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## VSAT Glossary of Terms

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### A

Amplitude Modulation – The base-band signal is caused to vary in amplitude or height of the carrier wave to create the desired information content.

Amplifier – A device used to boost the strength of an electrical signal.

Analogue – A form of transmitting information characterised by continuously variable quantities, as opposed to digital transmission, which is characterised by discrete bits of information in numerical steps.

ADC – Analogue-to-Digital Conversion – A process of converting analogue signals to a digital representation. DAC represents the reverse translation.

Antenna – A device for transmitting and receiving radio waves. Depending on their use and operating frequency, antennas can take the form of a single piece of wire, a di-pole, a gride such as a yagi array, a horn, a helix, a parabolic dish.

ACU – Antenna Control Unit -The control unit for antenna tracking controls. Manufacturers include Seatel with their DAC 2202 series, Intellian, Orbit and SpaceTrack.

ACI – Adjacent Channel Interference – Unwanted electrical interference from signals that are immediately adjacent in frequency to the desired signal. This can arise due to imperfections in the transmission channel and/or equipment.

ACM – Adaptive Coding and Modulation uses an algorithm to dynamically change the coding and modulation scheme based on atmospheric conditions and network configurations.

AES – Advanced Encryption Standard is an encryption standard comprised of three blocks of ciphers AES-128, AES-192, and AES-256

APIU – Antenna Position Indicator – The digital position indicator normally on or near the ACU.

Aperture – A cross sectional area of the antenna which is exposed to the satellite signal.

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**Apogee** – The point in an elliptical satellite orbit which is farthest from the surface of the earth. Geosynchronous satellites which maintain circular orbits around the earth are the first launched into highly elliptical orbits with apogees of 22,237 miles or 35,787Km.

**AKM** – Apogee Kick Motor – A rocket motor fired to circulate orbit and deploy a satellite into geosynchronous orbit.

**Assignment Channel** – A channel carrying assignment information in the Intelsat TDMA system.

**Attenuation** – The loss in power of electromagnetic signals between transmission and reception points.

**Attitude Control** – The orientation of the satellite in relationship to the earth and the sun.

**Audio Subcarrier** – A carrier between 5MHz and 8MHz containing audio (or voice) information inside of a video carrier.

**AFC** – Automatic Frequency Control – A circuit which automatically controls the frequency of a signal.

**AGC** – Automatic Gain Control – A circuit which automatically controls the gain of an amplifier so that the output signal level is virtually constant or a varying input signal levels.

**AZ/EL Mount** – Antenna mount that requires two separate adjustments to move from one satellite to another.

**Azimuth** – The angle of rotation (horizontal) that a ground based parabolic antenna must be rotated through to a specific satellite in geosynchronous orbit. Can be true or relative azimuth.

## **B**

**B-Mac** – A method of transmitting and scrambling television signals. In such transmissions MAC (Multiplexed Analogue Component) signals are time-multiplexed with a digital burst containing digitised sound, video synchronising, authorisation and information.

**Backhaul** – A terrestrial communications channel linking an earth station to a local switching network or population centre.

**BO** – Backoff – The process of reducing the input and output power levels of a travelling wave tube to obtain more linear operation.

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**Band Pass Filter** – An active or passive circuit which allows signals within the desired frequency band to pass through but impedes signals outside this pass band from getting through.

**Bandwidth** – A measure of spectrum (frequency) use or capacity. For example, a voice transmission by telephone requires a bandwidth of about 3000 cycles per second (3 KHz)...read more.

**Baseband** – The basic direct output signal in an intermediate frequency based obtained directly from a television camera, satellite television receiver, or video tape recorder...read more.

**Baud** – The rate of data transmission based on the number of signal elements or symbols transmitted per second. Today most digital signals are characterized in bits per second (bps).

**Beacon** – A low power and highly stable carrier signal, which is used by earth stations equipped with an automatic (satellite) tracking system. Beacons can be generated on-board the satellite, or transmitted from the ground and relayed through the satellite. When generated on-board the satellite, they are also known as satellite or on-board beacons and sometimes carry telemetry signals.

**Beam** – A unidirectional flow of radio waves concentrated in a particular direction. A term commonly used to refer to an antenna's radiation pattern by analogy with a light beam. It is most often used to describe the radiation pattern of satellite antennas. The intersection of a satellite beam with the earth's surface is referred to as the (beam's) footprint.

**Beamwidth** – A measure of the ability of an antenna to focus signal energy towards a particular direction in space (e.g. towards the satellite for a ground-based transmitting antenna), or to collect signal energy from a particular direction in space (e.g. from the satellite for a ground-based receiving antenna). The beamwidth is measured in a plane containing the direction of maximum signal strength. It is usually expressed as the angular separation between the two directions in which the signal strength is reduced to one-half of the maximum value (the -3 db half-power points).

**Bel** – The unit of which the Decibel (dB) is one tenth.

**Bird** – Slang for a communication satellite located in geostationary orbit.

**Bit** – A single digital unit of information (e.g 1 or 0).

**BER** – Bit Error Rate – The fraction of a sequence of message bits that are in error. A bit error rate of  $10^{-6}$  means that there is an average of one error per million bits.

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**Bit Rate** – The speed of a digital transmission, measured in bits per second (bps).

**BNC Connector** – A twist-lock coaxial connector that is commonly used on commercial video equipment and on some brands of satellite receiver. Can be 50 or 75Ω and one way tell tell which type you have is to look at the size of the centre pin on the BNC connector or it may be printed on the outer sheath of the cable.

**BDC – Block Down Converter** – A device used to convert the C or Ku band signals down to UHF or lower frequencies (1 GHz and lower).

**BUC – Block Up-Converter** – Earth station transmitter combining signal up-conversion and power amplification in a single unit, normally located directly at the antenna input, or close to it. Typically converts the L band signal form the satellite modem to C or Ku band frequencies.

**Byte** – A sequence of bits processed as one unit of information. A byte is a digital “word” normally consisting of eight bits (e.g 11110000).

## **C**

**C Band** – This is the band of frequencies between 4 to 8 GHz with the 6 GHz and 4 GHz band used for satellite communication. Specifically, the 3.7 to 4.2 GHz satellite communication is used for the downlink frequencies in tandem with the 5.925 to 6.425 GHz band that serves as the uplink. Satellite Frequency bands in detail.

**C/I – Carrier to Interference Ratio – Carrier-to-Interference-Ratio.** A measure of the quality of a signal at the receiver input. It is the ratio of the power of the carrier to the power of interference arising from man-made sources, measured within a specified bandwidth (usually the modulated carrier’s bandwidth). It is usually expressed in decibels. The higher the ratio, the better quality of the received signal.

**C/N – Carrier to Noise Ratio -Carrier-to-Noise-Ratio.** A measure of the quality of a modulated carrier at the receiver input. It is the ratio of the power of the carrier to the power of the noise introduced in the transmission medium, measured within a specified bandwidth (usually the modulated carrier’s bandwidth). It is usually expressed in decibels. The higher the ratio, the better quality of the received carrier.

**C/T – Carrier to Temperature Ratio** – The ratio normally used to quantify noise contributions.

**Carrier** – The basic radio, television or telephony centre of frequency transmit signal. The carrier in an analogue signal is modulated by manipulating its amplitude (make it louder or softer) or its frequency (shifting it up or down) in relation to the incoming signal. Satellite carriers operating in the analogue mode are usually frequency modulated.

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**Carrier Frequency** – The main frequency on which a voice, data or video signal is sent. Microwave and satellite communications transmitters operate in the band from 1 to 14GHz (a GHz is one billion cycles per second).

**Cassegrain Antenna** – The antenna principle that utilises a sub-reflector at the focal point which reflects energy to or from a feed located at the apex of the main reflector.

**CDMA – Code Division Multiple Access** – Code Division Multiple Access refers to a multiple-access scheme where stations use spread-spectrum modulations and orthogonal codes to avoid interfering with another.

**Channel** – A band of radio frequencies assigned for a particular purpose, usually for the establishment of one complete communication link, or a path for an electrical signal. This term is often used interchangeably with Transponder, but in general the channel bandwidth is less than the transponder bandwidth.

**CinC – Carrier in Carrier** -This is one of the latest techniques the satellite industry has adopted to enable customers to save on bandwidth costs. It allows a full duplex satellite link to be allocated the same transponder space as a single carrier using Applied Signals patented technology – Adaptive Cancellation – to place carriers directly on top of one another in terms of frequency. [Read More...](#)

**Circular Polarisation** – A circularly-polarised wave, in which the electric field vector, observed in any fixed plane normal to the direction of propagation, rotates with time and traces a circle in the plane of observation. Unlike linear polarisation, circular polarisation does not require alignment of earth station and satellite antennas with the polarisation of the radio waves.

**Clamp** – A video processing circuit that removes the energy dispersal signal component from the video waveform.

**Clarke Orbit** – The circular orbit at approximately 35,800 km above the equator, where the satellites travel at the same speed as the earth's rotation (Geostationary Orbit) and thus appear to be stationary to an observer on Earth. Named after Arthur C. Clarke who first postulated the idea of geostationary communication satellites.

**Clear Sky** – A term describing the weather conditions encountered at the terrestrial end of an earth-space path of a satellite communication link. It is used to describe the condition where the attenuation of radio waves caused by precipitation (rain, snow, sleet, dew, etc.) is lowest (cloud-free sky and good visibility).

**C/N – Carrier to Noise Ratio** – is measured either at the Radio Frequency (RF) or Intermediate Frequency (IF).

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**Coaxial Cable** – Commonly shortened to Coax. A cable consisting of an inner insulated core of stranded or solid wire surrounded by an outer insulated flexible wire braid. Used principally as a transmission line for radio frequency signals with low loss. Often referred to as screened cable because the outer braid screens the inner conductor from electrical interference. How To: Terminate an F-type connector on a coax cable.

**Codec** – Coder/Decoder system for digital transmission.

**C0-Location** – Ability of multiple satellites to share the same approximate geostationary orbital assignment, frequently due to the fact that different frequency bands are used.

**Colour Subcarrier** -A sub-carrier that is added to the main video signal to convey the colour information. In NTSC systems the colour sub-carrier is centred on a frequency of 3.579545MHz, referenced to the main video carrier.

**Common Carrier** – Any organisation which operates communications circuits used by other people. Common carriers include the telephone companies as well as the owners of satellites, Comsat, Direct Net, AT&T and others.

**Coverage** – The geographical area in which satellite signals can be transmitted or received with sufficient quality when using appropriately sized earth stations. Satellite coverage is usually communicated in the form of footprints displaying satellite G/T, EIRP or other quantity, such as the antenna size required for good quality reception of a particular service.

**Cross Modulation** – A form of signal distortion in which modulation from one or more RF carrier(s) is imposed on another carrier.

**C/T** – Carrier to Noise Temperature Ratio.

**D**

**E**

**F**

**G**

**Gain** – A measure of amplification expressed in dB

**GEO** – Geostationary Earth Orbit satellites orbit at 35,786 km (22,282 mi) above the equator in the same direction and speed as the earth rotates on its axis, making them appear as fixed in the sky

**GSM** – Global System for Mobile communications is a standard for digital wireless communications to mobile phones

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**GQoS** – Group Quality of Service is iDirect’s bandwidth allocation and prioritization algorithm that allows for countless possibilities of quality of service levels, bandwidth management and traffic prioritization

**G/T** – A figure of merit of an antenna and low noise amplifier combination expressed in dB. “G” is the gain of the system and “T” is the noise temperature. The higher the G/T, the better the system

**Guard Band** – Transmission carriers are separated on a transponder by spacing them several kilohertz apart. This unused space serves to prevent the adjacent transmission carriers from interfering with each other

**GUI** – Graphical User Interface is a type of user interface that allows users to interact with electronic devices using images rather than text commands

## **H**

**HNO** – Host Network Operator is a network operator who leases out hub space to smaller service providers

**HTS** -High Throughput Satellites is a classification for communications satellites that provide at least twice, though usually by a factor of 20 or more, the total throughput of a classic Fixed Satellite Service (FSS) satellite for the same amount of allocated orbital spectrum thus reducing cost-per-bit

**HTTP** – Hyper Text Transfer Protocol is an application level protocol used to request and transfer objects across the web

**Hub** – Satellite network equipment that controls the satellite bandwidth allocation, often located at a teleport. It usually consists of a chassis and other equipment connected to terrestrial networks

## **I**

**IDU** – Indoor Unit is network equipment typically located inside a building that consists of a modem and router (or hub if it is inside a teleport) connected to the corporate LAN or terrestrial infrastructure

**IP** – Internet Protocol is a protocol used for data communication across a packet switched network. Typically used with TCP, a higher level protocol

**ISO** – International Organization for Standardization is a standard setting body composed of multiple national standards organizations

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ISP – Internet Service Provider is a company that offers Internet access to customers

ITU – International Telecommunication Union is a United Nations organization helping governments and private organizations coordinate global telecommunications usage

Inbound – Transmission of a signal to the satellite. In a network it is typically referred to as the transmission from the remote router to a satellite to a hub

Inroute – See Inbound

iNFINITI – iDirect's product line of routers and line cards, built on iDirect's proprietary implementation of the TDM protocol

## **J**

## **K**

Ka Band – Frequency band with uplink 26.5-40GHz; downlink 18-20 GHz, this band was previously known for consumer broadband applications and is now widening to enterprise and military use. Satellite Frequency bands in detail.

kbps – Kilobits per second. Refers to transmission speed of 1,024 bits per second is 1kbps.

Ku Band – Frequency band with uplink 14 GHz; downlink 10.9-12.75 GHz, with more powerful transmission from the satellite more susceptible to rain fade than C-Band. Satellite Frequency bands in detail.

## **L**

L-Band – The frequency range from 500 MHz to 1.5 GHz. Also used to refer to the 950 MHz to 1450 MHz used for mobile communications.

LDPC – Low Density Parity Check is a forward error correction code that is currently the most efficient scheme, used with DVB-S2

LEO – