

Glossary of RF Terms

The following terms are commonly used in radio frequency connector applications. Can't find what you're looking for? Contact us and we'll be happy to help.

A

AMPS

Advanced Mobile Phone System, an analog standard for wireless service.

Accessories

Mechanical devices, such as cable clamps, added to connector shells and other such hardware which is attachable to connectors to make up the total connector configuration.

A/D

Analog-to-digital.

Alloy

A mixture of two or more metals combined to achieve properties, such as a lower melting point or greater strength, that the individual metals do not possess.

Ambient

The atmospheric conditions surrounding a given item. Normally in terms of factors which influence or modify, such as temperature, humidity, etc.

Amplitude

The magnitude of variation in a changing quantity from its zero value. The word required modification - as with adjectives such as peak, maximum, rms, etc. - to designate the specific amplitude in question.

Analog

The representation of information by means of continuously variable signal.

Attenuation (a)

The reduction in signal strength that occurs when it travels over a long distance. Attenuation may be expressed as the scalar ratio of the input power to the output power, or as the ratio of the input signal voltage to the output signal voltage.

B

Back Mounted (rear mounting)

When a connector is mounted from the inside of a panel or box with its mounting flange inside the equipment.

Backplane Panels

An interconnection panel into which PCB cards or other panels can be plugged. These panels come in a variety of designs ranging from a PC motherboard to individual connectors mounted in a metal frame. Panels lend themselves to automated wiring.

Ball Bond

The thermo-compressed bond between a metalized pad and a wire which has a ball shaped end to it.

Band Reject Filter

A filter that rejects one band of frequencies and passes both higher and lower frequencies. Sometimes called a notch filter.

Bandpass Filter

A filter that passes one band of frequencies and rejects both higher and lower frequencies.

Bandwidth

The range of frequencies for which performance falls within specific limits.

Barrier Seal

A barrier seal is a seal preventing the passage of moisture or gases through the insulator and the gap between insulator and center conductor or outer conductor of a connector or adapter.

Base Material

Metal from which the connector, contact or other piece part accessory is made and on which one or more metals or coatings may be deposited.

Bayonet Coupling

A quick coupling device for plug and receptacle connectors, accomplished by rotation of a cam operating device designed to bring the connector halves together.

B-CDMA

Broadband - Code Division Multiple Access (CDMA)

Bending Radius

The minimum permissible radius for fixed installation of the cable. This radius is mainly used in climatic tests. Minimum dynamic: The minimum permissible radius for flexible applications of the cable.

Blind Mate

SMP and SMPM are blind mate or "push-on" connectors. They make interconnections without the need of coupling nuts and tools. Useful when making connections in tight spaces or in conjunction with bullets which compensate for axial or radial misalignment.

BNC (Bayonet Neill Concelman)

Coaxial connector with bayonet coupling mechanism. Available in 50 Ohm and 75 Ohm versions. Frequency range DC - 4 GHz (50 Ohm) and DC-1 GHz (75 Ohm), respectively. Named after Amphenol Engineer Carl Concelman, and Bell Labs Engineer Paul Neill.

Body

Main, or largest, portion of a connector to which other portions are attached.

Bonded Assembly

A connector assembly in which the components are bonded together using an electrically appropriate adhesive in a sandwich structure to provide sealing against moisture.

Braid

Woven wire used as shielding for insulated wires and coaxial cables. Also, a woven fibrous protective outer covering over a conductor or cable.

Braid Coverage

A calculated percentage which defines the completeness with which a braid or shield covers the surface of the underlying component.

Bulkhead

A term used to define a mounting style of connectors. Bulkhead connectors are designed to be inserted into a panel cutout from the rear (component side) or front side of the panel.

Bullets

Female to female interconnects. Can help reduce insertion loss by eliminating the need for some cable assemblies with female to female connections. Bullets also compensate for radial and/or axial misalignment when blind mating.

Butted Contact

When two conductors come together end-to-end, but do not overlap, with their axis in line.

C

CATV

Cable television (previously community antenna television) technology, commonly employed by broadband LANs for signal distribution.

Cable Assembly

A completed cable and its associated hardware (e.g. connector).

Capacitance

The property of an electrical conductor (dielectric in a capacitor) that permits the storage of energy as a result of electrical displacement. The basic unit of capacitance is the Farad, however measurement is more commonly in microfarads or picofarads.

Capillary Actions

The effect of surface tension that draws a liquid into a small opening.

CDMA (IS-95)

Code Division Multiple Access, a digital standard for wireless service.

Center Frequency (Fc)

The arithmetic mean frequency is normally calculated using the 3dB relative band edges (F1 & F2).

$$F_c = (F_1 + F_2) / 2$$

Where F1 and F2 are lower and upper frequencies respectively at which a particular signal attenuation occurs, usually taken as 3dB relative attenuation - an important parameter of bandpass and bandstop filters.

