

## ADEC GLOSSARY OF TERMS

Applicable to Satellite, Telecommunications and Computer  
Technology  
for  
Distance Education

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Words and terms in **bold** are defined in this Glossary.

**ACTS (ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE):** The NASA experimental satellite project which demonstrated the use of the **Ka Band** (30/20 GHz) services; on-board processing with multiple beams, electronic hopping antenna beams, and dynamic adjustment of power to cope with rain **attenuation**. The experimental network supported low to medium rate mobile services to high data rate **HDTV** fixed services. (*Pelton, 1995*)

**ALGORITHM:** A procedure or formula for solving a mathematical problem in a finite number of steps. Extremely complex algorithms or sets of algorithms are used to simplify, modify or predict data in the **digital** manipulation of information. Often, algorithms which are developed for digital applications are proprietary and are an important aspect of defining significant differences among the various digital compression and codec (coding/decoding) standards.

**AM (AMPLITUDE MODULATION):** **Modulation** which is accomplished by varying the amplitude (height of the carrier wave) of the carrier signal in accordance with the information to be transmitted. (*Inglis & Luther, 1996*)

**ANALOG:** Representing something in the real world. Analog is often used in comparison with **digital**, for example comparing analog and digital computers or analog or digital electrical signals. Analog computers actually measure, analyze and compute using real physical measures and numbers. Analog electrical signals (such as the radio frequencies used to transmit telecommunications information) are directly generated by physical stimuli in the form of light or sound waves.

**APERTURE:** In image scanning, the size of the sensitive spot that moves over the image. In an antenna, an imaginary cylinder in space surrounding the radiating elements. (*Inglis & Luther, 1996*)

**APOGEE:** The point in an elliptical satellite orbit which is farthest from the center of the earth (the opposite of **perigee**).

**ARTIFACT:** Any anomaly, distortion or unnatural component in an image -- usually associated with digital video transmission. (See **DIGITAL ARTIFACT**).

**ASCII (AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE):** A standardized format for computer system text coding.

**ASPECT RATIO:** The ratio of the width to the height of an image. For example, **analog** television uses a 4:3 (1.33) aspect ratio, while **HDTV** has an aspect ratio of 16:9 (1.78). (*Inglis & Luther, 1996*)

**ATM (ASYNCHRONOUS TRANSFER MODE):** A high-speed (155 and 622 Mb/s), fast-**packet** switching technique employing short, fixed length cells that are statistically **multiplexed** over virtual connections. Each cell consists of a 5-octet header and a 48-octet payload of user information (data, voice, or video). (*Carne, 1995*)

**ATSC (ADVANCED TELEVISION SYSTEMS COMMITTEE):** An international organization of approximately 200 members that is establishing voluntary technical standards for advanced television systems. ATSC Digital TV Standards include digital **HDTV** (High Definition Television), **SDTV** (Standard Definition Television), data broadcasting, multichannel surround-sound audio, and Satellite direct-to-home broadcasting. (*ATSC Home Page, <http://www.atsc.org/>, Oct 06, 1999*)

**ATTENUATION:** The loss of power of electromagnetic signals between transmission and reception points. (*Pelton, 1995*)

**AZIMUTH:** The definition from Webster's New Collegiate Dictionary states, "an arc of the horizon measured between a fixed point such as true north and the vertical circle passing through the center of an object." Azimuth is an important consideration in locating a satellite for transmission or reception of RF signals. The azimuth expressed in degrees of a circle will be the horizontal angle of rotation that the ground antenna must be rotated through to point at the specific satellite. Azimuth angles for any satellite may be calculated given the latitude and longitude of the ground station and the location of the satellite in geosynchronous orbit relative to true north.

**BACKHAUL:** A process where a television signal is transmitted from a remote site to a central site where the backhaul signal is integrated into a program which is being broadcast from the central site.

**BANDWIDTH:** A measure of radio frequency (**RF**) use or capacity. A terrestrial broadcast television channel, for example occupies a RF bandwidth of 6 MHz or six million cycles per second while a telephone voice transmission requires a RF bandwidth of only 3 KHz or 3,000 cycles per second.

**BASEBAND:** The bandwidth of the **modulating** (message) signal. (Carne, 1995)

A transmission medium through which digital signals are sent without frequency shifting. In general, only one communication channel is available at any given time. **Ethernet** is an example of a baseband network. (Howe, 1999)

**BAUD:** A description of the rate of data transmission usually expressed in **bit rate** measurements of thousand **bits** per second (Kb/s). A 14.4 Baud modem for example will accommodate a bit rate of 14,400 bits per second.

**BIG LEO:** (See **LEO: LOW EARTH ORBIT**)

**B-ISDN (BROADBAND ISDN):** An **ISDN (Integrated Services Digital Network)** offering **broadband** capabilities. B-ISDN is a CCITT-proposed service that may (a) include interfaces operating at data rates from 150 to 600 Mb/s, (b) use **ATM (Asynchronous Transfer Mode)** to carry all services over a single, integrated, high-speed **packet**-switched network, (c) have LAN interconnection capability, (d) provide access to a remote, shared disk server, (e) provide voice/video/data teleconferencing, (f) provide transport for programming services such as cable TV, (g) provide single-user controlled access to remote video sources, (h) handle voice/video telephone calls and (i) access shop-at-home and other information services. (GSA, 1996)

**BIT:** (Abbreviation for binary digit ) The smallest increment of digital information. Often referred to as a 1 or 0 in the binary system. Also referred to as an 'on' or 'off' when referring to the mechanical operation of bits in the computer.

**BIT RATE:** The amount of data being transported, measured relative to quantity over time in **bits** per second (thousand bits per second or Kb/s, million bits per second or Mb/s, billion bits per second or Gb/s and trillion bits per second or Tb/s).

Summary of bitrate notations:

<b>Bit:</b>	10p0	(1 bit)
<b>Kilobit:</b>	10p3	(1,000 bits)
<b>Megabit:</b>	10p6	(1,000,000 bits)
<b>Gigibit:</b>	10p9	(1,000,000,000 bits)
<b>Terabit:</b>	10p12	(1,000,000,000,000 bits)
<b>Petabit:</b>	10p15	(1,000,000,000,000,000 bits)
<b>Exabit:</b>	10p18	(1,000,000,000,000,000,000 bits)
<b>Zettabit:</b>	10p21	(1,000,000,000,000,000,000,000 bits)
<b>Yottabit:</b>	10p24	(1,000,000,000,000,000,000,000,000 bits)

A 40 Exabit file would contain all of the words ever spoken by human beings.

**BIT STREAM:** (see **DIGITAL BIT STREAM**)

**BROADBAND:** (See **WIDEBAND**)

**BSS (BROADCAST SATELLITE SERVICE):** The segment of **Ku-band**

satellite service established by the **FCC** which is provided by high power satellites (or clusters of satellites) which must be separated in orbit by 9 degrees. The frequencies of RF signals transmitted to and received from the BSS satellites are higher than those permitted for **FSS** satellites. The BSS transmission frequency from high-power satellites to satellite receivers has been established by the FCC between 12.2 - 12.7 GHz.

**BYTE:** (Abbreviation for binary term ) The simplest combination of **bits** producing recognizable information such as a number or a word. For example, the number 50 is represented by a byte made up of the eight bits 0,0,1,1,0,0,1 and 0.

**CACHE:** A small fast memory which holds recently accessed data, designed to speed up subsequent access to the same data. Most often applied to processor-memory access but also used for a local copy of data accessible over a network, etc. (*Howe, 1999*)

**C-BAND:** A portion of the Radio Frequency (**RF**) spectrum located between 4 GHz and 8 GHz, a part of which is dedicated to satellite communications. Satellite downlink frequencies are located between 3.7 GHz and 4.2 GHz and uplink frequencies are located between 5.925 GHz and 6.425 GHz.

**CDMA (CODE DIVISION MULTIPLE ACCESS):** See (**MULTIPLE ACCESS**)

**CHROMINANCE:** In color video systems, the signal component(s) that describe **Color Difference** information. (*Inglis & Luther, 1996*)

**CLARKE ORBIT:** (See **GEO**)

**CLIFF EFFECT:** A characteristic of the **digital** transmission of **RF** signals where there is a radical change in reception quality which results from a small change in reception power. By comparison, when an **analog** RF signal approaches the fringes of acceptable reception power, the television picture begins to experience gradual degradation with increasing sparkles or snow. As a digital RF signal reaches the fringes of acceptable reception power, there is no discernible degradation of picture quality until the level of reduced power reaches a threshold. At that point, picture quality changes from perfect to no picture.

**CLIPPER CHIP:** An asymmetric **encryption** chip proposed for use by the United States government so that the pervasive encryption of communication channels shall not protect both the law-abiding and law-breakers. Designated MYK-78, a secret key is created at the time of manufacture and placed in escrow. With court approval, government agencies can obtain this key and employ it to decipher encrypted messages obtained through wiretaps. (*Carne, 1995*)

**COLOR DIFFERENCE:** In a color video system, signals that represent the difference between specified colors and the **luminance** component. They have the property that they go to zero for monochrome images. (*Inglis & Luther, 1996*)

**COMMON CARRIER:** An entity which provides communication transmission facilities for use by other entities or which carries other entity's communications signals. Examples of common carriers include the telephone or telegraph companies and the companies which own communications satellites. Common carriers are subject to tariff regulation and must file rates for specific services with appropriate regulatory agencies such as the **FCC** or state regulatory agencies. As a rule, common carriers are not permitted to control content.

**CONUS (CONTIGUOUS UNITED STATES):** A term used to describe satellite coverage limited to the continental United States excluding Alaska and Hawaii.

**DAMA (DEMAND-ASSIGNED MULTIPLE ACCESS):** A process whereby satellite **transponder** channels are assigned for telephony transmission on the basis of immediate traffic demands.

**DARPA (DEFENSE ADVANCED RESEARCH PROJECTS AGENCY):** An agency of the USDoD (United States Department of Defense) responsible for the development of new technology for use by the military. DARPA, originally ARPA, was established in 1958. The agency is independent from other more conventional military R&D operations and focusses on short (two to four-year) projects run by small, purpose-built teams. ARPA was responsible for funding development of ARPANET (which grew into the **Internet**), as well as the Berkeley version of **Unix** and **TCP/IP**. (Howe, 1999)

**dB (DECIBEL):** An analog unit of measure of signal strength, volume, or signal loss due to resistance as expressed in logarithmic form. (*Satellite Industry News*, Jan, 1999)

**DCII (DIGICIPHER II):** An **MPEG II digital** standard developed by General Instruments Corporation which uses the MPEG II video encoding standards and the **ATSC (Advanced Television Systems Committee)** Dolby AC-3 digital audio standard. This standard has been adopted for standard and **high definition television** (SDTV & **HDTV**) transmission in North America, South Korea and Taiwan (see also **DVB**).

**DIGITAL:** The conversion of information into a binary format (1's and 0's or on's and off's), the smallest or simplest unit of information being a **bit**. These bits of information may be transmitted using radio frequency techniques such as terrestrial broadcasting, satellite and microwave transmission or over coaxial or fiber optic cable and copper wire. Digital information may be manipulated at extremely high speeds.

**DIGITAL ARTIFACTS:** Errors in a **digital** transmission of data which result from **digital compression** applications which remove information from a data inventory in an amount sufficient to cause noticeable anomalies.

**DIGITAL BIT STREAM:** A continuously changing flow of **digital**

information which is being transported over some transmission medium such as cable or on a satellite microwave frequency.

**DIGITAL COMPRESSION:** A process by which complex sets of **algorithms** are employed to rearrange, reassemble and eliminate **digital** information from a data inventory in such a way that the amount of data (bits) to be stored or transported is reduced without a resulting loss of apparent resolution.

**DSL (DIGITAL SUBSCRIBER LINE):** In **ISDN (Integrated Services Digital Networks)**, equipment that provides full-duplex service on a single twisted metallic pair at a rate sufficient to support ISDN basic access and additional framing, timing recovery, and operational functions. The physical termination of the DSL at the network end is the line termination; the physical termination at the customer end is the network termination. (GSA, 1996)

**DS-LEVEL: DIGITAL SIGNAL LEVEL:**

**DS-0:** 64 Kb/s.

**DS-0A:** A DS-0 signal containing data from a single subrate station. The **bytes** are repeated as necessary to match the sender's speed to the speed of the DS-0 line.

