical fiber device. Electrical connectors are used in a wide variety of applications from passing low voltage data, audio video signals or radio frequency to providing power for device operations from a power source. The connection can be temporary, require a tool for assembly and removal, or serve as a permanent electrical joint between two wires or devices. Fiber connectors hold the fiber core in place and allow it to pass data signal based on light from one fiber optic cable or device to another. In computing, a connector is known as a physical interface

DescripID Naming formula (for un-terminated connectors): End type has a formula in itself and is used not only in the connector category, but many other categories where the end type description is desired.

Conn <Type> < Cable/Cord Type> < End Type> < Gender> [Termination Type] [Remarks]

Conn –*Required* : is short for connectors and is used to denote the category used for un-terminated connectors.

Type - *Required* : Denotes the type of connector it is categorized under. Example: Modular, Power, Fiber, RF.

Cable/ Cord Type: *Recommended*: Denotes the type of cable commonly used with the connector or the cable the connector was built for. (Example: CAT5e, RG6, RG59, MM, SM, SP-1. This denotation is recommended but not required because it does not always apply to all connectors (ie D-Sub connectors) or may be redundant (such as HDMI cables and HDMI connectors))

End Type - *Required* : Denotes the actual name of the connector end. (Example: XLR, DE-9, Phono).

Gender – *Required* : Denotes the sex of the end. For Electrical connectors, receptacle (R) is used to denote female connectors, and plug (P) is used to denote male connectors. For all other connectors, male (M) and female (F) is used.

Termination Type: *Optional* – Denotes how the connector is terminated to a cable. (Example: Crimp, UNICAM, Solder, Compress, 110)

Remarks- *Optional* : If a connector has a significant color or other feature that should be denoted, it would be denoted at the end of its DescripID. This can represent the package size, state if the connector is shielded or is a boot to the connector.

Modular Connectors

Left to right, modular connectors:8P8C plug, 6P6C plug, 6P4C, 4P4C, 6P6C Jack

Modular connector is the name given to a family of electrical connectors examples of which are pictured. These connectors were originally used in telephone wiring. Even though they are still used for that purpose they are used for a variety of other things as well. A modular connector's advantage over many other kinds includes small size and ease of plugging and unplugging. Many uses that originally used a bulkier connector have migrated to modular connectors. Probably the most well-known applications of modular connectors is for telephone jacks and for Ethernet jacks, which are nearly always modular connectors.

Modular connectors were first used in the Registered Jack system, so Registered Jack specifications describe them precisely. Those are the specifications to which all practical modular connectors are built. However, the Registered Jack specifications don't name the physical connectors. Instead, these are covered by ISO standard 8877, first used in ISDN systems.

Position and conductor

Modular connectors come in four sizes: 4-, 6-, 8-, and 10-position. A position is a place that can hold a conductor (pin). The positions need not all be used; a connector can have any even number of conductors. Unused positions are usually the outermost positions. The connectors are designed so that a plug can fit into any jack that has at least the number of positions as the plug. Where the jack has more positions than the plug, the outermost positions are unused. However, plugs from different manufacturers may not have this compatibility, and some manufacturers of eight position jacks now explicitly warn that they are not designed to accept smaller plugs without damage.

The positions of a jack are numbered left to right, looking into the receiving side of the jack with the hook (locking tab or clip) side down, starting at 1. The positions of plug are numbered the same as the jack positions with which they mate. The number of a conductor is the same as the number of the position it's in. So for example in a 6P2C plug, only conductors 3 and 4 exist.

Some connector types in the family are indexed, which means their shape is altered from the standard somewhat to prevent them from mating with standard connectors. The indexing is usually a different shape or position of the hook, but can also be an additional tab.

The members of the family are typically identified using the format "[number]P[number]C", e.g. "6P2C", which means 6 positions, 2 conductors. Alternate formats "[number]x[number]" (e.g. "6x2") or "[number]/[number" (e.g. "6/2") are also used.

Copied from: http://en.wikipedia.org/wiki/modular_connectors

4P4C – 4 position, 4 conductors (and 4P2C)

4P4C M

End Type Formula:
4P<# of conductors> <MorF>

DescripID Ex:
Conn Modular Phone 4P2C M Crimp
Conn Modular Phone 4P4C F Crimp

Connector Type Name: 4P4C

AKA: 4X4, 4/4, (totally incorrect but common terminology refers to these as RJ9, RJ22 and RJ12)

Usage: Telephone handsets or headsets

Description: Modular plug with 4 positions for cable and 4 conductors. With a clip on the plug to keep it from coming out of the jack. The number of conductors can either be 2 or 4.

Standardized by: ISO 8877

For more:
http://en.wikipedia.org/wiki/modular_connectors

6P6C – 6 position, 6 conductor (and 6P4C, 6P2C)

Connector Type Name: 6P6C

AKA: RJ11 (protocol name, not connector name), Phone plug (Laymen's terms not to be confused with TRS or phono plugs)

Usage: Phones, RJ11, RJ14, RJ25

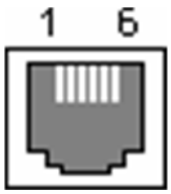
Description: Modular plug with 6 positions for cable and 6 conductors. With a clip on the plug to keep it from coming out of the jack.

Other: There are other plugs with 6 positions, but only 4 conductors or 2 conductors. In RJ11 configuration, only 2 conductors are required.

Standardized by: ISO 8877

For more:
http://en.wikipedia.org/wiki/modular_connector

6P6C M



6P6C F

End Type Formula:
6P<# of conductors> <MorF>

DescripID Ex:
Conn Modular Phone 6P2C M Crimp
Conn Modular Phone 6P6C F Crimp

8P8C – 8 position, 8 conductors

8P8C M

8P8C F

End Type Formula:
8P<# of conductors> <MorF>
DescripID Ex:
Conn Modular CAT5E 8P8C M Crimp
Conn Modular CAT5E 8P8C F 110 Green Quick Port
Note: if it's a Tyco/AMP connector, annotate in remark It is also wise to put the color and mount type for the female connectors in remarks.

Connector Type Name: 8P8C

AKA: 8X8, 8/8, RJ45 (used incorrectly to identify the part; RJ45 is not even used with this plug)

Usage: Data transmission, RS232, RJ48 configurations, and most commonly TIA/EIA 568 A&B, also provides power to some devices

Description: Modular plug with 8 positions for cable and 8 conductors. With a clip on the plug to keep it from coming out of the jack.

Other: There are 2 different types of crimp connectors in this variety: WE/SS and Tyco AMP, difference being where the cable strain relief is placed, making Tyco/AMP connectors incompatible with WE/SS tools.

Standardized by: ANSI/TIA-968-A, IEC 60653

For more:
http://en.wikipedia.org/wiki/8P8C

10P10C – 10 position, 10 conductor

Connector Type Name: 10P10C

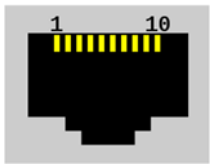
AKA: 10X10 (totally incorrect but common terminology refers to these as RJ48 (actually used on 8p8c), and RJ50)

Usage: data transfer systems, RS232 and RS-485

Description: Modular plug with 10 positions for cable and 10 conductors. With a clip on the plug to keep it from coming out of the jack.

Standardized by: ISO 8877

For more:
http://en.wikipedia.org/wiki/modular_connector



10P10C M 10P10C F

End Type Formula:
10P<# of conductors> <MorF>

DescripID Ex:
Conn Modular Serial 10P10C M Crimp
Conn Modular Serial 10P10C F Crimp

Audio, Video, and Communication connectors

The connectors listed in this section have a wide variety of uses. Remember that all a connector does is pass through electricity. The electricity could be analog or digital signals related to audio or video applications, or it could be electricity used to power devices, as is common with some D Sub connectors and DIN connectors. A connector in this section may be listed for a specific use that it is com for that connector, but it is in no way limited to that one application.

ADC Display Connector

AKA: Apple DVI

Usage: Apple computer display

Description: The **Apple Display Connector** (**ADC**) is a proprietary modification of the DVI connector that combines analog and digital video signals, USB, and power all in one cable. Apple used ADC for its LCD-based Apple Cinema Displays and their final CRT displays, before deciding to use standard DVI connectors on later models.

For More:
http://en.wikipedia.org/wiki/Apple_Display_Connector

End Type Formula:
ADC <MorF>

DescripID EX:
Conn AV ADC M
Conn AV ADC M

Pin 1	25 V Supply	**Pin 19**	DDC CLock	
Pin 2	25 V Supply	**Pin 20**	Clock Return	
Pin 3	LED	**Pin 21**	USB Data+	
Pin 4	TMDS Data0–	**Pin 22**	USB Data–	
Pin 5	TMDS Data0+	**Pin 23**	USB Return	
Pin 6	TMDS Data0/5 Shield	**Pin 24**	TMDS Data2–	
Pin 7	TMDS Data5–	**Pin 25**	TMDS Data2+	
Pin 8	TMDS Data5+	**Pin 26**	TMDS Data2/4 Shield	
Pin 9	DDC Data	**Pin 27**	TMDS Data4–	
Pin 10	Vsync	**Pin 28**	TMDS Data4+	
Pin 11	25 V Return	**Pin 29**	Clock+	
Pin 12	25 V Return	**Pin 30**	Clock-	
Pin 13	Soft Power	**C1**		Analog Blue Video
Pin 14	TMDS Data1–	**C2**		Analog Green Video
Pin 15	TMDS Data1+	**C3**		Analog Horizontal Sync
Pin 16	TMDS Data1/3 Shield	**C4**		Analog Red Video
Pin 17	TMDS Data3–	**C5**		Analog RGB Return and DDC Return
Pin 18	TMDS Data3+			

Banana Plug

End Type Formula: Banana <MorF>

DescripID EX:
Conn Audio Banana M

Connector Type Name: Banana

AKA: 4mm jack

Usage: Connecting the amplifier to loudspeakers and to terminate patch cords for electronic test equipment

Description: A cylindrical metal pin about 25mm long, with a diameter of 4mm with a lengthwise spring that bulges outward to hold the plug in place.

Other: There is also a miniature version that is about 1/3 of the size.

For more:
http://en.wikipedia.org/wiki/banana_connector

CN (Centronics, Micro ribbon)

CN36 M

CN36 F

End Type Formula:
CN<Pin count> <MorF>

DescripID EX:
Conn CN36 M Solder
Conn CN50 F Crimp

Connector Type Name: Centronics (CN)

AKA: Telco, Amphenol, 25-pair, Delta Ribbon, CHAMP, Micro Ribbon

Usage: IEEE 488, IEEE1284 Parallel interface, SCSI, RJ21X Telco

Description: A micro ribbon connector contains two parallel rows of pins within a shielded case. There are 14, 24, 36, 50 and 64 pin varieties, for mounting on boards, panels, or terminating cables. Contact is made by solder, crimping or insulation displacement. Female connectors have bail locks for a sturdy connection to the male connector. In the telecommunications sector screws are used instead, since a loose connector would have a greater impact.

Other: Although it is technically a micro ribbon connector, we use CN (for centronics) to name the connector because it is more common

Standardized by: IEEE 1394

For more:
http://en.wikipedia.org/wiki/Micro_ribbon

DIN

End Type Formula:
DIN- <#ofPins>-<Angle> <MorF>
Note: Angle only used for 4, 5, 7 and 8 pin varieties
DescripID EX:
CONN Audio Stereo DIN-5-270 M
CONN Audio Stereo DIN-3 M

Connector Type Name: DIN

AKA: DIN

Common Usage: Audio ports and microphones

Description: Originally standardized by Deutsches Institut fur Normung, this is a 13.2mm connector with a metal shield and a notch that limits the orientation in which a plug and socket can mate. They are used for many applications ranging from MIDI to IBM PS/2 keyboard and mouse layouts.

Other: Although similar, they are not compatible with XLR connectors.

Standardized by: DIN-41524, DIN 45322, DIN 45326, DIN 45329, IEC 60130-9

For more:
http://en.wikipedia.org/wiki/DIN_connector

DMS-59

Connector Type Name: DMS-59

Usage: Providing analog or digital video for DVI or VGA, usually through a Y splitter cable

Description: A 59 pin electrical connector with signals for 2 digital and 2 analog connectors commonly used with graphics cards.

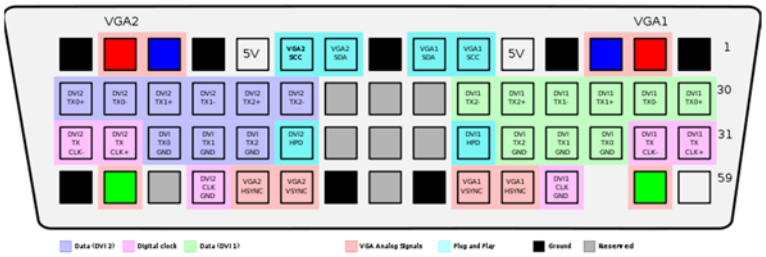
Standardized by: Molex

For more:
http://en.wikipedia.org/wiki/DMS-59

DMS-59 F

DMS-59 M
End Type Formula:
DMS-59 <MorF>

DescripID EX:
CONN Video DMS-59 M



D-Subminiature

Connector Type Name: (see diagram to the right)

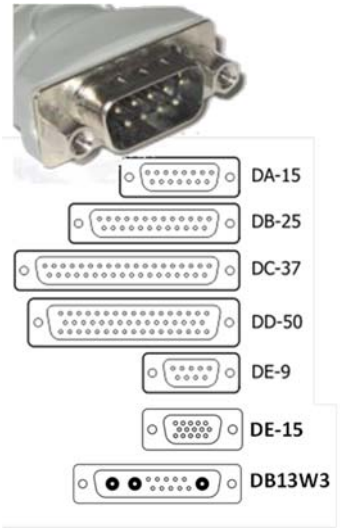
AKA: Depends, but: Parallel port, VGA port, Serial port or RS232 port, (incorrectly DE9 is often referred to as DB9) Subminiatures

Usage: Varies: Printer cables, communication cables, Video cables, Device cables, RS232, etc.

Description: D-subs are connectors that have a trapezoid shape to them and 2 or more rows of pins. They come in varying sizes and pin counts.

Other: Invented by ITT Canon, the whole series is identified by D followed by a letter denoting shell size and a number referring to number of pins.

Standardized by: DIN-41652 and IEC-807-3
For more:
http://en.wikipedia.org/wiki/D-subminiature



End Type Formula:
D<ShellSizes>-<#ofPins> <MorF>

DescripID EX:
When unterminated and individual:

Conn D-Sub DB-25 F
Conn D-Sub VGA DE-15 M

DE-15 (as used in a standard VGA configuration

Connector Type Name: DE-15

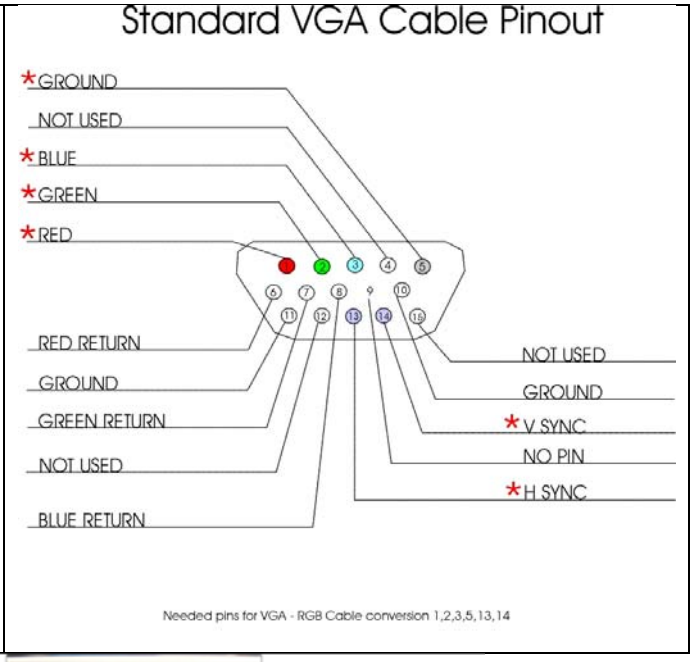
AKA: VGA

Usage: Video and sometimes carries other device signals (keyboard and mouse in some KVM)

Description: DE shell with 15 pins.

Standardized by: DIN-41652 and IEC-807-3

For more:
http://en.wikipedia.org/wiki/vga



Male

Female

DVI

Connector Type Name: DVI-I, DVI-D, DVI-A, (Dual added for dual)

AKA: HDMI(incorrectly used)

Usage: High Definition Multimedia Device Video,. Supports multiple monitors from one port in certain configurations.

Description: A Video interface standard designed to maximize the visual quality of digital display devices. It is mounted in a D sub shell and comes in a variety of pin outs

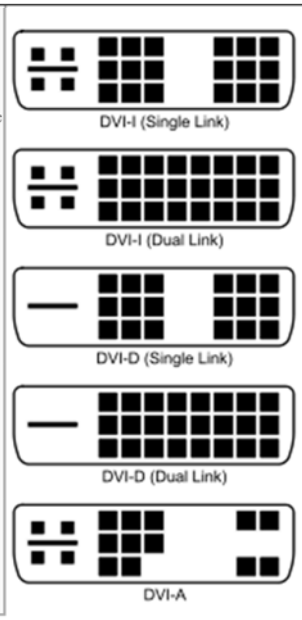
Standardized by: Digital Display Working Group

For more:
http://en.wikipedia.org/wiki/Digital_Visual_Interface

End Type Formula:
DVI-<Link>-<Dual or Single> <MorF>
Note: DVI-A does not have single or double
DescripID Ex: CONN AV DVI-I-S F
CONN AV DVI-A M

Pin 1	TMDS Data 2-	Digital red - (Link 1)
Pin 2	TMDS Data 2+	Digital red + (Link 1)
Pin 3	TMDS Data 2/4 shield	
Pin 4	TMDS Data 4-	Digital green - (Link 2)
Pin 5	TMDS Data 4+	Digital green + (Link 2)
Pin 6	DDC clock	
Pin 7	DDC data	
Pin 8	Analog vertical sync	
Pin 9	TMDS Data 1-	Digital green - (Link 1)
Pin 10	TMDS Data 1+	Digital green + (Link 1)
Pin 11	TMDS Data 1/3 shield	
Pin 12	TMDS Data 3-	Digital blue - (Link 2)
Pin 13	TMDS Data 3+	Digital blue + (Link 2)
Pin 14	+5 V	Power for monitor when in standby

Pin 15	Ground	Return for pin 14 and analog sync
Pin 16	Hot plug detect	
Pin 17	TMDS data 0-	Digital blue - (Link 1) and digital sync
Pin 18	TMDS data 0+	Digital blue + (Link 1) and digital sync
Pin 19	TMDS data 0/5 shield	
Pin 20	TMDS data 5-	Digital red - (Link 2)
Pin 21	TMDS data 5+	Digital red + (Link 2)
Pin 22	TMDS clock shield	
Pin 23	TMDS clock+	Digital clock + (Links 1 and 2)
Pin 24	TMDS clock-	Digital clock - (Links 1 and 2)
C1	Analog red	
C2	Analog green	
C3	Analog blue	
C4	Analog horizontal sync	
C5	Analog ground	Return for R, G and B signals



Connector Type Name: HDMI-A, HDMI-C

AKA: HDMI

Usage: High Definition Multimedia Device Video. They can be used to carry both audio and visual

Description: A Video interface standard designed to maximize the visual quality of digital display devices.

Type A is 13.9mm wide, 4.45mm high with 19 pins.
It is compatible with DVI single link

Type B is 21.2mm by 4.45mm high, has 29 pins and is compatible with dual link DVI-D, but is not currently in use.

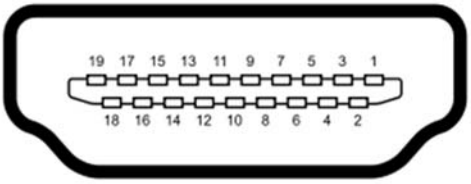
Type C is intended for portable devices and is 10.42mm X 2.42mm, with 19 pins. It can be connected to a Type A using ADA HDMI-A , HDMI-C

Standardized by: HDMI Licensing

For more:
http://en.wikipedia.org/wiki/HDMI#Connectors

End Type Formula: HDMI-<Type> <MorF>

DescripID EX:
Conn AV HDMI-A M
Conn AV HDMI-C M



Pin 1	TMDS Data2+
Pin 2	TMDS Data2 Shield
Pin 3	TMDS Data2–
Pin 4	TMDS Data1+
Pin 5	TMDS Data1 Shield
Pin 6	TMDS Data1–
Pin 7	TMDS Data0+
Pin 8	TMDS Data0 Shield
Pin 9	TMDS Data0–
Pin 10	TMDS Clock+
Pin 11	TMDS Clock Shield
Pin 12	TMDS Clock–
Pin 13	CEC
Pin 14	Reserved (N.C. on device)
Pin 15	SCL
Pin 16	SDA
Pin 17	DDC/CEC Ground
Pin 18	+5 V Power (max 50 mA)
Pin 19	Hot Plug Detect

JIS F05

Connector Type Name: F05 or JIS F05

AKA: TOSLINK (Toshiba Link), EIAJ optical

Usage: Used primarily as audio over fiber in TOSLINK cables and S/PDIF protocol

Description: A 4mm long, square plug with a notch on top and a small cylinder with fiber protruding from the center.

Standardized by: JIS C5974-1993 F05

For more:
http://en.wikipedia.org/wiki/TOSLINK

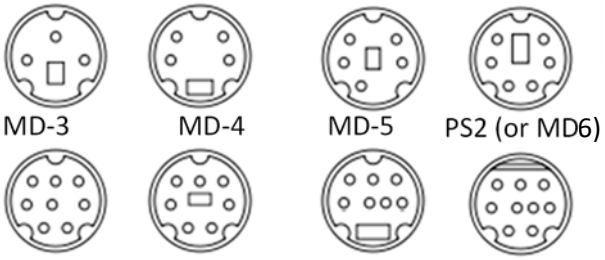
End Type Formula: F05 <MorF>

DescripID EX:
Conn Audio Fiber F05 M Glue

MD (MiniDIN)

4 pin mini-DIN male connector
at the cable

Pin	Name	Description
1	GND	Ground (Y)
2	GND	Ground (C)
3	Y	Intensity (Luminance)
4	C	Color (Chrominance)



End Type Formula: MD- <#ofPins <MorF> (NS)
Note: NS used for nonstandard

DescripID EX:
CONN MINIDIN SVID MD-4 M
CONN MINIDIN PS2 MD-6 M
CONN MINIDIN MD-7 (NS) F

Connector Type Name: MiniDIN (MD4, MD5, etc)

AKA: Svideo (4 pin), PS/2 (6 pin)

Usage: Varies from Video to other applications

Description: Mini-DIN connectors are 9.5 mm in diameter and come in seven patterns, with the number of pins from three to nine. Each pattern is keyed in such a way that a plug with one pattern cannot be mated with any socket of another pattern.

Other: There are several nonstandard varieties, mainly with the 7 pin. MD-6 is commonly known as PS2 and used for legacy keyboards and mice

Standardized by: DIN-41524(no longer in print) and *IEC 60130-9*

For more:
http://en.wikipedia.org/wiki/Mini-DIN_connector

Micro D-sub

End Type Formula:
Micro D-<Pin count> <MorF>

DescripID EX:
Conn Micro D-26 M Solder

Connector Type Name: Micro D

AKA: MD, Microminature D Sub

Usage: Cisco DTE cables

Description: A smaller version of the Dsub connector that usually has an even number of pins and sharper edges than a normal D-sub

Phono

Connector Type Name: Phono
AKA: RCA jack, CINCH/AV Connector
Usage: Analog Video and Audio
Description: Phono (abbr. for phonograph) Connectors have an outer shell of 8.25 mm in diameter and a center pin which is 3.70mm in diameter. The cables are usually color coded, but still interchangeable. They do not need to be used in sets in all scenarios.

Standardized by: CEA-863-A
For more:
http://en.wikipedia.org/wiki/RCA_connector

End Type Formula:
Phono <MorF>

DescripID EX:
Conn RF Comp Phono M Red
Conn RF Comp Phono M

Composite analog Video	Cmposite Video	Yellow	Digital audio	S/PDIF	Orange
	Left/Mono	White	Component analog video (YPbPr)	Y	Green
	Right	Red		P_B	Blue
	Center	Green		P_R	Red
	Left surround	Blue	Component analog video/VGA (RGB/HV)	R	Red
	Right surround	Gray		G	Green
	Left back surround	Brown		B	Blue
	Right back surround	Tan		H/Horizontal sync	Yellow
Analog audio	Subwoofer	Purple		V/Vertical sync	White
Digital audio	S/PDIF	Orange			

TS, TRS, TRRS

Connector Type Name: TRS (stereo) TS (mono), TRRS (A/V or Stereo and Microphone)

AKA: audio jack, phone plug, jack plug, stereo plug, mini jack, or mini-stereo.

Usage: Audio ports and microphones

Description:
It is cylindrical in shape, typically with three contacts, although sometimes with two (a **TS connector**) or four (a **TRRS connector**).
The sizes of the plugs range from 2.5mm to 6.3 mm, but we generally use 3.5mm with computers and other devices.

Other: TRS stands for Tip Ring Sleeve. Male connectors are often referred to as Plugs, female as jacks

Standardized by: PC-99 (color code)
For more:
http://en.wikipedia.org/wiki/Tip_Ring_sleeve

1. **Sleeve:** usually ground
2. **Ring:** Right-hand channel for stereo signals, negative phase for balanced mono signals, power supply for power-requiring mono signal sources
3. **Tip**: Left-hand channel for stereo signals, positive phase for balanced mono signals, signal line for unbalanced mono signals
4. **Insulating rings**

GREEN 3.5MM TRS	STEREO OUTPUT, FRONT CHANNELS
BLACK 3.5MM TRS	STEREO OUTPUT, REAR CHANNELS
GREY 3.5MM TRS	STEREO OUTPUT, SIDE CHANNELS
GOLD 3.5MM TRS	DUAL OUTPUT, CENTER AND SUBWOOFER
BLUE 3.5MM TRS	STEREO INPUT, LINE LEVEL
PINK 3.5MM TS	MONO MICROPHONE INPUT

End Type Formula: <Size in mm> <TYPE> <MorF>
EX:
3.5mm TRS M 3.5mm TS F
2.5mm TRRS M 6.35mm TRS F
DescripID Ex: CONN Audio Stereo 3.5MM TRS M

XLR (XLR3)

Pin Function
1 -Chassis ground (cable shield)
2- Normal polarity ("hot")
3- Inverted polarity ("cold")

End Type Formula: XLR <MorF>
XLR M
XLR F
DescripID Ex:
Conn Audio Stereo XLR M
Conn Audio Stereo XLR F

Connector Type Name: XLR

AKA: Cannon plug, cannon connector.

Usage: Audio Cable, microphones (Tandberg VTC)

Description: An electrical connector design used mostly in professional audio and video electronics cabling applications.

Other: XLR stands for Cannon X, Latch, Rubber. There are many different pin outs for the XLR connector, but the three pin (XLR3) is the most common

Standardized by: EIA RS-297-A
For more:
http://en.wikipedia.org/wiki/XLR_connector

RF Connectors

A coaxial RF connector is an electrical connector designed to work at radio frequencies in the multi-megahertz range. RF connectors are typically used with coaxial cables and are designed to maintain the shielding that the coaxial design offers. Better models also minimize the change in transmission line impedance at the connection. Mechanically they provide a fastening mechanism (thread, bayonet, braces, push pull) and springs for a low ohmic electric contact while sparing the gold surface thus allowing above 1000 reconnects and reducing the insertion force. Research activity in the area of radio-frequency (RF) circuit design has surged in the last decade in direct response to the enormous market demand for inexpensive, high data rate wireless transceivers

These connectors are used for a wide array of applications including, but not limited to, radio signal transmission, analog and digital TV (either from antenna, cable or satellite), composite video or audio, and networking (such as in token rings or bus networks)

1.0/2.3

Female

Male

End Type Formula: 1.0/2.3 <MorF>

DescripID EX:
Conn RF 1.0/2.3 M

Connector Type Name: 1.0/2.3

Usage: Audio and Video analog and digital in rack mount panels where space is tight

Description: A small push-pull connector that supports 50 Ω and 75 Ω units operating from 0-10 GHz. Also available threaded

Standardized by: DIN 41626, 47297
For more:
http://www.amphenolrf.com/products/1023.asp

1.6/5.6

Connector Type Name: 1.6/5.6

Usage: Audio and Video analog and digital in rack mount panels where space is tight

Description: A small push-pull connector that 75 Ω units operating from 0-1 GHz . Also available threaded

Standardized by: DIN 41626, 47297
For more:
http://www.amphenolrf.com/products/1656.asp

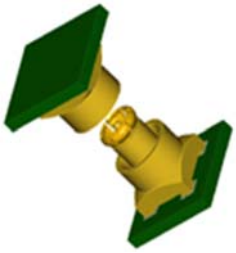
Female

Male

End Type Formula: 1.6/5.6 <MorF>

DescripID EX:
Conn RF 1.6/5.6 M

AFI



Female **Male**

End Type Formula: AFI <MorF>

DescripID EX:
Conn RF AFI M

Connector Type Name: 1.0/2.3

Usage: board to board RF applications

Description: A small push-pull connector that supports 50 Ω and 75 Ω units

Standardized by: Amphenol
For more:
http://www.amphenolrf.com/products/1023.asp

BNC

Male

Female

End Type Formula: BNC <MorF>

DescripID EX:
Conn RF BNC M

Connector Type Name: BNC

Usage: Audio, analog and Serial Digital Video, Radio Antenna connections, and 10base2 thin Ethernet. Used on composite and RF cable.

Description: The **BNC** (**bayonet Neill-Concelman**) **connector** is a very common type of RF connector used for terminating coaxial cable.

Other: A threaded version of the BNC connector, known as the TNC connector (for **Threaded Neill-Concelman**) is also available. It has superior performance to the BNC connector at microwave frequencies.

For more:
http://en.wikipedia.org/wiki/bnc_connector

C Connector

Connector Type Name: C Connector (Concelman)

Usage: Radio communication antennas

Description: weatherproof connectors with coupling that uses two-stud bayonet-type locks and Provides constant 50 Ω impedance. They may be used with 75 Ω cable, at lower frequencies (below fg300 MHz) where no serious mismatch is introduced.

For more:
http://www.amphenolrf.com/products/c.asp

End Type Formula: C <MorF>

Female **Male**

Picture shows the similarity between 50ohm and 75ohm C connectors

DescripID EX:
Conn RF C M

FME

Female **Male**

End Type Formula: FME <MorF>

DescripID EX:
Conn RF FME M

Connector Type Name: FME (For Mobile Equipment)

Usage: for mobile equipment

Description: A miniature 50Ω RF connector used with RG-58 and RG-174 cable

For more:
http://www.amphenolrf.com/products/1023.asp

F Type

Connector Type Name: FType

AKA: Incorrectly RG6 or RG59 Connector

Usage: Connecting device to another device receiving RF signal for CATV, Terrestrial TV, and FM radio.

Description: A type of coaxial RF connector that is 10.5mm in diameter and has an open space in the middle to allow the copper and insulation of a RF cable to pass through.

Other: There are different sizes of these connectors which should be paid attention to, most commonly RG59 and RG6.

Standardized by: IEC 60169-24

For more:
http://en.wikipedia.org/wiki/F_connector

Approximate size relation of RG 6 connectors to RG 59

End Type Formula: FType <MorF>

DescripID EX:
Conn RF RG6 FType M Compress
Conn RF RG59 FType M Crimp

HN Connector

Connector Type Name: HN Connector

Usage: Radio communication antennas (AT-197)

Description: A weatherproof connectors with ¾-20 threaded coupling designed for high voltage applications.
It is just slightly larger than an N connector and will not mate with an N connector.

For more:
http://www.amphenolrf.com/products/hn.asp

Male **Female**

Picture shows the difference between an N and HN connector, HN with a .55” ground sleeve diameter and N with .325” diameter

End Type Formula: HN <MorF>

DescripID EX:
Conn RF HN M

MCX

End Type Formula: MCX <MorF>

DescripID EX:
Conn RF MCX M

Connector Type Name: MCX (Micro Coaxial)

Usage: GPS external antennas, USB DVB-T tuners

Description: A 3.6mm snap on RF connector with a broadband capability through 6 GHz

Standardized by: CECC 22220

For more:
http://www.amphenolrf.com/products/MCX.asp

MiniSMB

Connector Type Name: Mini SMB 75 Ω

Usage: Telecommunications, Cisco 7600 series routers, Cisco ONS 15400

Description: A miniature version of the SMB connector. It is a snapfit connector operates up to 2 GHz.

Standardized by: Mil-C-39012

For more:
http://www.amphenolrf.com/products/mini75ohm.asp

Male **Female**

End Type Formula: MiniSMB <MorF>

DescripID EX:
Conn RF MiniSMB M

MiniUHF

Male **Female**

End Type Formula: MiniUHF <MorF>

DescripID EX:
Conn RF MiniUHF M

Connector Type Name: Mini UHF

Usage: Mobile Phones, automotive systems

Description: A miniature version of the UHF connector. Has a 3/8-24 thread size and operates up to 2.5 GHz Terminate to most RG-58 cable.

For more:
http://www.amphenolrf.com/products/miniuhf.asp

MMCX

Connector Type Name: MMCX

AKA: MicroMateTM, Micro-miniature connector

Usage: Satcom, PCMCIA cards, GPS, antennas

Description: A snap on connector. It is a snapfit connector operates up to 6 GHz 50 Ω.

Standardized by: CECC 22000

For more:
http://www.amphenolrf.com/products/mmcx.asp

Male **Female**

End Type Formula: MMCX <MorF>

DescripID EX:
Conn RF MMCX M

PAL

End Type Formula: PAL <MorF>

DescripID EX:
Conn RF RG6 PAL M Screw On
Conn RF RG59 PAL M Crimp

Connector Type Name: PAL

AKA: TV Aerial Plug, Belling-Lee connector

Usage: Connecting device to another device receiving RF signal for CATV, Terrestrial TV, and FM radio.

Description: The PAL connector is used mainly as an antennae in Europe for TV sets and FM-radios. The plug is about 33mm long and 9.5mm in diameter with a short pin in the middle (not to be confused with a phono plug, which is longer)

Other: A smaller version also exist called a miniature PAL plug

Standardized by: IEC 169-2, IEC 60169-2 (for unmatched cable ends)

For more:
http://en.wikipedia.org/wiki/TV_Aerial_Plug

NType

Connector Type Name: NType

AKA: Paul Neill connector

Usage: Radios, Antennas, SATCOM

Description: A weatherproof, durable, 5/8-24 threaded connector that supports broadband up to 11 GHz, available in 50Ω and 75Ω.

Standardized by: MIL-C-39012

For more:
http://www.amphenolrf.com/products/typen.asp

Male (203mm) **Female (140mm)**

Picture to show the similarity between 50Ω (bottom) and 75Ω (top) N connectors

End Type Formula: NType <MorF>

DescripID EX:
Conn RF ¼" NType M Crimp

QMA

Male **Female**

End Type Formula: QMA <MorF>

DescripID EX:
Conn RF QMA M

Connector Type Name: QMA

Usage: Amplifiers, base station equipment

Description: A quick disconnect version of the SMA. Operates up to 6 GHz

For more:
http://www.amphenolrf.com/products/qma.asp

SC

Male **Female**

End Type Formula: SC <MorF>

DescripID EX:
Conn RF SC M

Connector Type Name: SC

Usage: military aerospace

Description: A quick disconnect version of the SMA. Operates up to 6 GHz

Standardized by: MIL-C-39012

For more:
http://www.amphenolrf.com/products/sc.asp

SMA

Connector Type Name: SMA

AKA: SubMiniature version A

Usage: Military Aerospace, Telecom

Description: A ¼”-36 threaded connector. It supports broadband rom DC to 18 GHz, 50 Ω.

Standardized by: MIL-C-39012, CECC 22110/111

For more:
http://www.amphenolrf.com/products/SMA.asp

Male **Female**

End Type Formula: SMA <MorF>

DescripID EX:
Conn RF SMA M

SMB

Female **Male**

End Type Formula: SMB <MorF>

DescripID EX:
Conn RF SMB M

Connector Type Name: SMB

AKA: SubMiniature version B

Usage: Automotive, GPS, Telecom, Video

Description: A snap-on connector with 50 Ω or 75 Ω impedance. It supports broadband from DC to 4 GHz.

Standardized by: MIL-C-39012, MIL-STD-348

For more:
http://www.amphenolrf.com/products/SMB.asp

SMC

Connector Type Name: SMC

AKA: SubMiniature version C

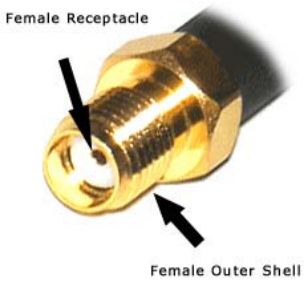
Usage: GPS, Radio Boards, PC/LAN

Description: A 10-32 threaded connector. It supports broadband rom DC to 10 GHz, Available in 50 Ω & 75 Ω impedance

Standardized by: : MIL-C-39012, MIL-STD-348

For more:
http://www.amphenolrf.com/products/SMC.asp

Male **Female**

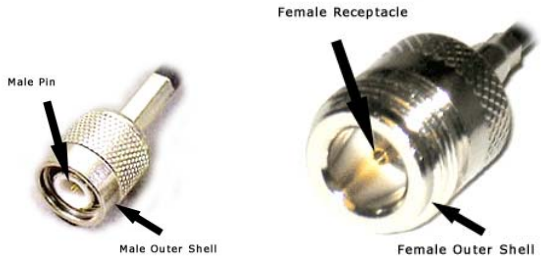


End Type Formula: SMC <MorF>

DescripID EX:
Conn RF SMC M

TNC

Male (15mm) **Female (9.6mm)**



End Type Formula: TNC <MorF>

DescripID EX:
Conn RF TNC M

Connector Type Name: TNC

Aka: Threaded Neill Concelman
Usage: Antennas, networks, radar, military aerospace

Description: A threaded connector that supports a frequency range from 0 to 11 GHz with 50 Ω impedance.

For more:
http://www.amphenolrf.com/products/tnc.asp

UHF

Male **Female**

End Type Formula: UHF <MorF>

DescripID EX:
Conn RF UHF M

Connector Type Name: UHF

AKA: Ultra High Frequency connector

Usage: Antennas, CB radios

Description: A 5/8-24 threaded connector that supports a frequency range from 0.6 to 300 MHz with 50 Ω impedance.

For more:
http://www.amphenolrf.com/products/uhf.asp

FW (Firewire)

FW400-4 **FW400-6**

FW800

End Type Formula:
FW <Speed>-<Pin count> <MorF>
Note: Pincount only for 400 speed

DescripID EX:
Conn FW400-6 M
Conn FW600 M

Connector Type Name: FW400-6, FW400-4, FW800

AKA: 1394a, 1394b, Firewire 400 4 pin, firewire 400 6 pin

Usage: Electrical connections, usually 250V

Description: A serial bus interface for high-speed communications in isochronous real-time data transfer used in personal computers to connect to devices. It connect up to 63 peripherals in a tree topology.

Firewire 400 (IEEE 1394): Data transfer rates between devices are 100, 200, or 400 Mbit/s. Cable length is limited to 14.8ft and the cable can be daisy chained 16 times by repeaters.
IEEE 1394a: Standardized the use of the FW400-4

Firewire 800(IEEE 1394b): 9 pin connector allowing a transfer rate of 786.432 Mbit/s over copper.

Standardized by: IEEE 1394

For more:
http://en.wikipedia.org/wiki/Firewire

Radio

U-229, U-182B/U, and U-183/U

Connector Type Name: U-229, U-182B/U, and U-183/U

AKA: ADF Audio, fill port

Usage: Standard military audio ports for headsets and fill cables.

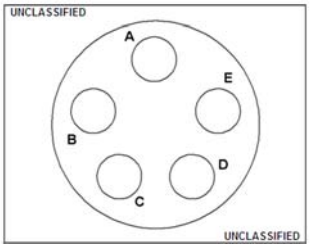
Description: A 21mm in diameter cylinder with 5 pins in the shape of bumps and locking guides on the inside of the cylinder.

Other: The most common is the U-229/U. It accommodates the standard military coiled or straight audio cables. The U-182B/U is electrically identical. The only differences are in the shell body material and in its cable strain relief. Its distinguishable features are its shell color (black) and the fact that it employs a small cable opening which is accompanied with a black rubber gasket instead of the traditional spring strain relief.

Standardized by: MIL-C-55116
For more:
http://www.milspec.ca/radaccs/raccspec.html

U-182B/U, U-229/U

U-183/U



PIN ID	WIRE COLOR	FUNCTION
A	Black	Ground
B	White	Receiver Audio (headset)
C	Green	Transmit (PTT)
D	Red	Transmitter Audio (Mic)
E	Orange	Retransmit/ Remote Key

End Type Formula: <Type>
Note: No need for M or F designation

DescripID EX:
Conn Radio U-229

Identical to ON-241775 Series, except for material differences.

GC 283

The GC 283 connector is the 6 pin version of the U-183/U. It is now common on modern radio and cipher equipment and accessories. Pin "F" normally carries DC voltage to power accessories and comsec equipment. In some instances, it may also carry data when the connector is used, for example, to interface between a terminal device and a printer.

GC 329

The GC 329 connector is the 6 pin version of the U-229/U. It is most commonly used with modern radios, cipher equipment and key fill devices. Pin "F" normally carries DC voltage to power the accessory or COMSEC equipment. In some instances, it may also carry data when the connector is used, for example, to interface between a terminal device and a printer, between 2 radios for cloning purposes or, to carry key fill programming data. The GC 329 is the mate to chassis mounted GC 283.

U-77/U and U-79/U

The U-77/U and U-79/U connectors are generally found on older radio sets. They are a 10 pin/contact connector. The U-77/U is the cable (handset) plug and is matted to the chassis mounted U-79/U jack. There are many variations in the wiring of this connector. Below is the common pin-out and related information that apply to standard military radio use.

USB

Connector Type Name: USB

Variety Names: USB-A, USB-B, USB-MiniB 5, USB MiniB4, USB MiniB4 Mitsumi

Usage: Connecting devices to a computer or other type of device. It can provide +5V of power in addition to data

Description: Almost all USB cables use a USB-A on one end and the other end is usually one of the other varieties. There are many different ends for USB, this dictionary does not cover them all. Max cable length is about 12'

Other: Up to 127 devices can be connected (through hubs, star topology) to one single interface. There are different versions with different speeds, all are backwards compatible.

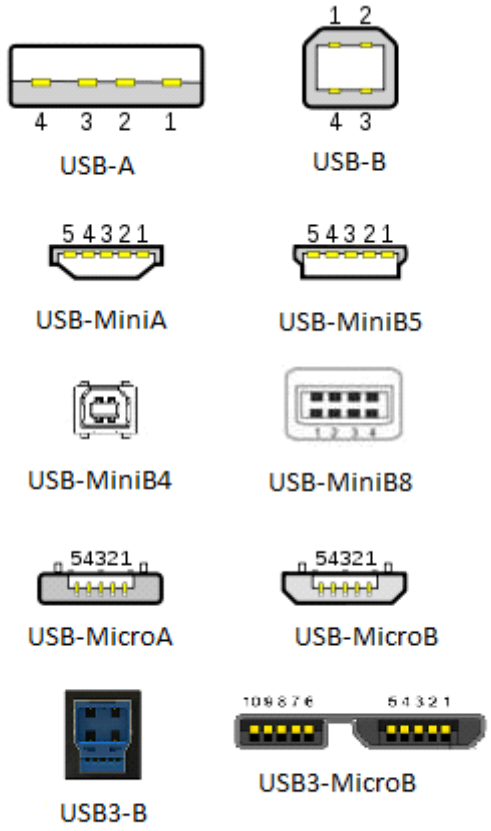
USB 1.10 and 1.1: 1.5 Mbit/s (low speed) 12 Mbit/s (High speed)

USB 2.0: 480 Mbit/s

USB 3.0: 4 Gbit/s, Has additional pins not found in USB 1.1 or 2.0. They often have blue connectors to help identify them.

Classified by: USB Implementers Forum
For more:
http://en.wikipedia.org/wiki/USB

CONNECTOR NAMES:
<USB OR USB3 > <TYPE> <MORF>



USB 4 Pin pin-outs

Pin	Name	Cable color	Description
1	VCC	Red	+5V
2	D−	White	Data −
3	D+	Green	Data +
4	GND	Black	Ground

Miniplug/Microplug

Pin	Name	Color	Description
1	VCC	Red	+5 V
2	D-	White	Data -
3	D+	Green	Data +
4	ID	none	permits distinction of Micro-A- and Micro-B-Plug Type A: connected to Ground Type B: not connected
5	GND	Black	Signal Ground

Micro D-sub

End Type Formula:
Micro D-<Pin count> <MorF>

DescripID EX:
Conn Micro D-26 M Solder

Connector Type Name: Micro D

AKA: MD, Microminature D Sub

Usage: Cisco DTE cables

Description: A smaller version of the Dsub connector that usually has an even number of pins and sharper edges than a normal D-sub

Molex 8981

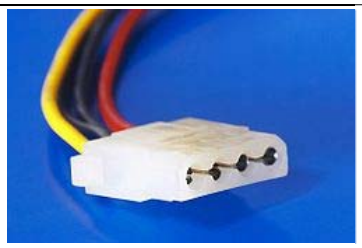
Connector Type Name: Molex 8981

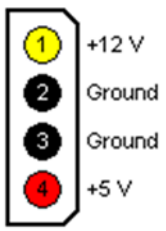
AKA: Molex, Molex IDE, Molex 4-pin

Usage: cylindrical spring-metal pins fit into cylindrical spring-metal sockets. The pins and sockets are held in a rectangular matrix in a nylon shell.

Standardized by: Molex

For more:
http://en.wikipedia.org/wiki/Molex_connector

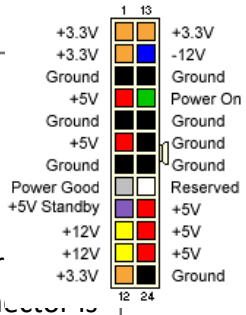


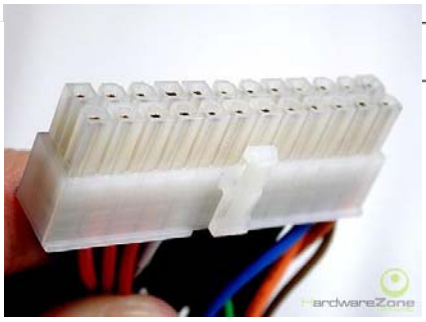


Female connector

End Type Formula:
Molex 8981 <MorF>

ATX-24pin





Connector Type Name: ATX-24pin

Usage: Motherboard power

Description: Provides a motherboar various voltages of power. The conn two rows of 12 pins (for male) and sockets (for female)

For more:
http://en.wikipedia.org/wiki/Serial_ATA

Female Connector

End Type Formula:
ATX-29pin <MorF>

Berg-4pin

Connector Type Name: Berg-4pin

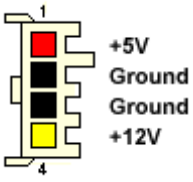
AKA: Floppy Drive Connector

Usage: floppy drive connectors

Description: A connector from a computer PSU that has 4 square pines in a single row

Standardized by: Berg Electronics

For more:
http://en.wikipedia.org/wiki/Berg_connector



Female connector

End Type Formula:
Berg-4pin <MorF>

P4

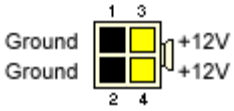
Connector Type Name: P4

AKA: +12 V Power Connector

Usage: Powers motherboards with Intel Pentium 4 processors

Description: An extra 4-pin mini fit JR, 12-volt connector to power the CPU. Referred to as the P4 connector because this was first needed to support the Pentium 4 processor.

Standardized by: ATX12V 1.0

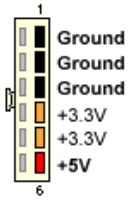


Female connector

End Type Formula:
P4 <MorF>

For more: http://www.technologyuk.net/computing/computer_systems/power_supply_unit.shtml

AUX-6pin



Female Connector
End Type Formula:
AUX-6pin <MorF>

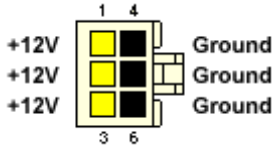
Connector Type Name: AUX-6pin

Usage: Older CPU AMD motherboards

Description: a connector with a straight row of 6 rectangular pins (male) or sockets (female)

For more: http://www.playtool.com/pages/psuconnectors/connectors.html#aux

PCI-E-6pin



Female Connector
End Type Formula:
PCI-E-6pin <MorF>

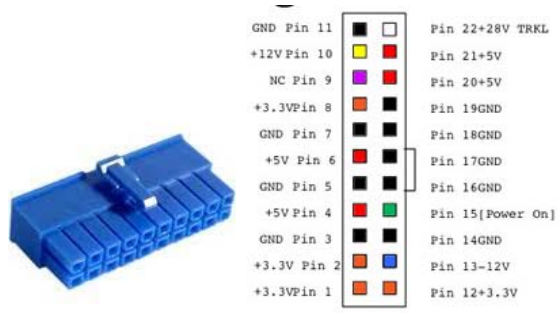
Connector Type Name: PCI-E-6pin

Usage: Powers PCI Express cards

Description: A connector with 2 rows of 3 pins (male) or sockets (female). Can produce a max of 75 watts

For more: http://en.wikipedia.org/wiki/Power_supply_unit_(computer)

ATX-20pin



Female Connector
End Type Formula:
ATX-20pin <MorF>

Connector Type Name: ATX-20pin

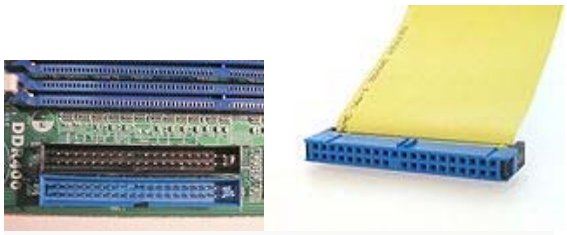
AKA: P1, PC Main, Molex Mini-fit Jr (when paired with a P4 connector)

Usage: Primary motherboard power

Description: a connector with 2 straight rows of 10 rectangular pins (male) or sockets (female)

For more: http://en.wikipedia.org/wiki/ATX

IDE



ATA connector on the right, with two motherboard ATA sockets on the left.

End Type Formula:
IDE <MorF>

Connector Type Name: IDE

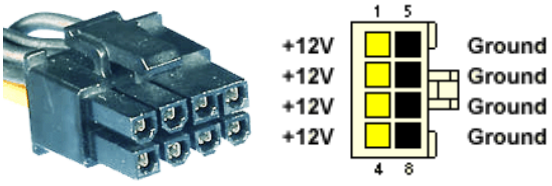
AKA: ATA, Advanced Technology Attachment, Parallel ATA, PATA

Usage: Connecting IDE hard drives and other devices to the motherboard

Description: A connector with 1 row of 20 pins (male) or sockets and a second row of 19. Can usually connect two devices to the motherboard using the same cable

For more:
http://en.wikipedia.org/wiki/Serial_ATA

PCI-E-8pin



Female Connector
End Type Formula:
PCI-E-8pin <MorF>

MATE-N-LOK

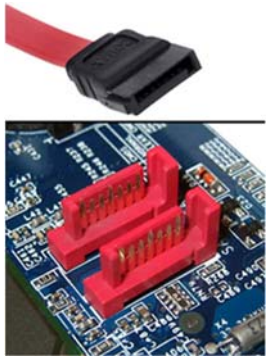
Connector Type Name: PCI-E-8pin

Usage: Powers PCI Express cards

Description: A connector with 2 rows of 4 pins (male) or sockets (female).

For more: http://en.wikipedia.org/wiki/Power_supply_unit_(computer)

SATA



Pin	Function
1	Ground
2	A+
3	A−
4	Ground
5	B− (receive)
6	B+ (receive)
7	Ground
—	Coding notch

End Type Formula:
SATA <MorF>

Connector Type Name: SATA

AKA: Serial Advanced Technology Attachment

Usage: a computer bus interface for connecting host bus adapters to mass storage devices such as hard disk drives and optical drives.
Description: a data cable with seven conductors (3 grounds and 4 active data lines in two pairs) and 8 mm wide wafer connectors on each end. SATA cables can have lengths up to 3.3 ft, and connect one motherboard socket to one hard drive.
Standardized by: SATA-IO

For more:
http://en.wikipedia.org/wiki/Serial_ATA

SATA Power

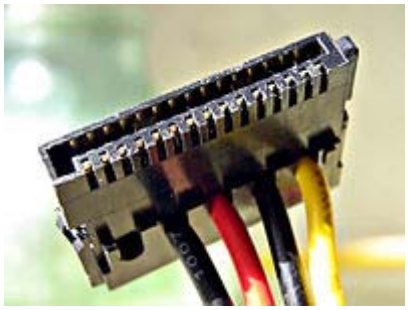
Connector Type Name: SATA Power Connector

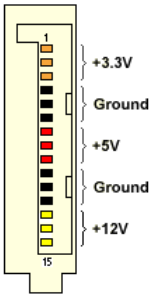
Usage: Hard drive power, DVD drive power

Description: wafer-based, but its wider 15-pin shape prevents accidental mis-identification and forced insertion of the wrong connector type

Standardized by: SATA-IO

For more:
http://en.wikipedia.org/wiki/Serial_ATA

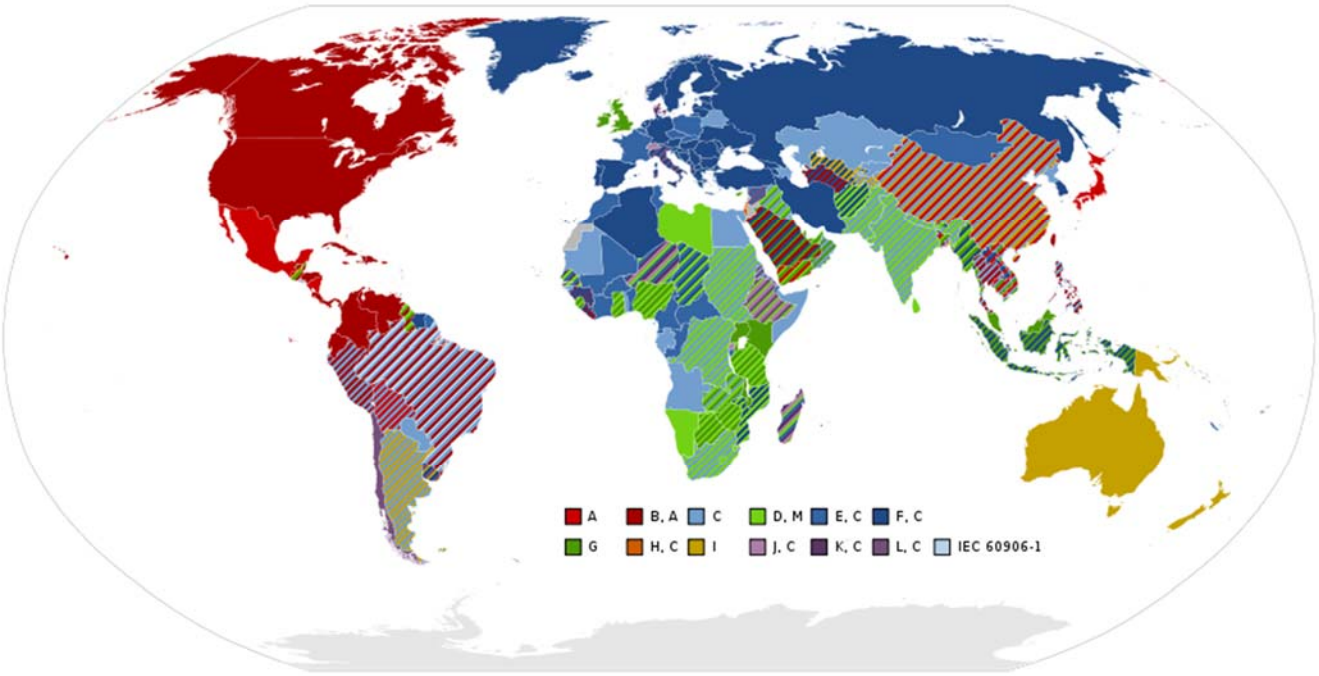




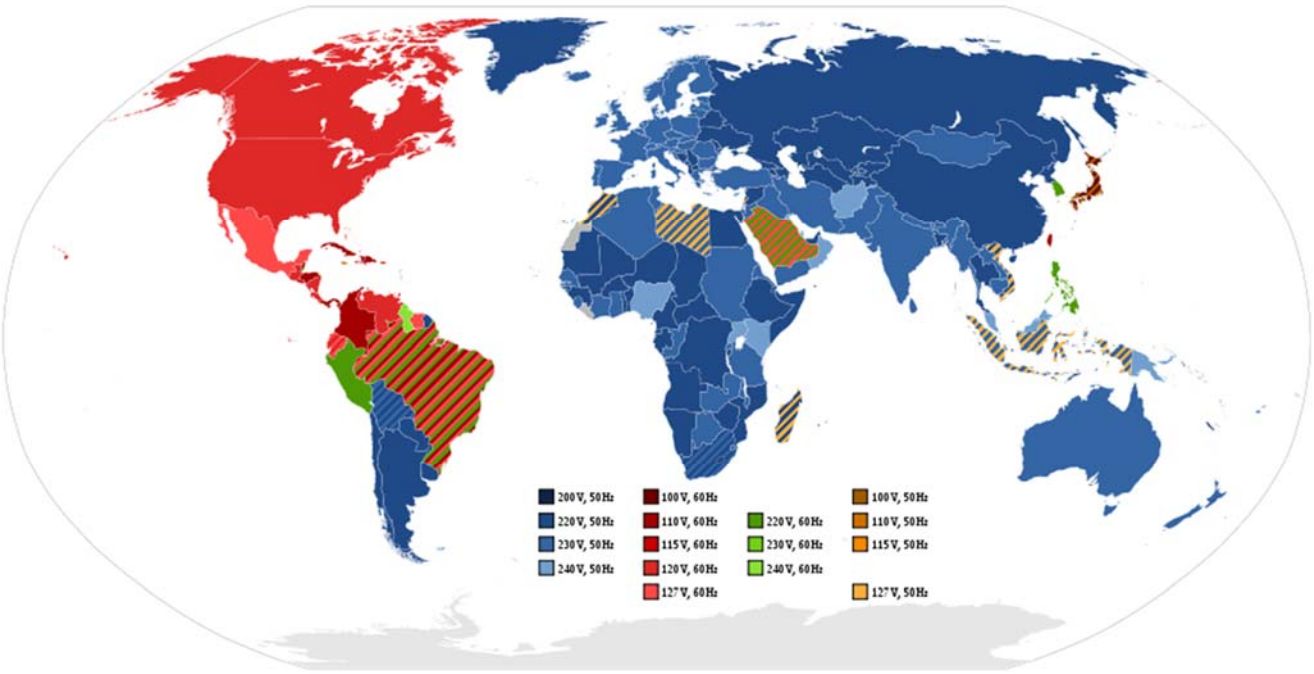
A 15-pin SATA power connector. Note that this connector is missing the 3.3V (orange) wire.

End Type Formula:
SATA Power <MorF>

World Wide Plug Type Chart



World Wide Voltage Chart



NEMA 1-15 (Type A)

End Type Formula:
NEMA 1-15 <PorR>

DescripID Ex:
Conn Power NEMA 1-15P Crimp
ElecOutlet NEMA 1-15R Dup Single Gang

Connector Type Name: NEMA 1-15

AKA: North American 15A

Usage: Electrical connections, usually 125v

Description: This plug has 2 round pins , each 4.8mm, 19mm apart with a half circle ground pin between, off to the side.

Other: Used mainly in North America and Japan

Standardized by: ANSI/NEMA WD 6-2002, JIS C 8303

ECA Type: A

For more:
http://en.wikipedia.org/wiki/NEMA_connector

NEMA 5-15 (Type B)

Connector Type Name: NEMA 5-15

AKA: American 3-pin, U-ground, North American 15 A

Usage: Electrical connections, usually 125V

Description: This plug has 2 flat parallel blades with a round ground pin.

Other: Used primarily in North America and Japan

Standardized by: ANSI/NEMA WD 6-2002, JIS C 8303, IEC 60906-2

ECA Type: B

For more:
http://en.wikipedia.org/wiki/NEMA_connector

End Type Formula:
NEMA 5-15 <PorR>

DescripID Ex:
Conn Power NEMA 5-15P Solder
ElecOutlet NEMA 5-15R Dup Single Gang

NEMA Non-Locking Plugs

VOLTAGE	NEMA	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125 V	1	1-15R	1-15P								
250V	2		2-15P	2-20R	2-20P	2-30R	2-30P				
125V	5	5-15R	5-15P	5-20R	5-20P	5-30R	5-30P	5-50R	5-50P		
250V	6	6-15R	6-15P	6-20R	6-20P	6-30R	6-30P	6-50R	6-50P		
277V, A.C.	7	7-15R	7-15P	7-20R	7-20P	7-30R	7-30P	7-50R	7-50P		
125/ 250V	10			10-20R	10-20P	10-30R	10-30P	10-50R	10-50P		
3Ø 250V	11	11-15R	11-15P	11-20R	11-20P	11-30R	11-30P	11-50R	11-50P		
125/ 250V	14	14-15R	14-15P	14-20R	14-20P	14-30R	14-30P	14-50R	14-50P	14-60R	14-60P
3Ø 250V	15	15-15R	15-15P	15-20R	15-20P	15-30R	15-30P	15-50R	15-50P	15-60R	15-60P
3Ø Y 120/208V	18	18-15R	18-15P	18-20R	18-20P	18-30R	18-30P	18-50R	18-50P	18-60R	18-60P

NEMA Locking Plugs

VOLT	NEMA	15 AMPERE		20 AMPERE		30 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125 V	L1	 L1-15R	 L1-15P				
250 V	L2			 L2-20R	 L2-20P		
125 V	L5	 L5-15R	 L5-15P	 L5-20R	 L5-20P	 L5-30R	 L5-30P
250 V	L6	 L6-15R	 L6-15P	 L6-20R	 L6-20P	 L6-30R	 L6-30P
277V, A.C.	L7	 L7-15R	 L7-15P	 L7-20R	 L7-20P	 L7-30R	 L7-30P
480 V	L8			 L8-20R	 L8-20P	 L8-30R	 L8-30P
600 V	L9			 L9-20R	 L9-20P	 L9-30R	 L9-30P

CEE 7/16 (Type C)

End Type Formula:
CEE 7/16<PorR>

DescripID Ex:
Conn Power CEE 7/16P Screw
ElecOutlet CEE 7/16R Sim Single Gang

Connector Type Name: CEE 7/16

AKA: Europlug 2.5 A

Usage: Electrical connections, usually 220V

Description: This plug has 2 round pins, each 4.8mm, 19mm apart. It is ungrounded.

Other: Used mainly in Germany and France

Standardized by: CEE 7/16

ECA Type: C

For more:
http://en.wikipedia.org/wiki/Europlug

CEE 7/17 (Type C)

Connector Type Name: CEE 7/17

AKA: German/French 16 A

Usage: Electrical connections, usually 220V

Description: This plug has 2 round pins , each 4.8mm in diameter, 19mm apart, and a round plastic or rubber base that stops it from being inserted into small sockets intended for Euro plugs (CEE 7/16). It is ungrounded.

Other: Used mainly in Germany and France
Standardized by: CEE 7/17

ECA Type: C

For more:
http://en.wikipedia.org/wiki/Europlug

End Type Formula:
NEMA 5-15 <PorR>

DescripID Ex:
Conn Power NEMA 5-15P Solder
ElecOutlet NEMA 5-15R Dup Single Gang

BS 546 (Type D)

End Type Formula:
BS 546<PorR>

DescripID Ex:
Conn Power BS 546P Screw
ElecOutlet BS 546R Sim Single Gang

Connector Type Name: BS546

AKA: Old British 3 pin

Usage: Electrical connections, usually 250V

Description: This plug has 3 round pins , each 7.05mm X 21.1mm. Live and neutral are spaced 25.4mm apart and ground is 28.6mm away from each of them.

Other: Used primarily in India, Pakistan, Sri Lanka, Nepal and Namibia

Standardized by: BS 546

ECA Type: D

For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

CEE 7/5 (Type E)

Connector Type Name: CEE 7/5

AKA: French 2-pin

Usage: Electrical connections, usually 220V

Description: This plug has 2 round pins , each 4.8mm, 19mm apart. With a hole in the center of the plug allowing a grounding pin mounted on its corresponding socket to fit.

Other: Used primarily in France, Belgium, Poland, Slovakia, and the Czech Republic. It is compatible with CEE 7/16, but not CEE 7/4

Standardized by: France

ECA Type: E

For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

End Type Formula:
CEE 7/5 <PorR>

DescripID Ex:
Conn Power CEE 7/5P Solder
ElecOutlet CEE 7/5R Sim Single Gang

CEE 7/7 (Type E/F)

End Type Formula:
CEE 7/7<PorR>

DescripID Ex:
Conn Power CEE 7/7P Screw

Connector Type Name: CEE 7/7

AKA: E/F Plug, Euro plug

Usage: Electrical connections, usually 220V

Description: A plug that was developed to bridge the gap between CEE7/4 and CEE 7/5.

Other: Used primarily in France and Germany. Also used heavily in Iraq

Standardized by: CEE 7/7
ECA Type: E/F

For more:
http://en.wikipedia.org/wiki/Domestic_AC_power_plugs_and_sockets

CEE 7/4 (Type F)

Connector Type Name: CEE 7/4

AKA: Schuko

Usage: Electrical connections, usually 220V

Description: This plug has 2 round pins , each 4.8mm, 19mm apart with side clips used for grounding

Other: It is used in Albania, Austria, Bosnia and Herzegovina, Bulgaria, Chile, Croatia, Estonia, Finland, Germany, Greece, Hungary, Iceland, Indonesia, Italy, Latvia, Luxembourg, the Netherlands, Norway, Pakistan, Portugal, Romania, Russia, Serbia, Slovenia, South Korea, Spain, Sweden, Turkey, Ukraine and Uruguay.

Standardized by: CEE 7/4

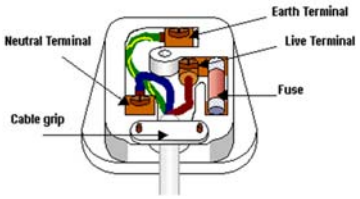
ECA Type: F

For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

End Type Formula:
CEE 7/4 <PorR>

DescripID Ex:
Conn Power CEE 7/4P Solder
ElecOutlet CEE 7/4R Sim Single Gang

BS1363 (Type G)



End Type Formula:
BS1363<PorR>

DescripID Ex:
Conn Power BS1363P Screw

Connector Type Name: BS1363

AKA: Euro three prong, 13 amp plug socket

Usage: Electrical connections, usually 220V

Description: A fused plug (13amp) that has 2 horizontal, rectangular pins for phase and neutral, and a larger, vertical pin above for the ground

Other: Used mainly in Britain, Ireland and other former colony states of the British empire. Also used in Iraq.

Standardized by: BS 1363

ECA Type: G

For more:
http://en.wikipedia.org/wiki/BS_1363

SI 32 (Type H)

Connector Type Name: SI 32

AKA: Israeli 16A

Usage: Electrical connections, usually 220V

Description: Has 3 flat pins that form a Y-shape. Live an neutral is spaced 19mm apart. In 1989, a revision was made to make the pins round to accommodate the use of CEE 7/16 plugs

Other: Primarily used in Israel

Standardized by: SI 32

ECA Type: H

For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

Left plug is the old standard, right is the 1989 revision

End Type Formula:
SI 32<PorR>

DescripID Ex:
Conn Power SI 32P Solder
ElecOutlet SI 32R Sim Single Gang

AS3112 (Type I)

End Type Formula:
AS3112<PorR>

DescripID Ex:
Conn Power AS3112P Screw
ElecOutlet AS3112R Dup Single Gang

Connector Type Name: AS 3112

AKA: Australian 10 A

Usage: Electrical connections, usually 240V

Description: 2 flat pins forming an upside down V-shape measuring 6.5 X 1.6 mm and set to 30 degrees to the vertical pitch of 13.7mm

Other: Used mainly in Australia and China

Standardized by: AS 3112

ECA Type: I

For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

SEV 1011 (Type J)

Connector Type Name: SEV 1011

AKA: Swiss 10 A

Usage: Electrical connections, usually 220V

Description: Similar to CEE 7/16, but this plug has a grounding pin off to the side and the plug is mounted in a flat hexagonal shape

Other: Used primarily in Switzerland

Standardized by: SEV 1011 (ASE1011/1959 SW10A-R)

ECA Type: J

For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

End Type Formula:
SEV 1011<PorR>

DescripID Ex:
Conn Power SEV 1011P Solder
ElecOutlet SEV 1011R Sim Single Gang

SRAF 1962 (Type K)

End Type Formula:
SRAF1962<PorR>

DescripID Ex:
Conn Power SRAF1962P Screw
ElecOutlet SRAF1962R Sim Single Gang

Connector Type Name: SRAF 1962/DB

AKA: Danish 10A, AFSNIT 107-2-D1

Usage: Electrical connections, usually 250V

Description: This plug has 2 round pins , each 4.8mm, 19mm apart with a half circle ground pin between, off to the side.

Other: Used mainly in Denmark

Standardized by: Danish plug Equipment standard Section 107-2-D1

ECA Type: K

For more:
http://www.stayonline.com/reference-international-plugs.aspx

CEI 23-16 (Type L)

Connector Type Name: CEI 23-16

AKA: Italian 3-pin

Usage: Electrical connections, usually 250V

Description: This plug has 2 round pins , each 4.8mm, 19mm apart and another round pin in between as a grounding pin.

Other: Used primarily in Italy, North Africa, Libya, Chile, Argentina and Uruguay.

Standardized by: **CEI 23-16/VII**

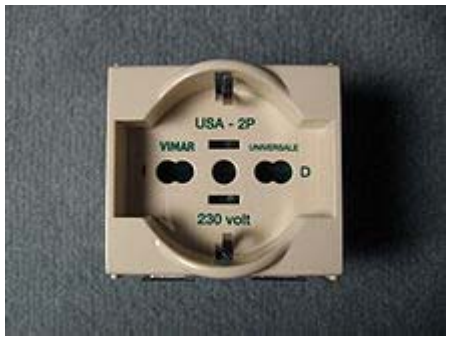
ECA Type: L

For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

End Type Formula:
CEI 23-16<PorR>

DescripID Ex:
Conn Power CEI 23-16P Solder
ElecOutlet CEI 23-16R Sim Single Gang

Multi-standard Sockets



MS-CEE7/16R, CEE7/5R, CEI23-16

Universal Socket

MS-CEE7/16R, NEMA5-15R

Connector Type Name: Universal or MS-(Multi standard)

Description: The universal socket will allow a wide variety of plugs to "plug in". There are other types of sockets that allow varing plugs. These are often referred to by the type of plugs they will accept.

End Type Formula:
Universal <PorR>
MS-<type of recepticals Listed><R>

DescripID Ex:
ElecOutlet Universal R Sim Single Gang
ElecOutlet MS-CEE7/16R, NEMA5-15R Dup Single Gang

IEC 60906-1

Connector Type Name: IEC 60906-1
Usage: Electrical connections, usually 230V

Description: IEC 60906-1 is an international standard for 230 V AC domestic power plugs and sockets. It was intended to become the common mains plug and socket standard, to be used one day everywhere in Europe and other regions with 230 V mains.

Other: Used primarily in Brazil and South America, but with 127V. It looks similar to the SEV1011, but there are significant differences.

Standardized by: IEC 60906-1

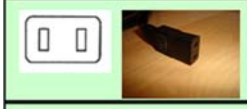
For more:
http://en.wikipedia.org/wiki/Domestic_AC_Power_plugs_and_sockets

End Type Formula:
IEC 60906-1<PorR>

DescripID Ex:
Conn Power IEC 60906-1P Solder
ElecOutlet IEC 60906-1R Sim Single Gang

IEC320

International Electrotechnical Commission 60320 sets a standard for attaching electric cords to end devices.

Pin Configuration	Designation	Rated Current (Amps)	Equipment Class	Rated Temperature
	Female - C1 Male - C2	0.2	II	65ºC
	Female - C3 Male - C4	2.5	0	65ºC
	Female - C5 Male - C6	2.5	I	65ºC
	Female - C7 Male - C8	2.5	II	65ºC
	Female - C9 Male - C10	6	II	65ºC
	Female - C11 Male - C12	10	0	65ºC
	Female - C13 Male - C14	10/15	I	65ºC
	Female - C15 Male - C16	10/15	I	120ºC
	Female - C15A Male - C16A	10/15	I	155ºC
	Female - C17 Male - C18	10/15	II	65ºC
	Female - C19 Male - C20	16/20	I	65ºC
	Female - C21 Male - C22	16/20	I	155ºC
	Female - C23 Male - C24	16/20	II	65ºC

End Type Formula:

IEC320<Designation>

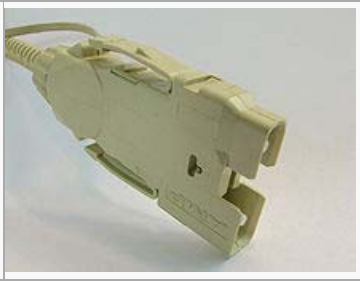
DescripID Ex:

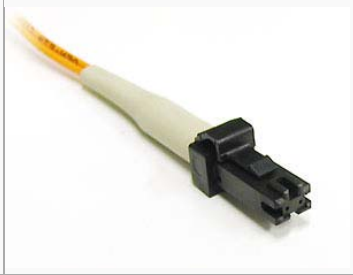
Conn Power IEC320 C5 Solder

Fiber Connectors

Short name	Long form	Coupling type	Ferrule diameter	Standard	Typical applications	Picture
Avio		Screw			Aerospace and avionics	
ADT-UNI		Screw	2.5 mm		Measurement equipment	
Biconic		Screw	2.5 mm		Obsolete	
D4		Screw	2.0 mm		Telecom in the 1970s and 1980s, obsolete	
Deutsch 1000		Screw			Telecom, obsolete	
DINLSA		Screw		IEC 61754-3	Telecom in Germany in 1990s; measurement equipment; obsolete	
DMI		Clip	2.5 mm		Printed circuit boards	

E-2000		Snap, with light and dust-cap	2.5 mm	IEC 61754-15	Telecom, DWDM systems;	
EC		push-pull type		IEC 1754-8	Telecom & CATV networks	
ESCON	Enterprise Systems Connection	Snap (duplex)	2.5 mm		IBM mainframe computers and peripherals	
F07			2.5 mm	Japanese Industrial Standard (JIS)	LAN, audio systems; for 200 µm fibers, simple field termination possible, mates with ST connectors	
F-3000		Snap, with light and dust-cap	1.25 mm	IEC 61754-20	Fiber To The Home (LC Compatible)	
FC	Ferrule Connector *or* Fiber Channel	Screw	2.5 mm	IEC 61754-13	Datacom, telecom, measurement equipment, single-mode lasers; becoming less common	
Fibergate		Snap, with dust-cap	1.25 mm		Backplane connector	

FSMA		Screw	3.175 mm	IEC 60874-2	Datacom, telecom, test and measurement	
LC	Lucent Connector, Little Connector, *or* Local Connector	Snap	1.25 mm	IEC 61754-20	High-density connections, SFP transceivers, XFP transceivers	
LuxCis			1.25 mm	ARINC 801	PC or APC configurations (note 3)	
LX-5		Snap, with light- and dust-cap		IEC 61754-23	High-density connections; rarely used	
MIC	Media Interface Connector	Snap	2.5 mm		Fiber distributed data interface (FDDI)	
MPO / MTP	Multiple-Fibre Push-On/Pull-off	Snap (multiplex push-pull coupling)	2.5×6.4 mm	IEC-61754-7; EIA/TIA-604-5 (FOCIS 5)	SM or MM multi-fiber ribbon. Same ferrule as MT, but more easily reconnectable. Used for indoor cabling and device interconnections. MTP is a brand name for an improved connector, which intermates with MPO	

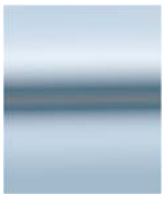
MT	Mechanical Transfer	Snap (multiplex)	2.5×6.4 mm		Pre-terminated cable assemblies; outdoor applications	
MT-RJ	Mechanical Transfer Registered Jack *or* Media Termination - recommended jack	Snap (duplex)	2.45×4.4 mm	IEC 61754-18	Duplex multimode connections	
MU	Miniature unit	Snap	1.25 mm	IEC 61754-6	Common in Japan	
NEC D4		Screw	2.0 mm		Common in Japan telecom in 1980s	
Opti-Jack		Snap (duplex)				
OPTIMATE		Screw			Plastic fiber, obsolete	

SC	Subscriber Connector *or* square connector *or* Standard Connector or Snap Click	Snap (push-pull coupling)	2.5 mm	IEC 61754-4	Datacom and telcom;GBIC; extremely common	
SMA 905	Sub Miniature A	Screw	Typ. 3.14 mm		Industrial lasers, military; telecom multimode	
SMA 906	Sub Miniature A	Screw	Stepped; typ. 0.118 in (3.0 mm), then 0.089 in (2.3 mm)		Industrial lasers, military; telecom multimode	
SMC	Sub Miniature C	Snap	2.5 mm			
ST	Straight Tip/Bayonet Fiber Optic Connector or Stick Twist	Bayonet	2.5 mm	IEC 61754-2	Multimode, rarely single-mode; APC not possible	
TOSLINK	Toshiba Link	Snap			Digital audio	
VF-45		Snap			Datacom	

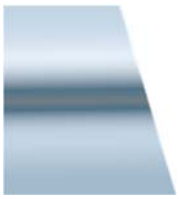
1053 HDTV	Broadcast connector interface	Push-pull coupling	Industry-standard 1.25 mm diameter ceramic ferrule		Audio & Data (broadcasting)	
V-PIN	V-System	Snap (Duplex) Push-pull coupling			Industrial and electric utility networking; multimode 200 µm, 400 µm, 1 mm, 2.2 mm fibers	

UPC vs APC: Ultra-Polished Connectors vs Angle-Polished Connectors

UPC and APC refers to the shape of the cladding on the tip of a fiber connector. UPC is a flat tip perpendicular to the sides of the cladding while APC is a flat angled tip. UPC is used more commonly primarily in data networks, whereas APC is used more commonly with RF video signal applications. UPC has more return loss because light is reflected back down the core. With APCs, light is reflected into the cladding. Generally, UPC connectors have a blue housing and APC have green.



UPC Polish
Light is reflected back down to the core
Return Loss = -55 dB
(Adequate for most applications)



8° Angled Polish
Light is reflected into the cladding
Return Loss = -65 dB
(0.0001% of power reflected back)
(ideal for video and single fiber applications)

Green = APC Blue = UPC

For more, see http://www.adc.com/Attachment/1270711936302/105662AE.pdf

Note: since APCs are less commonly used, if the connector is an APC it should be annotated in the remarks of the descripID.

End Type Formula:
<ShortName> <MorF>

DescripID Ex:
Conn Fiber MM LC M UNICAM
Conn Fiber SM ST M Hotmelt

Cable

CAT Cable (Twisted Pair Cable)

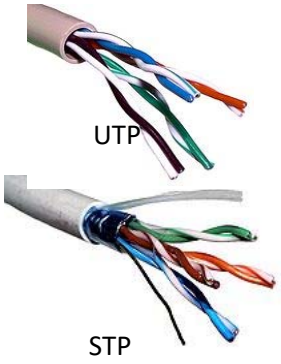
CAT cable, or category cable, is a type of wiring in which two conductors (the forward and return conductors of a single circuit) are twisted together for the purposes of canceling out electromagnetic interference (EMI) from external sources; for instance, electromagnetic radiation from unshielded twisted pair (UTP) cables, and crosstalk between neighboring pairs. The tighter the twists, the less attenuation that occurs, and the higher the frequency that can be transmitted. These pairs usually run alongside other pairs within the same outer jacket to create a cable. The cable sometimes has a foil that acts as an electromagnetic shield either between the outer jacket and the wires or between each twisted pair. The cable is primarily used for data, known as Ethernet, and voice applications

Cable Shielding

Note that different vendors and authors use different terminology (i.e. STP has been used to denote both STP-A, S/STP, and S/UTP).[3] See below for the ISO/IEC attempt to internationally standardize the various designations.