Center Line Spacing

The distance from the center of adjacent contacts as installed in a system and/or within a connector housing. Varies depending on the mounting configuration and can be as low as .160" on the SMP connectors. Critical for high density spacing applications.

Closed Entry Contact

A specially designed connector interface which controls the entry of the male pin from damaging the female contact.

Coaxial Cable

A transmission line consisting of two concentric conductors insulated from each other. In its flexible form it consists of either a solid or stranded center conductor surrounded by a dielectric. A braid is then woven over the dielectric to form an outer conductor. A protective plastic covering is placed on top of the braid.

Concelman

Amphenol Engineer after which many coaxial connectors are named: C, BNC, TNC, etc.

Connector Assembly

Includes housing and contact plus additional components such as hardware used to hold the assembly together and/or make the assembly a functional connector.

Contact

The conducting part of an interconnect at the interface between the connector and the lead on the device being connected.

Contact Alignment

Defines the overall radial play which contacts shall have within the insert cavity so as to permit self-alignment of mated contacts. Sometimes referred to as amount of contact float.

Contact Cavity

A defined hole in the connector insert or housing into which the contact must fit.

Contact Durability

The number of insertion and withdrawal cycles that a connector must be capable of withstanding while remaining within the performance levels of the applicable specification.

Contact Engaging & Separating Force

Force needed to either engage or separate pins and socket contacts when they are in and out of connector inserts. Values are generally established for maximum and minimum forces. Performance acceptance levels vary by specification and/or customer requirements.

Contact Plating

Deposited metal applied to the basic contact metal to provide the required contact-resistance and/or wear-resistance.

Contact Pressure

Force which mating surfaces exert against one another.

Contact Resistance

Measurement of electrical resistance of mated contacts when assembled in a connector under typical service use. Electrical resistance is determined by measuring from the rear of the electrical area of one contact to the rear of the mating contact (excluding both crimps) while carrying a specified test current.

Contact Retention

Defines minimum axial load in either direction which a contact must withstand while remaining firmly fixed in its normal position within an insert.

Convection

The transfer of heat by movement of hot air. Often used in conjunction with infrared radiation to reduce the effect of IR shadowing.

Conversion Loss

The ratio in dB of the IF output of a mixer to the rf input power. All conversion loss measurements and specification are normally based on the mixer being terminated on all ports and a stated LO signal power level being applied.

Coplanarity

The distance between the lowest and highest lead when the connector is laying in its seating plane.

Corona

A luminous discharge due to ionization of the air surrounding a conductor caused by a voltage gradient exceeding a certain critical value.

Corona Level

The minimum voltage level at which there is no breakdown of air gaps between the conductors. This is a situation that can develop in low pressure conditions experienced, for example, at high altitudes. Corona will create noise and distort the transmission signal.

Crimp

Act of compressing (deforming) a connector ferrule around a cable in order to make an electrical connection.

Crimping Dies

A term used to identify the shaping tools that, when moved toward each other, produce a certain desirable shape to the barrel of the terminal or contact that has been placed between them. Crimping dies are often referred to as die sets or as die inserts.

Crimping Termination

Connection in which a metal sleeve is secured to a conductor by mechanically crimping the sleeve with pliers, presses or crimp dies.

Crimping Tool

A term commonly used to identify a hand held mechanical device or table press that is used to crimp a contact, terminal or splice.

Cross Talk

A magnetic or electrostatic coupling which causes the unwanted transfer of energy from one circuit (disturbing circuit) to another circuit (disturbed circuit).

CTIA

Cellular Telecommunications Industry Association.

Cut-off Frequency (f_c)

The frequency, above which other than the TEM mode may occur. The transmission characteristics of cables above their cutoff frequency may be unstable.

Cycle

One complete sequence of values of an alternating quantity, including a rise to maximum in one direction and of return to zero. The number of cycles occurring in one second is called the frequency.

D

D/A

Digital-to-analog

DBm

Relative measure of signal power where the reference 0 dBm is equal to one milliwatt. See also decibel.

Decibel (dB)

A relative unit without dimensions calculated as ten times the logarithm to the base 10 of a power ratio or as twenty times the logarithm to the base 10 of a voltage ratio. Note: What is commonly measured as VSWR in the RF world is referred to as return loss and measured in dB in the CATV industry.

Delay Line

A cable that delays electrical signals by a specified amount of time. There are two basic types: passive and active. Passive delay lines are built with analog components and can delay analog and digital signals. Active delay lines are built with digital components and are normally used to delay digital signals. Measured in units of time.

Dewetting

A situation where a lead or pad was at one point in the soldering process wetted by the solder, but due to extended time or temperature, the presence of intermetallics, volatiles or other causes, has become withdrawn from the wetted surface.

Dielectric

In a coaxial cable, the insulation between inner and outer conductor. It significantly influences electrical characteristics such as impedance, capacitance, and velocity of propagation.

Dielectric Constant

Electrical property of a material that describes its behavior in an electric field. The dielectric constant of the dielectric is the most important design parameter for coaxial cables and determines dimensions, losses and propagation characteristics.

Dielectric Loss

In a coaxial cable, the losses caused by transformation of electromagnetic energy into heat within the dielectric material.

Dielectric Material

Insulator material chosen to conform to specification and application to minimize power absorption and hence power loss in the system due to the connectors. For example, we use Expanded Teflon for low loss applications.

Dielectric Strength

The voltage which an insulating material can withstand before breakdown occurs.

Dielectric Withstanding Voltage

The maximum potential gradient that a dielectric material can withstand without failure.

Digital

(1) Pertaining to the utilization of discreet integral numbers in a given base to represent all the quantities that occur in a problem or a calculation. It is possible to express in digital form all information stores, transferred or processed by a dual-state condition; e.g., on-off, open-closed and true-false. (2) Compare with analog.

DIN 7/16

50 ½ coaxial connector with screw type coupling mechanism providing excellent intermodulation characteristics. Suitable for medium to high power applications. Frequency range DC - 7.5 GHz.

Dip Solder Terminal

The terminals on a connector which are inserted into holes in the PC board and then soldered in place.

Direct Current (DC)

An electric current which flows in only one direction.

Dissipation

Unusable or lost energy, such as the production of unused heat in a circuit.

Distortion

An unwanted change or addition to a signal or waveform when it is amplified. This definition excludes noise which is an extraneous signal super-imposed on the desired signal.

Dummy Load

A dissipative device used at the end of a transmission line or waveguide to convert transmitted energy into heat, so essentially no energy is radiated outward or reflected back to its source.

Dust Cap

A device attached to a connector to provide protection against dust and foreign debris.

Dynamic Range

The range, from the minimum, which is at a level 3 dB above the amplifier's internally generated floor, to a maximum input signal level that a component can accept and amplify without distortion.

$$\text{Dynamic Range} = P_{1dB} - P_{MDS}$$

Where:

P_{MDS} = Minimum detectable signal 3 dB above the noise floor.

E

Eccentricity

A measure of a conductor's location with respect to the circular cross section of the insulation. Expressed as a percentage of center displacement of one circle within the other.

EIA

Electronic Industries Association.

Electromagnetic Compatibility (EMC)

EMC describes the ability of an electrical system to avoid electromagnetic interference with the environment.

Electromagnetic Interference (EMI)

Unwanted electrical or electromagnetic energy that causes undesirable responses, degrading performance or complete malfunctions in electronic equipment. See also: Noise.

Electronic Industries Association (EIA)

A U.S. manufacturer's group which, as one of its functions, sets some interface standards.

Electroplating

A method of electrically depositing metals of very precise compositions and thickness onto a base metal.

Elliptic Function

A mathematical function used to yield the squarest possible amplitude filter response with a given number of circuit elements, The elliptic function has a CHEBYSHEV response in both the passband and the stopband. The elliptic function filter has a poorer phase response and transient response than any of the classical transfer functions.

Envelope Delay

The propagation time delay of the envelope of an amplitude modulated signal as it passes through a filter. Sometimes called time delay or group delay. Envelope delay is proportional to the slope of the phase shift response versus frequency curve, Envelope delay distortion occurs when the delay is not constant at all frequencies in the passband area.

Ethernet

In a local computer network, a branching broadcast communications system for carrying digital data packets among locally distributed computing stations.

A two-level baseband, local-area data communications network developed by Xerox and supported by DEC and Intel, among others.

Eutectic Bonding

The term for properties of an alloy that have the lowest melting point. In eutectic bonding, the ingredients involved go from completely molten to solid without going through a slushy phase at the eutectic composition. Eutectic bonding also provides superior heat transfer for active devices.

Eutectic Solder

The most common solder alloy because of its low melting point (183oC/361oF), composed of 63% tin and 37% lead.

F**FCC**

Federal Communications Commission.

Feed-through

A connector or terminal block, usually having double-ended terminals which permits simple distribution

and bussing of electrical circuits. Also used to describe a bushing in a wall or bulkhead separating compartments at different pressure levels, with terminations on both sides.

Ferrule

A short tube to make solderless connections to shielded or coaxial cable (e.g. as in crimping).

Fiber Optics

The technology for guidance of light waves through optical fibers; specifically when the optical energy is guided to another location in order to transmit information.

Flange

A projection extending from, or around the periphery of, a connector and provided with holes to permit mounting the connector to a panel, or to another mating connector half.

Flexible Cable

Braided and or helically wrapped outer conductor covered by a flexible outer jacket, conductor can be 1 to 3 layers. Center conductor can be solid or stranded wire, dielectric can be solid or low-loss. Ranges in diameter from .050" to .500" and bend radius capability is determined by the cable diameter and construction. Average to excellent performance.

Footprint

The pattern on the printed circuit board to which the leads on a surface mount component are mated. Also called a land or a pad.

Force to Mate & Unmate

The amount of force required to mate or unmate a connector expressed in maximum or minimum pounds. An SMP with full detent has a mating (engaging) force of 15 lbs max and an unmating (disengaging) force of 5 lbs min.

Frequency

The number of cycles per second of a given wavelength and expressed in Hz. So, 1 Hz = 1 cps, 1 MHz = 1 million cps, GHz = 1 billion cps, etc. An RF signal is an AC waveform.

Frequency Modulation (fm)

A scheme for modulating a carrier frequency in which the amplitude remains constant but the carrier frequency is displaced in frequency proportionally to the amplitude of the modulating signal. An fm broadcast is practically immune to atmospheric and man-made interference.

Frequency Range or Operating Frequency

That range of frequencies the connector must work within. Typical ranges for micro-wave products are K band (18-26 GHz), X band (8-12.4GHz), mm range (40-100 GHz) and C (4-8 GHz). The frequency range a major consideration in selecting the appropriate connector and cable to fit design requirements and price requirements.

Fretting Corrosion

A form of accelerated oxidation that appears at the interface of contacting materials undergoing slight cyclic relative motion. All non-noble metals (tin) are susceptible to some degree of fretting corrosion and will suffer contact resistance increases.

Front Mounted (front mounting)

A connector is front mounted when it is attached to the outside or mating side of a panel. A front mounted connector can only be installed or removed from the outside of the equipment.

G

Gain

Gain is the ratio of the power output to the power input of the amplifier in dB. The gain is specified in the linear operating range of the amplifier where a 1 dB increase in input power gives rise to a 1 dB increase in output power. $\text{Gain} = 20 \cdot \log(S_{21})$

Gigahertz (GHz)

One billion cycles per second (1×10^9).

GPS

Global Positioning System

Group Delay Deviation

Generally specified as the deviation between two points within the passband (i.e., 10 NS P-P). Excessive delay deviation results in modulated signal distortion.

GSM

Global System for Mobile communication, a digital standard for wireless service for high-performance cell phones; European and defacto world standard.

H

Hand-conformable cable

Solder-dipped, braided outer conductor. Gives better flexibility than semi-rigid but lower performance (higher VSWR and lower operating frequencies). Sizes limited to .047", .086" and .141" and have limited bend radius. Not available with low-loss dielectric.

HDTV

High-definition television.

Heat Shock

Test to determine the stability of a material when exposed to a sudden high temperature change for a short period of time.

Heat Treating

A process that uses precise heating and tooling of metals in order to optimize internal stresses and spring properties.

Hermetic Seal

Hermetically sealed connectors provide contacts bonded to the connector by glass. They permit maximum leakage rate of gas through the connector of 1.0 micron ft/hr at one atmosphere pressure for special applications.

Hermaphroditic Connector

A connector where both mating members are exactly alike at their mating face. There are no male or female members, but provisions have been made to maintain correct polarity, hot lead protection, sealing and coupling.

Hermaphroditic Contacts

Contacts in which both mating elements are precisely alike at their mating face.

Hertz (Hz)

International standard term for cycles per second. Named after the German physicist Heinrich R. Hertz (e.g. 60 cycles per second is equal to 60 hertz or 60 Hz).

Highpass Filter

A filter which passes high frequencies and rejects low frequencies.

I**IEEE**

Institute of Electrical and Electronics Engineers.

IM/PIM (Passive Intermodulation)

The generation of new (and in the case of cable assemblies undesirable) signals (intermodulation products) at the non-linear characteristics of transmission elements.

Impedance (characteristic, Z_0)

Characteristic property of a transmission line describing the ratio between electric and magnetic fields.

Impedance Match

A condition in which the impedance of a component or circuit is equal to the internal impedance of a transmission line. This gives maximum transfer of energy from the source to the load, as well as minimum reflection and distortion.

Inductance

The property of a circuit or circuit element that opposes a change in current flow, thus causing current changes to lag behind voltage changes. It is measured in Henrys.

Insert

The part which holds the contacts in their proper arrangement and electrically insulates them from each other and from the shell.

Insertion Loss

The loss in load power due to the insertion of a component, connector or device at some point in a RF transmission system. Generally expressed in decibels as the ratio of the power received at the load before insertion of the apparatus, to the power received at the load after insertion

Insulation

A material having high resistance to the flow of electric current. Often called a dielectric in RF cable.

Insulation Resistance

The electrical resistance of the insulating material (determined under specified conditions) between any pair of contacts, conductors, or grounding device in various combinations.

Interconnection

Mechanically joining assemblies together to complete electrical circuits.

Interface

The two surfaces on the contact side of both halves of a multiple-contact connector which face each other when the connector is assembled.

Interference

An electrical or electromagnetic disturbance that causes undesirable response in electronic equipment.

Intermetallic

Chemical compounds formed between the metals present in the solder, base metal and protective plating. Intermetallic formation is necessary for good solder joints, but excessive intermetallics can cause brittleness.

Intermodulation (IMD)

A phenomenon that occurs when two or more fundamental frequencies are present in an electronic circuit.

IR Shadowing

When connector bodies or other components prevent the infrared energy from directly striking some solder joints, causing non-uniform heating.

ISO

International Standards Organization.

Isolation

The ratio (expressed in dB) of the power level at one port compared to the resulting power level of the output port.

Isolation from Ground

The outer conductor of the cable acts as a shield and carries the signal ground and is a key part of RF/Microwave transmissions. The signal ground of the cable and the connectors need to be isolated from the system (or enclosure) ground to avoid ground loops which in turn directly affect the signal integrity.

J**Jack**

A connecting device into which a plug can be inserted to make circuit connections. The jack may also have contacts which open or close to perform switching functions when the plug is inserted or removed. See also: receptacle.

Jacket

An outer non-metallic protective cover applied over an insulated wire or cable.

J-Lead

A surface mount lead configuration where leads are bent into curves. Infrequently used on interconnects.

L

LAN

Local Area Network. A data communication network confined to a limited geographic area (up to 6 miles or about 10 kilometers).

Land

The metal portion of a printed circuit board where the pads on a surface mount component are mated. Also called a footprint or a pad.

Limiting Level

This is the input power level when the output power is goes into compression and no longer becomes linear.

Linear Phase Filter

A filter that exhibits a constant change in degrees per unit of frequency. The resultant plot of frequency versus phase is a straight line. This type of filter ideally displays a constant delay in its passband.

Line Impedance

Impedance as measured across the terminals of a transmission line; frequently the characteristic impedance of the line.

Low Noise Cable

Cable specially constructed to avoid spurious electrical disturbances caused by mechanical movements.

Lowpass Filter

A filter which passes low frequencies and rejects high frequencies.

M

M39012

Basic military spec defining RF connectors, including electrical and physical characteristics. Current designation is MIL-PRF-39012; see Mil Standards and Specs page.

Mating Face Seal

A mating face seal is a seal preventing the passage of moisture or gases into or out of the connecting interface of two connectors in mated condition.

MCX (Micro coaxial)

Micro coaxial connector with snap on coupling mechanism. Available in 50 ohm and 75 ohm versions. Frequency range DC - 6 GHZ.

MHV (Miniature High Voltage)

Coaxial connector with bayonet coupling mechanism. Working voltage 2.2 kV DC.

Microstrip

A type of transmission line configuration which consists of a conductor over a parallel ground plane, and separately by a dielectric.

Microwave

That portion of the electromagnetic spectrum lying between the far infrared and conventional radio frequency range. The microwave frequency range extends from 1 GHz to 300 GHz. Microwaves are usually used in point-to-point communications because they are easily concentrated into a beam.

MIL

Military (e.g. as in Military Standards).

MIL-C-17

Government listing for coaxial cables, replaces RG designations for military applications.

MIL-STD-202

One of the commonly used Mil standards that gives the test method and conditions for various environmental situations. These conditions include Corrosion, Vibration and Thermal Shock.

Mismatch (Connector Impedance or Line Impedance)

The condition in which the impedance of a source does not match or equal the impedance of the connected load. This reduces power transfer by causing reflection.

MMCX

Miniature Microcoax connector with snap on coupling mechanism. Available in 50 ohm and 75 ohm versions. Frequency range DC - 6 GHz.

Moisture Resistance

The ability of a material to resist absorbing moisture from the air or when immersed in water.

Motherboard

A printed board used for interconnecting arrays of plug-in electronic modules.

N

N (Neill)

Coaxial connector with screw type coupling mechanism. Available in 50 ohm and 75 ohm version. Frequency range DC - 18 GHz (50 ohm) and DC-1 GHz (75 ohm), respectively.

NAB

National Association of Broadcasters

Noise

Random electrical signals, generated by circuit components or by natural disturbances.

Noise Figure / Noise Factor

The Noise Factor of a transducer at a specified input frequency is the ratio of (a/b) where "a and b" are:

- (A) the available Signal to Noise Ratio (SNR) at the signal generator terminals per unit bandwidth when the temperature of the input termination (generator or source) is 290°K and the bandwidth is limited by the transducer, to
- (B) the available SNR per unit bandwidth at the output terminals of the transducer.

Noise Floor

This is defined as the lowest possible input to a chain or a component, that will produce a detectable output.

Noise Temperature

This is the amount of thermal noise in a chain or a component. Noise Factor and Noise Temperature (T_e) are related as follows:

$$\text{Noise Temperature } (T_e) = (F - 1)T_o$$

Where:

T_e is the noise temperature

T_o is standard temperature 290 K

F is noise factor

O**OEM**

Original Equipment Manufacturer.

Ohm

The unit of measurement for electrical resistance. A circuit is said to have a resistance of one ohm when an applied emf of one volt causes a current of one ampere to flow.

One dB Compression Point

The 1 dB compression point is the point on a P_{out} vs. P_{in} graph, where an increase power input causes the measured gain to decrease from the linear gain by one dB. Typically, if not explicitly stated, the 1 dB compression point refers to the output power (P_{out}) at that point.

Outgassing

De-aeration or other gaseous emission from materials such as plastics when exposed to pressure and/or heat. Cristek utilized materials that minimize outgassing in all connectors and cables.

Overshoot

The amount in percent by which a signal exceeds its steady-state output on its initial rise.

P

Pad

The metal portion of a printed circuit board where the leads on a surface mount component are mated. Also called a footprint or a land.

Panel Seal

A panel seal is a seal preventing the passage of moisture or gases through the gap between the mounting hole of the panel and the connector body of the fixed connector.

Passband

The frequency range in which a filter is intended to pass signals.

Passband Ripple

Variations of attenuation with frequency within the passband of a filter.

PC

Personal Computer.

Permeability (magnetic)

The measure of how much better a material is than air as a path for magnetic lines of force. Air is assumed to have a permeability of 1.

Permittivity Relative

Synonym term for relative dielectric constant ϵ_r .

Phase Matching and Electrical Length

The electrical length of a connector is its physical length expressed in wavelength at a specified frequency and also in degrees of phase angle for that frequency. The Electrical Length is critical in manufacturing phase matched cable assemblies for applications such as phased array radar. "Out of phase" components can result in misreading of the signal message but, for example, physically adjusting the length of the transmission line can cure the mismatch.

Phase Shift

Change in phase of a voltage or current after passing through a circuit or cable.

Phase Stability

Variation of the electrical length of a cable that can result from temperature or mechanical stress due to bending or torsion.

Pin Contact

A male type contact, usually designed to mate with a socket or female contact. It is normally connected to the "dead" side of a circuit.

PIN Diode

A diode where a thin layer exists between the N and P regions. Rectification with pin diodes is limited. They actually behave more like a variable resistor that changes based upon the DC bias.

Plated Through-Hole

A hole through a printed circuit board that has been electroplated and into which a lead is placed and soldered for electrical and mechanical connection.

Plug

In coaxial RF connectors the plug is usually the movable portion, and is usually attached to a cable or removable assembly. Plugs mate with receptacles, jacks, outlets, etc.

Power Loss

Also expressed as Voltage Drop or Signal Attenuation, just means that the signal strength decreases as you go further down the transmission line. Loss is the result of the resistance in the conductor and the losses in the dielectric material. The unit of measure is a decibel or dB.

Power Rating

This is the maximum power a connector can handle and is frequency related. As the frequency increases the power handling capability decreases, also high altitude reduces the rating. Basically, the Power Rating is how well the connector and/or cable dissipate heat generated by high RF power.

Press-Fit Contact

An electrical contact which can be pressed into a hole in an insulator, printed board (with or without plated-through holes), or a metal plate.

Printed Circuit Board (PCB)

An epoxy glass and metal composite on which circuits are etched and to which active, passive and hardware components are attached. Also called PCB or PC Board.

Propagation Delay

Time required for an electronic digital device, or transmission network to transfer information from its input to its output.

Prototype

A model suitable for use in the complete evaluation of form, design and performance.

PTFE (polytetrafluoroethylene)

The thermally most stable and chemically most resistant carbonaceous compound. It is unaffected by sunlight, moisture, and virtually all chemicals. Temperature range is -200°C to +260°C / -392°F to +500°F. Electrical properties are very constant over temperature and wide range of frequencies.

Pulling

The difference between the maximum frequency of a VCO when the phase angle of the load impedance reflection coefficient varies through 360 degrees.

Pulse

A change in the level, over a relatively short period of time, of a signal whose value is normally constant.

Pulse Width

The length of time that the pulse voltage is at the transient level. Electronic pulse widths are usually in the millisecond (10⁻³), microsecond (10⁻⁶) or nanosecond (10⁻⁹) range.

Push-On Connectors

Connectors that mate without the need for a threaded coupling nut. Can have a "snap-in" locking feature.

Pushing

The change in frequency when the supply voltage changes, expressed in MHz/V.

R

Range

Number of sizes of connectors or cables of a particular type.

Receptacle

Usually the fixed or stationary half of a two-piece multiple contact connector. Also the connector half usually mounted on a panel and containing socket (female) contacts.

Reflection

When a connector is inserted into the line, a loss of signal strength or attenuation is seen. Some of the signal is actually re-reflected back on itself and when this occurs it sets up a standing wave between the connector and the source. The result is diminished signal strength. The loss is expressed in several terms including return loss, VSWR and insertion loss.

Reflection Coefficient

This is an expression of loss between a value of zero and one. Zero means no reflection and one is total reflection.

Reflection Loss

The part of a signal which is lost due to reflection of power at a line discontinuity.

Reflow Soldering

The process of screen printing solder paste and then heating it to cause it to melt, or "reflow", to wet the leads and pads around it.

Relative Attenuation

Attenuation measured with the point of minimum attenuation taken as zero dB.

Return Loss

A) Return Loss (dB) is defined as a ratio of the incoming signal to the same reflected signal as it enters a component.

B) The ratio in dB of maximum power sent down a transmission line to the power returned toward the source, Also equal to 20 times the log of the reciprocal of the reflection coefficient.

RF

Radio frequency.

RF High Potential

The minimum voltage requirement for the connector at frequencies above 1 MHz. At this minimum voltage level, the connector will not have excessive leakage current or dielectric failure.

RF Leakage

Signal that escapes from the connector or the cable. The cable shielding in coax cable prevents both outside interference and the signal escaping into the environment. Double- and triple-shielded cable may be used to prevent leakage at very high frequencies and to avoid RFI. Expressed as dB to frequency.

RG/U

Symbol used to designate coaxial cables that are made to government specification (e.g., RG-58U; in this designation the "R" means radio frequency, the "G" means government, the "58" is the number assigned to the government approval, and the "U" means it is an universal specification).

Ringling

The tendency of a filter to oscillate for a time when a transient waveform is applied to it.

Ripple

Generally referring to the wavelike variations in the amplitude response of a filter. Chebyshev and elliptic function filters ideally have equi-ripple characteristics, which means that the difference in peaks and valleys of the amplitude response in the passband are always the same. Butterworth, Gaussian, and Bessel functions have no ripple. Ripple is usually measured in dB.

Rise Time

The time required for a component or logic circuit to change from the quiescent to the transient state when an output is applied, (e.g. elapsed time between application of input and attainment of full output level).

RMS (Root Mean Square)

The effective value of an alternating current, corresponding to the direct current value that will produce the same heating effect.

S

SC (Concelman, Amphenol Engineer)

Threaded connector 0 to 11 GHz.

Scattering Parameters

Better known as S-Parameters, these 4 values help define the performance of several variables at various frequencies.

(A) S_{11} (Input Reflection Coefficient) = b_1/a_1

(B) S_{12} (Isolation) = b_1/a_2

(C) S_{21} (Forward Transfer Coefficient or Gain /Loss) = b_2/a_1

(D) S_{22} (Output Reflection Coefficient) = b_2/a_2

Screening Effectiveness

Ratio of the power fed into a coaxial cable to the power transmitted by the cable through the outer conductor.

Screw Machine Contact

A contact which is machined from solid bar stock.

Self-Align

Design of two mating parts so that they will engage in the proper relative position.

Self Alignment

The tendency of leads to center themselves on solder pads due to the surface tension of the liquid solder.

Semi-Rigid

A cable containing a flexible inner core and a relatively inflexible sheathing.

Shape Factor

An important parameter of all filters:

- A. BANDPASS:SF = Attenuation Bandwidth/3dB Bandwidth
- B. BANDSTOP:SF = 3dB Bandwidth/Attenuation Bandwidth
- C. LOWPASS:SF = Attenuation Frequency/ F_{co}
- D. HIGHPASS:SF = F_{co} /Attenuation Frequency

Spurious Free Dynamic Range

Spurious Free Dynamic Range = $2/3$ (PTOI - Gain - PMDS)

Where:

P1dB = 1 dB Output Compression Point

PTOI = Third Order Intercept

PMDS = Minimum detectable signal 3 dB above the noise floor.

Stopband

The area of frequency where it is desirable to reject or attenuate all signals as much as practical.

Shield

(1) A conducting housing or screen that substantially reduces the effect of electric or magnetic fields on one side thereof, upon devices or circuits on the other side. Cable shields may be solid, braided, or taped (longitudinally or spirally). (2) In cables, a metallic layer placed around a conductor or group of conductors to prevent electrostatic or electromagnetic interference between the enclosed wires and external fields.

Shielding

The metal sleeve surrounding one or more of the conductors, in a wire circuit to prevent interference, interaction or current leakage.

Shock (mechanical)

(1) An abrupt impact applied to a stationary object. (2) An abrupt or non-periodic change in position, characterized by suddenness, and by the development of substantial internal forces.

SHV (Safe High Voltage)

Coaxial connector with bayonet coupling mechanism. Working voltage 5 kV DC.

Skin Effect

The phenomenon wherein the depth of penetration of electric currents into a conductor decreases as the frequency of the current increases.

SMA (Subminiature A)

50 ohm - subminiature coaxial connector with screw type coupling mechanism. Frequency range DC-18 GHz.

SMB (Subminiature B)

Subminiature coaxial connector with snap-on coupling mechanism. Frequency range DC - 4 GHz.

SMC (Subminiature C)

Subminiature coaxial connector with screw type coupling mechanism. Frequency range DC - 10 GHz.

SMS

Subminiature coaxial connector with slide-on coupling mechanism. Frequency range DC - 4 GHz.

Snap on

Used to describe the easy removal or assembly of one part to another. A connector containing socket (female) contacts into which a plug connector having male contacts is inserted.

Solder Contact

A contact or terminal with a cup, hollow cylinder, eyelet or hood to accept a wire for a conventional soldered termination.

Spring-Finger Action

Design of a contact, as used in a printed circuit connector or a socket contact, permitting easy, stress-free spring action to provide contact pressure and/or retention.

Standing-Wave

Distribution of current and voltage on a transmission line, resulting from two sets of waves traveling in opposite directions.

Standing Wave Ratio

A measure of the mismatch between the load the line. It is equal to 1 when the line impedance is perfectly matched to the load. (In which case the maximum and minimum are the same, as current and voltage do not vary along the line). The perfect match would be a 1 to 1 ratio.

Stripline

A type of transmission line configuration which consists of a single narrow conductor parallel and equidistant to two parallel ground planes.

Surface Mount Device (SMD)

An active or passive device designed to be soldered to the surface of the printed circuit board.

Surface Mount Technology(SMT)

The process of assembling printed circuit boards with components soldered to the surface rather than fastened to printed circuit board through-holes.

SWR

Standing Wave Ratio.

T**TDMA**

Time Division Multiple Access, a digital standard primarily used in Asia and Europe.

Thermal Shock

The effect of heat or cold applied at such a range that non-uniform thermal expansion or contraction occurs within a given material or combination materials. The effect can cause inserts and other insulation materials to pull away from metal parts.

Third Generation (3G)

The next generation in wireless producing a convergence of standards and services.

Third Order Intercept

The third order intercept is the intercept point formed by the intersection of the fundamental output and the two-tone third order distortion product, when plotted as a theoretical linear function of input power. The higher the Third Order Intercept, the lower the intermods for the incoming signals.

Time Delay

The amount of time it takes for certain signals to pass through a filter.

TNC (Threaded Neill Concelman)

Coaxial connector with screw type coupling mechanism. Available in 50 ohm and 75 ohm versions. Frequency range DC - 11 GHz (50 ohm) and DC - 1 GHz (75 ohm), respectively.

Transmission Line

A signal-carrying circuit composed of conductors and dielectric material with controlled electrical characteristics used for the transmission of high-frequency, narrow-pulse type signals.

Transmission Loss

The decrease of loss in power during transmission of energy from one point or another. Usually expressed in decibels.

Triaxial Cable

A cable consisting of one center conductor and two outer concentric conductors (with an insulating layer separating them). Notable for increased shielding efficiency.

Twinaxial Cable

Two conductors that are insulated from one another, twisted together and surrounded by a common shield.

U**UG**

Symbol used to describe coaxial connectors that were made to a government specification. This specification is now obsolete.

Ultra High Frequency (UHF)

A Federal Communications Commission designation for the band from 300 MHz to 3,000 MHz (3GHz) on the radio spectrum. Coaxial connector with screw type coupling mechanism invented in the 1930's by Amphenol engineer E. Clark Quackenbush for use in the radio industry. Non-defined impedance. Frequency range DC.

UMTS

Universal Mobile Telecommunications Systems.

V

Very High Frequency (VHF)

A Federal Communications Commission designation for the band from 30 to 300 MHz on the radio spectrum.

Velocity of Propagation

The speed of an electrical signal down a length of cable compared to speed in free space expressed as a percentage.

Voltage

The term most often used to designate electrical pressure that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points. Voltage is measured in volts, millivolts, microvolts and kilovolts. The terms electromotive force (emf), potential, potential difference and voltage drop are often referred to as voltage.

Voltage Rating

Usually specified as the peak voltage that a connector can handle without breaking down. The voltage rating is a consideration in connector selection for a given application.

Voltage Standing Wave Ratio (VSWR)

A measure of the reflection, resulting from a ratio of the input signal to the reflected signal. $VSWR = (1+L) / (1-L)$

VSWR

See Voltage Standing Wave Ratio and Standing Wave Ratio.

W

Wavelength

The distance, measured in the direction of propagation, of a repetitive electrical pulse or waveform between two successive points that are characterized by the same phase of vibration.

Wave Soldering

The most widely used mass soldering process, primarily for through-hole boards, where the board is passed over a wave of solder which laps against the bottom of the board to wet the metal surfaces to be joined.

W-CDMA

Wideband-Code Division Multiple Access (CDMA).

Wedge Bond

It is the bond that exists between the substrate and the wire. The term wedge comes from the tool used to perform this operation which is wedge shaped.

Wetting

The ability of liquid solder to attach itself to the surfaces being joined through the formation of intermetallic bonds.

Wiping Action

The action which occurs when contacts are mated with a sliding action. Wiping has the effect of removing small amounts of contamination from the contact surfaces, thus establishing better conductivity.

WLAN

Wireless Local Area Network.

WLL

Wireless Local Loop.