**DS-0B:** A DS-0 signal containing data from several subrate stations. The octets contain a subrate synchronizing **bit** (bit#1) and six data bits (bits 2 through 7). The eighth bit is set to 1 to ensure meeting the 1s density requirement.

**DS-1:** 1.544 Mb/s.

**DS-1C:** 3.152 Mb/s.

**DS-2:** 6.312 Mb/s.

**DS-3:** 44.736 Mb/s.

**DS-4:** 274.176 Mb/s.

**DS-4A:** 139.264 Mb/s.

(Carne, 1995)

**DVB (DIGITAL VIDEO BROADCAST):** A suite of digital video standards formulated by the European Launch Group (ELG). The standard is based on **MPEG II** video. MPEG II/DVB uses the Musicam audio standard (see also **DCII**).

**EIRP (EFFECTIVE ISOTROPIC RADIATED POWER):** The arithmetic product (expressed as **dBW**) of, (a) the power supplied to an antenna and (b) its **gain**. (GSA, 1996)

**ELECTROMAGNETIC SPECTRUM:** The entire range of frequencies of electromagnetic radiation from zero to infinity which measure electromagnetic energy. The Radio spectrum (less than 300 GHz bandwidth) is divided into subsets of various bandwidths which are identified by their frequency characteristics. For example, the **Ku-band** subset includes those frequencies of the radio frequency (**RF**) spectrum between 10.7 GHz and 17.8 GHz while the **C-band** subset includes those frequencies between 3600 MHz and 7075 MHz. (See Figure 1)

**ENCAPSULATOR:** An IP gateway at a satellite uplink or cable/wireless headend which is a router taking traffic from the terrestrial network and routing **packets** to the satellite WAN (Wide Area Network). The encapsulator offers streaming capabilities that encapsulate content into datagrams and then route it to subscriber subnets. (*Satellite Communications*, Oct., 1999)

**ENCRYPTION:** The action of disguising information so that it can be recovered relatively easily by persons who have the key, but is highly resistant to recovery by persons who do not have the key. Encryption is accomplished by scrambling the bits, characters, words or phrases in the original message. (*Carne*, 1995)

**EQUIVALENT NOISE TEMPERATURE:** The temperature, usually expressed in Kelvins, of a hypothetical matched resistance at the input of an assumed noiseless device, such as a noiseless amplifier, that would account for the measured output **noise**. (*GSA*, 1996)

**ETHERNET:** A standard protocol (IEEE 802.3) for a 10 Mb/s baseband **LAN** (local area network) bus using carrier-sense multiple access with collision detection (CSMA/CD) as the access method, implemented at the **Physical Layer** in the **ISO Open Systems Interconnection-Reference Model**, establishing the physical characteristics of the CSMA/CD network. (*GSA*, 1996)

**ETHERNET CABLE:** Cable transmission medium for Ethernet classified as XbaseY, where X is the data rate in Mb/s, base means **baseband** (as opposed to radio frequency) and Y is the category of cabling. The original cable was **10base5**. Common XbaseY Ethernet Cable Classifications include:

**10baseT:** A variant of Ethernet which allows stations to be attached via twisted pair cable.

**10base2:** The variant of Ethernet that uses thin coaxial cable (RG-58 or similar) limited to a maximum single cable length of 200 meters; (sometimes referred to as cheapernet ).

**10base5:** The original full spec variant of Ethernet cable, using a stiff, large diameter coaxial cable with an impedance of 50 ohms and with multiple shielding. Maximum cable length is limited to 500 meters; (Sometimes referred to as thicknet or thick Ethernet ).

**100BaseT:** Any of several Fast Ethernet 100 Mb/s, CSMA/CD (Carrier Sense Multiple Access/Collision Detect) standards for twisted pair cables including: 100BaseTx (100 Mb/s over two-pair Category 5 or better cable), 100BaseT4 (100 Mb/s over four-pair Category 3 or better cable) and 100BaseT2 (100 Mb/s over two-pair Category 3 or better cable). All are standards under **IEEE 802.3**.

**100Base FX:** Fast Ethernet over optical fibre.

**100Base VG:** A 100 Mb/s Ethernet standard specified to run

over four pairs of Category 3 UTP(Unshielded Twisted Pair) wires (known as Voice Grade or VG). It is also called 100VG-AnyLAN because it was defined to carry both **Ethernet** and **token ring** frame types.

(Howe, 1999)

**FCC (FEDERAL COMMUNICATIONS COMMISSION):** This is the national regulatory body for interstate telecommunications in the United States. The commission consists of five members all nominated to a specific term by the President of the United States and confirmed by the Senate. The current chairperson is William Kennard. The authority for the commission is contained within the Communications Act of 1934 as amended (most notably by the Telecommunications Act of 1996).

**FDMA (FREQUENCY DIVISION MULTIPLE ACCESS):** See (**MULTIPLE ACCESS**).

**FEC (FORWARD ERROR CORRECTION):** A technique which employs special codes that allow the receiver to detect and correct a limited number of errors without referring to the transmitter. (Carne, 1995)

**FM (FREQUENCY MODULATION):** **Modulation** in which the instantaneous frequency of a sine wave carrier is caused to depart from the center frequency by a amount proportional to the instantaneous value of the modulating signal. In FM, the carrier frequency is called the center frequency. In optical communications, even if the electrical baseband signal is used to frequency-modulate an electrical carrier, it is still the intensity of the lightwave that is varied (modulated) by the electrical FM carrier. The lightwave is varied in intensity at an instantaneous rate corresponding to the instantaneous frequency of the electrical carrier. (GSA, 1996)

**FSS (FIXED SATELLITE SERVICE):** The segment of **Ku-band** satellite service established by the **FCC** to be provided from medium power satellites. These satellites are separated in orbit by at least 2 degrees. **RF** signals are transmitted to FSS satellites in the 14 GHz to 14.5 GHz range and received from the satellite in the 11.7 GHz to 12.2 GHz range.

**GAIN:** The ratio of output current, voltage or power to input current, voltage or power, respectively. Gain is usually expressed in **dB**. If the ratio is less than unity, the gain expressed in dB, will be negative, in which case there is a loss between input and output. (GSA, 1996)

**GEO (GEOSYNCHRONOUS EARTH ORBIT):** This is the orbital altitude of 35,580 km (22,237 miles) above the earth's surface where a satellite's velocity matches with the rotation of the earth. A satellite which is in a GEO position above the earth's equator (geostationary) will appear from the earth to be occupying a stationary position. The geosynchronous earth orbit is also referred to as the **Clarke Orbit** (named in honor of Arthur C.

Clarke, a science fiction writer who first postulated the characteristics of this orbit in 1945).

**GMT (GREENWICH MERIDIAN TIME):** The time zone which includes Greenwich, England, and which is bisected by 0 Degree Longitude. This is the time notation which is used for booking international satellite time. (also referred to as **ZULU** Time)

**GROUND SEGMENT:** A term which describes that portion of the total communications satellite system which is situated on the earth such as transmitting and receiving antenna, RF (radio frequency) signal generating facilities, RF receivers and digital encoding equipment and decoders.

**G/T (GAIN TO NOISE TEMPERATURE):** In the characterization of antenna performance, a figure of merit, where G is the antenna **gain** in **dB** (decibels) at the receive frequency, and T is the **equivalent noise temperature** of the receiving system in Kelvin. (GSA, 1996)

**GUARD BAND:** Referring to the frequency that is left vacant between two channels. The margin of safety that is provided helps to insure that adjacent signals do not interfere with one another.

**HDTV (HIGH DEFINITION TELEVISION):** The term refers to the new format of **digital** signal to be seen on the television screen. The HDTV format will be delivered by the ATV (Advanced Television) digital system developed by the members of the Grand Alliance (AT&T, David Sarnoff Research Center, General Instrument, Massachusetts Institute of Technology, North American Philips, Thomson Consumer Electronics and Zenith Electronics). This new system will provide a television picture with about 1000 scanlines per picture (compared to 525 for existing standard) and a picture **aspect ratio** of 16:9 (compared to 4:3 for existing standard). This format will be broadcast over the UHF **spectrum**.

**HERTZ (Hz):** A basic measurement of the frequency of an electrical signal equal to one cycle per second.

<b>KILOHERTZ (KHz):</b>	one Thousand cycles/second	(10p3)
<b>MEGAHERTZ (MHz):</b>	one Million cycles/second	(10p6)
<b>GIGAHERTZ (GHz):</b>	one Billion cycles/second	(10p9)
<b>TERAHERTZ (THz):</b>	one Trillion cycles/second	(10p12)
<b>PETAHERTZ (PHz):</b>	one Quadrillion cycles/second	(10p15)
<b>EXAHERTZ (EHz):</b>	one Quintillion cycles/second	(10p18)

An electromagnetic wave oscillates from positive to negative poles. An oscillation from positive to negative and back to positive again is one complete cycle.

**HIGH-POWER SATELLITE:** A satellite with greater than 100 Watts of transponder radio frequency (**RF**) transmitting power.

**ICANN (INTERNET CORPORATION FOR ASSIGNED NAMES & NUMBERS):** organization established by the United States Department of

Commerce in 1998 to oversee how Internet names are awarded.

**IEEE (INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS, INC.):** A USA based international technical/professional society founded in 1884. The IEEE promotes standardization in technical disciplines which include aerospace, biomedical technology, computers and communications, consumer electronics and electrical power. The institute conducts educational programs, sponsors international technical conferences and symposia and publishes nearly 25% of the world's technical papers in electronics and computer engineering and computer science.

**IEEE 802:** A set of **IEEE** standards applicable to **local area networks**, The equivalent **ISO** standard is IS 8802.

**IEEE 802.2:** Defines Logical Link Control (LLC, the upper portion of the **data link layer**) for local area networks.

**IEEE 802.3:** Defines the **transport layer** of (a variant of) **Ethernet**.

**IEEE 802.3u:** The IEEE committee working on standards for Fast Ethernet.

**IEEE 802.3z:** The IEEE committee working on standards for Gigabit Ethernet.

**IEEE 802.4:** Token Bus standard.

**IEEE 802.5:** **Token ring** standard.

(Howe, 1999)

**INCLINED ORBIT:** A condition in which a satellite is unable to maintain a **geostationary** position above the earth's equator. Almost all satellites generate electrical power to operate their transponders by converting the sun's energy to electricity. Energy used for station keeping, that is keeping the satellite within a very narrow range of movement north or south of the equator, is stored on board the spacecraft and over time is dissipated, usually after passage of the design life of between 8-15 years. When this fuel runs out, the satellite is no longer able to keep station above the equator. Since satellite uplink and downlink antenna are aimed at a particular point above the equator, a satellite in inclined orbit will move in and out of the antenna's "range of vision" as the satellite's orbit fluctuates north and south of the equator.

**INTERLACED SCANNING:** The television picture in the **NTSC** system is made up of 525 scan lines. One-half of the scan lines which make up the video picture are traced on the screen approximately 30 times a second alternating with the other one-half of the scan lines which are traced on the screen approximately 30 times a second thus providing 60 interlaced line scanning events each second. (see also **PROGRESSIVE SCANNING**)

**INTERNET:** The Internet is the largest interconnection of networks in the world. It is a three level hierarchy composed of backbone networks such as ARPAnet, NSFnet and MILNET, mid-level networks, and stub networks. These include among others commercial (.com

or .co), university and educational (.edu or .ac), other research networks (.org or .net), governmental (.gov) and military (.mil) networks and span many different networks around the world with various protocols including the **Internet Protocol**. (Howe, 1999)

**IP (INTERNET PROTOCOL):** See **TCP/IP**.

**IRD (INTEGRATED RECEIVER/DECODER):** Satellite **ground segment** equipment which receives and decodes **digital** information transmitted via satellite **RF** signals. Manufacturers have until now incorporated proprietary **algorithms** into digital transmission systems which result in the lack of interoperability among the differing systems. An IRD will only operate successfully within the particular proprietary system of which it is a part.

**ISL (INTER-SATELLITE LINK):** A satellite architecture whereby two or more satellites are configured in such a way that they may communicate directly with one another. This architecture is used in the TDRESS system of satellites and is a component of the design of **Big LEO** communications satellite systems.