Old name	New name	cable screening	pair shielding
UTP	U/UTP	none	none
STP	U/FTP	none	foil
FTP	F/UTP	foil	none
S-STP	S/FTP	braiding	foil
S-FTP	SF/UTP	foil, braiding	none

TP = twisted pair
U = unshielded
F = foil shielding
S = braided shielding



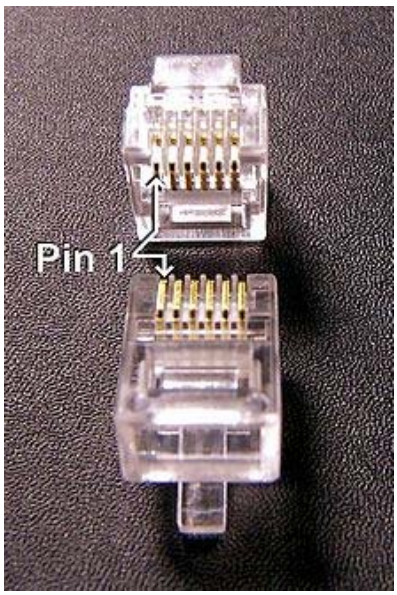
Name	Type	Bandwidth	Applications	Notes
Level 1		0.4 MHz	Telephone and modem lines	Not described in EIA/TIA recommendations. Unsuitable for modern systems.
Level 2		4 MHz	Older terminal systems, e.g. IBM 3270	Not described in EIA/TIA recommendations. Unsuitable for modern systems.
Cat3	UTP	16 MHz	10BASE-T and 100BASE-T4 Ethernet	Described in EIA/TIA-568. Unsuitable for speeds above 16 Mbit/s. Now mainly for telephone cables
Cat4	UTP	20 MHz	16 Mbit/s Token Ring	Not commonly used, but meant for telephone networks for voice and data from 12 Mbit/s to 16Mbit/s
Cat5	UTP	100 MHz	100BASE-TX & 1000BASE-T Ethernet	Common in most current LANs
Cat5e	UTP	100 MHz	100BASE-TX & 1000BASE-T Ethernet	Enhanced Cat5. Same construction as Cat5, but with better testing standards.
Cat6	UTP	250 MHz	1000BASE-T Ethernet	Most commonly installed cable in Finland according to the 2002 standard. SFS-EN 50173-1
Cat6a		500 MHz	10GBASE-T Ethernet	ISO/IEC 11801:2002 Amendment 2.
Class 7	S/FTP	600 MHz	Telephone, CCTV, 1000BASE-TX in the same cable. 10GBASE-T Ethernet.	Four pairs, S/FTP (shielded pairs, braid-screened cable). Development complete - ISO/IEC 11801 2nd Ed.
Class 7a		1000 MHz	Telephone, CATV, 1000BASE-TX in the same cable. 10GBASE-T Ethernet.	Four pairs, S/FTP (shielded pairs, braid-screened cable). Development complete - ISO/IEC 11801 2nd Ed. Am. 2

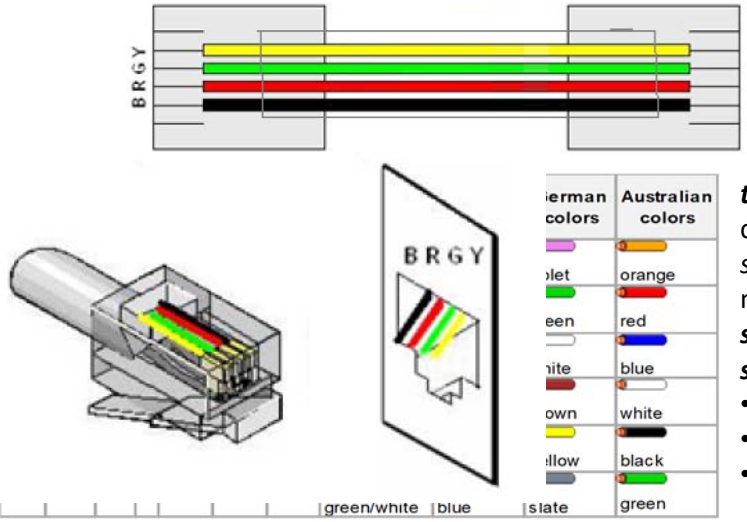
Note: Max recommended length is 100m (328ft) for any cable segment regardless of type.

For more: http://en.wikipedia.org/wiki/Twisted_pair

Phone Cable Termination

A working phone cable for one line requires two conductors. A “Tip” and a “Ring” conductor. Tip is the ground side (positive) and Ring is the battery (negative) side of a phone circuit. A 6P6C can support 3 different lines. The most common phone cable used for subscriber lines are Black, red, green, and yellow placed in an RJ14 configuration. All subscriber phone cables are roll over cables.



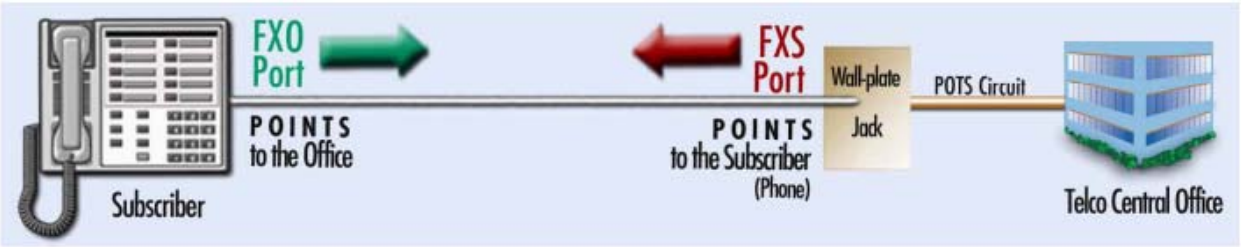


FXS - Foreign eXchange Subscriber interface (the plug on the wall) delivers POTS service from the local phone company’s Central Office (CO) and must be connected to *subscriber equipment* (telephones, modems, and fax machines). In other words an FXS interface ***points to the subscriber. An FXS interface provides the following primary services to a subscriber device:***

- Dial Tone
- Battery Current
- Ring Voltage

FXO - Foreign eXchange Office interface (the plug on the phone) receives POTS service, typically from a Central *Office of the Public Switched Telephone Network (PSTN). In other words* an FXO interface ***points to the Telco office. An FXO interface provides the following primary*** service to the Telco network device:

- on-hook/off-hook indication (loop closure)

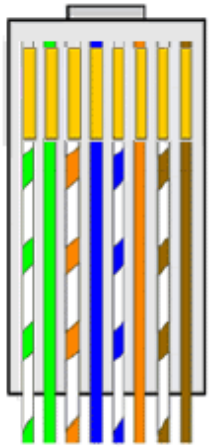


http://www.patton.com/technotes/fxs_fxo.pdf

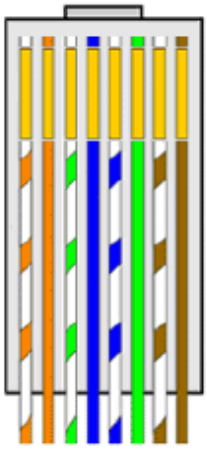
EIA TIA Cabling Standards

http://en.wikipedia.org/wiki/TIA/EIA-568

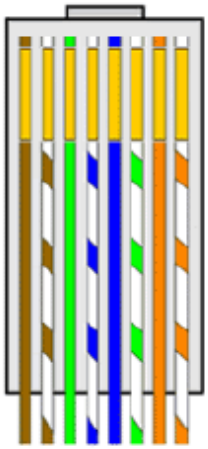
Perhaps the widest known and most discussed feature of TIA/EIA-568-B.1-2001 is the definition of pin/pair assignments for eight-conductor 100-ohm balanced twisted-pair cabling, such as Category 3, Category 5 and Category 6 unshielded twisted-pair (UTP) cables. These assignments are named T568A and T568B and they define the pinout, or order of connections, for wires in 8P8C (often incorrectly referred to as RJ45) eight-pin modular connector plugs and sockets. Although these definitions consume only one of the 468 pages in the standards documents, a disproportionate amount of attention is paid to them. This is because cables that are terminated with differing standards on each end will not function normally.



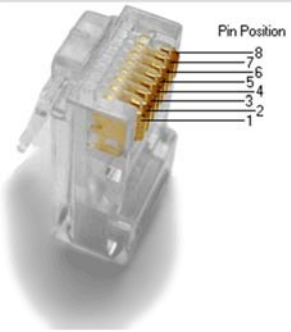
T568A



T568B
(AT&T 258A)



T568B
Rollover

Pin	T568A Pair	T568B Pair	Wire	T568A Color	T568B Color	Pins on plug face (socket is reversed)
1	3	2	tip	white/green stripe	white/orange stripe	
2	3	2	ring	green solid	orange solid	
3	2	3	tip	white/orange stripe	white/green stripe	
4	1	1	ring	blue solid	blue solid	
5	1	1	tip	white/blue stripe	white/blue stripe	
6	2	3	ring	orange solid	green solid	
7	4	4	tip	white/brown stripe	white/brown stripe	
8	4	4	ring	brown solid	brown solid	

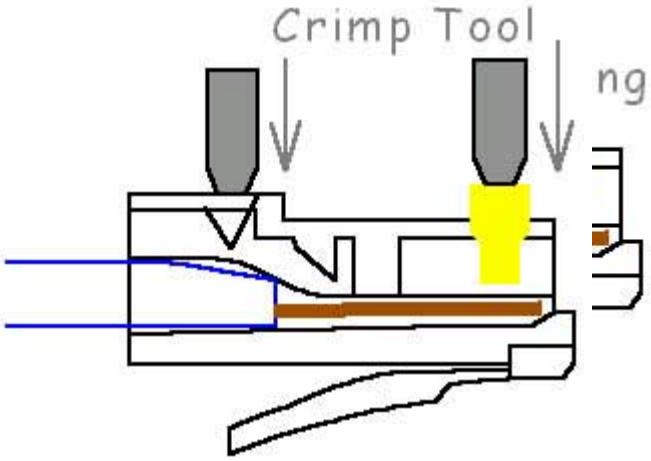
Straight Through:
T568B to T568B

Cross Over:
T568A to T568B

Rollover:
T568B to T568B in reverse

Ethernet Patch Cable Termination

	1. Cut the cable to length needed. Place boots on both ends if you are using them with the boot facing out.
	2. Scour the outer jacket about 1 ½" from each end. Don't cut all the way through if you don't have to so the inner wires don't get nicked. Pull off the jacket from where it was scoured.
	3. Cut the foil back (if using STP) and the strain relief fibers. If STP, ensure you do not cut the ground wire. If CAT 6, cut the center spine so that it is flush with the jacket.
	4. If terminating STP, wrap the ground wire around the edge of the jacket, within about ¼" of the edge.
	5. Untwist all the wires and fan out in the appropriate color code order. Pinch the fan near the jacket and with your other hand, pinch the wires and wiggle then back and forth to make straight and adjacent to each other
	6. Cut the wires so they are flush about ½" from the jacket
	7. Ensure that the wires are still in the proper color sequence and insert them into the rear of the 8P8C. Try to slide it in at an angle with the tips of the wire pressed against the bottom of the 8P8C as you slide them in.
	8. Double check the color sequence again and ensure you can see the copper core of each wire on the front of the 8P8C.
	9. Ensure that the jacket is in the 8P8C and insert the 8P8C into the crimper. Squeeze down all the way and remove the connector from the body.
	10. Ensure that the crimper crimped the wires and is crimped over the outer jacket.
	11. If terminating STP, crimp ground sleeve over the coiled ground wire.
	12. Slide the boots over the connectors if used.
	13. Repeat the procedure on the opposite end of the cable
	14. Test the cable



Controversies and Caveats: Category 5, 5E, and Cat 6 Patch Cables

568B vs 568A

For patch cables, 568-B wiring is by far, the most common wiring method. Virtually all pre-assembled patch cables are wired to the B standard. There is no difference in connectivity between 568B and 568A cables. However, EIA/TIA standards and The United States National Communication Systems Federal Telecommunications Recommendations use T568A

Re-use of old cables

We have seen this happen time and time again. Perfectly good patch cables that have been working fine for years get removed from their installation, and re-installed on the same, or different network. The result can be a nightmare. What happens is that the cable, over time, adapts to the way that it is bent in it's original installation. When these cables are removed and re-installed, they can either completely lose their connection, or develop intermittent problems. This is due to stresses that may be opposite to what they were originally subject to. If the integrity of your network is more valuable than the price of new patch cables, then we strongly suggest that you use brand new cables for all closet cleanups, network moves, etc.

Stranded vs. Solid wire

Almost all patch cables that are made have stranded wire. Stranded wire is normally specified for use in patch cables due to its superior flexibility. There has been some talk recently, in the technical sector of the structured wiring community, regarding the possible use of solid conductors for patch cables. The reason for the spotlight on solid wire is that it is supposedlymore stable, under a variety of conditions.

Keystone Jack Termination

http://cableorganizer.com/learning-center/how-to/how-to-wire-keystone-jack.htm

STEP 1

Strip approximately 1.5 inches of jacket from the twisted-pair cable.

STEP 2

Separate the twisted wire pairs from each other; then untwist each pair. Straighten wire ends out as much as possible.

STEP 3

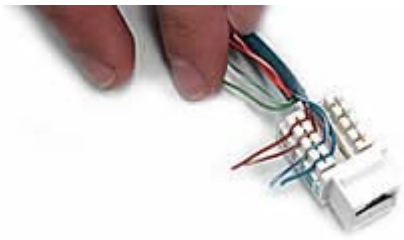
Remove the jack's protective cap.

STEP 4

Once the cap has been removed, you'll notice that there are wire configurations printed near the termination slots. If you are given a choice between "A" and "B" configurations, choose whichever one you'd like, just be sure to remember which one you're using when it comes time to terminate the cable's other end with a jack! Configurations ***must*** be the same at both ends of the network cabling.

STEP 5

Place all 8 wires into the center of the jack; from there, divert the wires into their correct slots, pressing them as far down into the termination slots as they will go. Excess wire length will be extending out of the sides of the jack.



STEP 6

It's easiest to punch down wires if you do one side of the jack at a time. Make sure that the punchdown tool's "**Cut**" side is aligned with the outer edge of the jack, and that the jack assembly is resting on a hard, sturdy surface that is able to withstand force.
To punch down each wire, press down on the punchdown tool until you hear a loud click and simultaneous, metallic-sounding "ping". These noises are indicators that the punch-down has been done correctly; if you don't hear them, you'll know that the punchdown hasn't been successful.

STEP 7

Check the quality of the punches. Inspect each termination slot along the outer edge of the jack; each wire should be firmly anchored at the bottom of its slot, and the wires' copper conductors will be visible.

STEP 8

Snap the jack's cover back on, over the wires.

STEP 9

Firmly insert the jack assembly into the faceplate from the back; be sure that the jack's clip is facing up, so that it properly snaps into the faceplate port.

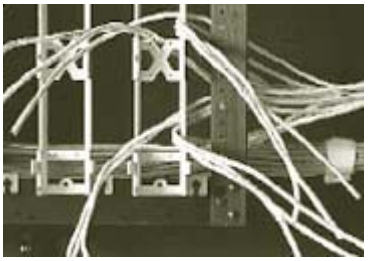
STEP 10

Screw the completed jack / faceplate assembly into the wall.

How to Install a 66 Connecting Block

http://cableorganizer.com/phone-data-connection-blocks/66-installation-instructions.htm

1. Mount an S89-type bracket firmly on a properly prepared plywood wall using two wood screws; or alternately mount on a Siemon cross-connect frame.



2. Route the horizontal, or backbone cables inside the S89 bracket and feed the cables out either the right or the left side of the bracket as needed.

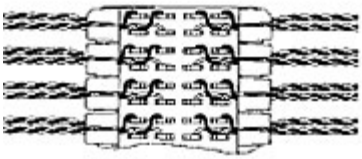
3. Install the S66 block onto the S89-type bracket.

4. Strip back only as much cable jacket as is necessary to terminate the conductors. *Note: Common practice prior to the emergence of category 5/5e cable was to strip back the cable jacket to the side of the block so that no jacket was visible. This practice is not recommended when installing systems where category 5e performance is required. The cable jacket should be left on the cable as close to point of termination as possible.*

5. Route each pair through the same slot in the fanning strip in its mated state. Separate the conductors of each pair inside the fanning strip and place in the appropriate quick clips. Pair twist must be maintained to within .05 in. of the point of termination for category 5e installations. Check the conductor sequence at this point and correct any miss-wires or reversals.

6. Terminate each conductor using an S814 impact tool or equivalent. *Note: It is important to keep the S814 tool perpendicular to the block when terminating the conductors. Twisting of the S814 tool while terminating can result in bent pins and subsequent damage to the S66 block.*

7. Label each block on the fanning strip, designation strips, or cover as appropriate.



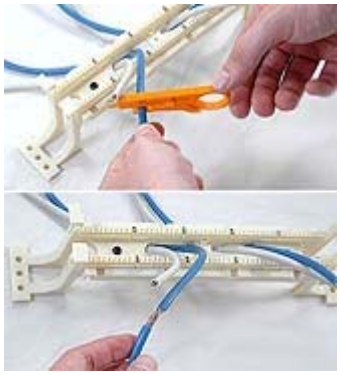
8. Cross-connect wires should be installed through the same slot in the fanning strip as the horizontal or backbone cable pairs.

1. Mount the S110® wiring base and legs onto a suitable mounting surface with the necessary screws and hardware.

2. Remove the S110® wiring base from the legs by depressing the outer 4 fanning strips of the S110® wiring base inward to defeat the leg latches. Pull the wiring base away from the legs.

3. With the S110® base removed, route the cable between the legs.

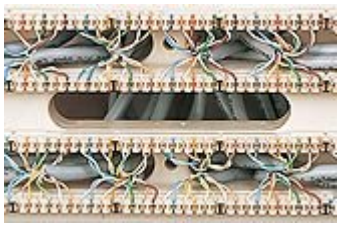
4. Lace the cables through the appropriate openings in the wiring base and snap the S110® wiring base back onto the legs. Push the wiring base onto the legs until the latches “snap” into place. NOTE: For additional security, the assembly can be fastened together using the self-tapping, Phillips-head screws included.



5. Strip back only as much cable jacket as is necessary to terminate the conductors using the Siemon CPT **tool** or equivalent.

6. Lace the conductors into the S110® wiring base. Pair twist must be maintained to within 12mm (.5") of the point of termination for **category 5** installations. Ample channel space is provided to allow jacketed cable to continue close to the point of termination.

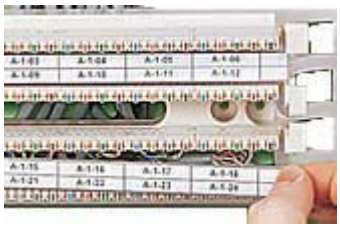
7. Seat the conductors and trim off the excess wire with the cutting edge of the **punchdown tool** or equivalent.
NOTE: Be sure that the cutting edge is properly oriented prior to trimming the wire.



8. Visually inspect the conductor and cable placement at this point to eliminate any miss-wires or reversals.

9. Insert a **connecting block** into the head of a **impact tool / punchdown tool**.

10. Carefully align the S110C connecting block over the wiring base, with the blue marking to the left side of the block (gray stripe down), and seat the connecting block.

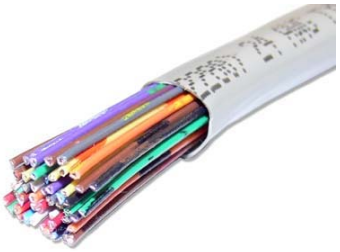


11. **Label** the circuits then slide the designation strip into the S110-HLDR and snap the holder onto the wiring base. Complete the connections using CJ5 series cross-connect wire or S110P patch cables.

NOTE: Remove designation strips prior to removing base from legs.

25-Pair Color Code

Twisted pair cable usually comes in 2- 4 pair (4-8 wire) for general use. Generally on the provider side, it can come in larger numbers of pairs ranging from 12 pair all the way to 100 or more. It's usually used for voice trunk lines going to 66 blocks, 110 blocks or terminal blocks. To help distinguish between the multiple wires, they are given color combinations. Each color combination always goes to the same position in any install. This is known as a color code.



25 PAIR WITH VIOLET

TIP / RING	WHT	RED	BLK	YEL	VIO
BLU	1 (1-25)	6 (126-150)	11 (251-275)	16 (376-400)	21 (501-525)
ORN	2 (26-50)	7 (151-175)	12 (276-300)	17 (401-425)	22 (526-550)
GRN	3 (51-75)	8 (176-200)	13 (301-325)	18 (426-450)	23 (551-575)
BRN	4 (76-100)	4 (201-225)	14 (326-350)	19 (451-475)	14 (576-600)
SLT	5 (101-125)	5 (226-250)	15 (351-375)	20 (476-500)	15 (601-625)

1 (1-25)

Note: When there is more than 25 pairs in a cable, they will usually be grouped together and wrapped with lanyard that follows the same colorcode. A white blue lanyard will wrap around wires 1-25 (WHT-BLU to VIO-SLT) and will be the first group of wires.

25 PAIR WITHOUT VIOLET

TIP / RING	WHT	RED	BLK	YEL
BLU	1 (1-20)	6 (101-120)	11 (201-220)	16 (301-320)
ORN	2 (20-40)	7 (121-140)	12 (221-240)	17 (321-340)
GRN	3 (41-60)	8 (141-160)	13 (241-260)	18 (341-360)
BRN	4 (60-80)	4 (161-180)	14 (261-280)	19 (361-380)
SLT	5 (81-100)	5 (181-200)	15 (281-300)	20 (381-400)

Cable Jacket Types

PVC Jacket

Cables with a Poly Vinyl Chloride (PVC) jacket are the most commonly used and are often referred to as general purpose cables. These types of cables are intended for installations with no particular fire safety code requirements. Some examples are home or office environments for CPU to monitor connections. In a fire, PVC-coated wires can form HCl fumes; the chlorine serves to scavenge free radicals and is the source of the material's fire retardance. While HCl fumes can also pose a health hazard in their own right, HCl breaks down on surfaces, particularly in areas where the air is cool enough to breathe, and is not available for inhalation.

Plenum (CMP) Rated Jacket

Cables with plenum rated jackets are intended for installations where cables are routed through an air handling conduit (often called a plenum). Plenum cables must self extinguish and not reignite. They also produce less smoke than traditional PVC cables. The smoke and fumes are toxic. This requirement is usually imposed by fire safety codes and is related to the stringent burn test that this type of cable must meet. Complies with NFPA-262 and UL-910.

Low Smoke Zero Halogen (LSZH) Rated Cable

Cables with a LSZH jacket are intended for applications where both low smoke and low corrosive gases are needed. Used in shipboard applications and computer networking rooms where toxic or acidic smoke and fumes can injure people and/or equipment. Examples of Halogens include Fluorine, Chlorine, Bromine, and Iodine. These materials when burned produce acidic smoke that can harm people and computer equipment. Low Smoke means the cable does not produce the heavy black soot and smoke common with PVC cables. These cables will self extinguish but cannot pass UL-910 or UL-1666 for a plenum or riser rating.

Riser (CMR) Rated Cable

Comples with UL-1666. Defined for usage in vertical tray applications such as cable runs between floors through cable risers or in elevator shafts. These spaces cannot be used for environmental air. These cables must self extinguish and must also prevent the flame from traveling up the cable in a vertical burn test.

General Purpose (CM, CMG, CMx) Cable

Will burn and partially self extinguish. Not for use between build floors or in air plenum spaces. Often these cables are used for workstation cables and patch cords. Complies with UL-1581 testing.

Limited Use Cable

This cable has certain restriction on open laying, ex. It's usage is permitted only in residential buildings, it's laying is allowed only in tubing made of incombustible material or maximal diameter is limited etc.

FR-PVC (fire retardant polyvinylchloride)

FR-PVC insulation has better fire retardant properties than normal PVC. It has significant advantages in terms of lower acid emissions and smoke generation. The amount of chlorine in the flame-retardant PVC (FRPVC) jacket cable is significantly higher (5%) than the conventional PVC jacket cable. FRPVC has good electrical insulation properties below 100°C.

HFFR (Halogen Free Flame Retardant)

HFFR cables help to prevent cable fires from occurring, and even if fire does break out, there is considerably less accompanying smoke. Therefore, they are especially important in protecting the lives of people and animals.
For HFFR cables too, top priority is mechanical and electrical product properties and the best possible melt processability. This can only be achieved through the optimum adhesion of fillers and polymers and through good cross-linking of the

polyethylenes.
The advantages of HFFR compounds: increased loading levels, high flame retardation, significantly reduced water uptake into the polymer, much improved electrical properties, increased throughput during cable production, improved mechanical properties.

PE (polyethylene)

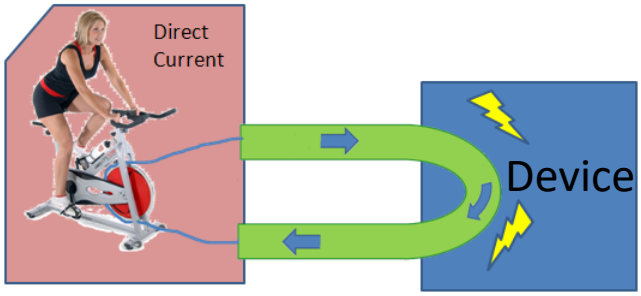
PE is a semi-crystalline thermoplastic material and one of the most commonly used plastics. It is generally ductile, flexible and has low strength. There are two basic families: LDPE (low density polyethylene), and HDPE (high density polyethylene).

HDPE (high density polyethylene)

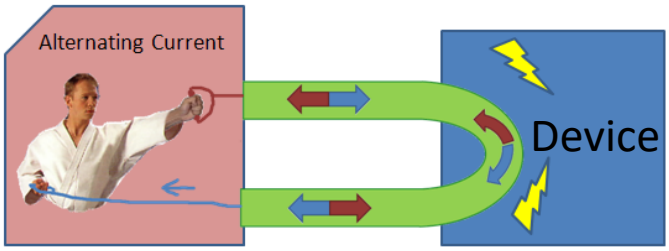
HDPE is the high density version of PE plastic. It is harder, stronger and a little heavier than LDPE, but less ductile. The use of UV-stabilizators (carbon black) improves its weather resistance but turns it black. HDPE is also more opaque and it can withstand rather higher temperatures (120°C for short periods, 110°C continuously). HDPE has many advantages: chemical- and corrosion-resistant, light-weight, low moisture absorption, non-staining, thermoforming performance, non-toxic, high tensile strength.

AC vs DC

http://en.wikipedia.org/wiki/War_of_Currents



Direct Current: The DC power system was invented by Thomas Edison. The electric charge on the circuit is circulated in one direction continuously. This is why it is important to pay attention to the polarity of a device, or else a motor that is suppose to run forward will run backward. DC use to be the American standard for power providers, but AC has taken it's place. However, the majority of modern day devices require DC to operate.



Alternating Current: AC was invented by Nikola Tesla. The electric charge on the circuit are pushed and pulled back and forth in regular intervals to transmit power. Being that the charge is going back and forth over the same area instead of circulating through the circuit, the distance of cable ran that AC provides power over can be greater than DC, and this is why the majority of prime power outlets are now AC

AC and DC working together: Being that most devices require DC to operate, and that prime power is usually AC, the device usually needs a AC Adapter. This converts the alternating current to DC and converts the voltage and amperage to the proper volt and amps required for the device to operate.

AC Adapter

(Power Supply)

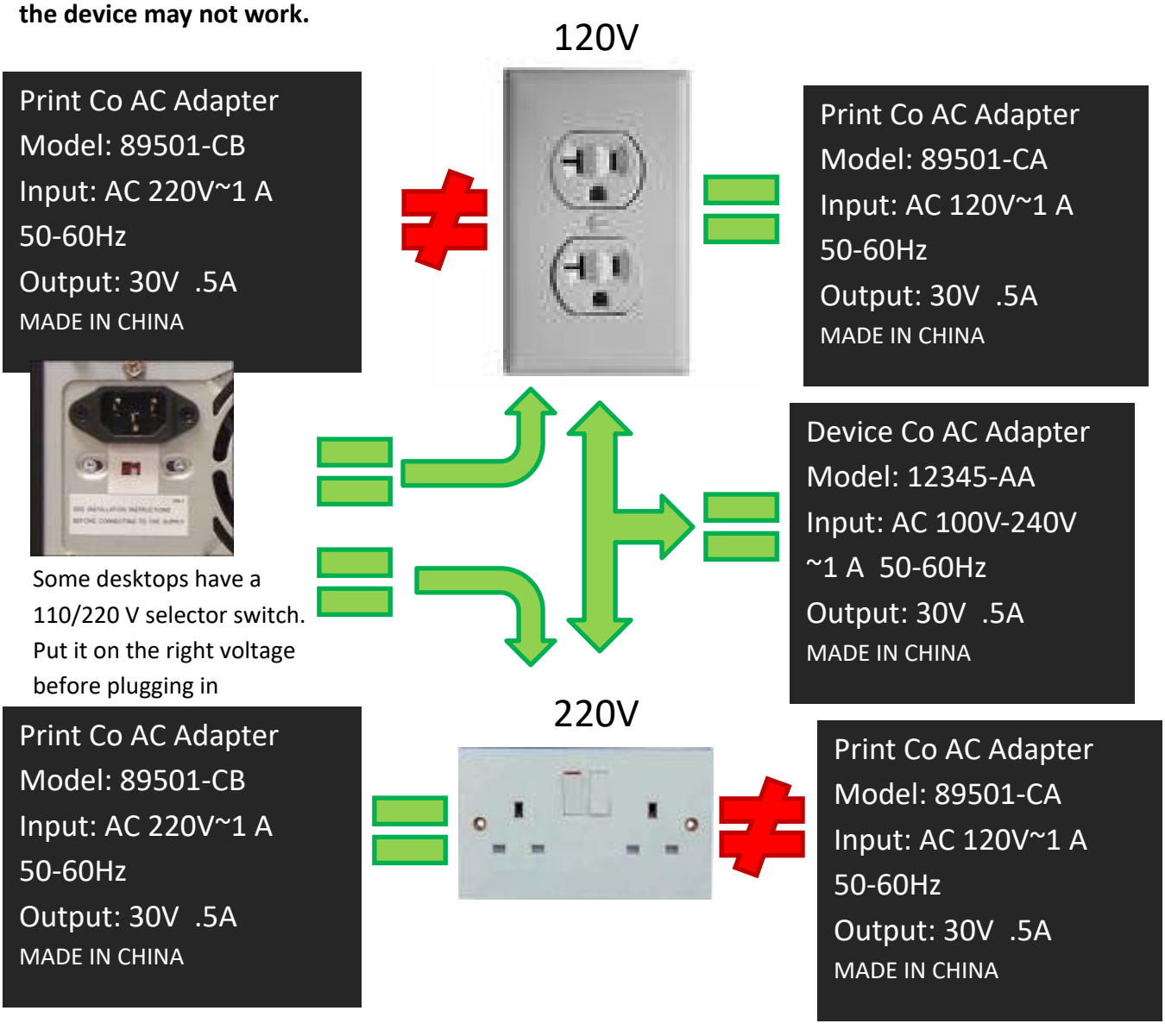
Reading a power supply

Input Voltage: This indicates what range of voltage the device can be plugged into. If you have a device that only support 110 volts and you plug it into a 220 volt outlet, you will likely burn out that device or it's power supply. If a 220 Volt device is plugged into a 110 volt outlet, it more than likely will not be enough power to work. If a 100 V – 240 V device can be plugged into either 110 or 220 volt outlet.

Hz (Hertz): Hertz measure the cycles per second (Frequency) the power is produced in. If a device, like a clock, is 50 Hz and is plugged into a 60Hz outlet even if it is the same voltage, the clock will likely run too fast or won't function at all.

Output Voltage: AC adapters convert AC to DC in order for the device to utilize the correct power for that device. This can be used to identify what kind of power supply is needed to replace a power supply that is burned out.

Output Amps: This is the amount of electrical charge passing a point per unit of time. To little, the device may not work.



Electronic Math

Knowing the wattage that your appliances are pulling is important to know so you don't overload a breaker, Ups or power strip. You can generally find the power ratings of a device imprinted on the device itself or the power supply that comes with the device. The values you would be using to determine the wattage is the output of the power supply. To determine if you are going to over load, add all devices' wattage together and see if it's greater than 80% of the wattage of the power source

P = Watts (power)	P= V x I
V = Voltage	V= P/I
I = Amps (Current)	I = P/V

Example1: **You have a 450 Watt UPs and 6 Device Co Devices you plan on plugging into the Ups. Will these devices over load the Ups?**

Device Co AC Adapter
Model: 12354-AA
Input: AC 100-240V~1.5A 50-60Hz

Output: 19.5V 3.34A
MADE IN CHINA

First, find the watts each device needs
19.5 Volts X 3.34 Amps = 65.13 Watts
Then add the wattage together (or multiply by the amount if same)
65.13 Watts x 6 devices = 390.78 Watts

390.78 Watts < 450 Watts **BUT**

450 Watts x 80%= 360 Watts
390.78 Watts > 360 Watts
VERDICT: those are not to many devices for one Ups, but it is dangerously close to overloading the power source

Computer Co AC Adapter
Model: 54321-ZZ
Input: AC 100-240V~1.5A 50-60Hz
Output: 15.6V 5A
MADE IN CHINA

Example2: **You are on a site providing 120V power and have to hook up 7 Computer Co Computers to a power strip plugged into an outlet on the service end of a 15 Amp breaker. Will these computers over load the breaker?**

First, find the watts each device needs
15.6 Volts X 5 Amps = 78 Watts
Than how many all devices need
78 Watts x 6 devices = 390.78 Watts
Find out how much wattage a 15 amp breaker can handle

15Amps x 120V = 1800 Watts
1800 Watts x 80% = 1440 Watts
390.78 Watts < 1440 Watts
VERDICT: The computers should not be able to overload the breaker

Using a Multimeter

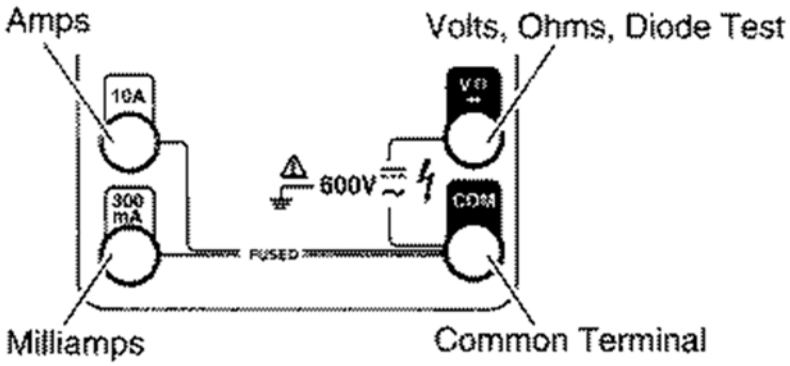
http://mechatronics.mech.northwestern.edu/design_ref/tools/multimeter.html

A multimeter is used to make various electrical measurements, such as AC and DC voltage, AC and DC current, and resistance. It is called a *multi*meter because it combines the functions of a voltmeter, ammeter, and ohmmeter. Multimeters may also have other functions, such as diode and continuity tests. The descriptions and pictures that follow are specific to the Fluke 73 Series III Multimeter, but other multimeters are similar.

Important note: The most common mistake when using a multimeter is not switching the test leads when switching between current sensing and any other type of sensing (voltage, resistance). It is critical that the test leads be in the proper jacks for the measurement you are making.

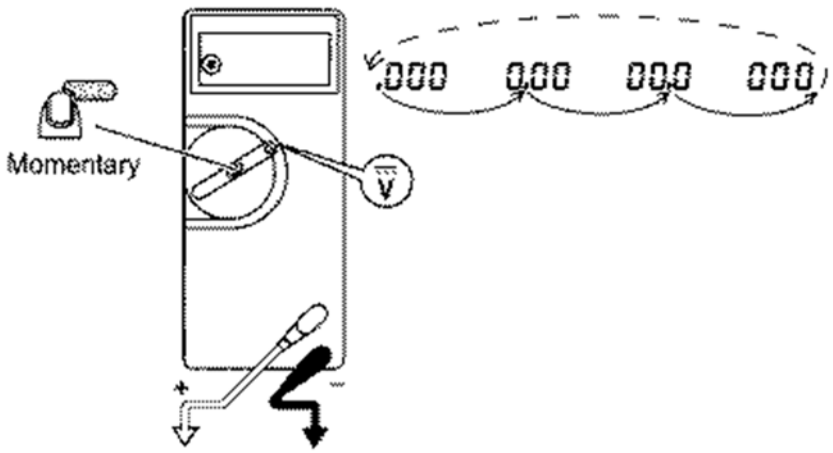
Safety Information

- Be sure the test leads and rotary switch are in the correct position for the desired measurement.
- Never use the meter if the meter or the test leads look damaged.
- Never measure resistance in a circuit when power is applied.
- Never touch the probes to a voltage source when a test lead is plugged into the 10 A or 300 mA input jack.
- To avoid damage or injury, never use the meter on circuits that exceed 4800 watts.
- Never apply more than the rated voltage between any input jack and earth ground (600 V for the Fluke 73).
- Be careful when working with voltages above 60 V DC or 30 V AC rms. Such voltages pose a shock hazard.
- Keep your fingers behind the finger guards on the test probes when making measurements.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.



The black lead is always plugged into the common terminal. The red lead is plugged into the 10 A jack when measuring currents greater than 300 mA, the 300 mA jack when measuring currents less than 300 mA, and the remaining jack (V-ohms-diode) for all other measurements.

Range



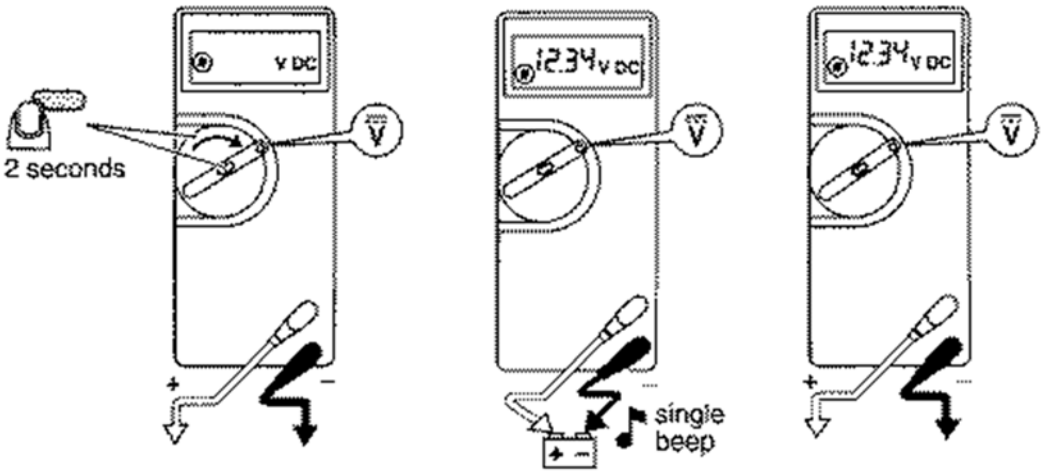
The meter defaults to autorange when first turned on. You can choose a manual range in V AC, V DC, A AC, and A DC by pressing the button in the middle of the rotary dial. To return to autorange, press the button for one second.

Automatic Touch Hold Mode

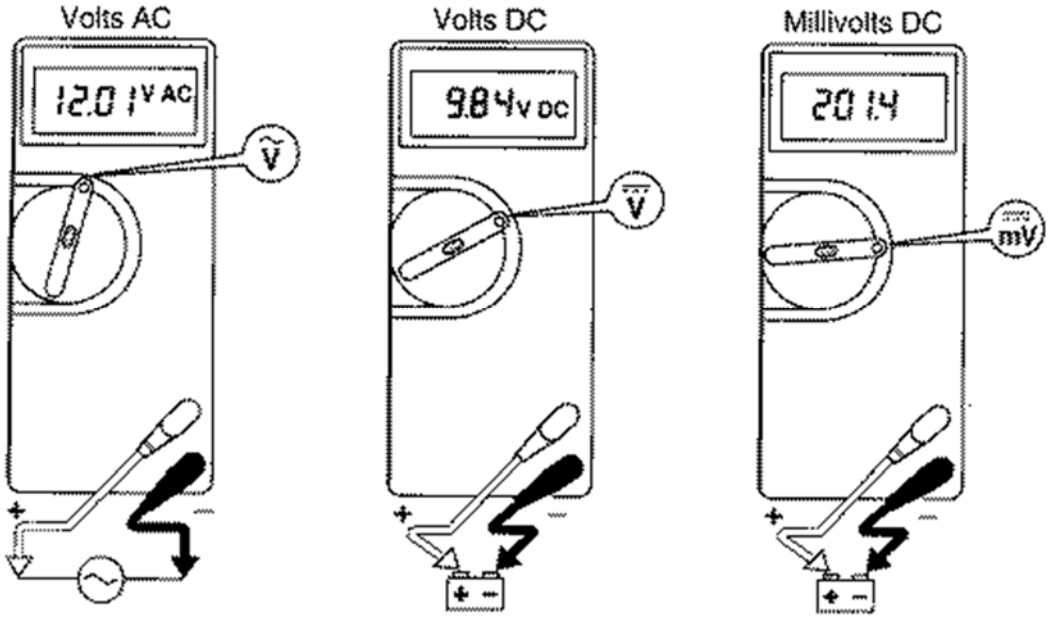
The Touch Hold mode automatically captures and displays stable readings. Press the button in the center of the dial for 2 seconds while turning the meter on. When the meter captures a new input, it beeps and a new reading is displayed. To manually force a new measurement to be held, press the center button. To exit the Touch Hold mode, turn the meter off.

Note: stray voltages can produce a new reading.

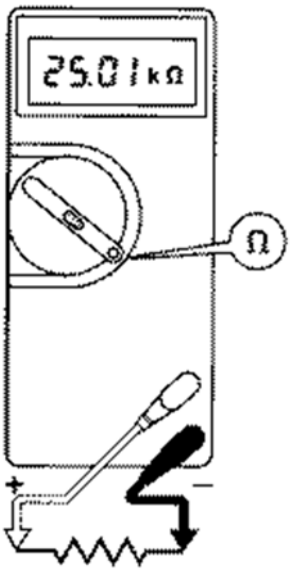
Warning: To avoid electric shock, do not use the Touch Hold to determine if a circuit with high voltage is dead. The Touch Hold mode will not capture unstable or noisy readings.



AC and DC Voltage

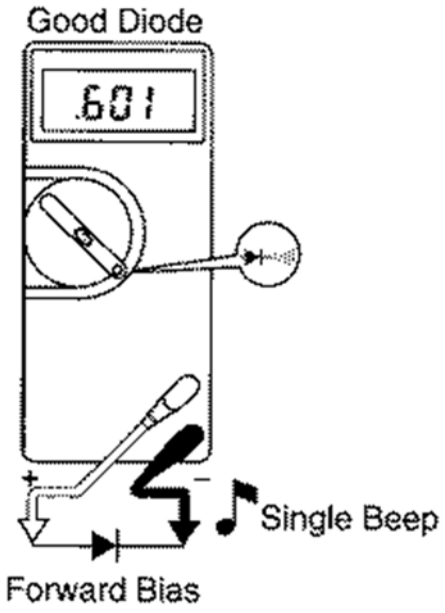


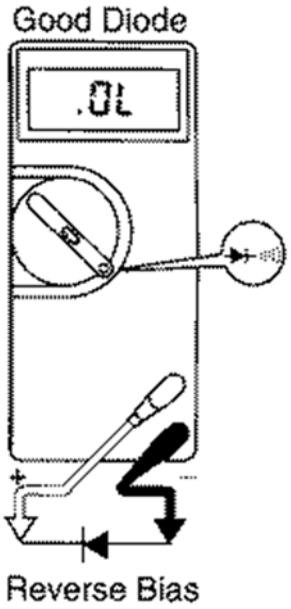
Resistance

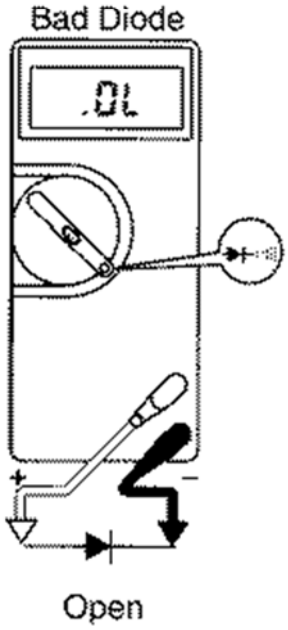


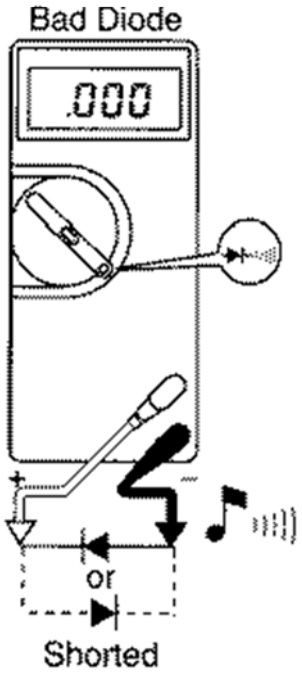
Turn off the power and discharge all capacitors. An external voltage across a component will give invalid resistance readings.

Diode Test

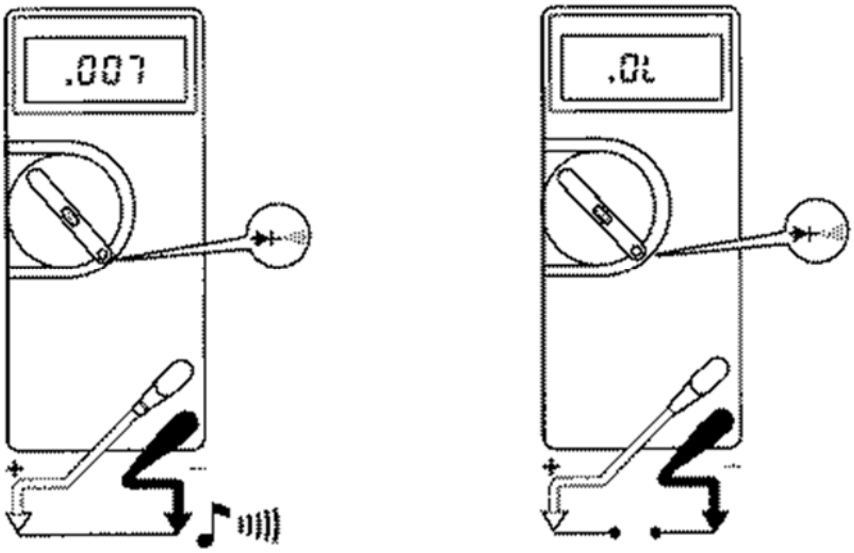

Good Diode
.601
Single Beep
Forward Bias


Good Diode
.OL
Reverse Bias


Bad Diode
.OL
Open


Bad Diode
.000
or
Shorted

Continuity Test



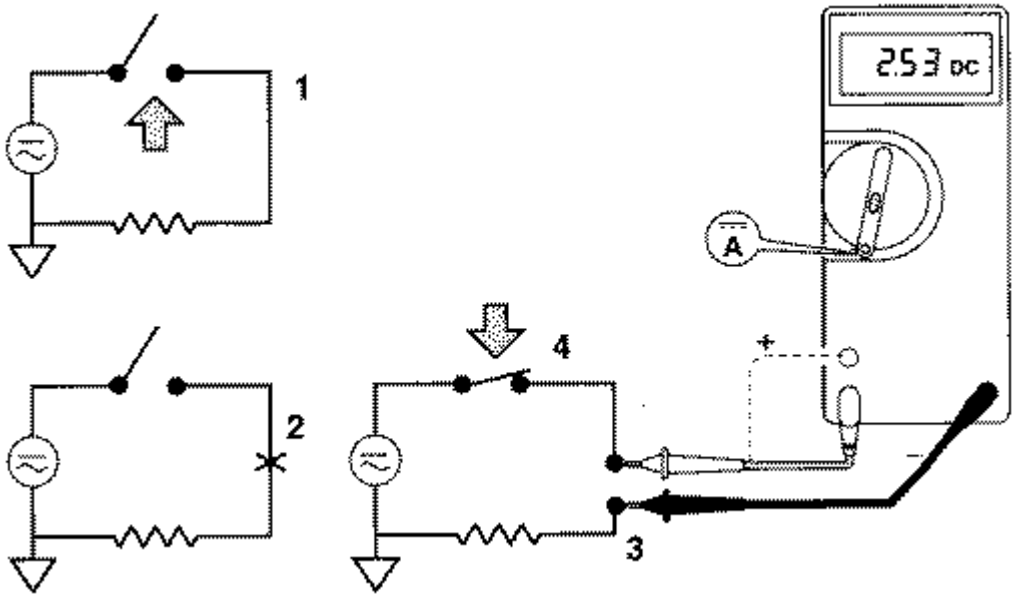
This mode is used to check if two points are electrically connected. It is often used to verify connectors. If continuity exists (resistance less than 210 ohms), the beeper sounds continuously. The meter beeps twice if it is in the Touch Hold mode.

Current

Warning: To avoid injury, do not attempt a current measurement if the open circuit voltage is above the rated voltage of the meter.

To avoid blowing an input fuse, use the 10 A jack until you are sure that the current is less than 300 mA.

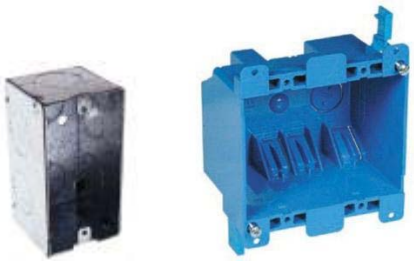
Turn off power to the circuit. Break the circuit. (For circuits of more than 10 amps, use a current clamp.) Put the meter i



Engineering

Cable support Indoor plant and Outdoor

Mountbox In-wall

Usage: Used for installation of data ports, audio/video ports, and electrical devices. Mounts inside of the wall, floor, or ceiling, usually installed during construction (pictured in blue is a post construction install box). Accepts a faceplate and is measured by gang size. Gang: A space where a switch or electrical device can be installed in electrical boxes, usually measuring 2”x4” **DescripID Formula:** Mountbox In-wall <Material> <Shape> <Number of Gangs> <Remarks> **DescripID Ex:** Mountbox In-wall Steel Handy 1-Gang Mountbox In-wall PVC Square 2-Gang Old Work	 **For more**: http://www.homedepot.com

Mountbox Surface

Usage: Used for installation of data ports and audio/video ports. Usually has ports built in or are ready to have ports installed on the side so that when it is mounted, the cables run out of the box parallel to the surface the box is mounted on. **DescripID Formula:** Mountbox Surface <Number of ports> <Color(Optional)> <Type of port> <Remarks> **DescripID Ex:** Mountbox Surface 4p Leviton Quickport Mountbox Surface 1p 8P8C F	 **For more**: http://www.leviton.com

Mountbox Wallbox

Usage: Used for installation of data ports, audio/video ports, and electrical devices. Mounts on top of the wall, usually in post construction installations. Accepts a faceplate and is measured by gang size. Gang: A space where a switch or electrical device can be installed in electrical boxes, usually measuring 2”x4” **DescripID Formula:** Mountbox Wallbox <Color(Optional)> <Number of Gangs> <Remarks> **DescripID Ex:** Mountbox Wallbox White 1-Gang Mountbox Wallbox Gray 2-Gang	 **For more**: http://www.leviton.com

Faceplate

Usage: Used for installation of data ports, audio/video ports and electrical devices. Has ports built in or are ready to have ports, light switches or outlets installed.

DescripID Formula:
Faceplate <Type of port or outlet> <Material Type> <Color-Optional> <Gang Size> <Number of ports or duplexes> <Remarks>

DescripID Ex:
Faceplate Leviton Quickport PVC White 1-Gang 2p
Faceplate NEMA 106 Steel 2-Gang 2-Duplex


For more:
http://www.leviton.com

Cabinet Enclosure Outdoor

Usage: Used for splices and panel boards in outdoor installations

AKA: NEMA Enclosure

DescripID Formula:
Cabinet Enclosure Outdoor <Manufacturer> <Model>

DescripID Ex:
Cabinet Enclosure Outdoor JIC N-JIC04X30400400403

For more:
http://www.nema.org/prod/be/enclosures/

Pullbox

Usage: Used to access below ground conduit for pulling cables or other utilities. Also used in plumbing and sewage

AKA: Hand hole, Man Hole, Maintenance Hole, Valve box

DescripID Formula:
Pullbox <Shape> <Material> <Outside Length>x<Outside Width>x<Outside Height> <straight or sloped> <Pipe holes per side if applicable> <Remarks>

DescripID Ex:
Pullbox Rect HPDE 20”x12”x13” Slopped
Pullbox Circ Cement 5’x5’x6’ Straight 4Hole

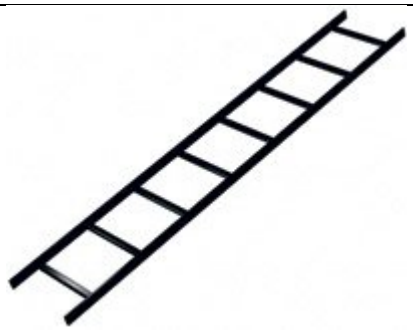
For more:
http://en.wikipedia.org/wiki/modular_connectors

CabLadder

Usage: Used to manage data and electrical cables above racks, above head and sometimes below a raised floor.

End Type Formula:
CabLadder <Product Line> <Width if applicable> <Description> <Length if straight>

For more: http://cableorganizer.com



Straight

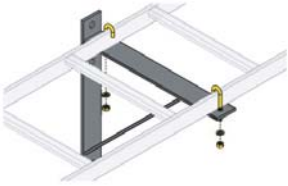
DescripID Ex:
CabLadder MidAtlantic CL 12" Straight 10'
CabLadder MidAtlantic CL 12" 90 Vertical Inside

Fittings

90 Horizontal

90 Vertical Inside

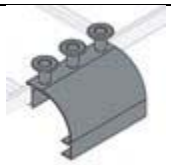
90 Vertical Outside



Support Wall Triangle

Support Center

Drop End



Drop Side

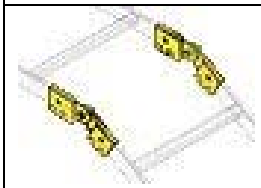
Rung Adjustable

Support Wall End

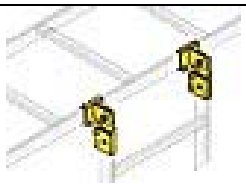
Splice Adjustable Horizontal

Splice Straight

Splice 90



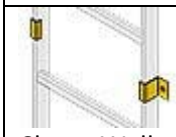
Splice Adjustable Vertical End



Splice Adjustable Vertical Side

Hang Kit

Support End



Clamp Wall

End Cap

Bonding Kit

CabTray

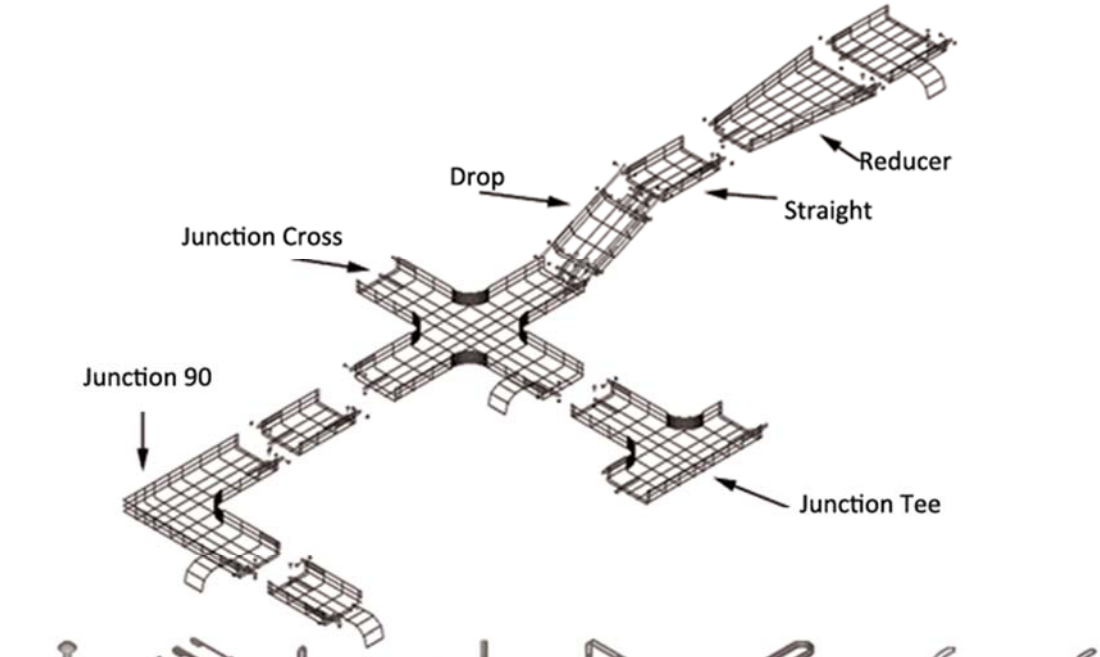
Usage: Used to manage data and electrical cables above racks, above head and sometimes below a raised floor.

End Type Formula:
CabTray <Product Line> <Width if applicable>x<Depth><Fitting Type> <Length if straight>

For more: http://cableorganizer.com/cable-trays

Straight

DescripID Ex:
CabTray CM10 12”x4” Straight 10’
CabTray CM10 10”x6” Junction Tee



Innerduct

Usage: Installed inside existing ducts, cable ladders and racks. Used to run cables easily so they don’t rub against other cables already installed. Also provides extra protection

DescripID Formula:
Innerduct <Material> <corrugated or smooth> <Outer diameter> x<length>

DescripID Ex:
Innerduct HDPE Corrugated 1”x1000’

For more:
http://en.wikipedia.org/wiki/User:RoySmith/Innerduct

Pipe

Usage: Used for electrical, communications cable, plumbing, and gas. Used (and called) conduit, ducts, and pipes

Outside Diameter: Pipe is measured by its outside diameter because it's inside diameter is changed by the schedule it is.

Schedule: The schedule is the measure of the service pressure divided by the allowable stress a pipe is able to handle which relates to the thickness of the pipe's sidewalls. In copper pipe, Type K-M is used

For more:
http://en.wikipedia.org/wiki/Electrical_conduit
http://www.copper.org/applications/plumbing/overview/commy_tube_tbl.html



Straight

End Type Formula:
Pipe <Material Type> <Outside Diameter> <Sch # or Type-# if applicable> <Fitting Type> <Length (if straight or curve>

DescripID Ex:
Pipe PVC 2" Sch40 Straight 16'
Pipe EMT ¾" Straight 10'
Pipe Copper ¼" Type-K 90

Types of Conduit
RMC – Rigid Metal Conduit
GRC – Galvanized Rigid Conduit
IMC – Intermediate Metal Conduit
EMT – Electrical Metallic Tubing
RNMC – Rigid NonMetallic Conduit
ENT – Electrical Nonmetallic Tubing
FMC – Flexible Metallic Conduit
LFMC – Liquidtight Flexible Metal Conduit
FMT – Flexible Metallic Tubing
LFNC – Liquidtight Flexible Nonmetallic Conduit

Other Types
PVC - Polyvinyl chloride
Concrete
Copper
Steel
Aluminum

Fittings


90


45


Tee


Wye


End Cap


Coupling


Reducer


Reducer Bushing


Cross


Curve 90 (angle)


Plug

Raceway

Usage: Used to run electrical and communications cable on the surface, usually in a post construction installation

End Type Formula:
Raceway <Product Line> <Width> <Fitting Type> <Length if straight>

DescripID Ex:
Raceway Tyton 1 ¾" Straight 8'
Raceway Panduit T70 4" 90

For more: http://www.cablestogo.com
http://www.cableorganizer.com


Straight

Note: Some types of raceway come in two parts; a cover and a base. Other types come in one piece that folds on itself; a straight


90


90 Inside


90 Outside


Tee


End Cap


Splice Cover


Ceiling Drop

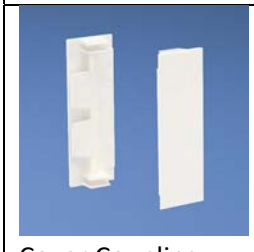

Reducer


Base


Cover


Divider


Base Coupling

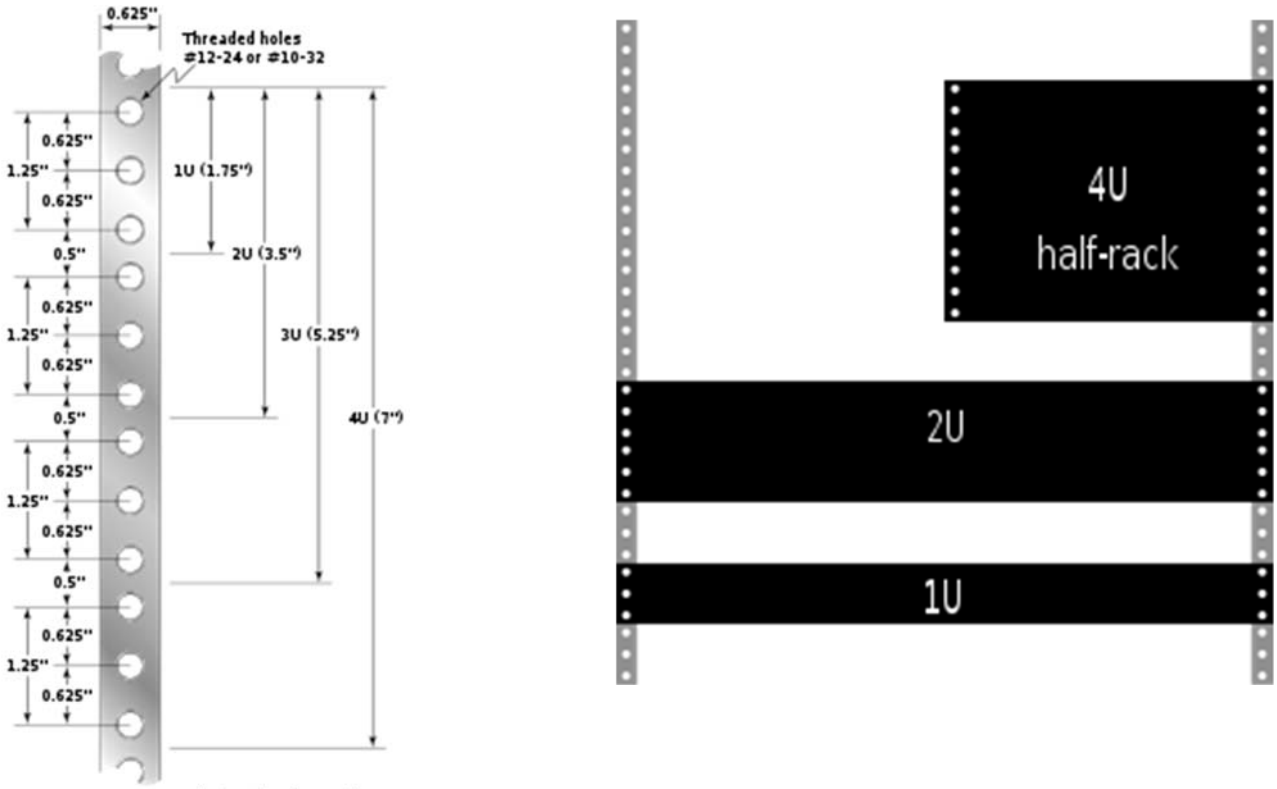

Cover Coupling


Transition Fitting

Rack unit

From Wikipedia, the free encyclopedia

http://en.wikipedia.org/wiki/Rack_unit



A typical section of rack rail, showing rack unit distribution

A rack unit or U is a unit of measure used to describe the height of device intended for mounting in a in a 19-inch rack or a 23-inch rack (refers to width of rack). One rack unit is 44.45 mm (1.75 in) high.

One rack unit is commonly designated as "1U"; similarly, 2 rack units are "2U" and so on. The size of a piece of rack mounted equipment is usually described as a number in "U". One rack unit is also sometimes referred to as "1RU"; most server racks have 42 U of height.

Professional audio and video gear often comes with rack mount options and use the same measurement specifications.

Half-rack units typically describe units that fit in a certain number of rack units, but occupy only half the width of the rack (9.5 inches or 241 mm). For example, a "4U half-rack" DVCAM deck would occupy 4U (4 × 1.75 inches) height × 9.5 inches width. In theory, two half-rack decks could occupy the 4U space.

A front panel or filler panel in a rack is not an exact multiple of 1.75-inches (44.45 mm). To allow space between adjacent rack mounted components, a panel is 1⁄32 inch (0.031 inch or 0.79 mm) less in height than the full number of rack units would imply. Thus, a 1U front panel would be 1.719 inches (43.66

mm) high. If n is number of rack units, the formula for panel height is h = (1.750n − 0.031) inch = (44.45n − 0.79) mm.

Coincidentally, a rack unit is equal to a vershok, which is an obsolete Russian length unit.

The rack unit size is based on a standard rack specification as defined in EIA-310.

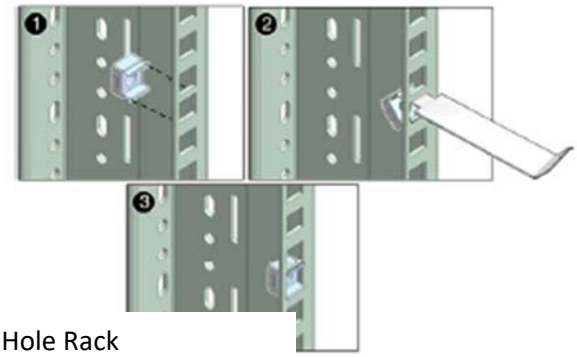
Rack rails, screw types and cage nuts

From Wikipedia, the free encyclopedia
http://en.wikipedia.org/wiki/Screw, http://en.wikipedia.org/wiki/Rack_rail

Rack Rail known as **Rack Strip** or **Rack Rail** is used to mount rackable electronic hardware and 19-inch rack mount accessories within 19-inch rack. Within a rack a minimum of two rack rails are required to mount equipment. The height of rack rail is determined by the number of rack units required for mounting the equipment. Each rack unit (U) is equivalent to 1.75 inches/44.4 mm. Most rack rail is in sizes from 2 Units high (3.5") to 45 Units high (78.75").

Rack Rails types

In the USA the commonly used form of rack rail is called **Imperial Rack Rail**. Imperial rack rail has round holes tapped for 10/32 UNF screws



Full Hole Rack

k Rail

In Europe the common form of rack rail is Full Hole Rack strip which has square holes for M6 screws.

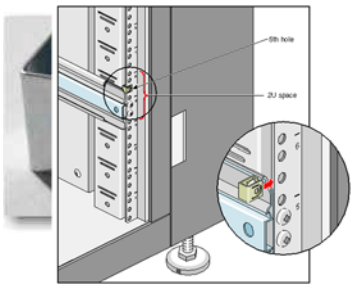
http://download.oracle.com/docs/cd/E19657-01/820-4759-16/z4000e8e1007638.html

In both cases rack screws and washers are required to mount rack mount equipment to the rack rail. The size and strength of rack rail is determined by its application. Increased thickness of steel results in stronger rack rail and varieties of rack rail can be found such as double angle and single angle rack rail.

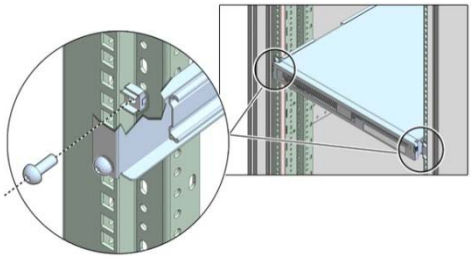
Cage Nuts, Clip Nuts and Screw Thread Sizes

Full Hole Racks require nuts on to hold the screws as they do not have screw threads drilled into the rails. The nuts are held on the back side of the rail by clips so the installer doesn't have to try and hold the nut while mounting the hardware. The clips do not provide any structural support to the device itself. Circular full Hole Rack systems generally use "Clip Nuts" while square full hole racks use "Cage Nuts". Common Sizes used with Racks are 10-32, 12-24, and M6

Cage Nut



Clip Nut



ISO metric screw threads

ISO metric screw threads are designated by the letter M followed by the major diameter of the thread in millimeters (e.g., M8). If the thread does not use the normal coarse pitch (e.g., 1.25 mm in the case of M8), then the pitch in millimeters is also appended with a multiplication sign (e.g. "M8×1" if the screw thread has an outer diameter of 8 mm and advances by 1 mm per 360° rotation).

The nominal diameter of a metric screw is the outer diameter of the thread. The tapped hole (or nut) into which the screw fits, has an internal diameter which is the size of the screw minus the pitch of the thread. Thus, an M6 screw, which has a pitch of 1 mm, is made by threading a 6 mm shank, and the nut or threaded hole is made by tapping threads into a hole of 5 mm diameter

ISO metric thread	M1.6	M2	M2.5	M3	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64
Wrench size (mm)	3.2	4	5	5.5	7	8	10	13	17	19	24	30	36	46	55	65	75	85	95

In addition, the following non-preferred intermediate sizes are specified:

ISO metric thread	M7	M14	M18	M22	M27	M33	M39	M45	M52	M60	M68
Wrench size (mm)	11	22	27	32	41	50	60	70	80	90	100

Unified Thread Standard

Machine screws are described as 0-80, 2-56, 3-48, 4-40, 5-40, 6-32, 8-32, 10-32, 10-24, etc. up to size

16. The first number can be translated to a diameter using a formula, the second is the number of
threads per inch. There is a coarse thread and a fine thread for each size, the fine thread being preferred in thin materials or when slightly greater strength is desired.
The numbering system follows a roughly logarithmic series where an increase in each screw number
size approximately doubles the tensile strength of the screw and the screw number is found by, where "d" is the nominal diameter. Using this formula a #5 screw has a major diameter of .125" (1/8"), a #10 screw has a diameter of .190" (or 3/16" in practical terms), etc.

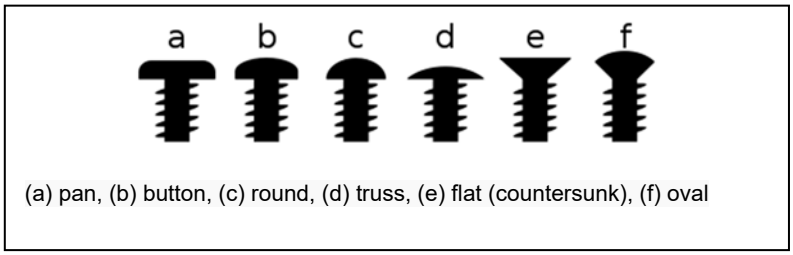
Fasteners

Bolts and Screws

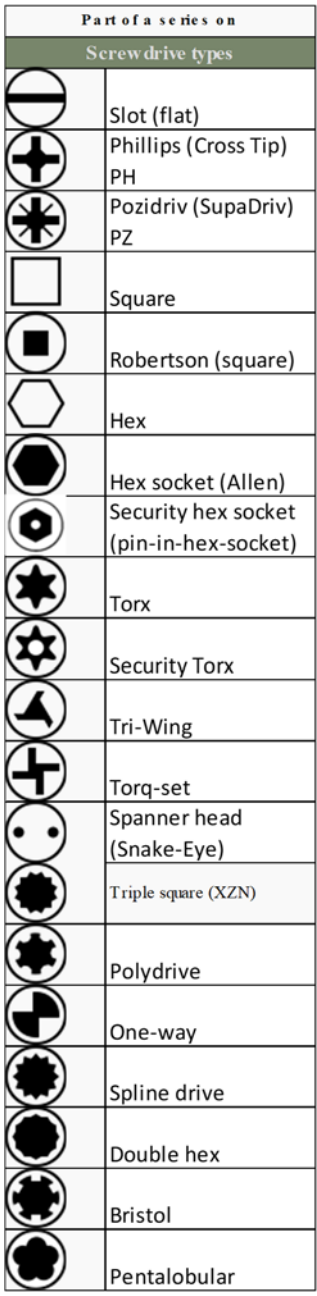
A **screw**, or **bolt**, is a type of fastener characterized by a helical ridge, known as an *external thread* or just *thread*, wrapped around a cylinder. Screws generally are pointed so they can bore their own holes, while bolts are usually flat and work with nuts or pre-threaded holes. Some screw threads are designed to mate with a complementary thread, known as an *internal thread*, often in the form of a nut or an object that has the internal thread formed into it. Other screw threads are designed to cut a helical groove in a softer material as the screw is inserted. The most common uses of screws are to hold objects together and to position objects.

Often screws have a *head*, which is a specially formed section on one end of the screw that allows it to be turned, or *driven*. Common tools for driving screws include screwdrivers and wrenches. The head is usually larger than the body of the screw, which keeps the screw from being driven deeper than the length of the screw and to provide a *bearing surface*. There are exceptions; for instance, carriage bolts have a domed head that is not designed to be driven; set screws have a head smaller than the outer diameter of the screw; J-bolts have a J-shaped head which is not designed to be driven, but rather is usually sunk into concrete allowing it to be used as an anchor bolt. The cylindrical portion of the screw from the underside of the head to the tip is known as the *shank*; it may be fully threaded or partially threaded.

The majority of screws are tightened by clockwise rotation, which is termed a *right-hand thread*. Screws with left-hand threads are used in exceptional cases. For example, when the screw will be subject to counterclockwise torque (which would work to undo a right-hand thread), a left-hand-threaded screw would be an appropriate choice. The left side pedal of a bicycle has a left-hand thread.



(a) pan, (b) button, (c) round, (d) truss, (e) flat (countersunk), (f) oval



DescripID Formula (Suggested for Screws and Bolts):

FAST <type of fastner> <Length> x <Gauge> <Head Shape> <Screw Drive>-<Material Type> <Remarks>

Ex: FAST Screw 2 1/2" x #8 Flat Phillips Wood

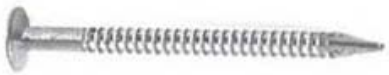
Gauge				1	2	3	4	5	6	7	8	9	10	12	14
Head-Bore Size		3mm	4mm	5mm	11/64"	13/64"	15/64"	1/4"	9/32"	5/16"	11/32"	23/64"	25/64"	7/16"	1/2"
Shank-Hole Size		1/16"	5/64"	3/32"	3/32"	7/64"	7/64"	1/8"	9/64"	5/32"	5/32"	11/64"	3/16"	7/32"	1/4"
Pilot-Hole Size	Hardwood				1/16"	1/16"	5/64"	5/64"	3/32"	7/64"	7/64"	1/8"	1/8"	9/64"	5/32"
	Softwood				1/16"	1/16"	1/16"	1/16"	5/64"	3/32"	3/32"	7/64"	7/64"	1/8"	9/64"
Phillips-Head Point Size		#000	#00	#0	#1			#2						#3	

Nails

In woodworking and construction, a **nail** is a pin-shaped, sharp object of hard metal or alloy used as a fastener. Nails are typically driven into the work piece by a hammer, a pneumatic nail gun, or a small explosive charge or primer. A nail holds materials together by friction in the axial direction and shear strength laterally. The point of the nail is also sometimes bent over or *clinched* after driving to prevent falling out.

http://homerepair.about.com/od/interiorhomerepair/ss/nails_types.htm

Cut 	**Cut nails** are cut or sheared from steel plate and may be hardened. They have a wedge shape with a square, blunt point which reduces spalling during penetration into concrete or masonry. Cut nails are often used to attach wood to concrete block, mortar joints, brick or to fresh concrete. For best results you want about 3/4" of penetration into masonry for good holding power.
Common 	**Common nails** are the most widely used nail used in general construction and are the nail type used where building code requires certain framing construction. These nails have a thick shank and are made from iron wire. They are most commonly used with dimensional lumber (e.g., 2x4 framing). The common nail has a wide head having a smooth or textured surface and has a sharp diamond shaped point. In some applications it makes sense to actually dull the nail tip to prevent splitting wood.
Box 	**Box nails** are wire nails similar to common nails except that they have thinner shanks and are not to be used for dimensional lumber framing construction requiring common nails. This is because box nails do not have as thick a shank as a common nail for a given penny size and as such have less holding power. For example a 16d common nail has a 0.162 inch diameter and a 16d box nail has a 0.135 inch diameter.Box nails are typically used on thinner wood material (like wood boxes) to reduce splitting.

Duplex 	**Duplex head nails** are a specialty nail useful for temporary construction, such as form work when pouring concrete. Let's say you were setting up a form for pouring a section of sidewalk. You'd use this type of nail to put the forms together.The nail's double head (duplex) makes it easier to remove and pull out of the form boards or other temporary construction.
Ring 	**Annular ring or ring shank nails** are another specialty wire nail that have rings on the shank providing better grip and additional resistance to pull-out of the lumber. This type of nail is also used for drywall nails or deck board nails because of the pullout resistant feature of the annular rings on the nail shank.
Masonary 	**Masonry and concrete nails** are hardened wire nails often with longitudinal grooves along the length of the nail's shaft. These nails are thick and very strong. They are designed to be fastened into concrete block, concrete or mortar joints.
Brad 	**Brad nails** are used in light finish woodworking. Because of the small shank diameter and the small head, these nails greatly reduce the possibility of splitting when used in hard wood. Brads are ideal for general joinery and are usually countersunk below the surface of the wood and filled to give smooth appearance.
Finish 	**Casing and finishing nails** are similar and differ primarily in the shape of the heads. A finishing nail has a small slightly rounded head just a tad bit bigger than the nail shank. The head is designed to fit into a nail set to be countersunk and the nail hole filled. A casing nail is often used in exterior applications and is often galvanized. The nail head of a casing nail is tapered and may be set flush or just below the wood surface.
Clout 	**Roofing nails** are technically called **clout nails** or nails with a short shank and a wide flat head. They can be used to fasten shingles, roofing felt, or sheet metal to wood. The shanks can be smooth or ringed for increased pull out resistance.

Spiral 	**Spiral Shank** nails are also called screw thread or drive nails. They have a spiral shank that causes them to turn and imprint their own thread into the wood when driven by a hammer. They are typically used for hardwoods and dense materials. Flooring, siding, decking, pallets and truss rafters are typical applications.

DescripID Formula (Suggested for Nails):

FAST Nail <Length> x <Gauge> <Nail Type> <Remarks>

Ex: FAST Nail 1 1/2" x #12 Common

How are nails sized?

You've seen how nail sizes are referred often to 10d or 16d and so on. The number and "d" suffix is called the "Penny" system. The English penny (or pence) used to be designated with a "d" representing the first letter of the Roman coin **denarius**.

One school of thought says that since nails used to be sold by the hundred, the small nails cost less since they weighed less and a hundred two-penny nails cost two pence, a hundred eight-penny nails cost eight pence and so on.

The other school of thought says that the "d" also represented the English unit of weight being a pound. One thousand nails of the same size would be weighed and if they weighed say, 6 pounds, then they were classified as six-penny nails, likewise one thousand nails weighing 16 pounds were sixteen-penny nails.

Today the penny system only refers to nail length; a 2d nail is 1" long. Each higher number in the penny system represents a 1/4" length increase up to a 12d nail (l3-1/4"). After the 12d nail, the penny system does not have a clearly defined relationship to length.

Tool Pictionary

Tool DescripID: The descripID term for tools is very broadly defined.It is just the category, Tool, followed by a description of what it is. It is suggested to descripID from the broadest term to the most specific term and include a size (i.e. a pair of slip joint pliers would be Tool Pliers Slip Joint 6”). Some tools (mainly power tools) you may want to put in the manufacturer , model number or the voltage. A hammer drill for example you could list as Tool Power Drill Hammer 36V DeWalt DC901KL.

Below is a list of commonly used tools and what they are commonly called. Highlighted in blue is the most common term for the tools. It is also the term we suggest to use in the DescripID naming system.

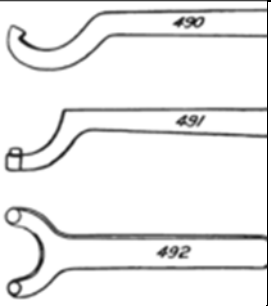
 ***Screwdriver*** Turnscrew	 ***Precision Screwdriver*** Jewelers Screwdriver	 ***Stubby Screwdriver***	 ***Keystone Blade*** (Left) ***Cabinet Blade*** (Right)
 ***Slip Joint Pliers***	 ***Lineman Pliers*** Combination Pliers	 ***Side Cutter Pliers*** Diagonal Cutters Dikes	 ***Needle-nose Pliers*** Long-nose Pliers Pinch-nose Pliers Snipe-nose Pliers
 ***Groove Joint Pliers*** Tongue-and-groove pliers Water pump pliers Channellocks	 ***End Nipper Pliers***	 ***Round-nose Pliers***	 ***Locking Pliers*** Vise Grips Mole grips

Wrench
Box Wrench
Spanner Wrench (UK)
Comination Wrench

Adjustable Wrench
Crescent Wrench

Pipe Wrench
Monkey Wrench
Stillson

Allen Wrench
Allen Key



Spanner Wrench

Socket Wrench

Coaxial Stripper

Wire Strippers

Fiber Buffer Strippers

Cable Jacket Stripper

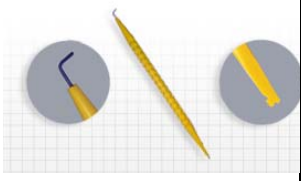
Cable Sheath Stripper
Cable Butter

Adjustable Wire Stripper
Precision Wire Stripper

Cable Ring Cutting
Cable Butting Tool

Fiber Cleaver

Fiber Scribe



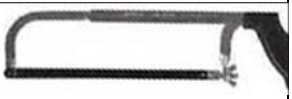
Spudger
Black Stick
Probe Pick

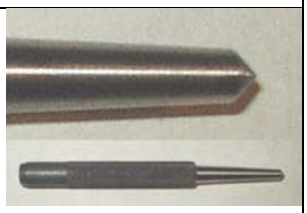
Unicam Installation Tool

Unicam Crimper

8P8C Crimper

Coaxial Crimper

 ***Coaxial Compression Tool***	 ***C-Clamp***	 ***Crowbar*** Prybar	 ***Halligan Bar*** Hooligan Tool Hoolie Tool
 ***Conduit Bender***	 ***Claw Hammer***	 ***Framing Hammer*** Rip-claw Hammer	 ***Sledge Hammer***
 ***PVC Pipe Cutter***	 ***Steel Pipe Cutter***	 ***Bolt Cutters***	 ***Hack Saw***
 ***Staple Gun***	 ***Caulk Gun***	 ***Nail Gun***	 ***Hot Glue Gun***
 ***Level*** ***Spirit Level*** ***Bubble Level***	 ***Plumb Bob*** Plummet	 ***Chalk Line***	 ***Carpenters Square*** Framers Square

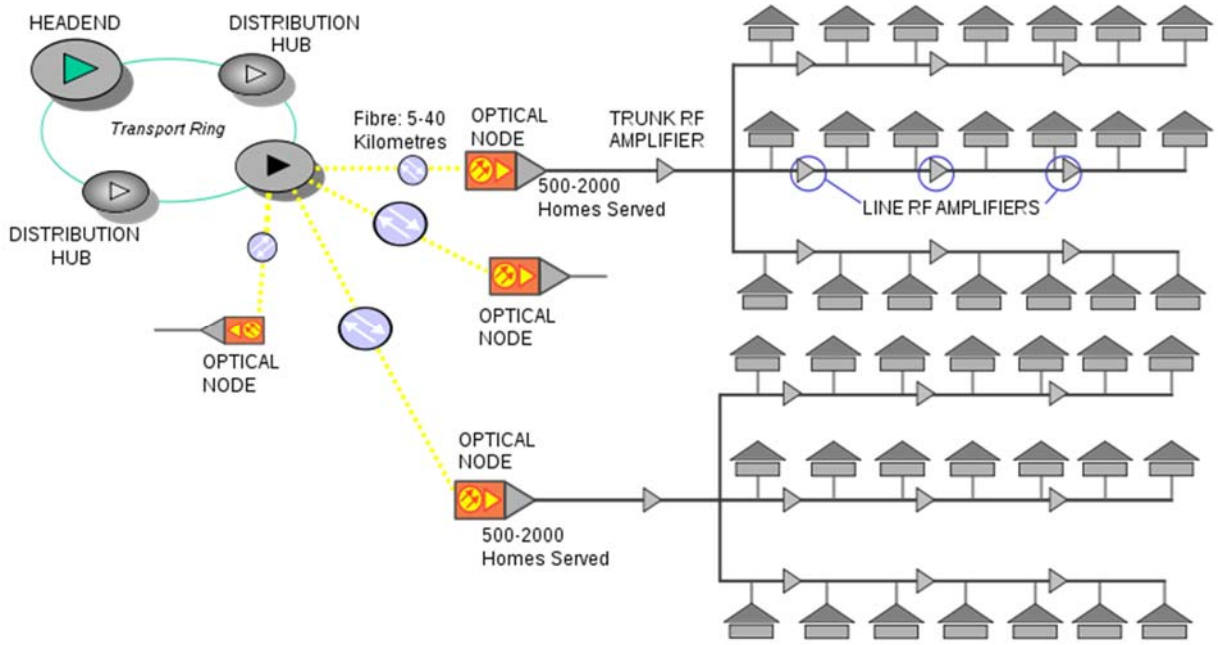
 ***Measuring Tape***	 ***Measuring Wheel***	 ***Conduit Measuring Tape***	 ***Fish Tape*** Steel Tape
 ***Pull Rod*** Cable Pull Pole Telescoping Pole	 ***Knockout Punch Kit***	 ***Hole Saw***	 ***Edge Grinder*** Side Grinder Angle Grinder
 ***Drill*** Screw Gun	 ***Jig Saw***	 ***Reciprocating Saw*** Rip Saw Sawzall	 ***Circular Saw*** Circsaw
 ***Mitre Saw*** Chop Saw Drop Saw	 ***Table Saw***	 ***Chisel***	 ***Punch***
 ***Box Knife*** Utility Knife	 ***Keyhole Saw*** Jab Saw Drywall Saw	 ***Pulling Grip***	

	Pad Saw		
			
Punch Down Tool Impact Tool Krone Tool	***110 Blade***	***66 Blade***	***Krone Blade***

CATV/ MATV Networks and Components

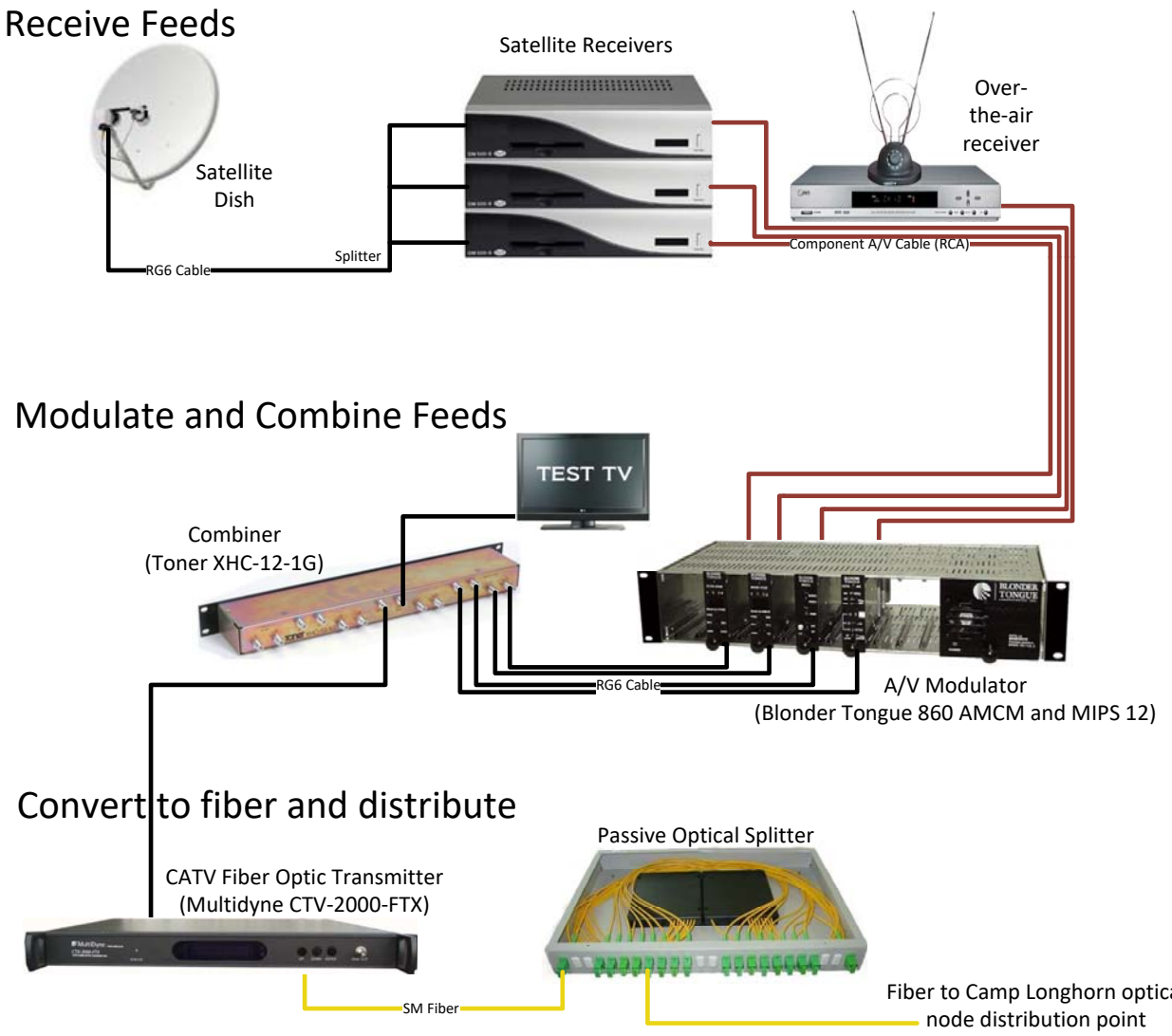
This chapter covers CATV (Community Access Television or Cable TV), MATV (Master Antenna Television), and CCTV (Closed Circuit Television) distribution. Most of the materials used in these networks (cables, connectors, and tools) are covered in other chapters. This chapter will attempt to cover the remaining components involved in building a basic Hybrid Fiber Coaxial (HFC) Network from the head end to the end user devices. In this scenario, we will be providing 4 CATV channels to a row of tents in Camp Longhorn from our head end on the other side of the post. The channels will be provided by three satellite channels and one over-the-air channel (local channel).

Below is a basic overview similar to what we will be using to demonstrate the HFC network.



Head End Equipment

Receive Feeds: The head end puts the feeds onto the CATV/ MATV network and feeds are audio and/or video signals. Feeds in a CATV network are usually provided by satellite. With this setup, each channel provided has its own receiver. In an MATV network, feeds are received by antenna via traditional over-the-air television stations. Channels are usually already modulated and don't need a receiver box on the head end to provide the feeds onto the network. However, you can use a receiver for each channel to have better control of your networks content. This is good for networks where you want to add in additional feeds provided from say a computer, DVD player or any other video source that is not provided by the over the air station.



Modulate and Combine Feeds: From the receivers, the feeds are introduced to modulators. Modulators modulate, or take the audio video input signals and output them on radio frequency modulated signals. These RF signals are related to the TV channel they are going to display on the television set with. For example, in the U.S., video is transmitted at 77.25 MHz, chroma (color) 80.8295 MHz, and audio on

81.75 MHz is received and combined into one channel by the television on channel 5. A combiner takes each of these channels and places all the frequencies on to the same output.

Convert to fiber and distribute: From the combiner, a cable is usually run to a TV to test the CATV signals at the head end. Another cable is run to the CATV Fiber Optic Transmitter where the RF signals are converted to optical fiber signals and placed onto fiber. The fiber in this network is usually single mode with APC connectors. The transmitters only transmit and have no need to receive signal back, so the network has a simplex configuration. The transmitter usually has only a single output, so to distribute to more optical nodes (receivers) we use an optical splitter.

CATV Fiber Optic Transmitter

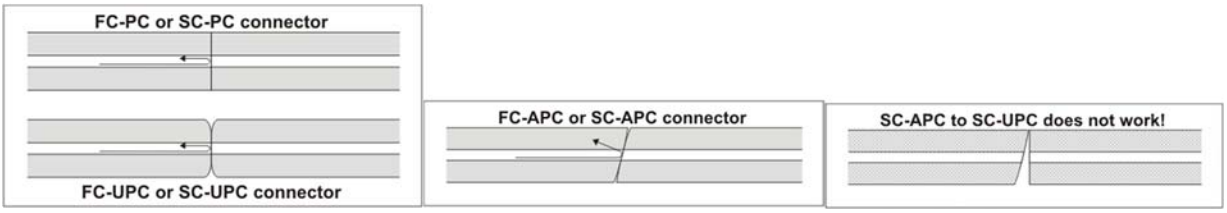
Usage: Converts RF signal to an optical signal and Transmits it over fiber **Device Formula** (This is categorized as a device, which has a very broad formula. But below is what is suggested) DEV <Description> <Model> <Input Connector>, <Output Connector> <Output Freq>, <output optical power>	 **DescripID Ex (pictured):** DEV CATV Fiber Optic Transmitter OTOT-1000C-15 Ftype F, SC F 48-1000MHz, 15dBm

Optical Splitter

Usage: Splits one single optical signal into multiple paths Active: a splitter that can add optical power to each output Passive: a splitter that does not usually require electricity, but usually splits the input optical power between its outputs. The amount of power to each output is not always even	 **DescripID Ex (pictured):** SPLT Fiber SC F, SC F 3p APC Passive

APC Single Mode Fiber

For analog RF placed on optical fiber, single mode fiber should be used and it is best to use APC connectors throughout the fiber run (green, angle polished connectors). APC has less reflection between connections, and reflection on the line will degrade the fiber optic signal.



Fusion splicing the factory terminated connectors (pigtails) is the preferred method of installing the APC connectors. Mechanical splicing (or UNICAM) still have a flat cut in the splice that will cause reflection in the line.

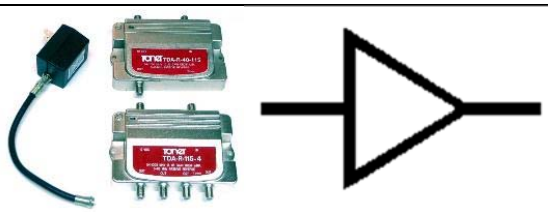
CATV Distribution

Components

Fiber Optic Receiver

Usage: Receives the fiber optic signal and converts it back to RF signal. **Device Formula** (This is categorized as a device, which has a very broad formula. But below is what is suggested) DEV <Description> <Model> <Input Connector>, <Output Connector> <Output Freq>, <output Power>	 **DescripID Ex (pictured):** DEV CATV Fiber Optic Rec CTV-2000-FRX SC F, Ftype F 2p 1000MHz, 20dBmV

Amplifier (AMP)

Usage: Amplifies a signal. It can also split and amplify the signal with multiple outlets. There are different units for indoor and outdoor use. **Device Formula:** AMP <Signal Type> <Connector>, <Frequency Range> <Output Power Gain>	 **DescripID Ex (pictured, bottom):** AMP RF FType F 4p, 54-1000MHz 15dB

Tap

Usage: A tap splits a signal in multiple directions, but allocates different power in each direction. It's used to provide the end device signal, usually in a bus line configuration. The output going to the end device attenuates (loses more power) and the output going to the next tap passes through as much power as possible. **AKA:** Directional Coupler **Device Formula:** Tap <Signal Type> > <Input Connector>, <Output Connector> <Frequency Range> <Output Power Attenuation (Device End)>	 **DescripID Ex (pictured):** TAP RF Ftype F, Ftype F 2p 5-1000MHz -3db

Splitter

Usage: A splitter splits a signal in multiple directions with the same attenuation in each direction. It's used to provide the end device signal, usually in a star configuration. **Device Formula:** Splitter <Signal Type> > <Input Connector>, <Output Connector> <Frequency Range> <Output Power Attenuation>	 **DescripID Ex (pictured):** Splitter RF Ftype F, Ftype F 4p 5-1000MHz -7db

Attenuator

Usage: A pad placed in the line to attenuate the power. It's usually used when you don't have a tap creating enough loss (i.e. you need to attenuate 15dB, but only have a 5dB tap, you can use a 10dB attenuator to meet the requirements **Device Formula:** Attenuator <Signal Type> > <Input Connector>, <Output Connector> <Frequency Range> <Output Power Attenuation>	 **DescripID Ex (pictured):** Attenuator RF Ftype F, Ftype M 5-1000MHz -10db

CATV Signal Level Meter

Usage: Tests the signal power on an RF cable. Usually measures each channel on NTSC CATV between Ch: 2-136 and Off-Air: 2-69 **Device Formula:** DEV <Signal Type and Description> <Manufacturer> <Model>	 **DescripID Ex (pictured):** DEV CATV Signal Level Meter Holland ST-4000D

Terminator

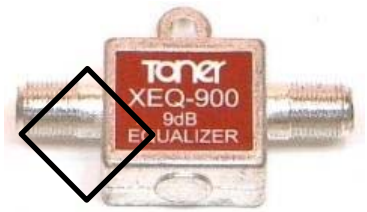
Usage: a device screwed on to unused tap ports to prevent signal leakage and theft of service **Device Formula:** Terminator <Signal Type> <Connector Type>	 **DescripID Ex (pictured):** Terminator RF FType M

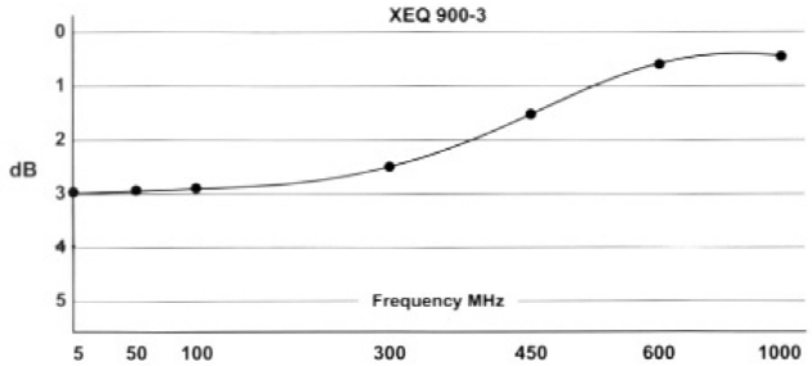
Equalizer

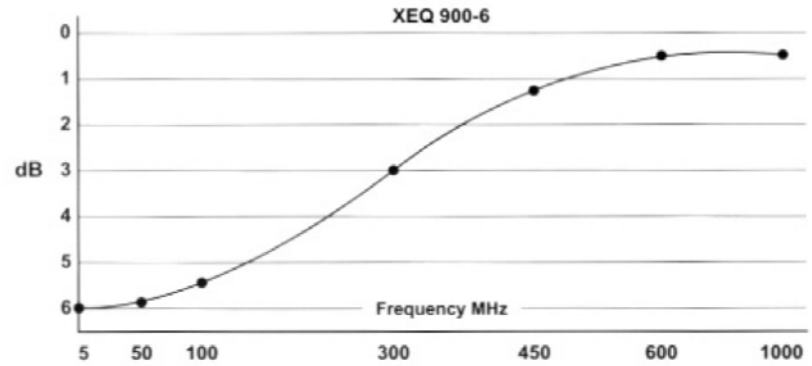
Usage: attenuates power on the low frequencies while keeping the power on the high frequencies high. Used to introduce slope the power on the line so it is flatter at the end of the line where the higher frequencies attenuate more than the low.

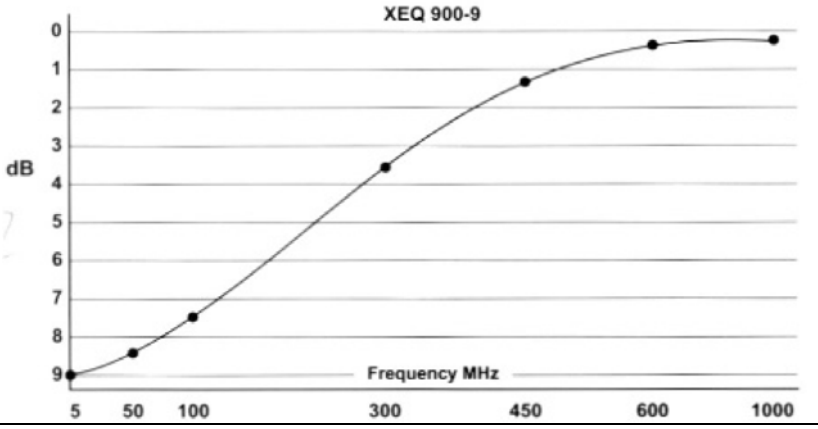
Device Formula:
Equalizer <Signal Type> <Connector Type>, <Connector Type> <Frequency Range> <attenuation value>

DescripID Ex (pictured):
Equalizer RF Ftype F, Ftype F 5-1000MHz -9db









These graphs show the attenuation at each frequency for an equalizer with the attenuation value of 3, 6, and 9

RF Power Calculations

Before going through the network design at the distribution point, it's important to know about RF power. RF Signal loses power as it goes through cable and loses power as it goes through connectors, taps and splitters (known as insertion loss). The higher the frequency, the more power that is lost at that frequency as it travels along a cable. The thinner the insulation on a cable and thinner the core is, the greater the loss of power will be. Power is measured in decibels (dB). An end device (TV) needs between 5dB and 10dB on every frequency associated with the channels it has in order to display quality video and sound. If the power is too low, the picture and sound will have a lot of static. If the power is too high, there is a risk of burning out the end device.

Calculating Cable and Passive Losses Between Amplifiers

http://www.n2prise.org/matvbil3.htm

The nominal cable losses per 100 feet of some popular cable sizes is given in the chart below. * The 0.412" and 1.000" cable losses are given as the maximum cable loss per 100 feet. To discover the loss of a given length of cable at specific CATV channels or frequencies, divide the length of cable in feet by 100, then multiply by the appropriate dB figure from the chart below. Doing this at the highest and lowest frequencies to be distributed will provide the losses needed to select a cable equalizer when reaching successive RF amplifiers. This topic is discussed in another article on this web site called Fixed Equalizer Selection. The formula for computing cable equalizer selection is explained and tables of signal level difference solutions are provided.

Cable Loss vs. Frequency	Times Fiber T10 Drop Cable Maximum Losses @ 68 deg.F			CommScope Parameter III Nominal Cable Attenuation at 68 degrees Farenheit in dB per 100 feet by cable sizes					
	RG-59	RG-6	RG-11	.412"	.500"	.625"	.750"	.875"	1.000"
5 MHz	0.77	0.57	0.36	0.20	0.16	0.12	0.10	0.09	0.08
30 MHz	1.45	1.15	0.75	0.50	0.38	0.31	0.25	0.23	0.21
50 MHz	1.78	1.48	0.93	0.63	0.50	0.40	0.33	0.28	0.27
220 MHz	3.60	2.87	1.83	1.38	1.08	0.87	0.72	0.62	0.62
300 MHz	4.27	3.43	2.17	1.63	1.26	1.02	0.85	0.73	0.72
400 MHz	4.88	4.00	2.53	1.90	1.47	1.18	0.99	0.86	0.84
450 MHz	5.30	4.28	2.69	2.05	1.56	1.26	1.06	0.91	0.90
550 MHz	5.90	4.51	3.01	2.25	1.75	1.41	1.19	1.03	1.01
600 MHz	6.18	4.98	3.16	2.36	1.83	1.48	1.23	1.08	1.06
750 MHz	6.96	5.62	3.58	2.55	2.04	1.66	1.38	1.21	1.21
865 MHz	7.54	6.09	3.90	2.84	2.20	1.77	1.49	1.30	1.34
1000 MHz	8.09	6.54	4.23	3.05	2.41	1.95	1.62	1.42	1.44

The above chart is given as an example only. The user should refer to the correct cable loss charts for actual signal loss calculations

Putting all together

For our scenario's install, we will be using components listed above and RG6 cable with the specifications listed above. The signal will be brought into the camp at a distribution point with a CATV fiber optic receiver that has an output power level of 20dB. We will calculate the power at each point of insertion for 55MHz (channel 2) and 862MHz (channel 134; because our scenario's transmitter only operates between 45 and 862MHz).

Our goal is to install one CATV drop per tent with the signal strength between 2dB and 10dB for each frequency we are going to broadcast. To get this, we will use taps with the attenuation values of 3, 6, 9, 12, 16, 20, 24, 27, 30 dB. At the end, we will use an attenuator pad that attenuates by 6dB.

Because the higher frequencies attenuate faster than the lower as it travels down the cable, we need to attenuate the lower frequencies early in the cable run to equalize the power between the highs and the lows at the end of the run. To do this, we use an equalizer with the attenuation value of 9.

We begin with the fiber receiver that provides 20dB of signal power. It won't be enough for the entire bus line, so we put an amplifier on the line adding 15dB giving us 35dB of power on the line. The equalizer would be placed before the amplifier to attenuate the lower frequencies (starting at 55MHz) by 9dB and only attenuate the higher (862MHz) by 1dB. The tent closest to the fiber node has about 45'worth of RG6 cable. Using the on the previous page, the RG6 at that length will cost 3dB for 862MHz. The insertion loss from the amplifier (according to the manufacturer) is 1dB, and the loss from the equalizer is about 1dB. We want around 7dB in the first tent, so 35 – 3 - 1 –1- 7 = 23dB. We could install a tap with an attenuation value of 24 and we get 6dB of signal power in the tent, BUT, we have to consider the lower frequencies have a higher attenuation at this point due to the equalizer.

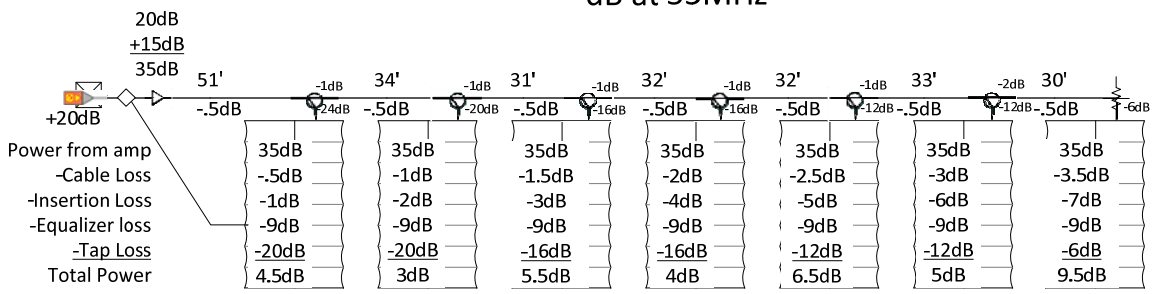
At 45', the attenuation at 55MHz would be .5dB. 35 - .5 – 1 (insertion loss) – 9 (equalizer) – 24 = .5, which is well out of nominal operating range (2dB-10dB). If we use a 20dB tap, we will have 10dB at 865MHz and 4.5dB at 55MHz.

The next tent has the cumulative loss from the first length of cable and the cable from the previous tap coming to a loss of 5dB. It has the cumulative loss of the amp and the tap from the first tent making resulting in a loss of 2dB. Again we need around 7dB in the tent, so 35 – 5 – 2 - 1 - 7 = 20dB. We install a tap with the attenuation value of 20dB and get exactly 7dB at 865MHz. When we calculate for 55MHz, we get 35 – 1 – 2 – 9 – 20 and get 3dB which is within operating levels.

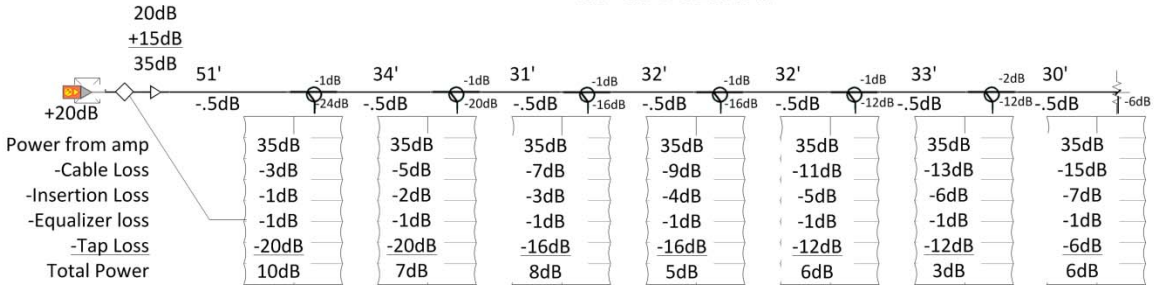
The pattern continues to the last tent where we have 12dB at the end of the last segment of cable. We use an attenuation pad with the attenuation of 6dB to provide the tent with 6dB. The last segment will have 15.5dB at 55MHz before the attenuator and 9.5dB after.

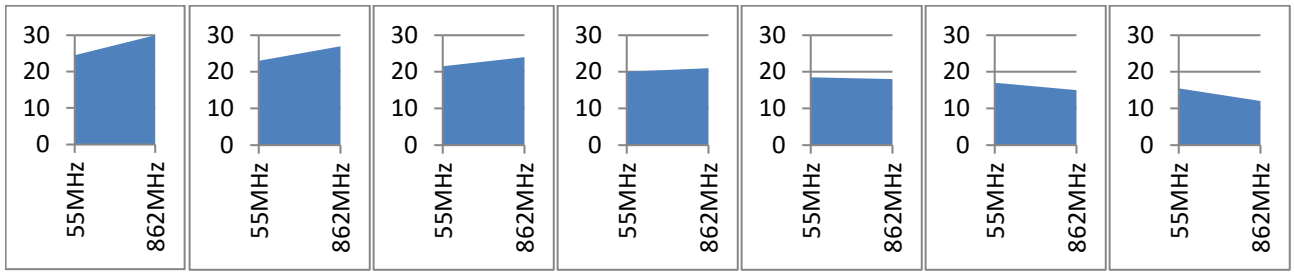
When we're done, each tent has between 2dB and 10dB for all frequencies we expect to use.

dB at 55MHz

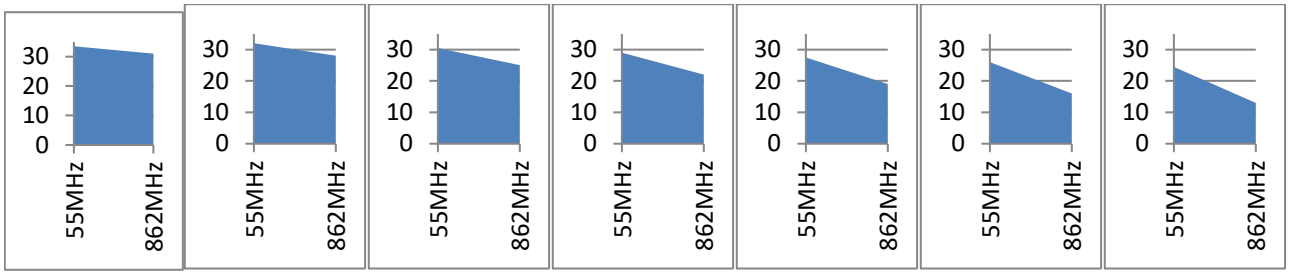


dB at 862MHz





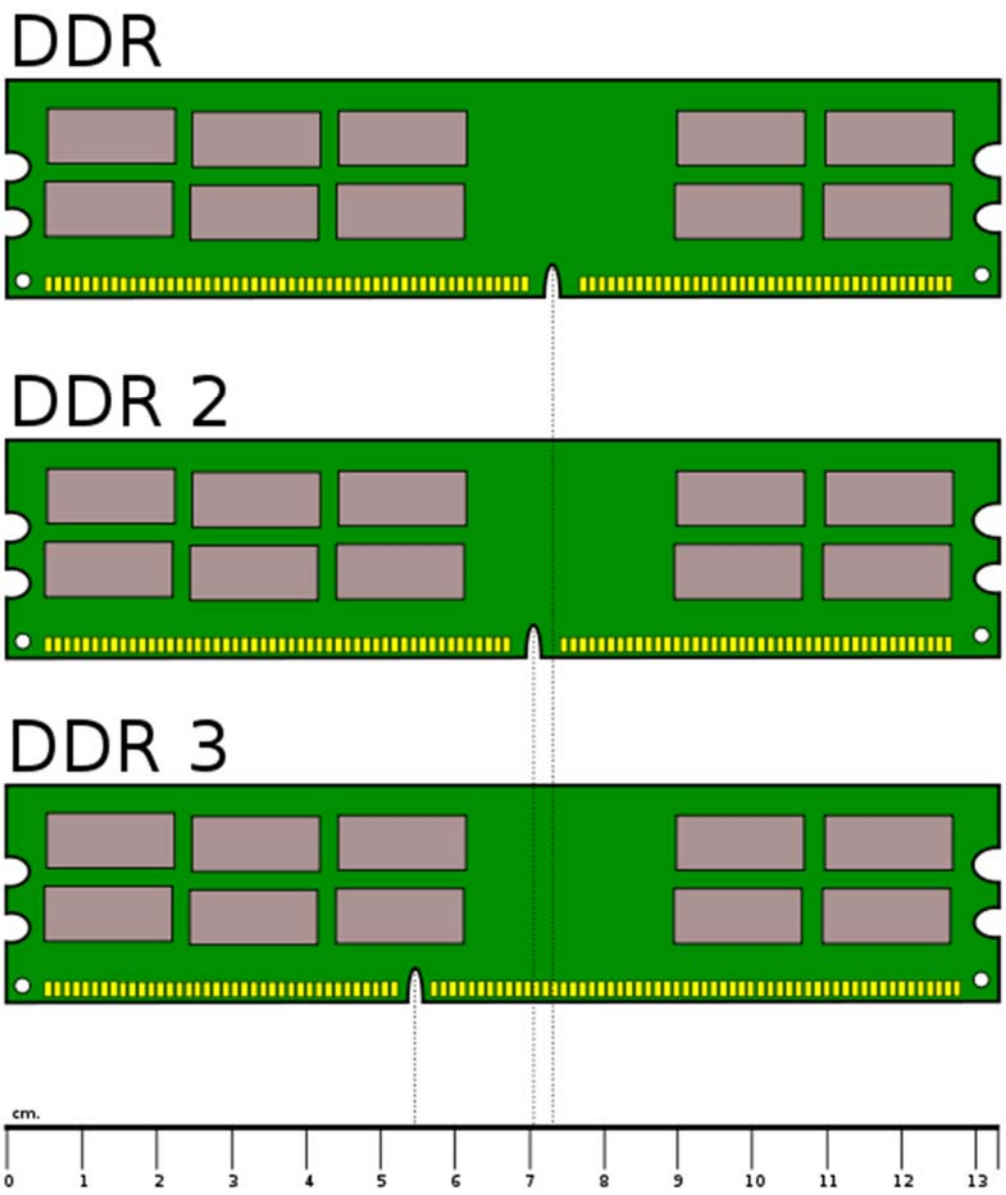
Power level on the Cable after each tap with the equalizer



Power level on the cable after each tap without the equalizer

Hardware

RAM



Standardized by: JEDEC

DescripID Formula:
RAM DIMM <type of DDR> <Memory Size> <speed> <JEDEC Standard>

Ex: RAM DIMM DDR2 2GB 533MHZ PC2-4200

For more:
http://en.wikipedia.org/wiki/DDR_SDRAM

DIMM DDR

AKA: Dual In-line Memory Module, Dual Data Rate RAM

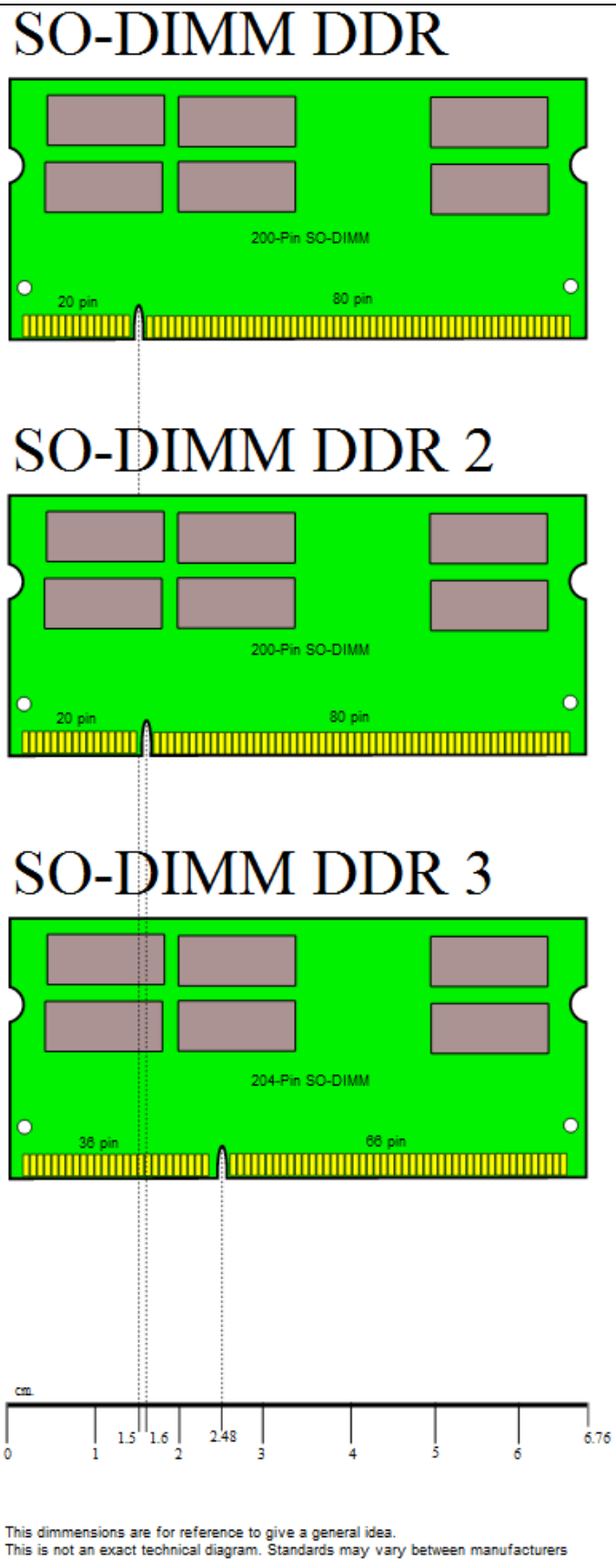
DDR Description: RAM used in desktop computers. The keying notch is located at 7.2cm from the edge and generally operates between 200 and 400MHZ.

DIMM DDR2

DDR2 Description: RAM used in desktop computers. The keying notch is 7cm from the edge and it generally operates between 400MHZ and 1200MHZ

SO-DIMM DDR3

DDR3 Description: RAM used in desktop computers. The keying notch is 5.4cm from the edge and it generally operates between 800MHZ and 2000MHZ



SO-DIMM DDR

AKA: Small Outline Dual In-line Memory Module, Dual Data Rate RAM

DDR Description: RAM used in notebook computers. The keying notch is located at 1.5cm from the edge and generally operates between 200 and 400MHZ

SO-DIMM DDR2

DDR2 Description: RAM used in notebook computers. The keying notch is 1.6cm from the edge and it generally operates between 400MHZ and 1200MHZ

SO-DIMM DDR3

DDR3 Description: RAM used in notebook computers. The keying notch is 2.48cm from the edge and it generally operates between 800MHZ and 2000MHZ

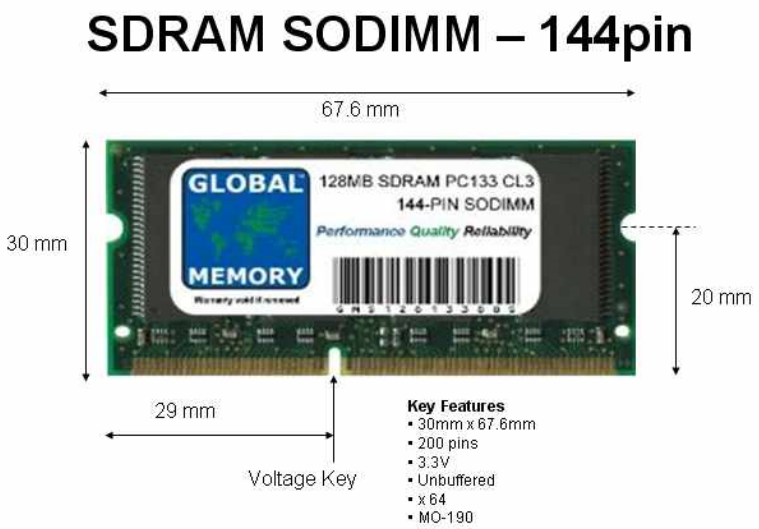
Other: . All SODIMM DDRs have 200 contacts, but they are not interchangeable (a DDR module will not fit into a DDR2 slot; the notch placement will prevent it)

Standardized by: JEDEC

DescripID Formula:
RAM SO-DIMM <type of DDR> <Memory Size> <speed> <JEDEC Standard>

Ex: RAM SO-DIMM DDR2 2GB 533MHZ PC2-4200

For more:
http://en.wikipedia.org/wiki/ SO-DIMM



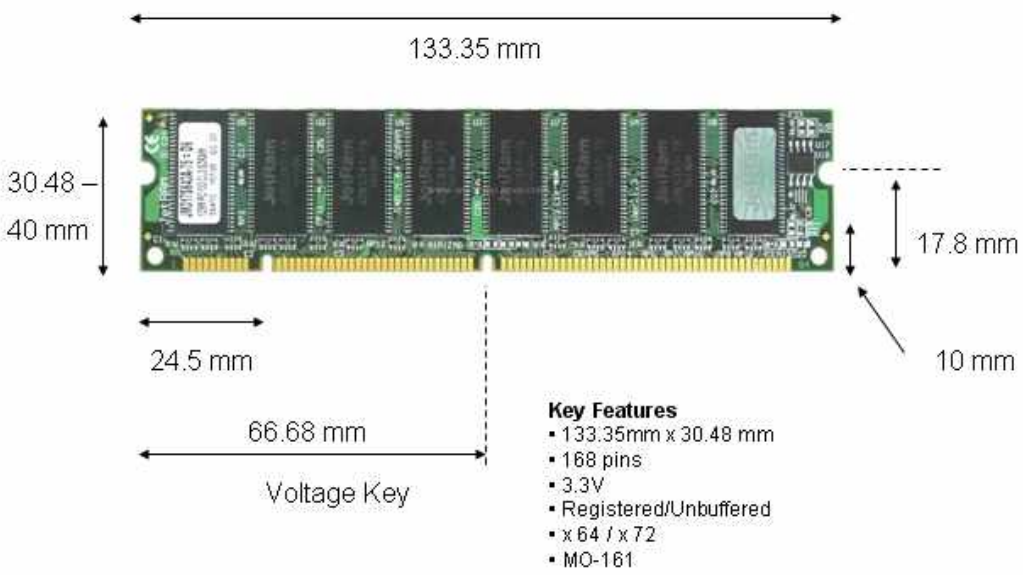
For More:
http://www.simmtester.com/page/news/showpubnews.asp?num=168

DescripID Formula:
RAM SO-DIMM <type of DDR> <Memory Size> <speed>
Ex: RAM SO-DIMM SDRAM 128MB 133MHZ

SO-DIMM SDRAM

AKA: Small Outline Dual In-line Memory Module, Synchronous Data Rate RAM, SDR

DDR Description: RAM used in notebook computers. The keying notch is located at 2.9cm from the edge.



For More:
http://www.simmtester.com/page/news/showpubnews.asp?num=168
DescripID Formula:
RAM DIMM SDRAM <Memory Size> <speed>

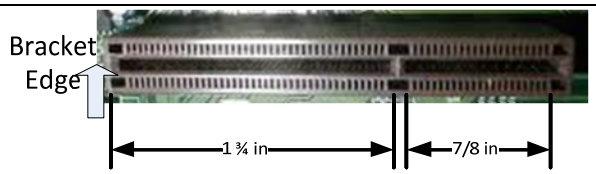
Ex: RAM DIMM SDRAM 128MB 133MHZ

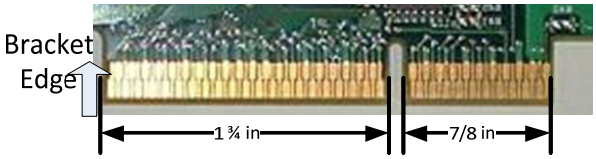
DIMM SDRAM

AKA: Dual In-line Memory Module, Synchronous Data Rate RAM

DDR Description: RAM used in notebook computers. The keying notch is located at 34.5mm from the edge and another at 66.68mm

AGP-1.5v

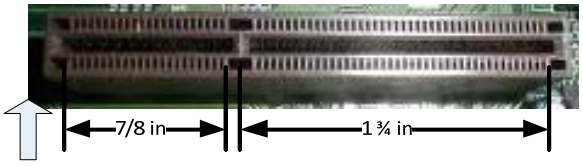


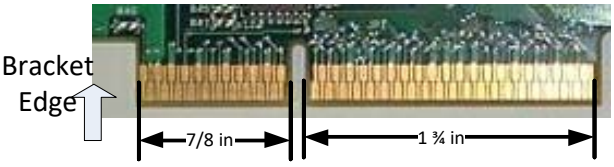


Expansion Slot **Board Key**

Connector Type Name: AGP-1.5v **Usage:** Expansion card graphics cards **Description:** an Accelerated Graphics Port card that operates on 1.5 volt **Standardized by**: Intel	**DescripID Formula:** ExpCard <type of card> <Make> <model> AGP-1.5v *Ex:* ExpCard Graphics NVidia P231 AGP-1.5v **For more**: http://en.wikipedia.org/wiki/Accelerated_Graphics_Port

AGP-3.3v



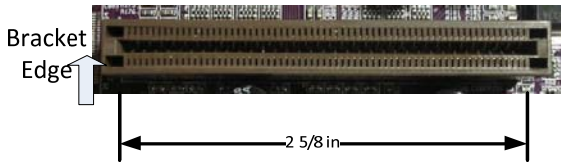


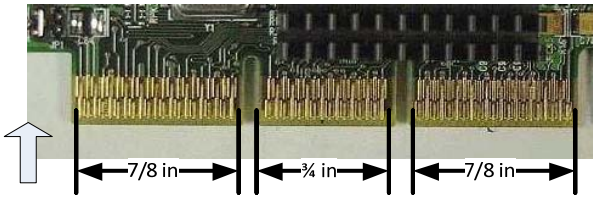
Expansion Slot **Board Key**

Connector Type Name: AGP-3.3v **Usage:** Expansion card graphics cards **Description:** an Accelerated Graphics Port card that operates on 3.3 volt **Standardized by**: Intel	**DescripID Formula:** ExpCard <type of card> <Make> <model> AGP-3.3v *Ex:* ExpCard Graphics VGA Trident 9880 AGP-3.3v **For more**: http://en.wikipedia.org/wiki/Accelerated_Graphics_Port

AGP-1.5v

AGP-Uni

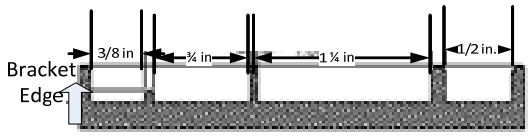




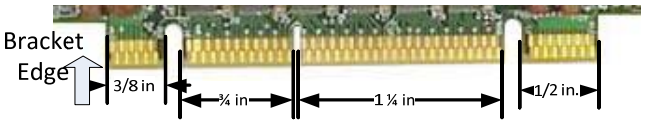
Expansion Slot **Board Key**

Connector Type Name: AGP-Uni **Usage:** Expansion card graphics cards **Description:** an Accelerated Graphics Port port or card that is compatible with 1.5 and 3.3 volt cards **Standardized by**: Intel	**DescripID Formula:** ExpCard <type of card> <Make> <model> AGP-Uni *Ex:* ExpCard Graphics VGA Matrox g450 AGP-Uni **For more**: http://en.wikipedia.org/wiki/Accelerated_Graphics_Port

AGP-Pro-3.3v



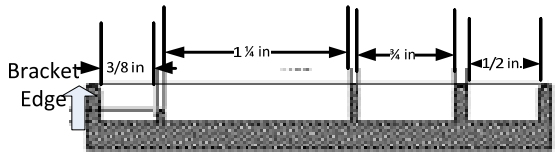
Expansion Slot



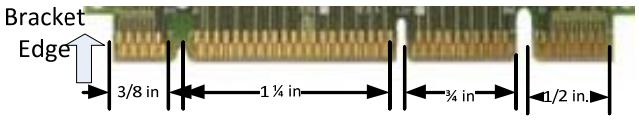
Board Key

Connector Type Name: AGP-Pro-3.3v **Usage:** Expansion card graphics cards **Description:** an Accelerated Graphics Port Pro card operates on 3.3 volts **Standardized by**: Intel	**DescripID Formula:** ExpCard <type of card> <Make> <model> AGP-3.3v *Ex:* ExpCard Graphics IBM 22p0624 g450 AGP-3.3v **For more**: http://en.wikipedia.org/wiki/Accelerated_Graphics_Port

AGP-Pro-1.5v



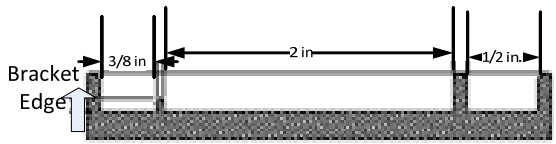
Expansion Slot

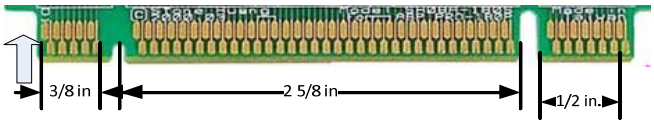


Board Key

Connector Type Name: AGP-Pro-1.5v **Usage:** Expansion card graphics cards **Description:** an Accelerated Graphics Port Pro card operates on 1.5 volts **Standardized by**: Intel	**DescripID Formula:** ExpCard <type of card> <Make> <model> AGP-1.5v *Ex:* ExpCard Graphics ATI GL4 AGP-1.5v **For more**: http://en.wikipedia.org/wiki/Accelerated_Graphics_Port

AGP-Pro-Uni



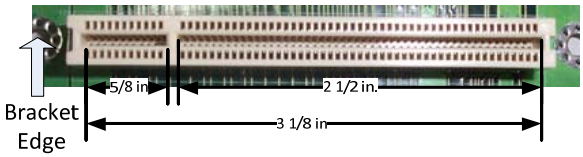


Expansion Slot

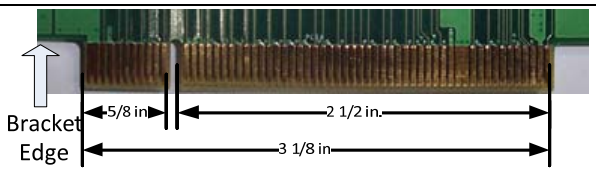
Board Key

Connector Type Name: AGP-Pro-Uni **Usage:** Expansion card graphics cards **Description:** an Accelerated Graphics	**DescripID Formula:** ExpCard <type of card> <Make> <model> AGP-Pro-Uni

PCI-3.3V-32b



Expansion Slot

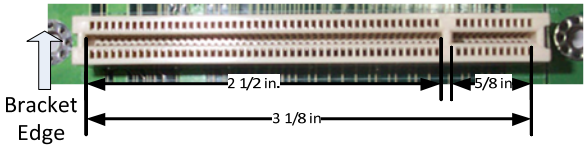


Board Key

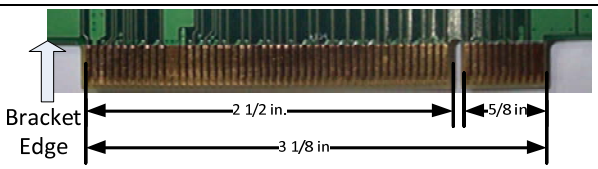
Connector Type Name: PCI-3.3V-32b
AKA: Conventional PCI
Usage: 32 bit expansion card for modems, network cards, sound cards, etc.
Standardized by: Intel

Description: a peripheral component interconnect 32 bit card that is supplied by 3.3 volts. The card can be used in 64 bit slots.
DescripID Formula:
ExpCard <type of card> <Make> <model>PCI-3.3V-32b
Ex: ExpCard Graphics GeForce 8400GS PCI-3.3V-32b

PCI-5V-32b



Expansion Slot

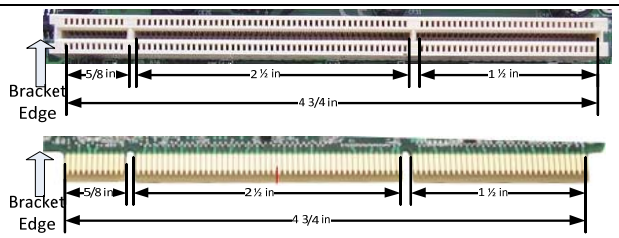


Board Key

Connector Type Name: PCI-5V-32b
AKA: Conventional PCI
Usage: 32 bit expansion card for modems, network cards, sound cards, etc.
Standardized by: Intel

Description: a peripheral component interconnect 32 bit card that is supplied by 5 volts. The card can be used in 64 bit slots.
DescripID Formula:
ExpCard <type of card> <Make> <model>PCI-5V-32b
Ex: ExpCard Parallel SIIGJJ-P01211-S6 PCI-5V-32b
For more: http://en.wikipedia.org/wiki/Conventional_PCI

PCI-3.3V-64b



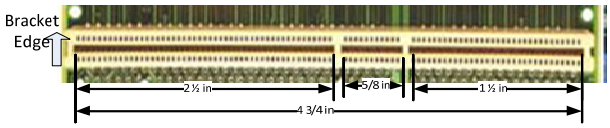
Expansion Slot

Board Key

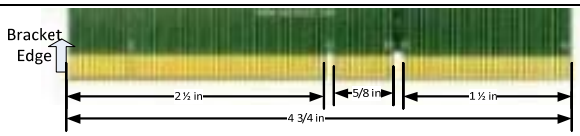
Connector Type Name: PCI-3.3V-64b
AKA: Conventional PCI 64 bit
Usage: 64 bit expansion card for modems, network cards, sound cards, etc.
Standardized by: Intel

Description: a peripheral component interconnect 64 bit card that is supplied by 3.3 volts.
DescripID Formula:
ExpCard <type of card> <Make> <model>PCI-3.3V-64b
Ex: ExpCard Extender PCIExtend 177 PCI-3.3V-64b
For more: http://en.wikipedia.org/wiki/Conventional_PCI

PCI-5V-64b



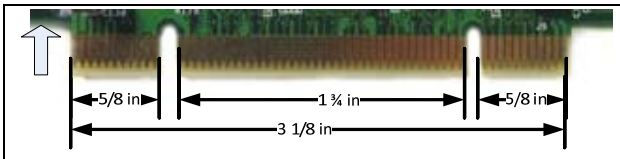
Expansion Slot



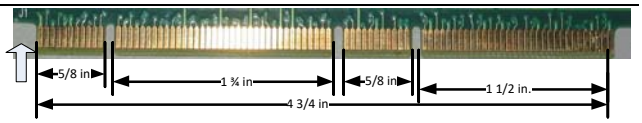
Board Key

Connector Type Name: PCI-5V-64b **AKA:** Conventional PCI 64 bit **Usage:** 64 bit expansion card for modems, network cards, sound cards, etc. **Standardized by**: Intel	**Description:** a peripheral component interconnect 64 bit card that is supplied by 5 volts. **DescripID Formula:** ExpCard <type of card> <Make> <model>PCI-5V-64b *Ex:* ExpCard Extender PCIExtend 176 PCI-5V-64b **For more**: http://en.wikipedia.org/wiki/Conventional_PCI

PCI-Uni-32b

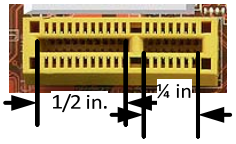


PCI-Uni-64b

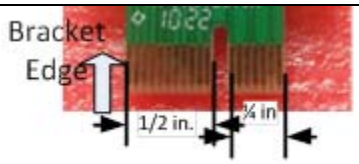


Connector Type Name: PCI-Uni-32b **AKA:** Conventional PCI 32 bit **Usage:** 32 bit expansion card for modems, network cards, sound cards, etc. **Description:** a peripheral component interconnect 32 bit card that is supplied by 5 volts or can be powered by 3.3V (hence the "Uni" for universal). **DescripID Formula:** ExpCard <type of card> <Make> <model>PCI-Uni-64b *Ex:* ExpCard USB Syba SD-NECPR-2U1P PCI-Uni-32b **For more**: http://en.wikipedia.org/wiki/Conventional_PCI **Standardized by**: Intel	**Connector Type Name:** PCI-Uni-64b **AKA:** Conventional PCI 64 bit **Usage:** 64 bit expansion card for modems, network cards, sound cards, etc. **Description:** a peripheral component interconnect 64 bit card that is supplied by 5 volts or can be powered by 3.3V (hence the "Uni" for universal). **DescripID Formula:** ExpCard <type of card> <Make> <model>PCI-Uni-64b *Ex:* ExpCard 1394 Startech PCI1394B PCI-Uni-64b **For more**: http://en.wikipedia.org/wiki/Conventional_PCI **Standardized by**: Intel

PCIe-1x



Expansion Slot

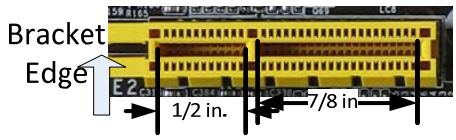


Board Key

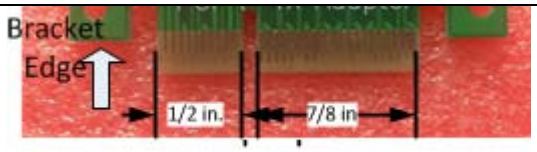
Connector Type Name: PCIe-1x
AKA: PCI Express Single Lane
Usage: Expansion card for modems, network cards, sound cards, etc.
Standardized by: PCI-SIG

Description: a peripheral component interconnect express card that has a single lane for data transfer.
DescripID Formula:
ExpCard <type of card> <Make> <model>PCIe-1x
Ex: ExpCard Wireless N D-Link DWA-556 PCIe-1x
For more: http://en.wikipedia.org/wiki /PCI_Express

PCIe-4x



Expansion Slot

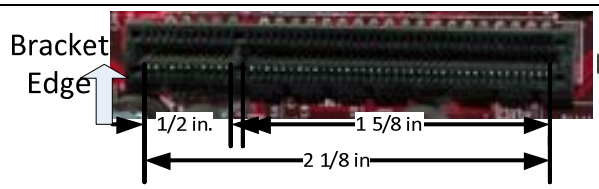


Board Key

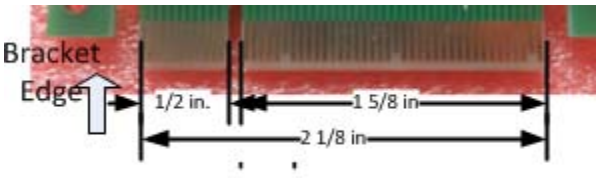
Connector Type Name: PCIe-4x
AKA: PCI Express 4 Lane
Usage: Expansion card for modems, network cards, sound cards, etc.
Standardized by: PCI-SIG

Description: a peripheral component interconnect express card that has 4 lanes for data transfer.
DescripID Formula:
ExpCard <type of card> <Make> <model>PCIe-4x
Ex: ExpCard USB/1394B Syba SD-PEX50011 PCIe-4x
For more: http://en.wikipedia.org/wiki /PCI_Express

PCIe-8x



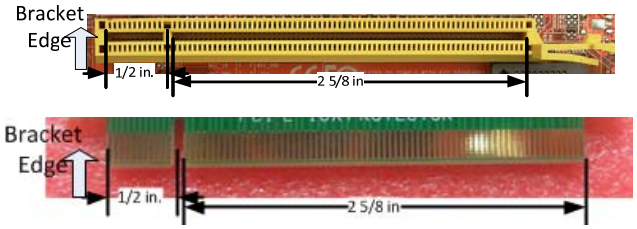
Expansion Slot



Board Key

Connector Type Name: PCIe-8x
AKA: PCI Express 8 Lane
Usage: Expansion card for modems, network cards, sound cards, etc.
Standardized by: PCI-SIG

Description: a peripheral component interconnect express card that has 8 lanes for data transfer.
DescripID Formula:
ExpCard <type of card> <Make> <model>PCIe-8x
Ex:
ExpCard RAID Controller 8p Intel RS2WC080 PCIe-8x
For more: http://en.wikipedia.org/wiki /PCI_Express



Expansion Slot **Board Key**

Connector Type Name: PCIe-16x
AKA: PCI Express 16 Lane
Usage: Expansion card for modems, network cards, sound cards, etc.
Standardized by: PCI-SIG

Description: a peripheral component interconnect express card that has 16 lanes for data transfer.
DescripID Formula:
ExpCard <type of card> <Make> <model> PCIe-16x
Ex: ExpCard Graphics NVidia P231 PCIe-16x
For more: http://en.wikipedia.org/wiki /PCI_Express

Compact Discs

Device Type Name: CDR

AKA: CD-WO, CD-WORM

Usage: Disc to write data or

audio tracks on from a computer

Capacity: 650-700MB

Drive speed	Data rate	Write time for 700 MB CD-R
1X	150 KiB/s	80 minutes
4X	600 KiB/s	20 minutes
8X	1200 KiB/s	10 minutes
12X	1800 KiB/s	6.7 minutes
32X	4800 KiB/s	2.5 minutes
52X	7800 KiB/s	1.5 minutes

Description: A standard CD-R is a 1.2 mm thick disc made of polycarbonate with a 120 mm or 80 mm diameter. The 120 mm disc has a storage capacity of 74 minutes of audio or 650 MB of data.

Other: A CD recorder can write to a CD-R using several methods including:

Disc At Once - the whole CD-R is written in one session with no gaps and the disc is "closed"
meaning no more data can be added and the CD-R effectively becomes a standard read-only CD. With no gaps between the tracks the Disc At Once format is useful for "live" audio recordings.

Track At Once - data are written to the CD-R one track at a time but the CD is left "open" for further recording at a later stage. It also allows data and audio to reside on the same CD-R.

Packet Writing - used to record data to a CD-R in "packets", allowing extra information to be appended to a disc at a later time, or for information on the disc to be made "invisible". In this way, CD-R can emulate CD-RW; however, each time information on the disc is altered, more data has to be written to the disc. There can be compatibility issues with this format and some CD drives.

A rough estimation of the amount of data on a CD-R can be gained on some discs by inspecting the playback side of the disc. A visible variation in the surface can be observed. The used disc space is seen as a light area and unused space is seen as a dark area. CD-Rs are written from the center of the disc outwards

Classified by: Orange book

For more: http://en.wikipedia.org/wiki/cd-r

CD-ROM

Device Type Name: CDROM

AKA: Compact Disc Read-only memory

Usage: Factory produced software

Description: Pre-pressed disc that can't be written by any computer (see CDR)

Other:

Classified by: Yellow book, ECMA-130, ISO 13490

For more:

http://en.wikipedia.org/wiki/CD-ROM

Device Type Name: CDRW

AKA: Compact Disc ReWritable, CD-E

Usage: Disc to write data or audio tracks on from a computer repeatedly

Capacity: 650-700MB

Description: A standard CD-RW is a 1.2 mm thick disc made of polycarbonate with a 120 mm or 80 mm diameter. The 120 mm disc has a storage capacity of 74 minutes of audio or 650 MB of data.

Other: In theory, a CD-RW disc can be re-written up to 1000 times, but in practice, this number is much lower (about 10 for me)

Classified by: Orange book

For more:

http://en.wikipedia.org/wiki/cd-rw

Device Type Name: DVD

AKA: Digital Versatile Disc, Digital Video Disc

Usage: Disc to hold a large amount of data, Digital Video

Capacity: 4.7GB Single Layer, 8.54 GB Dual Layer

Description: Same dimensions as a CD, but able to hold six times the data

Other:

Classified by: Orange book

For more:

http://en.wikipedia.org/wiki/DVD

Device Type Name: DVD+r, DVD-r, DVD-R DL, DVD+R DL, DVD+RW, DVD-RW, DVD-RW DL, DVD+RW DL

AKA: Digital Versatile Disc, Digital Video Disc

Usage: Disc to hold a large amount of data, Digital Video

Capacity: 4.7GB Single Layer, 8.54 GB Dual Layer

Description: Same dimensions as a CD, but able to hold six times the data

Other: There are slight differences between the "+" and "– " in that they have different capacities and some DVD writers are not compatible with the "–". Always buy the "+".

In the same way that RW means re-writable for a CD, the DVDs with RW markings mean that they to can be rewritten. You must have a DVD writer drive to utilize the writing aspect of the DVD R and DVD RW.

Classified by: Orange book

For more:

http://en.wikipedia.org/wiki/DVD

Drive speed	Data rate	Write time for Single Layer DVD+R
1X	1.32 MB/s	60 minutes
2X	2.64 MB/s	30 minutes
4X	5.28 MB/s	15 minutes
8X	10.56 MB/s	7.5 minutes
16X	21.12 MB/s	3.75 minutes

DVD capacity

Disk Type	Data sectors (2,048 B each)	Capacity		
		bytes	GB	GiB
DVD-R (SL)	2,298,496	4,707,319,808	4.7	4.384
DVD+R (SL)	2,295,104	4,700,372,992	4.7	4.378
DVD-R DL	4,171,712	8,543,666,176	8.5	7.957
DVD+R DL	4,173,824	8,547,991,552	8.5	7.961
SL / DL – Single/Dual layer				

Network Topologies

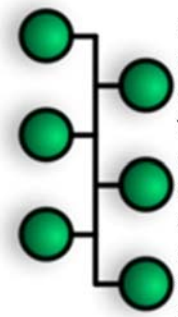
http://en.wikipedia.org/wiki/Network_topology

Network topology is the physical interconnections of the elements (links, nodes, etc.) of a computer network. A local area network (LAN) is one example of a network that exhibits both a physical topology and a logical topology.

Point-to-point

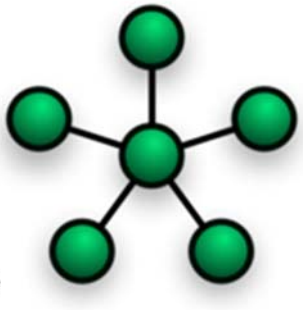
The simplest topology is a permanent link between two endpoints. Switched point-to-point topologies are the basic model of conventional telephony.

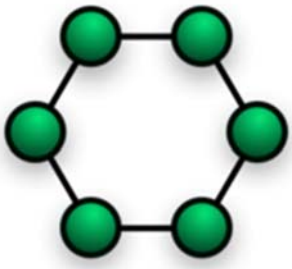
Bus network topology



In local area networks where bus technology is used, each machine is connected to a single cable. Each computer or server is connected to the single bus cable through some kind of connector. A terminator is required at each end of the bus cable to prevent the signal from bouncing back and forth on the bus cable. A signal from the source travels in both directions to all machines connected on the bus cable until it finds the MAC address or IP address on the network that is the intended recipient. If the machine address does not match the intended address for the data, the machine ignores the data. Alternatively, if the data does match the machine address, the data is accepted. Since the bus topology consists of only one wire, it is rather inexpensive to implement when compared to other topologies. However, the low cost of implementing the technology is offset by the high cost of managing the network. Additionally, since only one cable is utilized, it can be the single point of failure. If the network cable breaks, the entire network will be down.

Star Topology In local area networks where the star topology is used, each machine is connected to a central hub. In contrast to the bus topology, the star topology allows each machine on the network to have a point to point connection to the central hub. All of the traffic which transverses the network passes through the central hub. The hub acts as a signal booster or repeater which in turn allows the signal to travel greater distances. As a result of each machine connecting directly to the hub, the star topology is considered the easiest topology to design and implement. An advantage of the star topology is the simplicity of adding other machines. The primary disadvantage of the star topology is the hub is a single point of failure. If the hub were to fail the entire network would fail as a result of the hub being connected to every machine on the network.



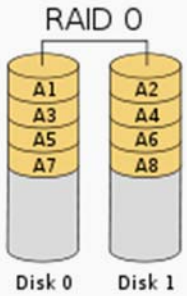
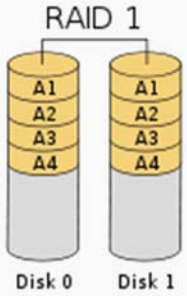
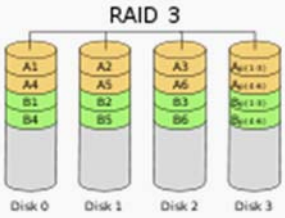


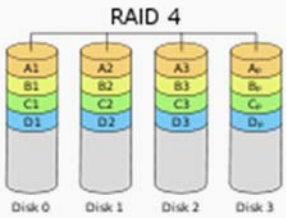
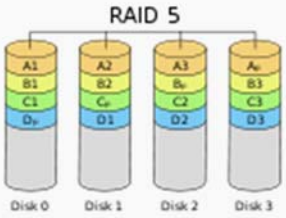
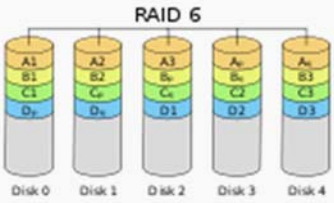
Ring Topology: In local area networks where the ring topology is used, each computer is connected to the network in a closed loop or ring. Each machine or computer has a unique address that is used for identification purposes. The signal passes through each machine or computer connected to the ring in one direction. Ring topologies typically utilize a token passing scheme, used to control access to the network. By utilizing this scheme, only one machine can transmit on the network at a time. The machines or computers connected to the ring act as signal boosters or repeaters which strengthen the signals that transverse the network. The primary disadvantage of ring topology is the failure of one machine will cause the entire network to fail.

Tree or Hierarchical Network: The type of network topology in which a central 'root' node (the top level of the hierarchy) is connected to one or more other nodes that are one level lower in the hierarchy (i.e., the second level) with a point-to-point link between each of the second level nodes and the top level central 'root' node, while each of the second level nodes that are connected to the top level central 'root' node will also have one or more other nodes that are one level lower in the hierarchy (i.e., the third level) connected to it, also with a point-to-point link, the top level central 'root' node being the only node that has no other node above it in the hierarchy (The hierarchy of the tree is symmetrical.) Each node in the network having a specific fixed number, of nodes connected to it at the next lower level in the hierarchy, the number, being referred to as the 'branching factor' of the hierarchical tree.

RAID Levels

http://en.wikipedia.org/wiki/RAID

Level	Description	Minimum # of disks	Space Efficiency	Image
RAID 0	"**Striped set without parity**" or "**Striping**". All disk act as one large disk	2	n	 Diagram of a RAID 0 setup.
RAID 1	'**Mirrored set without parity**' or '**Mirroring**'. Each disk has a corresponding mirrored disk that is exactly the same. As information is written to one disk, it is simultaneously written to it's mirrored disk.	2	1 (size of the smallest disk)	 Diagram of a RAID 1 setup
RAID 2	**Hamming code parity**. Disks are synchronized and striped in very small stripes, often in single bytes/words. Hamming codes error correction is calculated across corresponding bits on disks, and is stored on multiple parity disks.	3		
RAID 3	**Striped set with dedicated parity** or **bit interleaved parity** or **byte level parity**. This mechanism provides fault tolerance similar to RAID 5. However, because the strip across the disks is a lot smaller than a filesystem block, reads and writes to the array perform like a single drive with a high linear write performance. For this to work properly, the drives must have synchronised rotation. If one drive fails, the performance doesn't change.	3	n-1	 Diagram of a RAID 3 setup of 6-byte blocks and two parity bytes, shown are two blocks of data (orange and green)

Level	Description	Minimum # of disks	Space Efficiency	Image
RAID 4	**Block level parity.** Identical to RAID 3, but does block-level striping instead of byte-level striping. In this setup, files can be distributed between multiple disks. Each disk operates independently which allows I/O requests to be performed in parallel, though data transfer speeds can suffer due to the type of parity. The error detection is achieved through dedicated parity and is stored in a separate, single disk unit.	3	n-1	 Diagram of a RAID 4 setup with dedicated parity disk with each color representing the group of blocks in the respective parity block (a stripe)
RAID 5	**Striped set with distributed parity** or **interleave parity**. Distributed parity requires all drives but one to be present to operate; drive failure requires replacement, but the array is not destroyed by a single drive failure. Upon drive failure, any subsequent reads can be calculated from the distributed parity such that the drive failure is masked from the end user. The array will have data loss in the event of a second drive failure and is vulnerable until the data that was on the failed drive is rebuilt onto a replacement drive. A single drive failure in the set will result in reduced performance of the entire set until the failed drive has been replaced and rebuilt.	3	n-1	 Diagram of a RAID 5 setup with distributed parity with each color representing the group of blocks in the respective parity block (a stripe). This diagram shows left asymmetric algorithm
RAID 6	**Striped set with dual distributed parity.** Provides fault tolerance from two drive failures; array continues to operate with up to two failed drives. This makes larger RAID groups more practical, especially for high availability systems. This becomes increasingly important because large-capacity drives lengthen the time needed to recover from the failure of a single drive. Single parity RAID levels are vulnerable to data loss until the failed drive is rebuilt: the larger the drive, the longer the rebuild will take. Dual parity gives time to rebuild the array without the data being at risk if a (single) additional drive fails before the rebuild is complete.	4	n-2	 Diagram of a RAID 6 setup, which is identical to RAID 5 other than the addition of a second parity block

Registered Jacks

USOC No.	Description	Typical Application
RJ11W(Wall) RJ11C	Bridged configurations other than data; single line connections; bridged T/R; 6 position jack	Single line non-key telephone, ancillary devices, PBXS and key telephone systems.
RJ12W(Wall) RJ12C	Bridged T/R ahead of the line circuit of a key telephone system with A/A1; 6 position jack.	Single line non-key telephone sets and ancillary devices connected to a key system where registered terminal equipment is not compatible with electrical characteristics of tip and ring behind line circuit.
RJ13W(Wall) RJ13C	Bridged T/R behind the line circuit of a key telephone system with A/A1; 6 position jack.	Single line non-key telephone sets and ancillary devices connected to a key system.
RJ14W(Wall) RJ14C	Two line bridged T/R; 6 position jack.	Two line non-key telephone sets and ancillary devices.
RJ15C	Bridged T/R; 3 position weatherproof jack.	Providing telephone service to boats in marinas.
RJ16X	Bridged tip and ring with mode Indication to A Series Connection ahead of bridged connector; 6 position jack.	9dBM (Data equipment with MI (mode indication) and MIC (mode indication common) leads.
RJ17C	Single line bridged tip and ring leads. Tip and ring appear on pins 1 and 6 rather than 3 and 4. Positions 2, 3, 4 and 5 are not equipped with contacts, 6 position jack.	Special non-key telephone set or certain hospital ancillary equipment in hospital critical care areas.
RJ18C	A bridged connection of single line tip and ring with make-busy leads MB/MB1. 6 position jack.	When the registered equipment provides a contact closure between the MB and MBI leads, a make busy indication is transmitted to the network equipment busying out the line from further incoming calls.
RJ19C	Bridged tip and ring behind key telephone Line Circuit plus A, A1 and Make Busy Control. 6 position jack.	When the registered equipment provides a contact closure between the MB and MBI leads, a make busy indication is transmitted to the network equipment busying out the line from further incoming calls.
RJ21X	Multiple line; up to 25 bridged T/R; 50 position jack.	Traffic data recording equipment.
RJ22X	Multi-line: up to 12 bridged T/R ahead of the line circuit of a key telephone system with A/A1 connection; 50 position jack.	2 to 12 ancillary devices connected to a key system at one location where registered terminal equipment is not compatible with electrical characteristics of tip and ring behind the line circuit.
RJ23X	Multi-line: up to 12 bridged T/R behind the line circuit of a key telephone system with A/A1 connections; 50 position jack.	2 to 12 ancillary devices connected to a key system at one location.
RJ24X	Multi-line: up to 5 bridged T/R behind the line circuit of a key telephone system. This arrangement has the same wiring arrangement as a standard 5 line key telephone set.	Ancillary devices connected to a key system such as 5 line conferencing devices.
RJ2MB	Multi-line bridge tip ending with make busy indication.	2 to 12 non-key telephone and ancillary devices connected directly to c.o. lines with make busy requirement.
RJ25C	Up to three lines bridged connection 6-position jack.	Three line non-key telephone sets, ancillary devices, including message registration, automatic identification, outward dialing, and off-premise station.
RJ26X	Data: bridged T/R; 50 position ribbon jack, programmed.	Universal jack for fixed loss loop (FLL) or programmed (P) types of data equipment.
RJ27X	Bridged T/R; 50 position ribbon jack, programmed.	Programmed jack for programmed (P) types of data equipment.
RJ31M	Multi-line: up to 8 position series jacks.	Multiple series T/R ahead of all station equipment (reference section 68.502 (b)(1).FCC).
RJ31X	Series T/R ahead of all station equipment; 8 position series jack.	Alarm reporting devices.
RJ32M	Multi-line: up to 8 position series jack.	Multiple series T/R at station (reference section 68.502 (b)(3).FCC)
RJ32X	Series T/R at station; 8 position series jack.	Series ancillary devices such as such as automatic dialers. Single line sets with exclusion.

RJ33M	Multi-line: up to 8 position series jacks.	Multiple series T/R behind the line circuits leading to one key telephone system with A/A1 (reference section 68.502 (b) (3). FCC)
RJ33X	Series T/R ahead of the line circuit of a key telephone system with A/A1; 8 position series jack.	Series ancillary devices connected to a key system where registered terminal equipment is not compatible with electrical characteristics of tip and ring behind line circuit.
RJ34M	Multi-line: up to 8 position series jacks.	Multiple series T/R behind the line circuits of a key telephone system with A/A1 (reference section 68.502 (b)(4). FCC)
RJ34X	Series T/R behind the line circuit of a key telephone system with A/A1; 8 position series jack.	A single line set with exclusion or series ancillary device connected to a key system. This arrangement is preferred to arrangement shown in subsection (b) (3). FCC
RJ35M	Multi-line: up to 8 position series jacks.	Multiple series T/R behind the line circuits leading to one key telephone station instrument of a key telephone system, with A/A1.
RJ35X	Series T/R at key telephone station, behind station pickup key with A/A1; 8 position series jack.	Series ancillary devices connected to key telephone set.
RJ36X	Series T/R with mode indication signal; 6 position jack.	Mode indication (exclusion key) telephone set in series with data jack. Customer shall specify whether a closure or open shall indicate "exclusion" mode.
RJ37X	Series T/R on first line and bridged T/R on second line; 8 position series jack.	Two line telephones with exclusion on one line.
RJ38X	Series connection identical to RJ31X. Strap provides a continuity circuit between 2 and 7, which is used as an indication that the plug of the equipment is engaged with the jack strap provided by telephone company.	Registered alarm dialers.
RJ41M	Data: multiple bridged T/R; 8 position keyed data jack, universal.	Multiple installations of fixed loss loop or programmed types of data equipment.
RJ41S	Data: bridged T/R; 8 position keyed data jack, universal.	Universal jack for fixed loss loop (FLL) or programmed (P) types of data equipment
RJ42S	Data: multiple tip and ring, A and A1. Tip and ring ahead of line circuit; 8 position keyed data jack.	Universal jack for FLL or Programmed (P) types of data equipment connected to a key system where the registered terminal equipment is not compatible with electrical characteristics of tip and ring behind the line circuit.
RJ42M	Data: multiple tip and ring connected ahead of the line circuit, 8 position keyed data jack.	Multiple installations of fixed loss loop or programmed types of data equipment.
RJ43S	Data: multiple tip and ring A/A1. Tip and ring behind line circuit; 8 position keyed data jack.	Universal jack for FLL or Programmed types of data equipment connected to a key system.
RJ43M	Data: multiple tip and ring A/A1 tip and ring behind line circuit; 8 position keyed data jack.	Multiple installation of FLL or P data equipment.
RJ45M	Data: multiple bridged T/R; 8 position keyed data jack.	Multiple installations of programmed types of data equipment.
RJ45S	Data: bridged T/R; 8 position keyed data jack, programmed.	Programmed data equipment.
RJ46S	Data: Single Line bridged tip and ring, A/A1 tip and ring ahead of line circuit; 8 position keyed.	Programmed data equipment connected to a key system where the registered terminal equipment is not compatible with electrical characteristics of tip and ring ahead line circuit.
RJ46M	Same as RJ46S only in Multiple Mounting arrangements bridged tip and ring with or without A/A1.	Programmed data equipment connected to a key system.
RJ47M	Data same as RJ47S only in multiple mounting arrangements.	Programmed data equipment connected to a key system.

RJ47S	Data: single line bridged tip and ring. A/A1 tip and ring behind line circuit; 8 position keyed.	Programmed data equipment connected to a key system where the registered terminal equipment is not compatible with electrical characteristics of tip and ring behind line circuit.
RJ48C	8 position digital services jack.	Network connection for ISDN terminal equipment using 1.544 Mbps.
RJ48M	50 position miniature ribbon connector for digital services.	Multi-line (8 T& R, 8 T1 R1) connections for terminal equipment using 1.544 Mbps.
RJ48S	8 position keyed digital services jack.	Network connection for local area data channels and/or sub-rate digital services.
RJ48T	50 position miniature ribbon connector.	Multi-line network connection for local area data channels and/or sub-rate digital services.
RJ48X	8 position digital services jack with shorting bars.	Network connection for ISDN terminal equipment using 1.544 Mbps.
RJM2X	Wall or rack mounting enclosure for use with multiple lines of data and voice blocks and adapters.	
RJ51X	Data: bridged T/R with A/A1 and Mode Indication; 50 position ribbon jack, universal; T/R connected ahead of the line circuit.	Universal jack for fixed loss loop (FLL) or programmed (P) types of data equipment requiring both Mode Indication function and A/A1 connections to a key telephone system. This configuration will normally be used in conjunction with RJ36X series configuration.
RJ52X	Data: bridged T/R with A/A1 and Mode Indication; 50 position ribbon jack, programmed; T/R connected ahead of the line circuit.	Universal jack for fixed loss loop (FLL) or programmed (p) types of data equipment requiring both Mode Indication function and A/A1 connections to a key telephone system. This configuration will normally be used in conjunction with RJ36X series configuration.
RJ53X	Data: bridged T/R with A/A1 and Mode Indication; 50 position ribbon jack, programmed; T/R connected ahead of the line circuit.	Programmed jack for programmed (P) types of data equipment requiring both Mode Indication function and A/A1 connections to a key telephone system. This configuration will normally be used in conjunction with RJ36X series configuration.
RJ54X	Data: bridged T/R with A/A1 and Mode Indication; 50 position ribbon jack, programmed; T/R connected ahead of the line circuit.	Programmed jack for programmed (P) types of data equipment requiring both Mode Indication function and A/A1 connections to a key telephone system. This configuration will normally be used in conjunction with RJ36X series configuration.
RJ71A	8 position jack.	
RJ71M	50 pin ribbon jack.	
RJA1X	Adapter between non-standard square-array 4 pin jack and standard 6 position plug.	Single line non-key telephone set or ancillary devices where a working 4 pin jack exists and the registered terminal equipment is equipped with a miniature 6 position plug.
RJA2X	Adapters between non-standard square-array 4 pin jack and standard 6 position plug.	Single line non-key telephone set or ancillary device where a working miniature 6 position jack exists.
RJA3X	Adapter between non-standard 12 pin jack and standard 6 position plug.	Single line non-key telephone set or ancillary devices where a working 12 pin jack exists and the registered terminal equipment is equipped with a miniature 6 position plug.
RJA4X	Adapter between non-standard rectangular-array 6 pin jack and standard 6 position plug.	Single line non-key telephone set or ancillary devices where a working rectangular-array jack exists and the registered terminal equipment is equipped with a miniature 6 position plug.
RJ1DC	Single line bridged 4-wire tip/ring and T1/R1.	Terminal equipment and systems requiring 4-wire exchange access.

American Wire Gauge

The Facts on American Wire Gauge (AWG)

What is a American Wire Gauge?
From Cableorganizer.com

The American Wire Gauge (AWG), a wire-sizing standard also known as the Brown and Sharpe wire gauge, is used in North America to measure and regulate the thickness of conductive wires made from nonferrous metals. AWG is not to be confused with the Washburn and Moen (W&M), US Steel, or Music Wire gauging methods, which are used only for steel-based wire.

When did the American Wire Gauge system come into use?

AWG was developed in 1856 by J.R. Brown and Sharpe, a small firm in Providence, Rhode Island that specialized in the crafting and repair of watches, clocks, and mathematical instruments. That same year, Lucien Sharpe presented the new system to the Waterbury Brass Association. Convinced that Brown and Sharpe's gauging system would greatly improve uniformity throughout the wire manufacturing industry, Waterbury Brass Association made a movement to adopt the standard. By February of 1857, eight major American manufacturers had signed resolutions to adhere to the Brown and Sharpe gauge standard; the following month, a nationwide circular was distributed, introducing the new wire gauge standard to the American public.

What do the gauge numbers mean?

The American Wire Gauge system is based on a total of 44 standardized wire sizes: 0-40, as well as the additional 00, 000, and 0000 gauges (the thickest of all). It may seem a little counterintuitive, but the higher a gauge number is, the thinner the wire will be. This is because each gauge is named after the number of sizing dies the wire needs to be drawn through to reach the correct diameter (for example, a 24 gauge wire is drawn through 24 different sizing dies).

American Wire Gauge Chart

AWG	DIAMETER	TURNS OF WIRE (PER INCH)	EXAMPLE OF USE
0000 (4/0)	0.46" (11.7mm)	2.17	
000 (3/0)	0.41" (10.4mm)	2.44	
00 (2/0)	0.365" (9.27mm)	2.74	
0	0.325" (8.25 mm)	3.08	
1	0.289" (7.35 mm)	3.46	
2	0.258" (6.54 mm)	3.88	
3	0.229" (5.83 mm)	4.36	
4	0.204" (5.19 mm)	4.89	
5	0.182" (4.62 mm)	5.5	
6	0.162" (4.12 mm)	6.17	
7	0.144" (3.66 mm)	6.93	
8	0.128" (3.26 mm)	7.78	
9	0.114" (2.91 mm)	8.74	
10	0.102" (2.59 mm)	9.81	
11	0.0907" (2.30 mm)	11	
12	0.0808" (2.05 mm)	12.4	
13	0.0720" (1.83 mm)	13.9	
14	0.0641" (1.63 mm)	15.6	Speaker Cable
15	0.0571" (1.45 mm)	17.5	
16	0.0508" (1.29 mm)	19.7	Speaker Cable
17	0.0453" (1.15 mm)	22.1	
18	0.0403" (1.02 mm)	24.8	Coaxial
19	0.0359" (0.912 mm)	27.9	
20	0.032" (0.812 mm)	31.3	Coaxial
21	0.0285" (0.723 mm)	35.1	
22	0.0253" (0.644 mm)	39.5	Phone
23	0.0226" (0.573 mm)	44.3	Phone
24	0.0201" (0.511 mm)	49.7	Cat 5, 5e and 6, Phone
25	0.0179" (0.455 mm)	55.9	Phone
26	0.0159" (0.405 mm)	62.7	Phone
27	0.0142" (0.361 mm)	70.4	Phone
28	0.0126" (0.321 mm)	79.1	Phone
29	0.0113" (0.286 mm)	88.8	
30	0.01" (0.255 mm)	99.7	
31	0.00893" (0.227 mm)	112	
32	0.00795" (0.202 mm)	126	
33	0.00708" (0.18 mm)	141	
34	0.00630" (0.16 mm)	159	
35	0.00561" (0.143 mm)	178	
36	0.005" (0.127mm)	200	
37	0.00445" (0.113 mm)	225	
38	0.00397" (0.101 mm)	252	
39	0.00353" (0.0897 mm)	283	
40	0.00314" (0.0799 mm)	318	

Network and Computer Commands

Environmental Variables (common)

%COMPUTERNAME% - the computer name
%LOGONSERVER% - the DC authenticating with
%NUMBER_OF_PROCESSSORS% - number of processors on the system
%ProgramFiles% - Program Files directory
%USERDOMAIN% - Users domain
%USERNAME% - Users name
%windir% - Windows Directory

Batch Files (.bat)

REM is used to make a remark

Echo – When on, it displays the commands being executed in the command prompt. When off, it doesn't

```
@echo on
Echo This Command will display then echo the text
@echo off
Echo This Command will not display, but the text will show
```

Goto Labels (jumping around commands)

```
Goto End
ECHO Skipping this line
:END
ECHO Done!
```

Conditionals

Comparing Variable commands:

```
EQU  - equal
NEQ - not equal
LSS - less than
LEQ - less than or equal
GTR - greater than
GEQ - greater than or equal
```

If statements

```
IF %Number_of_Processors% EQU 2 (ECHO 2 Processors)
```

If Exist Statements

```
IF EXIST "C:\secfix.cmd" (ECHO Yes) ELSE (ECHO No)
or
IF EXIST "C:\secfix.cmd" (ECHO Yes)
IF NOT EXIST "C:\secfix.cmd" (ECHO No)
```

Map network drives

NET USE [driveletter:] \\Compname\share /persistent:No

If Persistent is no, the drive will not remain mapped when the user logs off

Example:

```
NET USE I: \\FS01.domain.net\Share /P:No
```

Map network printers

NET USE lpt# \\PrintServer\Printer /Persistant:No
Example:

```
NET USE lpt1 \\PS01.domain.net\printer1 /p:no
```

Disconnect Drive

```
NET USE I: /delete
```

Other Batch (DOS) Commands

CLS : Clears the DOS screen

EXIT: Exits DOS

PAUSE: Pauses the batch file till user presses any key to continue

CALL: used to run another batch file within a batch file. When the batch file that is called is completed, the remainder of the original batch file is completed. Note if the batch file does not exist it will give an error message.

VBScript (.vbs) Basics

‘ The Apostrophe is used to make **Remarks** in the script

Wscript.echo “Used to display a popup window with text”

Variables

Example of a string Variable:

strName = "Johnny"

Example of an integer Variable:

intNumber = 1

Example of variables being changed

intNumber = intNumber + 1

' intNumber is now 2

strName = strName &" Doomsday"

' strName is now Johnny Doomsday

‘ the & is used in front of new text

wscript.echo strName &" "&intNumber

wscript.quit *'Quits the script*

Conditionals

Comparing Variable commands:

= - equal

<> - not equal

< - less than

<= - less than or equal

> - greater than

>= - greater than or equal

If, Then, Else Statements: This statement can be placed on one line or encompass a number of lines of code.

‘Example of single line:

intValue = 4

If intValue = 4 Then wscript.echo "four"

‘Example of a multiple line When multiple lines are used, an "end if" statement needs to be used

```
intValue = 4
If intValue = 4 Then
        wscript.echo "four"
Elseif intValue = 5 Then
        wscript.echo "five"
Else
      wscript.echo "Not five or four"
End if
```

Case Statements

```
intValue = 4
Select Case intValue
      Case 4
            wscript.echo "Four"
      Case 5
            wscript.echo "Five"
      Case Else
            wscript.echo "not Five or Four"
End Select
```

Loops and Arrays

```
‘ Define array
Dim cars(2)
cars(0)="Volvo"
cars(1)="Saab"
cars(2)="BMW"
‘ Use the array in a For Each loop
For Each x in cars
        wscript.echo x
Next
```

```
‘ For next Loop
for I = 0 to 5
        wscript.echo "Number " & I
next
```

```
‘ Do While loop (conditional) Loop

i=0
Do While i < 10
        wscript.echo i
         i=i+1
Loop
```

Common Functions

Delete Network Printers

```
Set objNetwork = CreateObject ("Wscript.network")
Set objPrinter = objNetwork.enumprinterconnections
Printerflag=false
For I = 0 to objPrinter.count -1 Step 2
  if left(objPrinter.item(i+1), 2) ="\\" Then
        on error resume next
        objNetwork.RemovePrinterConnection
objPrinter.item(i+1)
        on error Goto 0
  End if
Next
```

Remove Network Drives

```
'Dim wshNetwork
Set wshNetwork = CreateObject("Wscript.network")
Dim bForce, bUpdateProfile
bForce = True
bUpdateProfile = True
On Error Resume Next
' Prevents the user from seeing an error if drive doesn't exist



WshNetwork.RemoveNetworkDrive "Z:", bForce, bUpdateProfile


On Error GoTo 0  'resets error handling
```

Mapping a Network Printer

```
Set WshNetwork = CreateObject("WScript.Network")
WshNetwork.AddWindowsPrinterConnection "\\PS01.domain.net\printer", "HP LaserJet 1200 Series PCL"
WshNetwork.SetDefaultPrinter "\\PS01.domain.net\printer"
```

Create or Change Registry Entries

```
strComputer = "."
Const HKEY_CURRENT_USER = &H80000001
 Set oReg=GetObject("winmgmts:{impersonationLevel=impersonate}!\\" & _
        strComputer & "\root\default:StdRegProv")
oReg.CreateKey HKEY_CURRENT_USER, "Software/Yoursite"
oReg.SetStringValue HKEY_CURRENT_USER, "Software/Yoursite", "Key Name", "Value“
```

Get registry values

```
oReg.GetStringValue HKEY_CURRENT_USER,"Software/Yoursite", "Key Name", strValue
wscript.echo strValue
```

Copy File

```
Const OverwriteExisting = TRUE
Set objFSO = CreateObject("Scripting.FileSystemObject")
objFSO.CopyFile  "\\fs01.domain.net\hidden$\your.ini", "C:\Program" & _
        " Files\YourProg\your.ini", OverwriteExisting
```

Add a favorite URL (Internet Explorer)

```
Const ADMINISTRATIVE_TOOLS = 6
Set objShell = CreateObject("Shell.Application")
Set objFolder = objShell.Namespace(ADMINISTRATIVE_TOOLS)
Set objFolderItem = objFolder.Self

Set objShell = WScript.CreateObject("WScript.Shell")
strDesktopFld = objFolderItem.Path

Set objURLShortcut = objShell.CreateShortcut(strDesktopFld & "\W3 Schools.url")
objURLShortcut.TargetPath ="http://www.w3schools.com"
objURLShortcut.Save
```

Prompt for User Input (yes or no)

```
const POPUP_TITLE="Your Printers and Drives"
Set objshell = wscript.createobject("wscript.shell")
iRetVal = objshell.popup("Would you like to setup your computer to the default" & _
        " settings for Your Site?", 10, POPUP_TITLE, vbquestion + vbyesno)

‘ iRetVal now has the value of vbYes or vbNo after execution (10 is a timeout value, leave blank if none desired)
```

Prompt for User Input (Text)

```
strUserInput = inputbox("Please enter your name:", "Name", "Your name here", 300, 400)
Wscript.echo strUserInput
```

Run a program or open another file

```
Set objShell= CreateObject("Wscript.Shell")
objShell.run "C:\yourprog.exe“
```

Set and then retrieve values from ADUC (for a computer)

```
Set objSysinfo = CreateObject("ADSystemInfo")
Set objComputer = GetObject("LDAP://" & objsysinfo.computername)
objComputer.put "Description", "Your Desc"
objComputer.Setinfo
wscript.echo objComputer.get("Description")
```

Set the home page (Internet Explorer)

```
Const HKEY_CURRENT_USER = &H80000001
strComputer = "."
Set oReg=GetObject("winmgmts:{impersonationLevel=impersonate}!\\" & _
        strComputer & "\root\default:StdRegProv")

strKeyPath = "Software\Microsoft\Internet Explorer\Main"
oReg.CreateKey HKEY_CURRENT_USER,strKeyPath

strValueName = "Start Page"
strValue = “http://blogs.technet.com/b/heyscriptingguy/”
oReg.SetStringValue HKEY_CURRENT_USER,strKeyPath,strValueName,strValue
```

Get the Computer Distinguished name

```
Set objSysinfo = CreateObject("ADSystemInfo")
wscript.echo objsysinfo.computername
```

Get the Computer Model Number

```
strComputer = "."
Set objWMIService = GetObject("winmgmts:\\" & strComputer & "\root\cimv2")
set colitems=objWMIservice.Execquery("Select * from win32_Computersystem",,48)
for each objItem in colItems
        ModelNum = objitem.model
        wscript.echo ModelNum
Next
```

Get the Computer Serial Number (If it is not null)

```
strComputer = "."
Set objWMIService = GetObject(_
   "winmgmts:\\" & strComputer & "\root\cimv2")
set colitems=objWMIservice.Execquery("Select * from win32_BIOS",,48)
for each objItem in colItems
            SerialNum = trim(objitem.serialnumber)
            if not isNull(SerialNum) then wscript.echo SerialNum
Next
```

DOS Command Index

DOS Command Index

Information about all current DOS commands

From the book
DOS the *Easy* Way
by Everett Murdock Ph.D.
CLICK HERE for information about downloading the book DOS the *Easy* Way.

Click on a command name for complete information about that command and examples of its use.

APPEND

(External)

APPEND ;
APPEND [d:]path[;][d:]path[...]
APPEND [/X:on|off][/path:on|off] [/E]

Displays or sets the search path for data files. DOS will search the specified path(s) if the file is not found in the current path.

ASSIGN

(External)

ASSIGN x=y [...] /sta

Redirects disk drive requests to a different drive.

ATTRIB

(External)

ATTRIB [d:][path]filename [/S]
ATTRIB [+R|-R] [+A|-A] [+S|-S] [+H|-H] [d:][path]filename [/S]

Sets or displays the read-only, archive, system, and hidden attributes of a file or directory.

BACKUP

(External)

BACKUP d:[path][filename] d:[/S][/M][/A][/F:(size)] [/P][/D:date] [/T:time] [/L:[path]filename]

Makes a backup copy of one or more files. (In DOS Version 6, this program is stored on the DOS supplemental disk.)

BREAK

(Internal)

BREAK =on|off

Used from the DOS prompt or in a batch file or in the CONFIG.SYS file to set (or display) whether or not DOS should check for a Ctrl + Break key combination.

BUFFERS

(Internal)

BUFFERS=(number),(read-ahead number)

Used in the CONFIG.SYS file to set the number of disk buffers (number) that will be available for use during data input. Also used to set a value for the number of sectors to be read in advance (read-ahead) during data input operations.

CALL

(Internal)

CALL [d:][path]batchfilename [options]

Calls another batch file and then returns to current batch file to continue.

CHCP

(Internal)

CHCP (codepage)

Displays the current code page or changes the code page that DOS will use.

CHDIR

(Internal)

CHDIR (CD) [d:]path
CHDIR (CD)[..]

Displays working (current) directory and/or changes to a different directory.

CHKDSK

(External)

CHKDSK [d:][path][filename] [/F][/V]

Checks a disk and provides a file and memory status report.

CHOICE

(Internal)

CHOICE [/C[:]keys] [/N][/S][/T[:]c,nn] [text]

Used to provide a prompt so that a user can make a choice while a batch program is running.

CLS (Clear Screen)

(Internal)

CLS

Clears (erases) the screen.

COMMAND

(External)

COMMAND [d:][path] [device] [/P][/E:(size)] [/MSG][/Y [/C (command)|/K (command)]

Starts a new version of the DOS command processor (the program that loads the DOS Internal programs).

COMP

(External)

COMP [d:][path][filename] [d:][path][filename] [/A][/C][/D][/L][/N:(number)]

Compares two groups of files to find information that does not match. (See FC command).

COPY

(Internal)

COPY [/Y|-Y] [/A][/B] [d:][path]filename [/A][/B] [d:][path][filename] [/V]
or
COPY [/Y|-Y][/A][/B] [d:][path]filename+[d:][path]filename[...][d:][path][file name] [/V]

Copies and appends files.

COUNTRY

(Internal)

COUNTRY=country code,[code page][,][d:][filename]

Used in the CONFIG.SYS file to tell DOS to use country-specific text conventions during processing.

CTTY

(Internal)

CTTY (device)

Changes the standard I/O (Input/Output) device to an auxiliary device.

DATE

(Internal)

DATE mm-dd-yy

Displays and/or sets the system date.

DBLSPACE

(External)

DBLSPACE / automount=drives
DBLSPACE /chkdsk [/F] [d:]
DBLSPACE /compress d: [/newdrive=host:] [/reserve=size] [/F]
DBLSPACE /create d: [/newdrive=host:] [/reserve=size] [/size=size]
DBLSPACE /defragment [d:]]/F]
DBLSPACE /delete d:
DBLSPACE /doubleguard=0|1
DBLSPACE /format d:
DBLSPACE [/info] [d:]
DBLSPACE /list
DBLSPACE /mount[=nnn] host: [/newdrive=d:]
DBLSPACE /ratio[=ratio] [d:] [/all]
DBLSPACE /size[=size] [/reserve=size] d:
DBLSPACE /uncompress d:
DBLSPACE /unmount [d:]

A program available with DOS 6.0 that allows you to compress information on a disk.

DEBUG

(External)

DEBUG [pathname] [parameters]
An MS-DOS utility used to test and edit programs.

DEFRAG

(External)

DEFRAG [d:] [/F][/S[:]order] [/B][/skiphigh [/LCD|/BW|/GO] [/H]
DEFRAG [d:] [/V][/B][/skiphigh] [/LCD]|/BW|/GO] [/H]

Optimizes disk performance by reorganizing the files on the disk.

DEL (ERASE)

(Internal)

DEL (ERASE) [d:][path]filename [/P]

Deletes (erases) files from disk.

DELOLDOS

(External)

DELOLDOS [/B]

Deletes all files from previous versions of DOS after a 5.0 or 6.0 installation.

DELTREE

(External)

DELTREE [/Y] [d:]path [d:]path[...]

Deletes (erases) a directory including all files and subdirectories that are in it.

DEVICE

(Internal)

DEVICE=(driver name)

Used in the CONFIG.SYS file to tell DOS which device driver to load.

DEVICEHIGH

(Internal)

DEVICEHIGH=(driver name)

Like DEVICE, DEVICEHIGH is used in the CONFIG.SYS file to tell DOS which device driver software to use for devices; however, this option is used to install the device driver into the upper memory area.

DIR

(Internal)

DIR [d:][path][filename] [/A:(attributes)] [/O:(order)] [/B][/C][/CH][/L][/S][/P][/W]

Displays directory of files and directories stored on disk.

DISKCOMP

(External)

DISKCOMP [d:] [d:][/1][/8]

Compares the contents of two diskettes.

DISKCOPY

(External)

DISKCOPY [d:] [d:][/1][/V][/M]

Makes an exact copy of a diskette.

DOS

(Internal)

DOS=[high|low],[umb|noumb]

Used in the CONFIG.SYS file to specify the memory location for DOS. It is used to load DOS into the upper memory area and to specify whether or not the upper memory blocks will be used.

DOSKEY

(External)

DOSKEY [reinstall] [/bufsize=size][/macros][/history][/insert|/overstrike] [macroname=[text]]

Loads the Doskey program into memory which can be used to recall DOS commands so that you can edit them.

DOSSHELL

(External)

DOSSHELL [/B] [/G:[resolution][n]]|[/T:[resolution][n]]

Initiates the graphic shell program using the specified screen resolution.

DRIVPARM

(Internal)

DRIVPARM= /D:(number) [/C] [/F:(form factor)] [/H:(number)] [/I][/N][/S:(number)] [/T:(tracks)]

Used in the CONFIG.SYS file to set parameters for a disk drive.

ECHO

(Internal)

ECHO on|off
ECHO (message)

Displays messages or turns on or off the display of commands in a batch file.

EDIT

(External)

EDIT [d:][path]filename [/B][/G][/H][/NOHI]

Starts the MS-DOS editor, a text editor used to create and edit ASCII text files.

EMM386

(External)

EMM386 [on|off|auto] [w=on|off]

Enables or disables EMM386 expanded-memory support on a computer with an 80386 or higher processor.

EXE2BIN

(External)

EXE2BIN [d:][path]filename [d:][path]filename

Converts .EXE (executable) files to binary format.

EXIT

(Internal)

EXIT

Exits a secondary command processor.

EXPAND

(External)

EXPAND [d:][path]filename [[d:][path]filename[. . .]]

Expands a compressed file.

FASTHELP

(External)

FASTHELP [command][command] /?

Displays a list of DOS commands with a brief explanation of each.

FASTOPEN

(External)

FASTOPEN d:[=n][/X]

Keeps track of the locations of files for fast access.

FC

(External)

FC [/A][/C][/L][/Lb n][/N][/T][/W][number] [d:][path]filename [d:][path]filename

or (for binary comparisons)
FC [/B][/number] [d:][path]filename [d:][path]filename

Displays the differences between two files or sets of files.

FCBS

(Internal)

FCBS=(number)

Used in the CONFIG.SYS file to specify the number of file-control blocks for file sharing.

FDISK

(External)

FDISK [/status]

Prepares a fixed disk to accept DOS files for storage.

FILES

(Internal)

FILES=(number)

Used in the CONFIG.Sys file to specify the maximum number of files that can be open at the same time.

FIND

(External)

FIND [/V][/C][/I][/N] ÒstringÓ [d:][path]filename[...]

Finds and reports the location of a specific string of text characters in one or more files.

FOR

(Internal)

FOR %%(variable) IN (set) DO (command)

or (for interactive processing)
FOR %(variable) IN (set) DO (command)

Performs repeated execution of commands (for both batch processing and interactive processing).

FORMAT

(External)

FORMAT d:[/1][/4][/8][/F:(size)] [/N:(sectors)] [/T:(tracks)][/B|/S][/C][/V:(label)] [/Q][/U][/V]

Formats a disk to accept DOS files.

GOTO

(Internal)

GOTO (label)

Causes unconditional branch to the specified label.

GRAFTABL

(External)

GRAFTABL [(code page)]
GRAFTABL [status]

Loads a table of character data into memory (for use with a color/graphics adapter).

GRAPHICS

(External)

GRAPHICS [printer type][profile] [/B][/R][/LCD][/PB:(id)] [/C][/F][/P(port)]

Provides a way to print contents of a graphics screen display.

HELP

(External)

HELP [command] [/B][/G][/H][/NOHI]

Displays information about a DOS command.

IF

(Internal)

IF [NOT] EXIST filename (command) [parameters]
IF [NOT] (string1)==(string2) (command) [parameters]
IF [NOT] ERRORLEVEL (number) (command) [parameters]

Allows for conditional operations in batch processing.

INCLUDE

(Internal)

INCLUDE= blockname

Used in the CONFIG.SYS file to allow you to use the commands from one CONFIG.SYS block within another.

INSTALL

(Internal)

INSTALL=[d:][\path]filename [parameters]

Used in the CONFIG.SYS file to load memory-resident programs into conventional memory.

INTERLINK

(External)

INTERLINK [client[:]=[server][:]]

Connects two computers via parallel or serial ports so that the computers can share disks and printer ports.

INTERSVR

(External)

INTERSVR [d:][...][/X=d:][...] [/LPT:[n|address]] [/COM:[n|address]][/baud:rate] [/B][/V]
INTERSVR /RCOPY

Starts the Interlink server.

JOIN

(External)

JOIN d: [d:path]
JOIN d: [/D]

Allows access to the directory structure and files of a drive through a directory on a different drive.

KEYB

(External)

KEYB [xx][,][yyy][,][d:][path]filename [/E][/ID:(number)]

Loads a program that replaces the support program for U. S. keyboards.

LABEL

(External)

LABEL [d:][volume label]

Creates or changes or deletes a volume label for a disk.

LASTDRIVE

(Internal)

LASTDRIVE=(drive letter)

Used in the CONFIG.SYS file to set the maximum number of drives that can be accessed.

LOADFIX

(Internal)

LOADFIX [d:][path]filename [parameters]

Ensures that a program is loaded above the first 64K of conventional memory, and runs the program.

LOADHIGH

(Internal)

LOADHIGH (LH) [d:][path]filename [parameters]

Loads memory resident application into reserved area of memory (between 640K-1M).

MEM

(External)

MEM [/program|/debug|/classify|/free|/module(name)] [/page]

Displays amount of installed and available memory, including extended, expanded, and upper memory.

MEMMAKER

(External)

MEMMAKER [/B][/batch][/session][/swap:d]
[/T][/undo][/W:size1,size2]

Starts the MemMaker program, a program that lets you optimize your computer's memory.

MENUCOLOR

(Internal)

MENUCOLOR=textcolor,[background]

Used in the CONFIG.SYS file to set the colors that will be used by DOS to display text on the screen.

MENUDEFAULT

(Internal)

MENUDEFAULT=blockname, [timeout]

Used in the CONFIG.SYS file to set the startup configuration that will be used by DOS if no key is pressed within the specified timeout period.

MENUITEM

(Internal)

MENUITEM=blockname, [menutext]

Used in the CONFIG.SYS file to create a start-up menu from which you can select a group of CONFIG.SYS commands to be processed upon reboot.

MIRROR

(External)

MIRROR [d:]path [d:] path [...]
MIRROR [d1:][d2:][...] [/T(drive)(files)]
[/partn][/U][/1]

Saves disk storage information that can be used to recover accidentally erased files.

MKDIR

(MD) (Internal)

MKDIR (MD) [d:]path

Creates a new subdirectory.

MODE

(External)

MODE n
MODE LPT#[:][n][,][m][,][P][retry]
MODE [n],m[,T]
MODE (displaytype,linetotal)
MODE
COMn[:]baud[,][parity][,][databits][,][stopbits][,][retry]
MODE LPT#[:]=COMn [retry]
MODE CON[RATE=(number)][DELAY=(number)]
MODE (device) CODEPAGE PREPARE=(codepage)
[d:][path]filename
MODE (device) CODEPAGE PREPARE=(codepage
list) [d:][path]filename
MODE (device) CODEPAGE SELECT=(codepage)
MODE (device) CODEPAGE [/STATUS]
MODE (device) CODEPAGE REFRESH

Sets mode of operation for devices or communications.

MORE

(External)

MORE < (filename or command)
(name)|MORE

Sends output to console, one screen at a time.

PRINT

(External)

PRINT [/B:(buffersize)] [/D:(device)] [/M:(maxtick)] [/Q:(value] [/S:(timeslice)][/U:(busytick)] [/C][/P][/T] [d:][path][filename] [...]

Queues and prints data files.

PROMPT

(Internal)

PROMPT [prompt text] [options]

Changes the DOS command prompt.

RECOVER

(External)

RECOVER [d:][path]filename
RECOVER d:

Resolves sector problems on a file or a disk. (Beginning with DOS Version 6, RECOVER is no longer available).

REM

(Internal)

REM [comment]

Used in batch files and in the CONFIG.SYS file to insert remarks (that will not be acted on).

RENAME (REN)

(Internal)

RENAME (REN) [d:][path]filename [d:][path]filename

Changes the filename under which a file is stored.

REPLACE

(External)

REPLACE [d:][path]filename [d:][path] [/A][/P][/R][/S][/U][/W]

Replaces stored files with files of the same name from a different storage location.

RESTORE

(External)

RESTORE d: [d:][path]filename [/P][/S][/B:mm-dd-yy] [/A:mm-dd-yy][/E:hh:mm:ss] [/L:hh:mm:ss] [/M][/N][/D]

Restores to standard disk storage format files previously stored using the BACKUP command.

RMDIR (RD)

(Internal)

RMDIR (RD) [d:]path

Removes a subdirectory.

SCANDISK

(External)

SCANDISK [d: [d: . . .]/all][/checkonly/autofix[/nosave]/custom][/surface][/mono][/nosummay]
SCANDISK volume-name[/checkonly/autofix[/nosave]/custom][/mono][/no summary]
SCANDISK /fragment [d:][path]filename
SCANDISK /undo [undo-d:][/mono]

Starts the Microsoft ScanDisk program which is a disk analysis and repair tool used to check a drive for errors and correct any problems that it finds.

SELECT

(External)

SELECT [d:] [d:][path] [country code][keyboard code]

Formats a disk and installs country-specific information and keyboard codes (starting with DOS Version 6, this command is no longer available).

SET

(Internal)

SET (string1)=(string2)

Inserts strings into the command environment. The set values can be used later by programs.

SETVER

(External)

SETVER [d:]:path][filename (number)][/delete][/quiet]

Displays the version table and sets the version of DOS that is reported to programs.

SHARE

(External)

SHARE [/F:space] [/L:locks]

Installs support for file sharing and file locking.

SHELL

(Internal)

SHELL=[d:][path]filename [parameters]

Used in the CONFIG.SYS file to specify the command interpreter that DOS should use.

SHIFT

(Internal)

SHIFT

Increases number of replaceable parameters to more than the standard ten for use in batch files.

SORT

(External)

SORT [/R][/+n] < (filename)
SORT [/R][/+n] > (filename2)

Sorts input and sends it to the screen or to a file.

STACKS

(Internal)

STACKS=(number),(size)

Used in the CONFIG.SYS file to set the number of stack frames and the size of each stack frame.

SUBMENU

(Internal)

SUBMENU=blockname, [menutext]

Used in the CONFIG.SYS file to create a multilevel menu from which you can select start-up options.

SUBST

(External)

SUBST d: d:path
SUBST d: /D

Substitutes a virtual drive letter for a path designation.

SWITCHES

(Internal)

SWITCHES= [/K][/F][/N][/W]

Used in the CONFIG.SYS file to configure DOS in a special way; for example, to tell DOS to emulate different hardware configurations.

SYS

(External)

SYS [source] d:

Transfers the operating system files to another disk.

TIME

(Internal)

TIME hh:mm[:ss][.cc][A|P]

Displays current time setting of system clock and provides a way for you to reset the time.

TREE

(External)

TREE [d:][path] [/A][/F]

Displays directory paths and (optionally) files in each subdirectory.

TYPE

(Internal)

TYPE [d:][path]filename

Displays the contents of a file.

UNDELETE

(External)

UNDELETE [d:][path][filename] [/DT|/DS|/DOS]
UNDELETE
[/list|/all|/purge[d:]|/status|/load|/U|/S[d:]|/Td:[-entries]]

Restores files deleted with the DELETE command.

UNFORMAT

(External)

UNFORMAT d: [/J][/L][/test][/partn][/P][/U]

Used to undo the effects of formatting a disk.

VER

(Internal)

VER

Displays the DOS version number.

VERIFY

(Internal)

VERIFY on|off

Turns on the verify mode; the program checks all copying operations to assure that files are copied correctly.

VOL

(Internal)

VOL [d:]

Displays a disk's volume label.

VSAFE

(External)

VSAFE [/option[+|-]...] [/NE][/NX][Ax|/Cx] [/N][/D][/U]

VSAFE is a memory-resident program that continuously monitors your computer for viruses and displays a warning when it finds one.

XCOPY

(External)

XCOPY [d:][path]filename [d:][path][filename] [/A][/D:(date)] [/E][/M][/P][/S][/V][/W][Y\-Y]
Copies directories, subdirectories, and files.

Syntax Notes

To be functional, each DOS command must be entered in a particular way: this command entry structure is known as the command's "syntax." The syntax "notation" is a way to reproduce the command syntax in print.

For example, you can determine the items that are optional, by looking for information that is printed inside square brackets. The notation [d:], for example, indicates an optional drive designation. The command syntax, on the other hand, is how YOU enter the command to make it work.

Command Syntax Elements

1. Command Name

The DOS command name is the name you enter to start the DOS program (a few of the DOS commands can be entered using shortcut names). The DOS command name is always entered first. In this book, the command is usually printed in uppercase letters, but you can enter command names as either lowercase or uppercase or a mix of both.

2. Space
Always leave a space after the command name.

3. Drive Designation

The drive designation (abbreviated in this book as "d:") is an option for many DOS commands. However, some commands are not related to disk drives and therefore do not require a drive designation. Whenever you enter a DOS command that deals with disk drives and you are already working in the drive in question, you do not have to enter the drive designator. For example, if you are working in drive A (when the DOS prompt A> is showing at the left side of the screen) and you want to use the DIR command to display a directory listing of that same drive, you do not have to enter the drive designation. If you do not enter a drive designation, DOS always assumes you are referring to the drive you are currently working in (sometimes called the "default" drive).

4. A Colon

When referring to a drive in a DOS command, you must always follow the drive designator with a colon (:) (this is how DOS recognizes it as a drive designation).

5. Pathname

A pathname (path) refers to the path you want DOS to follow in order to act on the DOS command. As described in Chapter 3, it indicates the path from the current directory or subdirectory to the files that are to be acted upon.

6. Filename

A filename is the name of a file stored on disk. As described in Chapter 1, a filename can be of eight or fewer letters or other legal characters.

7. Filename Extension

A filename extension can follow the filename to further identify it. The extension follows a period and can be of three or fewer characters. A filename extension is not required.

8. Switches

Characters shown in a command syntax that are represented by a letter or number and preceded by a forward slash (for example, "/P") are command options (sometimes known as "switches"). Use of these options activate special operations as part of a DOS command's functions.

9. Brackets

Items enclosed in square brackets are optional; in other words, the command will work in its basic form without entering the information contained inside the brackets.

10. Ellipses

Ellipses (...) indicate that an item in a command syntax can be repeated as many times as needed.

11. Vertical Bar

When items are separated by a vertical bar (|), it means that you enter one of the separated items. For example: ON | OFF means that you can enter either ON or OFF, but not both.

Subnet Cheat Sheet

IPv4 Subnetting Chart

CIDR	Subnet	# Addresses	Wildcard	Network Bit
/32	255.255.255.255	1	0.0.0.0	0
/31	255.255.255.254	2	0.0.0.1	2
/30	255.255.255.252	4	0.0.0.3	4
/29	255.255.255.248	8	0.0.0.7	8
/28	255.255.255.240	16	0.0.0.15	16
/27	255.255.255.224	32	0.0.0.31	32
/26	255.255.255.192	64	0.0.0.63	64
/25	255.255.255.128	128	0.0.0.127	128
/24	255.255.255.0	256	0.0.0.255	0
/23	255.255.254.0	512	0.0.1.255	2
/22	255.255.252.0	1024	0.0.3.255	4
/21	255.255.248.0	2048	0.0.7.255	8
/20	255.255.240.0	4096	0.0.15.255	16
/19	255.255.224.0	8192	0.0.31.255	32
/18	255.255.192.0	16,384	0.0.63.255	64
/17	255.255.128.0	32,768	0.0.127.255	128
/16	255.255.0.0	65,536	0.0.255.255	0
/15	255.254.0.0	131,072	0.1.255.255	2
/14	255.252.0.0	262,144	0.3.255.255	4
/13	255.248.0.0	524,288	0.7.255.255	8
/12	255.240.0.0	1,048,576	0.15.255.255	16
/11	255.224.0.0	2,097,152	0.31.255.255	32
/10	255.192.0.0	4,194,304	0.63.255.255	64
/9	255.128.0.0	8,388,608	0.127.255.255	128
/8	255.0.0.0	16,777,216	0.255.255.255	0

IPv6 Subnet Chart

Prefix	/48	/56	/64	/127	# Addresses
/24	16M	4G	1T	8388608Y	16777216Y
/25	8M	2G	512G	4194304Y	8388608Y
/26	4M	1G	256G	2097152Y	4194304Y
/27	2M	512M	128G	1048576Y	2097152Y
/28	1M	256M	64G	524288Y	1048576Y
/29	512K	128M	32G	262144Y	524288Y
/30	256K	64M	16G	131072Y	262144Y
/31	128K	32M	8G	65536Y	131072Y
/32	64K	16M	4G	32768Y	65536Y
/33	32K	8M	2G	16384Y	32768Y
/34	16K	4M	1G	8192Y	16384Y
/35	8K	2M	512M	4096Y	8192Y
/36	4K	1M	256M	2048Y	4096Y
/37	2K	512K	128M	1024Y	2048Y
/38	1K	256K	64M	512Y	1024Y
/39	512	128K	32M	256Y	512Y
/40	256	64K	16M	128Y	256Y
/41	128	32K	8M	64Y	128Y
/42	64	16K	4M	32Y	64Y
/43	32	8K	2M	16Y	32Y
/44	16	4K	1M	8Y	16Y
/45	8	2K	512K	4Y	8Y
/46	4	1K	256K	2Y	4Y
/47	2	512	128K	1Y	2Y
/48	1	256	64K	512Z	1Y
/49		128	32K	256Z	512Z
/50		64	16K	128Z	256Z
/51		32	8K	64Z	128Z
/52		16	4K	32Z	64Z
/53		8	2K	16Z	32Z
/54		4	1K	8Z	16Z
/55		2	512	4Z	8Z
/56		1	256	2Z	4Z
/57			128	1Z	2Z
/58			64	512E	1Z
/59			32	256E	512E
/60			16	128E	256E
/61			8	64E	128E
/62			4	32E	64E
/63			2	16E	32E
/64			1	8E	16E

Basic Router and Switch configuration

! Common commands

```
! Show model number and version information
show version

! show running configuration
show running-config

‘ Show the MAC Address Table, all then just for one specific MAC (switch ports)
show mac address-table
Show mac address-table address 0000.1111.1234

! save running configuration to startup-config
wr mem
! or
copy run start

! Encrypt all passwords (regardless of Secret or not)
service password-encryption

! Set Consol password and disable annoying logs while typing
line con 0
password cisco
logging synchronous
login

! Set Telnet password
line vty 0 4
password cisco
login local

! Set hostname
hostname HostDevice

! Set Enable password
enable password cisco

! Set Message of the Day
banner motd “Message”

! Disable Domain Service Lookup
no ip domain-lookup

! Set clock timezone (timezone <anyname> <-# or + from GMT>)
clock timezone eastern -4
clock summer-time eastern recurring

! Create DHCP pool
ip dhcp pool Data
network 172.22.101.0 255.255.255.0
default-router 172.22.101.1
dns-server 208.67.220.220 208.67.222.222
! lease <days> <hours><minutes>
lease 7 23 59
! Set DHCP excluded address
ip dhcp excluded-address 172.22.101.1
```

```
! Create DHCP pool for Voice VLAN (ip dhcp pool <pool name>)
ip dhcp pool Voice
network 172.18.0.0 255.255.255.0
! Set option for TFTP server
option 150 ip 172.18.0.1
default-router 172.18.0.1

! Create user and password for Router
!username <any name> privilege <1-15, 15 highest> secret <any pass>
username admin privilege 15 secret  cisco

! Start Web server for router
ip http server
ip http authentication local
ip http secure-server
ip http timeout-policy idle 600 life 86400 requests 10000

! Set VLAN IP Addresses (not needed for a Router without a switch module)
! Vlan 100 is being used for the End User Data Vlan
interface Vlan100
ip address 172.22.101.1 255.255.255.0
! Vlan 102 is being used for the Voice Vlan
interface Vlan102
ip address 172.18.0.1 255.255.255.0
!Vlan 104 is the is being used for the Management Vlan (printers, etc.)
interface Vlan104
ip address 10.0.0.1 255.255.255.0
! Set Default gateway for router
ip default-gateway 192.168.2.1
```

! Basic Router Configuration

```
! Set IP Address for WAN port
interface FastEthernet0/0
ip address 192.168.2.20 255.255.255.0
duplex auto
speed auto

! Set IP addresses for subinterfaces on LAN port
interface FastEthernet0/1.100
encapsulation dot1Q 100
ip address 172.22.101.2 255.255.255.0
interface FastEthernet0/1.102
encapsulation dot1Q 102
ip address 172.18.0.2 255.255.255.0
interface FastEthernet0/1.104
encapsulation dot1Q 104
ip address 10.0.0.2 255.255.255.0

! Set IP Address for service module (the Cisco unified express software engine or the switch module)
interface Integrated-Service-Engine0/0
ip unnumbered FastEthernet0/0
service-module ip address 192.168.2.22 255.255.255.0
```

!Routing protocols

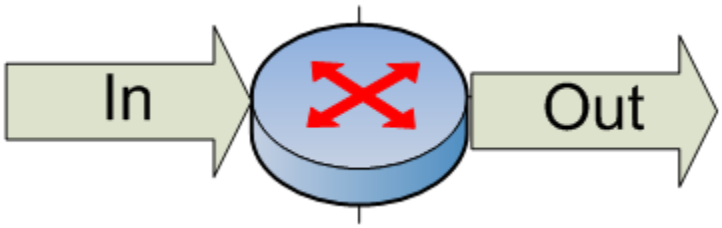
```
! Set a static route
! ip route[ Destination Network Address] [dest. subnet mask] [IP of next hop or port used to get to next hop]
ip route 192.168.3.0 255.255.255.0 192.168.2.1
! Set gateway of last resort (static route)
ip route 0.0.0.0 0.0.0.0 192.168.2.1

! Advertise EIGRP networks
router eigrp 12
network 192.168.2.0
network 172.22.101.0

! Advertise OSPF networks
router ospf 1
network 192.168.2.0 0.0.0.255 area 0
network 172.22.101.0 0.0.0.255 area 0
```

! Set WAN protocols

```
! PPP with CHAP
username OtherRouterHostName password cisco
interface serial 0/0/0
encapsulation ppp
ppp authentication chap

! PPP with PAP
username OtherRouterHostName password cisco
interface serial 0/0/0
encapsulation ppp
ppp authentication pap
ppp pap sent-username HostDevice password cisco

! HDLC (configured by default)
interface serial 0/0/0
encapsulation hdlc

! Setup router for SSH
ip domain-name cisco.com
! set the key to use and the size of the key module (360-2048)
crypto key generate rsa 360
username user password cisco
line vty 0 4
transport input ssh
login local


! NAT/ PAT configuration (this example will have fa0/1 as inside of the NAT and serial 0/0/0 as the outside)
access-list 21 permit 192.168.2.0   0.0.0.255
ip nat inside source list 21 interface serial 0/0/0 overload
interface fa0/1
ip nat inside
interface serial 0/0/0
ip nat outside
```

! Access Lists

```
! standard IP number access list (1-99 or 1300-1999)
access-list 1 deny host 192.168.3.3              ! deny a single host
! deny a range of IPs based on a wildcard mask (if bit is a 0, must be same, if 1 ignore)
access-list 1 deny 192.168.4.0  0.0.0.255
! permit all other traffic or there will be an implicit denial on any other traffic
 access-list 1 permit any

! Extended IP number access list (100-199 or2000-2699)
! access-list 100-199 {permit|deny} {ip|tcp|udp|icmp} source source-mask [lt|gt|eq|neq] [source-port] destination dest-mask [lt|gt|eq|neq] [dest-port]
access-list 100 deny tcp 192.168.5.64  0.0.0.63   192.168.2.0  0.0.0.255  eq 20
! permit all other traffic or there will be an implicit denial on any other traffic
access-list 100 permit ip any any


! named standard access list
ip access-list standard DenySub6
    deny 192.168.6.0  0.0.0.255
    permit any
! named extended access list
ip access-list extended DenySub7Ping
   deny icmp 192.168.7.0   0.0.0.255 echo
   deny icmp 192.168.7.0   0.0.0.255 echo reply
   permit ip any any
```




```
! Apply a numbered access list to a physical interface
interface fa0/1
ip access-group 1 out
ip access-group 100 in

! Apply a named access list to a physical interface
interface f0/2
ip access-class DenySub6 out
ip access-class DenySub7Ping in

! Apply an access list to a virtual interface
line vty 0 4
ip access-group DenySub6 in
```

! Setup Call Manager Express

```
telephony-service
! Prevent phones from automatically configuring themselves
no auto-reg-ephone

! Set the max number of Ephones for the manager
max-ephones 12
! Set the max number of Directory Numbers
max-dn 12
! Set IP for CallManager
```

```
ip source-address 172.18.0.1 port 2000
! Set system message to display on all phones
system message UNCLASSIFIED MWR

! Set voicemail extension
voicemail 2000
max-conferences 4 gain -6
transfer-system full-consult
secondary-dialtone 9
create cnf-files version-stamp Jan 01 2002 00:00:00

! Set Live music feed port for music on hold
voice-port 0/4/0
auto-cut-through
signal immediate
input gain auto-control
description Music On Hold Port

! Set Phone number for live Music on hold port
dial-peer voice 7777 pots
destination-pattern 7777
port 0/4/0

! Set arbitrary line to play MOH to ephone (ephone-dn <number of phone # being defined>)
ephone-dn 10
number 1003
moh out-call 7777

! Set up a VoIP Phone line
ephone-dn 11 dual-line

! Extension or e164 number for line
number 1001
! Line label and name (name <whatever name>)
name Your Phone
! Send busy calls to voice mail
call-forward busy 2000
! Send no answer calls to voicemail (phone num 2000) after 10 seconds
call-forward noan 2000 timeout 10
! Set up the phone
ephone 1
device-security-mode none
mac-address 001F.9E24.BA51
! Set the model of the phone
type 7970

! associate the phone with a phone number (button <button number>:<DN number> )
button 1:11

! Set dial peer route for voicemail and auto attendant (send all ext numbers that start with 2 to this IP)
dial-peer voice 2 voip
destination-pattern 2...
session protocol sipv2
session target ipv4:192.168.2.22
dtmf-relay sip-notify
codec g711ulaw
no vad

! Set phone number and route for POTs phone on router
```

```
dial-peer voice 1004 pots
destination-pattern 1004

! Set port for the phone number
port 0/0/3
! Set IP for service engine (voicemail and call attendant for Call Manager Express)
interface Integrated-Service-Engine0/0
ip unnumbered FastEthernet0/0
service-module ip address 192.168.2.22 255.255.255.0
service-module ip default-gateway 192.168.2.20
! Set a static route to Service engine (for CUE)
ip route 192.168.2.22 255.255.255.255 Integrated-Service-Engine0/0
```

! Enter service module configuration for CUE

```
service-module integrated-Service-Engine 0/0 session
!create new user and set phone number
username Josh create
username Josh phonenumber "1001"
! Setup Voice mail options
voicemail mailbox owner "Josh" size 300
description "Josh's Mailbox"
messagesize 120
end mailbox

! Setup voicemail application
ccn application voicemail
description "Cisco Voicemail 1"
enabled
maxsessions 4
end application
```

!Enable voicemail trigger

```
ccn trigger sip phonenumber 2000
application "voicemail"
bl d
- Cisco Commands
enabled
maxsessions 4
end trigger
! Setup Auto Attendant application
ccn application auto
description "Cisco AutoAttendant"
enabled
maxsessions 4
end application

! Set trigger for auto attendant
ccn trigger sip phonenumber 2001
application "autoattendant"
enabled
maxsessions 4
end trigger
! Switch configurations
! Set VLAN access and Voice for user access ports
interface FastEthernet0/0
switchport access vlan 10
switchport voice vlan 12
! Interface a range of ports and set VLANS
```

```
interface range FastEthernet0/1 – 7
switchport access vlan 10
switchport voice vlan 12
! Set host port to turn on faster
spanning-tree portfast
! Turn on Power Over Ethernet (POE)
power inline auto
! Set VTP Domain and mode
vtp domain MyDomain
vtp mode transparent
! Configure Trunk port
interface GigabitEthernet0/1
switchport trunk encapsulation dot1q
switchport mode trunk
End
```

Cisco Unity Express

For the rest of the CUE configuration and voice mail, go to the web browser and type in the CUE address (in the case of these cliff notes, it's 192.168.2.22)

The call attendant scripting program I used is called CUEEditor2.3.1.exe
Other quick references:
CUE Script Quick Start Guide:
http://www.cisco.com/en/US/products/sw/voicesw/ps5520/products_tech_note09186a008041d950.shtml
Cisco Call Manager Express Configuration Guide:
http://www.cisco.com/en/US/products/sw/voicesw/ps5520/products_configuration_example09186a008037f2a9.shtml
Configuring DHCP on a router or switch:
http://www.cisco.com/en/US/docs/ios/12_2/ip/configuration/guide/1cfdhcp.html

Cisco SFP fiber Modules and distances

GBIC Module	SFP Modules	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz-km)	Maximum Cable Distance
WS-G5484 or GLC-SX-MM	SFP-GE-S or GLC-SX-MM	850	MMF[1]	62.5	160	722 ft (220 m)
				62.5	200	902 ft (275 m)
				50.0	400	1640 ft (500 m)
				50.0	500	1804 ft (550 m)
WS-G5486 or GLC-LH-SM	SFP-GE-L or GLC-LH-SM	1300	MMF[2] and SMF	62.5	500	1804 ft (550 m)
				50.0	400	1804 ft (550 m)
				50.0	500	1804 ft (550 m)
				9/10	—	6.2 miles (10 km)
WS-G5487[3] or GLC-ZX-SM	SFP-GE-Z or GLC-ZX-SM	1550	SMF	9/10	—	43.5 miles (70 km)
			SMF[4]	8	—	62.1 miles (100 km)
GLC-GE-100FX	SFP-GE-F	1270 (min), 1300 (avg), 1380 (max)	MMF	62.5 62.5 50.0 50.0	500	1.4 miles (6562 ft)

Common TCP UDP ports

20	TCP		FTP—data transfer	Official
21	TCP		FTP—control (command)	Official
22	TCP	UDP	Secure Shell (SSH)—used for secure logins, file transfers (scp, sftp) and port forwarding	Official
23	TCP		Telnet protocol—unencrypted text communications	Official
25	TCP		Simple Mail Transfer Protocol (SMTP)—used for e-mail routing between mail servers	Official
53	TCP	UDP	Domain Name System (DNS)	Official
67		UDP	Bootstrap Protocol (BOOTP) Server; also used by Dynamic Host Configuration Protocol (DHCP)	Official
68		UDP	Bootstrap Protocol (BOOTP) Client; also used by Dynamic Host Configuration Protocol (DHCP)	Official
69		UDP	Trivial File Transfer Protocol (TFTP)	Official
80	TCP	UDP	Hypertext Transfer Protocol (HTTP)	Official
109	TCP		Post Office Protocol v2 (POP2)	Official
110	TCP		Post Office Protocol v3 (POP3)	Official
115	TCP		Simple File Transfer Protocol (SFTP)	Official
161		UDP	Simple Network Management Protocol (SNMP)	Official
162	TCP	UDP	Simple Network Management Protocol Trap (SNMPTRAP)[17]	Official
194	TCP	UDP	Internet Relay Chat (IRC)	Official
389	TCP	UDP	Lightweight Directory Access Protocol (LDAP)	Official
401	TCP	UDP	UPS Uninterruptible Power Supply	Official
402	TCP		Altiris, Altiris Deployment Client	Unofficial
443	TCP		HTTPS (Hypertext Transfer Protocol over SSL/TLS)	Official
445	TCP		Microsoft-DS Active Directory, Windows shares	Official
445	TCP		Microsoft-DS SMB file sharing	Official
464	TCP	UDP	Kerberos Change/Set password	Official

531	TCP	UDP	AOL Instant Messenger, IRC	Unofficial
546	TCP	UDP	DHCPv6 client	Official
547	TCP	UDP	DHCPv6 server	Official
587	TCP		e-mail message submission[20] (SMTP)	Official
666		UDP	Doom, first online first-person shooter	Official
691	TCP		MS Exchange Routing	Official
901	TCP		VMware Virtual Infrastructure Client (UDP from server being managed to management console)	Unofficial
901		UDP	VMware Virtual Infrastructure Client (UDP from server being managed to management console)	Unofficial
902	TCP		VMware Server Console (TCP from management console to server being Managed)	Unofficial
902		UDP	ideafarm-door	Official
902		UDP	VMware Server Console (UDP from server being managed to management console)	Unofficial
903	TCP		VMware Remote Console [36]	Unofficial
904	TCP		VMware Server Alternate (if 902 is in use, i.e. SUSE linux)	Unofficial
987	TCP		Microsoft This Secure Hypertext Transfer Protocol (HTTPS) port makes Windows SharePoint Services viewable through Remote Web Workplace	Unofficial
989	TCP	UDP	FTPS Protocol (data): FTP over TLS/SSL	Official
990	TCP	UDP	FTPS Protocol (control): FTP over TLS/SSL	Official
991	TCP	UDP	NAS (Netnews Administration System)	Official
992	TCP	UDP	TELNET protocol over TLS/SSL	Official
993	TCP		Internet Message Access Protocol over SSL (IMAPS)	Official
995	TCP		Post Office Protocol 3 over TLS/SSL (POP3S)	Official
1234		UDP	VLC media player Default port for UDP/RTP stream	Unofficial
1433	TCP		MSSQL (Microsoft SQL Server database management system) Server	Official
1434	TCP	UDP	MSSQL (Microsoft SQL Server database management system) Monitor	Official
1719		UDP	H.323 Registration and alternate communication	Official
1720	TCP		H.323 Call signalling	Official

1723	TCP	UDP	Microsoft Point-to-Point Tunneling Protocol (PPTP)	Official
3074	TCP	UDP	Xbox LIVE and/or Games for Windows - LIVE	Official
3283	TCP		Apple Remote Desktop reporting (officially Net Assistant, referring to an earlier product)	Official
3306	TCP	UDP	MySQL database system	Official
3389	TCP	UDP	Remote Desktop - Microsoft Terminal Server (RDP) officially registered as Windows Based Terminal (WBT) - Link	Official
4899	TCP	UDP	Radmin remote administration tool (program sometimes used by a Trojan horse)	Official
5190	TCP		ICQ and AOL Instant Messenger	Official
5500	TCP		VNC remote desktop protocol—for incoming listening viewer, Hotline control connection	Unofficial
6112	TCP		Blizzard's Battle.net gaming service, ArenaNet gaming service, Relic gaming sercive	Unofficial
6129	TCP		DameWare Remote Control	Official
6646		UDP	McAfee Network Agent	Unofficial
6660–6664	TCP		Internet Relay Chat (IRC)	Unofficial
6665–6669	TCP		Internet Relay Chat (IRC)	Official
6679	TCP		IRC SSL (Secure Internet Relay Chat)—often used	Unofficial
6697	TCP		IRC SSL (Secure Internet Relay Chat)—often used	Unofficial
6881–6887	TCP	UDP	BitTorrent part of full range of ports used most often	Unofficial
6888	TCP	UDP	BitTorrent part of full range of ports used most often	Unofficial
6889–6890	TCP	UDP	BitTorrent part of full range of ports used most often	Unofficial
6891–6900	TCP	UDP	BitTorrent part of full range of ports used most often	Unofficial
6891–6900	TCP	UDP	Windows Live Messenger (File transfer)	Unofficial
6901	TCP	UDP	Windows Live Messenger (Voice)	Unofficial
6901	TCP	UDP	BitTorrent part of full range of ports used most often	Unofficial

6902–6968	TCP	UDP	BitTorrent part of full range of ports used most often	Unofficial
6969	TCP	UDP	acmsoda	Official
6969	TCP		BitTorrent tracker	Unofficial
6970–6999	TCP	UDP	BitTorrent part of full range of ports used most often	Unofficial
8080	TCP		HTTP alternate (http_alt)—commonly used for Web proxy and caching server, or for running a Web server as a non-root user	Official
8090	TCP		HTTP Alternate (http_alt_alt)—used as an alternative to port 8080	Unofficial
8200	TCP		GoToMyPC	Unofficial
8222	TCP		VMware Server Management User Interface[68] (insecure Web interface).[69] See also port 8333	Unofficial
8333	TCP		VMware Server Management User Interface[68] (secure Web interface).[69] See also port 8222	Unofficial
8400	TCP	UDP	cvp, Commvault Unified Data Management	Official
9000	TCP		SqueezeCenter web server & streaming	Unofficial
12975	TCP		LogMeIn Hamachi (VPN tunnel software; also port 32976)—used to connect to Mediation Server (bibi.hamachi.cc); will attempt to use SSL (TCP port 443) if both 12975 & 32976 fail to connect	Unofficial
17500	TCP		Dropbox LanSync Protocol (db-lsp); used to synchronize file catalogs between Dropbox clients on your local network.	Official
17500		UDP	Dropbox LanSync Discovery (db-lsp-disc); used to synchronize file catalogs between Dropbox clients on your local network; is transmitted to broadcast addresses.	Official
19294	TCP		Google Talk Voice and Video connections [83]	Unofficial
19295		UDP	Google Talk Voice and Video connections [83]	Unofficial
19302		UDP	Google Talk Voice and Video connections [83]	Unofficial
33434	TCP	UDP	traceroute	Official
47001	TCP		WinRM - Windows Remote Management Service [87]	Official

Windows Shortcuts and Hot keys

Press this key	To do this
Right Shift for eight seconds	Turn Filter Keys on and off
Left Alt+Left Shift+PrtScn (or PrtScn)	Turn High Contrast on or off
Left Alt+Left Shift+Num Lock	Turn Mouse Keys on or off
Shift five times	Turn Sticky Keys on or off
Num Lock for five seconds	Turn Toggle Keys on or off

General Keyboard Shortcuts

The following table contains general keyboard shortcuts.

Press this key	To do this
F1	Display Help
Ctrl+C (or Ctrl+Insert)	Copy the selected item
Ctrl+X	Cut the selected item
Ctrl+V (or Shift+Insert)	Paste the selected item
Ctrl+Z	Undo an action
Ctrl+Y	Redo an action
Delete (or Ctrl+D)	Delete the selected item and move it to the Recycle Bin
Shift+Delete	Delete the selected item without moving it to the Recycle Bin first
F2	Rename the selected item
Ctrl+Right Arrow	Move the cursor to the beginning of the next word
Ctrl+Left Arrow	Move the cursor to the beginning of the previous word
Ctrl+Down Arrow	Move the cursor to the beginning of the next paragraph
Ctrl+Up Arrow	Move the cursor to the beginning of the previous paragraph
Ctrl+Shift with an arrow key	Select a block of text
Shift with any arrow key	Select more than one item in a window or on the desktop, or select text within a document
Ctrl with any arrow key+Spacebar	Select multiple individual items in a window or on the desktop
Ctrl+A	Select all items in a document or window
F3	Search for a file or folder
Alt+Enter	Display properties for the selected item
Alt+F4	Close the active item, or exit the active program
Alt+Spacebar	Open the shortcut menu for the active window
Ctrl+F4	Close the active document (in programs that allow you to have multiple documents open simultaneously)
Alt+Tab	Switch between open items
Ctrl+Alt+Tab	Use the arrow keys to switch between open items
Ctrl+Mouse scroll wheel	Change the size of icons on the desktop
Windows logo key + Tab	Cycle through programs on the taskbar by using Aero Flip 3-D
Ctrl+Windows logo key + Tab	Use the arrow keys to cycle through programs on the taskbar by using Aero Flip 3-D
Alt+Esc	Cycle through items in the order in which they were opened
F6	Cycle through screen elements in a window or on the desktop
F4	Display the address bar list in Windows Explorer
Shift+F10	Display the shortcut menu for the selected item
Ctrl+Esc	Open the Start menu
Alt+underlined letter	Display the corresponding menu
Alt+underlined letter	Perform the menu command (or other underlined command)
F10	Activate the menu bar in the active program
Right Arrow	Open the next menu to the right, or open a submenu
Left Arrow	Open the next menu to the left, or close a submenu
F5 (or Ctrl+R)	Refresh the active window
Alt+Up Arrow	View the folder one level up in Windows Explorer
Esc	Cancel the current task
Ctrl+Shift+Esc	Open Task Manager
Shift when you insert a CD	Prevent the CD from automatically playing
Left Alt+Shift	Switch the input language when multiple input languages are enabled
Ctrl+Shift	Switch the keyboard layout when multiple keyboard layouts are enabled
Right or Left Ctrl+Shift	Change the reading direction of text in right-to-left reading languages
Ctrl+PrtScn	Copy image of entire screen to clipboard
Alt+PrtScn	Copy image of active window to clipboard

Dialog box keyboard shortcuts

The following table contains keyboard shortcuts for use in dialog boxes.

Press this key	To do this
Ctrl+Tab	Move forward through tabs
Ctrl+Shift+Tab	Move back through tabs
Tab	Move forward through options
Shift+Tab	Move back through options
Alt+underlined letter	Perform the command (or select the option) that goes with that letter
Enter	Replaces clicking the mouse for many selected commands
Spacebar	Select or clear the check box if the active option is a check box
Arrow keys	Select a button if the active option is a group of option buttons

F1	Display Help
F4	Display the items in the active list
Backspace	Open a folder one level up if a folder is selected in the Save As or Open dialog box

Windows logo key keyboard shortcuts

The following table contains keyboard shortcuts that use the Windows logo key

Press this key	To do this
Windows logo key	Open or close the Start menu.
Windows logo key +Pause	Display the System Properties dialog box.
Windows logo key +D	Display the desktop.
Windows logo key +M	Minimize all windows.
Windows logo key +Shift+M	Restore minimized windows to the desktop.
Windows logo key +E	Open Computer.
Windows logo key +F	Search for a file or folder.
Ctrl+Windows logo key +F	Search for computers (if you're on a network).
Windows logo key +L	Lock your computer or switch users.
Windows logo key +R	Open the Run dialog box.
Windows logo key +T	Cycle through programs on the taskbar.
Windows logo key +number	Start the program pinned to the taskbar in the position indicated by the number. If the program is already running, switch to that program.
Shift+Windows logo key +number	Start a new instance of the program pinned to the taskbar in the position indicated by the number.
Ctrl+Windows logo key +number	Switch to the last active window of the program pinned to the taskbar in the position indicated by the number.
Alt+Windows logo key +number	Open the Jump List for the program pinned to the taskbar in the position indicated by the number.
Windows logo key +Tab	Cycle through programs on the taskbar by using Aero Flip 3-D.
Ctrl+Windows logo key +Tab	Use the arrow keys to cycle through programs on the taskbar by using Aero Flip 3-D.
Ctrl+Windows logo key +B	Switch to the program that displayed a message in the notification area.
Windows logo key +Spacebar	Preview the desktop.
Windows logo key +Up Arrow	Maximize the window.
Windows logo key +Left Arrow	Maximize the window to the left side of the screen.
Windows logo key +Right Arrow	Maximize the window to the right side of the screen.
Windows logo key +Down Arrow	Minimize the window.
Windows logo key +Home	Minimize all but the active window.
Windows logo key +Shift+Up Arrow	Stretch the window to the top and bottom of the screen.
Windows logo key +Shift+Left Arrow or Right Arrow	Move a window from one monitor to another.
Windows logo key +P	Choose a presentation display mode.
Windows logo key +G	Cycle through gadgets.
Windows logo key +U	Open Ease of Access Center.
Windows logo key +X	Open Windows Mobility Center.

Windows Explorer keyboard shortcuts

The following table contains keyboard shortcuts for working with Windows Explorer windows or folders.

Press this key	To do this
Ctrl+N	Open a new window
Ctrl+W	Close the current window
Ctrl+Shift+N	Create a new folder
End	Display the bottom of the active window
Home	Display the top of the active window
F11	Maximize or minimize the active window
Ctrl+Period (.)	Rotate a picture clockwise
Ctrl+Comma (,)	Rotate a picture counter-clockwise
Num Lock+Asterisk (*) on numeric keypad	Display all subfolders under the selected folder
Num Lock+Plus Sign (+) on numeric keypad	Display the contents of the selected folder
Num Lock+Minus Sign (-) on numeric keypad	Collapse the selected folder
Left Arrow	Collapse the current selection (if it's expanded), or select the parent folder
Alt+Enter	Open the Properties dialog box for the selected item
Alt+P	Display the preview pane
Alt+Left Arrow	View the previous folder
Backspace	View the previous folder
Right Arrow	Display the current selection (if it's collapsed), or select the first subfolder
Alt+Right Arrow	View the next folder
Alt+Up Arrow	View the parent folder
Ctrl+Shift+E	Display all folders above the selected folder
Ctrl+Mouse scroll wheel	Change the size and appearance of file and folder icons
Alt+D	Select the address bar
Ctrl+E	Select the search box
Ctrl+F	Select the search box

Taskbar keyboard shortcuts

The following table contains keyboard shortcuts for working with items on the taskbar.

Press this key	To do this
Shift+Click on a taskbar button	Open a program or quickly open another instance of a program
Ctrl+Shift+Click on a taskbar button	Open a program as an administrator
Shift+Right-click on a taskbar button	Show the window menu for the program
Shift+Right-click on a grouped taskbar button	Show the window menu for the group
Ctrl+Click on a grouped taskbar button	Cycle through the windows of the group

Magnifier keyboard shortcuts

The following table contains keyboard shortcuts for working with Magnifier.

Press this key	To do this
Windows logo key + Plus Sign (+) or Minus Sign (-)	Zoom in or out
Ctrl+Alt+Spacebar	Preview the desktop in full-screen mode
Ctrl+Alt+F	Switch to full-screen mode
Ctrl+Alt+L	Switch to lens mode
Ctrl+Alt+D	Switch to docked mode
Ctrl+Alt+I	Invert colors
Ctrl+Alt+arrow keys	Pan in the direction of the arrow keys
Ctrl+Alt+R	Resize the lens
Windows logo key + Esc	Exit Magnifier

Office keyboard shortcuts

The following table contains keyboard shortcuts for working with Office.

Press this key	To do this
CTRL+SHIFT+A	converts the selected text to capital letters or vice versa
CTRL+SHIFT+F	Displays the Font dialog box.
CTRL+SHIFT+G	Displays the Word Count dialog box.
CTRL+SHIFT+S	Displays the Apply Styles task pane.
ALT+a	Displays the Next Field
ALT+CTRL+1	Apply Heading 1, Similarly ALT + CTRL + 2 will apply heading 2
CTRL+SHIFT+L	Applies Bullets
CTRL+SHIFT+F5	Bookmark
CTRL + B	Bold Text
CTRL + I	Italic Text
CTRL + U	Underline Text
CTRL+PAGE DOWN	Browse Next
CTRL+E	Navigate to the center Paragraph
CTRL+SHIFT+ENTER	Column Break
CTRL+SHIFT+C	Copy Format
ALT+SHIFT+F7	Dictionary
ALT+CTRL+S	Splits the Document
CTRL+SHIFT+D	Double Underline
CTRL+END	End of Document
END	End of line
CTRL+SHIFT+P	Font size select
SHIFT+F5 or ALT+CTRL+Z	Go Back to previous state
CTRL+SHIFT+.	Grow Font
CTRL+]	Grow Font one point
ALT+SHIFT+R	Header Footer Link
CTRL+K	Hyperlink
CTRL+M	Indentation
CTRL+J	Justifies Paragraph
ALT+F8	Inserts Macros
ALT+SHIFT+K	Mail Merge Check
F10	Menu Mode
ALT+F7	Moves to the Next Misspelling
CTRL+H	Replace
CTRL+P	Print
CTRL+SHIFT+F12	Also launches Print
ALT+SHIFT+BACKSPACE	Redo
F12	Save As
CTRL+SHIFT+K	Small Caps
CTRL+SHIFT+S	Style
SHIFT+F7	Thesaurus
ALT+SHIFT+T	Time Field
CTRL+SHIFT+M	Unindent

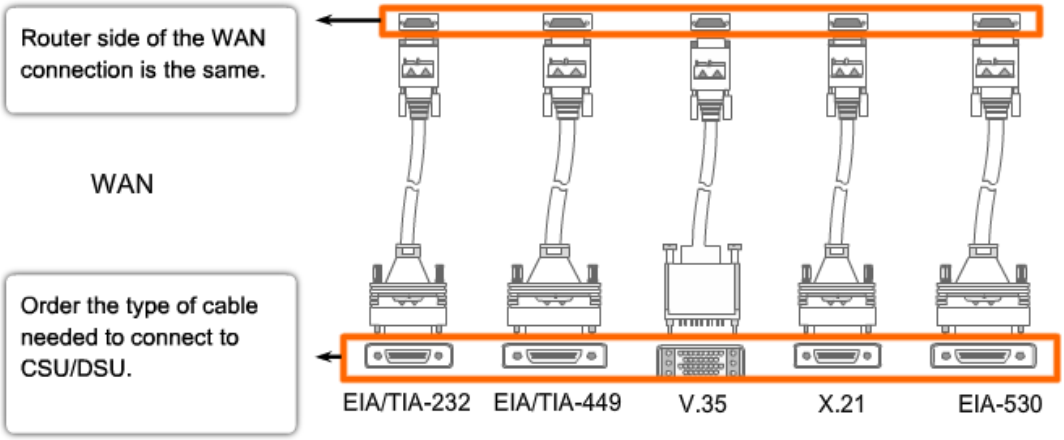
Physical Media - Characteristics

Wireless Media

Standards	Bluetooth 802.15	802.11 (a, b, g, n), HiperLAN 2	802, 11, MMDS, LMDS	GSM, GPRS, CDMA, 2.5- 3G
Speed	<1 Mbps	1 - 54+ Mbps	22 Mbps+	10- 384 Kbps
Range	Short	Medium	Medium - long	Long
Applications	Peer-to-peer device-to-device	Enterprise networks	Fixed, last mile access	PDAs, Mobile phones, Cellular access

Connections and Connectors

Router Connection



Physical Media - Characteristics

Ethernet Media

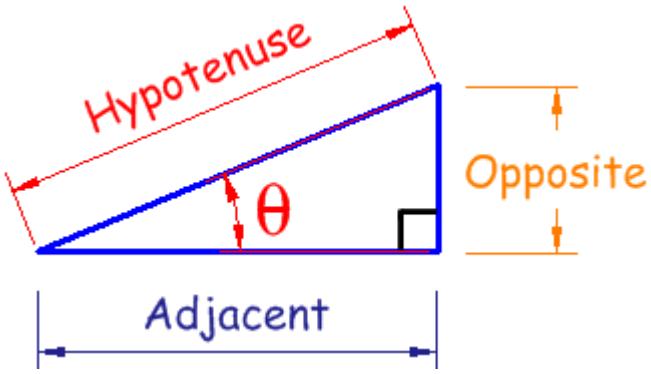
	10BASE-T	100BASE-TX	100BASE-FX	1000BASE-CX	1000BASE-T	1000BASE-SX	1000BASE-LX	1000BASE-ZX	10GBASE-ZR
Media	EIA/TIA Category 3, 4, 5 UTP - four pair	EIA/TIA Category 5 UTP - two pair	50/62.5 mmulti mode fiber	STP	EIA/TIA Category 5 (or greater) UTP, four pair	50/62.5 micron multimode fiber	50/62.5 micron multimode fiber or 9 micron single mode fiber	9m single mode fiber	9m single mode fiber
Maximum Segment Length	100m (328 feet)	100m (328 feet)	2 km (6562 ft)	25 m (82 feet)	100 m (328 feet)	Up to 550 m (1,804 ft) depending on fiber used	550 m (MMF)10 km (SMF)	Approx. 70 km	Up to 80 km
Topology	Star	Star	Star	Star	Star	Star	Star	Star	Star
Connector	ISO 8877 (RJ-45)	ISO 8877 (RJ-45)		ISO 8877 (RJ-45)	ISO 8877 (RJ-45)				

Sine, Cosine and Tangent

http://www.mathsisfun.com/sine-cosine-tangent.html

Three Functions, but same idea.

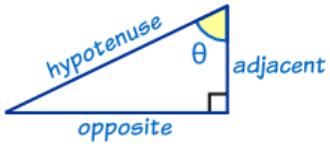
Right Triangle



Soh... **Sine = Opposite / Hypotenuse**

...cah... **Cosine = Adjacent / Hypotenuse**

...toa **Tangent = Opposite / Adjacent**



- "Opposite" is opposite to the angle ?
- "Adjacent" is adjacent (next to) to the angle ?
- "Hypotenuse" is the long one

Adjacent is always next to the angle (and **opposite** is opposite the angle):

Sine, Cosine and Tangent

The three main functions in trigonometry are **Sine**, **Cosine** and **Tangent.**

They are often shortened to **sin**, **cos** and **tan**.

The calculation is simply **one side divided by another side** ... you just have to know which sides!

For a triangle with an angle **?** , the functions are calculated this way

Sine Function:	**sin(?) = Opposite / Hypotenuse**	
Cosine Function:	**cos(?) = Adjacent / Hypotenuse**	
Tangent Function:	**tan(?) = Opposite / Adjacent**	
Secant Function:	**sec(?) = Hypotenuse / Adjacent**	*(=1/cos)*
Cosecant Function:	**csc(?) = Hypotenuse / Opposite**	*(=1/sin)*
Cotangent Function:	**cot(?) = Adjacent / Opposite**	*(=1/tan)*

Table of sin (angle)

Angle	sin (a)	Angle	sin (a)	Angle	sin (a)	Angle	sin (a)
0.0	0.0	25.0	.4226	46.0	.7193	71.0	.9455
1.0	.0174	26.0	.4384	47.0	.7314	72.0	.9511
2.0	.0349	27.0	.4540	48.0	.7431	73.0	.9563
3.0	.0523	28.0	.4695	49.0	.7547	74.0	.9613
4.0	.0698	29.0	.4848	50.0	.7660	75.0	.9659
5.0	.0872	30.0	.5000	51.0	.7772	76.0	.9703
6.0	.1045	31.0	.5150	52.0	.7880	77.0	.9744
7.0	.1219	32.0	.5299	53.0	.7986	78.0	.9781
8.0	.1392	33.0	.5446	54.0	.8090	79.0	.9816
9.0	.1564	34.0	.5592	55.0	.8191	80.0	.9848
10.0	.1736	35.0	.5736	56.0	.8290	81.0	.9877
11.0	.1908	36.0	.5878	57.0	.8387	82.0	.9903
12.0	.2079	37.0	.6018	58.0	.8480	83.0	.9926
13.0	.2249	38.0	.6157	59.0	.8571	84.0	.9945
14.0	.2419	39.0	.6293	60.0	.8660	85.0	.9962
15.0	.2588	40.0	.6428	61.0	.8746	86.0	.9976
16.0	.2756	41.0	.6561	62.0	.8829	87.0	.9986
17.0	.2924	42.0	.6691	63.0	.8910	88.0	.9994
18.0	.3090	43.0	.6820	64.0	.8988	89.0	.9998
19.0	.3256	44.0	.6947	65.0	.9063	90.0	1.00
20.0	.3420	45.0	.7071	66.0	.9135		
21.0	.3584			67.0	.9205		
22.0	.3746			68.0	.9272		
23.0	.3907			69.0	.9336		
24.0	.4067			70.0	.9397		

Use your browser "Print" command to make copies of this form.

Table of cos(angle)

Angle	cos(a)	Angle	cos(a)	Angle	cos(a)	Angle	cos(a)
0.0	1.00	25.0	.9063	46.0	.6947	71.0	.3256
1.0	.9998	26.0	.8988	47.0	.6820	72.0	.3090
2.0	.9994	27.0	.8910	48.0	.6691	73.0	.2924
3.0	.9986	28.0	.8829	49.0	.6561	74.0	.2756
4.0	.9976	29.0	.8746	50.0	.6428	75.0	.2588
5.0	.9962	30.0	.8660	51.0	.6293	76.0	.2419
6.0	.9945	31.0	.8571	52.0	.6157	77.0	.2249
7.0	.9926	32.0	.8480	53.0	.6018	78.0	.2079
8.0	.9903	33.0	.8387	54.0	.5878	79.0	.1908
9.0	.9877	34.0	.8290	55.0	.5736	80.0	.1736
10.0	.9848	35.0	.8191	56.0	.5592	81.0	.1564
11.0	.9816	36.0	.8090	57.0	.5446	82.0	.1392
12.0	.9781	37.0	.7986	58.0	.5299	83.0	.1219
13.0	.9744	38.0	.7880	59.0	.5150	84.0	.1045
14.0	.9703	39.0	.7772	60.0	.5000	85.0	.0872
15.0	.9659	40.0	.7660	61.0	.4848	86.0	.0698
16.0	.9613	41.0	.7547	62.0	.4695	87.0	.0523
17.0	.9563	42.0	.7431	63.0	.4540	88.0	.0349
18.0	.9511	43.0	.7314	64.0	.4384	89.0	.0174
19.0	.9455	44.0	.7193	65.0	.4226	90.0	0.0
20.0	.9397	45.0	.7071	66.0	.4067		
21.0	.9336			67.0	.3907		
22.0	.9272			68.0	.3746		
23.0	.9205			69.0	.3584		
24.0	.9135			70.0	.3420		

Use your browser "Print" command to make copies of this form.

Table of tan(angle)

Angle	tan(a)	Angle	tan(a)	Angle	tan(a)	Angle	tan(a)
0.0	0.00	25.0	.4663	46.0	1.0355	71.0	2.9042
1.0	.0175	26.0	.4877	47.0	1.0724	72.0	3.0777
2.0	.0349	27.0	.5095	48.0	1.1106	73.0	3.2709
3.0	.0524	28.0	.5317	49.0	1.1504	74.0	3.4874
4.0	.0699	29.0	.5543	50.0	1.1918	75.0	3.7321
5.0	.0875	30.0	.5773	51.0	1.2349	76.0	4.0108
6.0	.1051	31.0	.6009	52.0	1.2799	77.0	4.3315
7.0	.1228	32.0	.6249	53.0	1.3270	78.0	4.7046
8.0	.1405	33.0	.6494	54.0	1.3764	79.0	5.1446
9.0	.1584	34.0	.6745	55.0	1.4281	80.0	5.6713
10.0	.1763	35.0	.7002	56.0	1.4826	81.0	6.3138
11.0	.1944	36.0	.7265	57.0	1.5399	82.0	7.1154
12.0	.2126	37.0	.7535	58.0	1.6003	83.0	8.1443
13.0	.2309	38.0	.7813	59.0	1.6643	84.0	9.5144
14.0	.2493	39.0	.8098	60.0	1.7321	85.0	11.430
15.0	.2679	40.0	.8391	61.0	1.8040	86.0	14.301
16.0	.2867	41.0	.8693	62.0	1.8907	87.0	19.081
17.0	.3057	42.0	.9004	63.0	1.9626	88.0	28.636
18.0	.3249	43.0	.9325	64.0	2.0503	89.0	57.290
19.0	.3443	44.0	.9657	65.0	2.1445	90.0	infinite
20.0	.3640	45.0	1.000	66.0	2.2460		
21.0	.3839			67.0	2.3559		
22.0	.4040			68.0	2.4751		
23.0	.4245			69.0	2.6051		
24.0	.4452			70.0	2.7475		

Use your browser "Print" command to make copies of this form.

This publication is a compilation of several open source websites, facts and figures meant for a quick, printed out reference . This publication was not made for retail sale or distribution.