**ISDN (INTEGRATED SERVICES DIGITAL NETWORK):** A standard for the integrated transmission of voice, video and data developed by the Consultative Committee on International Telephony and Telegraphy (referred to as the CCITT now combined with the CCIR, Consultative Committee on International Radio to form the TSS, Telecommunications Standardization Sector). The ISDN bandwidths include the Basic Rate Interface or BRI at 144 Kb/s and the Primary Rate Interface or PRI at 1.544 and 2.048 MB/s (see **T-1 LINE**).

**ISO (INTERNATIONAL STANDARDS ORGANIZATION):** An international organization which developed the **MPEG** and **JPEG** standards and which is closely allied with the CCITT (part of the Telecommunications Standardization Sector, TSS)

**ITU (INTERNATIONAL TELECOMMUNICATIONS UNION):** A United Nations treaty organization (originally created in 1865 as the International Telegraph Union with a membership of twenty nations...current name adopted in 1932) which supports procedures for the international allocation of the radio frequency (RF) **spectrum** and provides the platform for the World Radio Conference (WRC), a biannual meeting of world communication leaders. The WRC publishes 'International Radio Regulations' for the RF spectrum. The ITU conducts ongoing policy and study group sessions.

**ITU-T MULTIMEDIA TELECONFERENCING STANDARDS:** Standards developed and ratified by the Telecommunication Standardization Sector of the International Telecommunications Union which define the core technologies for multimedia teleconferencing. Standards are developed to promote interoperability among different proprietary systems. These core standards include:

**T.120:** Data protocols for Real Time Data Conferencing (Audiographics). These standards cover document

conferencing and application sharing.

**H.320:** Governs the basic video-telephony concepts of audio, video and graphical communications over circuit-switched media such as **ISDN**.

**H.323:** An extension of the H.320 Standard to provide for multimedia telecommunications over intranets and packet-switched networks generally -- applicable to the use of video and other communications over the Internet. Provides standards for both reliable and unreliable transmission over the Internet.

**H.324:** Addresses and specifies a common method of sharing video, data, and voice simultaneously using V.34 modem connections over single analog POTS (Plain Old Telephone Service) line.

(*IMTC*, 1999)

**IXC (INTEREXCHANGE CARRIER):** Provides long-distance transport services between **points-of-presence (POP)** that are established for each local exchange carrier. (*Carne*, 1995)

**JPEG (JOINT PICTURE EXPERTS GROUP):** A subgroup of the **ISO** which has established international standards for the digital compression of still pictures.

**KA-BAND:** A portion of the **RF spectrum** located between 18 GHz and 31 GHz. Downlink frequencies for satellite communications are located in the 20 GHz range and uplink frequencies are located in the 30 GHz range.

**KU-BAND:** A portion of the **RF spectrum** located between 10.9 GHz and 17 GHz, a part of which is dedicated to satellite communications. Satellite downlink frequencies are located between 11.7 GHz and 12.2 GHz and uplink frequencies are located between 14 GHz and 14.5 GHz.

**LAN (LOCAL AREA NETWORK):** A bus or ring connected, limited distance network that serves the data communication needs of users within a building or several buildings in proximity to each other. (*Carne*, 1995) **Ethernet** is an example of a standard Local Area Network.

**LATA (LOCAL ACCESS AND TRANSPORT AREA):** A grouping of exchange areas served by a single **Local Exchange Carrier (LEC)**. Traffic between LATAs must be carried by an **Inter-Exchange Carrier (IXC)**. (*Carne*, 1995)

**L-BAND:** A portion of the **RF spectrum** located between 500 MHz and 1500 MHz. The RF (radio frequency) spectrum between 950 MHz and 1450 MHz is dedicated to mobile communications.

**LCD (LIQUID-CRYSTAL DISPLAY):** An electronic display panel that is based on the properties of a liquid-crystal material sandwiched between two transparent plates and illuminated from behind. The

transmittance of the liquid-crystal material changes with the applied electric field. (*Inglis & Luther, 1996*)

**LEC (LOCAL EXCHANGE CARRIER):** Provides public, switched telephone services within limited areas called **Local Access and Transport Areas (LATA)**. The LEC provides connections between users located within the same exchange area, between users located in different exchange areas that are in the same LATA, and delivers traffic directed to an exchange area outside the **LATA** to **Inter-Exchange Carriers (IXC)**. (*Carne, 1995*)

**LEO (LOW EARTH ORBIT):** Until recently, a distinction was made between LEO and **MEO (Medium Earth Orbit)** orbital classifications. LEO was classified as an earth orbit with an altitude of between 200-2400 kms. The MEO designation classified orbits between 2,400 and 10,000 km. Current literature frequently refers to any orbital distances from earth of less than that for **geostationary** orbit as being LEO. Almost all of the **Big LEO** and **Little LEO** systems which are currently planned will operate in orbits ranging between 640 km and 2,500 km above the earth.

Satellites which are placed in LEO orbits move rather swiftly in relation to the earth, generally from a westerly to an easterly direction. Some of the newly designed LEO communications satellite networks will launch some of the satellites in the network constellation into polar earth orbits. The relative motion of the satellite in relation to the earth slows as the altitude of the satellite increases. The rapid relative movement in low earth orbit enables data gathering and communication satellites to cover large areas of the earth's surface in short periods of time. The space shuttle is injected into a low earth orbit, for example.

**BIG LEO:** A **space segment** architecture which consists of a constellation of many satellites in Low Earth Orbit in a configuration which will permit the delivery of global mobile telephony and data services. The system is served by a network of **ground stations** which provides gateway access from terrestrial networks as well as management, control and orbital correction functions. This system is intended to provide telecommunication service to remote sites, high latitude geographic locations which are not accessible by GEO satellites and to omnidirectional antenna on handset transceivers. Examples of Big LEO systems include Teledesic and Iridium.

**LITTLE LEO:** A space segment architecture which is similar to that of Big LEO systems but which carries data only. The remote collection and transmission of utility meter data would be an example of a service provided by a Little LEO satellite system. Often, store and forward technology is used to facilitate communication with the ground segment.

**LMDS (LOCAL MULTIPOINT DISTRIBUTION SYSTEM):** A fixed, **broadband**

point-to-multipoint **wireless** service which can provide one-way and two-way high capacity voice, video and data service. Services are licensed and bandwidth auctioned by the **FCC**. Service rules were adopted by the FCC in March, 1997.

**LOW-POWER SATELLITE:** A satellite with less than 30 Watts of transponder radio frequency (**RF**) transmitting power.

**LUMINANCE:** In color video systems, a component signal that represents the brightness of the image. (*Inglis & Luther, 1996*)

**MEDIUM-POWER SATELLITE:** A satellite with greater than 30 Watts but less than 100 Watts of **transponder** radio frequency (**RF**) transmitting power.

**MEO (MEDIUM EARTH ORBIT):** See **LEO (LOW EARTH ORBIT)**.

**MID BAND:** A portion of the VHF (Very High Frequency) **RF spectrum** located between television channels 6 and 7 (88 MHz to 174 MHz) which has been reserved by the **FCC** for air, maritime and land mobile units, **FM** radio and aeronautical and maritime navigation. The frequencies between 108 MHz and 174 MHz can be used to provide additional channels on cable television systems.

**MODEM:** This term is a contraction of modulator and demodulator . A modem converts **digital** data generated by and coming into a computer which are transmitted over telephony circuits or by using terrestrial or satellite **RF** (radio frequency) circuits.

**MODULATION:** The process of modifying the channel signal (often called the carrier ) to represent information to be transmitted. Typical modulation methods involve the frequency, amplitude or phase of the carrier. (*Inglis & Luther, 1996*)

**MPEG (MOTION PICTURE EXPERTS GROUP):** A working group of a committee of the **ISO (International Standards Organization)**. They developed the MPEG worldwide standard for motion video compression and transport. (*Inglis & Luther, 1996*)

**MTOPS (MILLIONS OF THEORETICAL OPERATIONS PER SECOND):** A measure of computer processing speed used by the US Department of Commerce (USDoC) to define a classification system for export controls applicable to high-speed computers. For example, in February, 2000, the USDoC eliminated export controls on computers with speeds below 12,300 MTOPS to all countries with the exception of Iraq, Libya, North Korea, Cuba, Sudan and Syria.

**MULTIPLE ACCESS:** Techniques have been developed in the satellite industry which allow satellite **spectrum** and power to be shared efficiently among multiple users of a satellite **transponder**.

**CDMA (CODE DIVISION MULTIPLE ACCESS):** A multiple access scheme whereby ground station uplinks access a satellite

transponder using spread-spectrum **modulations** and orthogonal codes to avoid interfering with other transmissions using the same transponder. In contrast with the **FDMA** scheme which attempts to minimize the transmitted bandwidth, in this scheme all users transmit signals simultaneously across all of the dedicated multiple access channel. Receivers use a code corresponding to the transmission code to demodulate the signal or separate it from other signals on the channel.

**FDMA (FREQUENCY DIVISION MULTIPLE ACCESS):** A multiple access scheme whereby each ground station uplink is assigned a specific frequency slot and bandwidth for one of the multiple carriers within a specific satellite transponder. This scheme is usually used in conjunction with **Frequency Modulation**. The FDMA scheme may be divided into two categories, **Multiple Channel Per Carrier** (see **MCPC**) and **Single Channel Per Carrier** (see **SCPC**).

**TDMA (TIME DIVISION MULTIPLE ACCESS):** A multiple access scheme whereby many users may access a single carrier by time sharing. A **digital** signal is compressed in **packets** which are transmitted to the carrier in bursts. These packets are processed into consecutive time segments which do not overlap. Instructions are sent to a receiver which identify the packets representing a particular transmission (ie., every 4th packet).

**MULTIPLEXING:** A process in the transmission of RF (radio frequency) signals whereby a number of simultaneous transmissions can be accommodated on a single circuit.

**NAS (NETWORK-ATTACHED STORAGE):** A device used to enlarge the reserve of shared storage space. Also used to accelerate Web page transfer speeds through **caching**.

**NETWORK LAYER:** (See **OSI**)

**NOISE: 1.** An undesired disturbance with the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communication system from man-made and natural sources. **2.** A disturbance that affects a signal and that may distort the information carried by the signal. **3.** Random variations of one or more characteristics of any entity such as voltage, current or data. **4.** A random signal of known statistical properties of amplitude, distribution and spectral density. **5.** Loosely, any disturbance to interfere with the normal operation of a device or system. (GSA, 1996) (See **EFFECTIVE NOISE TEMPERATURE**)

**NTSC (NATIONAL TELEVISION SYSTEMS COMMITTEE):** The organization (RCA/NBC) which established the standards for the television broadcast system in the United States. A close approximation of this system was also adopted in Japan. The US and Japanese video systems are now referred to as **NTSC** systems. This video

standard provides for a screen density of 525 scanlines per picture and operates at 60 cycles per second. This system was developed so that existing black and white (B/W) mono audio television receivers would be compatible with color stereo audio broadcasts.

**OC-N (OPTICAL CARRIER LEVEL-N):** The optical equivalent of (STS-N)  
Typical OC Levels are:

<b>OC-1:</b>	51.84 Mb/s.
<b>OC-3:</b>	155.52 Mb/s.
<b>OC-12:</b>	622.08 Mb/s.
<b>OC-24:</b>	1.244 Gb/s.
<b>OC-48:</b>	2.488 Gb/s.
<b>OC-96:</b>	4.976 Gb/s.

See: **STS-N (SYNCHRONOUS TRANSPORT SIGNAL -- LEVEL N)** and **SONET (SYNCHRONOUS OPTICAL NETWORK)**. (*Carne, 1995*)

**OSA (OPEN SYSTEMS ARCHITECTURE):** Permits transparent communication between cooperating machines. **OSA** is embodied in international standards referred to as the **Open Systems Interconnection Reference Model (OSI)**. (*Carne, 1995*)

**OSI (OPEN SYSTEMS INTERCONNECTION REFERENCE MODEL):** The reference model, also referred to as OSIRM, provides a framework for communication that relies on standard non-proprietary interconnection protocols (protocol stack). It consists of seven layers that serve to decompose the complexity of information flow between cooperating machines into consecutive steps that are substantially independent of each other. (*Carne, 1995*)

The seven **OSI** model layers are:

- Layer #7 Application (User):** Handles issues like network transparency, resource allocation and problem partitioning. The application layer is concerned with the user's view of the network (e.g. formatting electronic mail messages). The **presentation layer** provides the application layer with a familiar local representation of data independent of the format used on the network.
- Layer #6 Presentation:** Performs functions such as text compression, code or format conversion to try to smooth out differences between hosts. Allows incompatible processes in the **application layer** to communicate via the **session layer**.
- Layer #5 Session:** Uses the **transport layer** to establish a connection between processes on different hosts. It handles security and creation of the session. It is used by the **presentation layer**.
- Layer #4 Transport:** Determines how to use the **network layer** to provide a virtual error-free, point to point

connection so that host A can send messages to host B and they will arrive un-corrupted and in the correct order. It establishes and dissolves connections between hosts. It is used by the **session layer**.

**Layer #3 Network:** Determines routing of packets or data from sender to receiver via the **data link layer** and is used by the **transport layer**. The most common network layer protocol is **IP**.

**Layer #2 Data Link:** Splits data into frames for sending on the **physical layer** and receives acknowledgment frames. It performs error checking and re-transmits frames not received correctly. It provides an error-free virtual channel to the **network layer**.

**Layer #1 Physical:** Concerning electrical and mechanical connections to the network. Examples of physical layer protocols are **CSMA/CD**, **token ring** and **bus**.

Note: Compare with the layers of the **TCP/IP** protocol suite. (Howe, 1999)

**PACKET:** A sequence of **bits** that is divided into two parts -- one contains the user's information, and the other contains control information. (Carne, 1995)

**PACKET JITTER:** (see **PACKET LOSS**)

**PACKET LOSS:** Packet Loss and Packet Jitter are types of degradation in the delivery stream of **digital** information which result from unfavorable network conditions such as extremely heavy or bursty traffic. Individual packets comprising the data stream can arrive early, late or out of sequence causing unstable video reception, pauses, the appearance of **artifacts** or the loss of the data altogether.

**PAL (PHASE ALTERATION SYSTEM):** A German developed color television standard which provides for a screen density of 625 scanlines per picture and which operates at 50 cycles per second. This system is common in the UK, much of Europe, Africa, Asia and Oceania and is incompatible with the North American and Japanese **NTSC** standards. The IntelSat satellite system often employs the PAL standard.

**PERIGEE:** The point in an elliptical satellite orbit where it is closest to the center of the earth (the opposite of **APOGEE**).

**POP (POINT-OF-PRESENCE):** In the field of telephony, POP refers to the facility interface between the **Local Exchange Carrier (LEC)** and the **Inter-Exchange Carrier (IXC)**. A POP must be established on each trunk path that connects switches that belong to the local and long-distance carriers. On one side of the POP, the LEC is responsible for service; on the other side, the IXC is responsible (Carne, 1995)

**PROGRESSIVE SCANNING:** The method for tracing scan lines onto a computer monitor whereby all scanlines are presented in sequence 60 or more times per second. Unlike the **NTSC** video standard, there is no single standard for computer display. Most computer monitors will accept a wide range of screen resolutions and scanning rates utilizing multiscan technologies. (see also **INTERLACED SCANNING**)

**QPSK (QUADRATURE PHASE SHIFT KEYING):** Used to **modulate** digital information onto an **RF** carrier when satellite transponders are used to transmit **MPEG 2** signals. Rather than using the amplitude or frequency of the carrier to convey the information, QPSK modulates the phase of the carrier signal. Depending on the data being modulated, the carrier is forced into one of four different phase states known as a symbol. The advantage of this method is that each symbol contains two data bits, thus doubling the potential amount of data that is transmitted over conventional amplitude or frequency modulation techniques. (Hewitt, 1999)

**RAM (RANDOM ACCESS MEMORY):** In computers, the main system memory, usually consisting of volatile memory (memory that loses its data when power is removed) solid-state chips. (Inglis & Luther, 1996)

**RBOC (REGIONAL BELL OPERATING COMPANY):** An independent **common carrier** that provides local exchange services within specific areas. The term originally referred to the local telephony service companies which were created as a result of the break-up of AT&T in 1984. The term now refers to all local exchange services. (Carne, 1995)

**RF (RADIO FREQUENCY):** Any frequency within the **electromagnetic spectrum** normally associated with radio wave propagation. Organizations such as the **FCC** and **ITU** have divided the radio frequency spectrum into subdivisions for management purposes. (GSA, 1996)

**ROM (READ-ONLY MEMORY):** In computers, nonvolatile memory (memory that retains its stored data when power is removed that stores permanent programs. ROM usually consists of solid-state chips. (Inglis & Luther, 1996)

**SAR (SPECIFIC ABSORPTION RATE):** Measures the maximum quantity of radiation absorbed by one Kilogram of tissue from a cell phone. Nokia, Motorola and Ericsson are working to establish international benchmark standards.

**SDH (SYNCHRONOUS DIGITAL HIERARCHY):** An international digital telecommunications network hierarchy which standardizes transmission around the bit rate of 51.84 megabits per second, which is also called **STS-1**. Multiples of this bit rate comprise higher bit rate streams. **SONET** is the American version of SDH. (Howe, 1999)

**SECAM (SEQUENTIAL ENCODED COLOR AMPLITUDE MODULATION):** A French developed color television standard which is common in Francophile countries and the former Soviet Union. The system operates with a screen density of 625 scanlines per picture and 50 cycles per second but inverts the signal making it incompatible with the **PAL** and **NTSC** video standards.

**SONET (SYNCHRONOUS OPTICAL NETWORK):** A synchronous digital network that employs optical fibers (exclusively). Each facility conforms to standards that include electrical and optical speeds, and frame formats. (*Carne, 1995*) SONET carries circuit-switched data in frames at speeds in multiples of 51.84 megabits per second. **SDH** is the international term for SONET. (*Howe, 1999*)

**SPACE SEGMENT:** A term which describes the portion of the total communications satellite system which is physically located in orbit around the earth.

**SPECTRUM:** A short-hand reference to the **ELECTROMAGNETIC SPECTRUM**. (See Figure 1.)

**STS-N (SYNCHRONOUS TRANSPORT SIGNAL -- LEVEL N):** In **SONET**, a frame of  $N \times 6480$  bits that is transported at  $N \times 51.84$  Mb/s. STS-N signals are created by interleaving  $N$  STS-1 signals, octet-by-octet. For various reasons, the values of  $N = 3, 12, 24, 48$  and 96 are preferred. The optical equivalent OF STS Levels are expressed as **OC-N** levels. (*Carne, 1995*)

**T-1 LINE:** A transmission medium with a transmission **bit rate** of 1.544 million bits per second (Mb/s), equivalent to the **ISDN** Primary Rate Interface (PRI) for the United States. The European T-1 transmission bit rate is 2.048 Mb/s.

**TCP/IP (TRANSMISSION CONTROL PROTOCOL over INTERNET PROTOCOL):** The de facto standard **Ethernet** protocols incorporated into 4.2BSD (Berkeley System Distribution-Version 4.2) **Unix**. TCP/IP was developed by **DARPA** (Defense Advanced Research Projects Agency) for internetworking and encompass both **network layer** and **transport layer** protocols. While **TCP** and **IP** specify two protocols at specific protocol layers, **TCP/IP suite** is often used to refer to the entire DoD (Department of Defense) protocol suite based upon these, including telnet (Remote Terminal Protocol), FTP (File Transfer Protocol) and UDP (User Datagram Protocol). (*Howe, 1999*)

**TCP (Transmission Control Protocol):** The most common **transport layer** protocol used on the **Ethernet** and the **Internet**. TCP is built on top of **IP (Internet Protocol)** and is nearly always seen in the combination **TCP/IP**. It adds reliable communication, flow control, **multiplexing** and connection-oriented communication. It provides full-duplex, process-to-process connections.

**IP (Internet Protocol):** The network layer for the **TCP/IP** protocol suite widely used on **Ethernet** networks. IP is a connectionless, best-effort **packet** switching

protocol. It provides packet routing, fragmentation and re-assembly through the data link layer.

(Howe, 1999)

**TCP/IP SUITE:** Members of the **Internet** community share a family of protocols called **TCP/IP**. The name is shorthand for a suite of protocols whose major members are TCP (transmission control protocol), a transmission layer procedure, and IP (internet protocol), a network layer procedure.

The five Layers of the TCP/IP suite of protocols are:

**Application Layer:** Interfaces user processes with lower level protocols.

**Transport Layer:** Contains protocols that establish, control and terminate network connections between data structure endpoints on source and destination hosts (**TCP** layer).

**Internet Layer:** Implements addressing that supports communication between network devices and provides routing for transmitting data between networks (**IP** layer).

**Datalink Layer:** Employs HDLC (High-level Data Link Control), LAP-B (Link Access Protocol-Balanced), LAP-D (Link Access Procedure on the D channel) and **IEEE 802.2** protocols.

**Physical Layer:** Incorporates a wide range of physical interfaces such as EIA232/449 (Electronics Industry Association; Standard RS-232/449), **ISDN** (Integrated Services Digital Network), **IEEE 802** and **ITU-T V.35** (International Telecommunications Union-Telecommunications Standards Sector; Standard V.35).

See also **OSI** (Open Systems Interconnection) Layers.

(Carne, 1995)

**TDMA (TIME DIVISION MULTIPLE ACCESS):** See **MULTIPLE ACCESS**.

**TOKEN-RING LOCAL AREA NETWORK:** A computer **LAN** arbitration scheme in which conflicts in the transmission of messages are avoided by the granting of tokens which give permission to send. A station keeps the token while transmitting a message, if it has a message to transmit, and then passes it on to the next station. Often, Token Ring is used to refer to the **IEEE 802.5** token ring standard which is the most common type of token ring. (Howe, 1999) -- A LAN in which each station is connected to two others so as to form a single-thread loop that connects all of the stations. Data is transferred around the ring from station to station. (Carne, 1995)

**TRANSPONDER:** A combination receiving and transmitting antenna on a communications satellite. A frequency converter is also including in the transmit/receive package which converts the uplinked signal frequency to a transmission or downlink frequency.

**TRANSPORT LAYER:** (See **OSI**)

**UNIX:** An interactive time-sharing operating system (OS) invented in 1969 by Ken Thompson of Bell Labs. Twenty-two years after its invention, Unix had become the most widely used multi-user general-purpose operating system in the world. It was the first source-portable OS. Unix is now offered by many manufactures and is the subject of an international standardization effort with the Unix trademark being owned by X/Open. A Unix reference desk may be found at <<http://www.geek-girl.com/unix.html>>. (Howe, 1999)

**USAT (ULTRA SMALL APERTURE TERMINAL):** Earth station satellite antenna with a diameter or cross-section dimension of about 50 cm or less.

**VGA (VIDEO GRAPHICS ADAPTER):** A video display standard for computer monitors which evolved from the CGA (computer graphics adapter) and EGA (enhanced graphics adapter) standards of the early 1980's. In 1987, IBM introduced the PC-AT computer which adopted a new display standard called VGA which allowed computer monitors to show integrated lifelike pictures using multiple shades of color. This standard uses **progressive line scanning**.

**VSAT (VERY SMALL APERTURE TERMINAL):** Earth station satellite antenna with a diameter or cross-section dimension in the general range of 1.2 to 2.4 meters.

**WIDEBAND:** The property of any communications facility, equipment, channel or system in which the range of frequencies used for transmission is greater than 0.1% of the midband frequency. Wideband is often used to distinguish it from narrowband , where both terms are subjectively defined relative to the implied context. The term also applies to the property of a circuit that has a bandwidth wider than normal for the type of circuit, frequency of operation or type of modulation. Synonymous with **Broadband**. (GSA, 1996)

**WIRELESS CABLE:** A multichannel broadcast service where the multiple channels are transmitted with frequency division multiplex (see **FDMA: FREQUENCY DIVISION MULTIPLE ACCESS**) in a manner similar to cable television. (Inglis & Luther, 1996)

**X-BAND:** A portion of the **RF spectrum** located between 7.25 GHz and 8.4 GHz which is dedicated to the United States Military for satellite communications.

**ZULU TIME:** (See **GMT-Greenwich Meridian Time**)

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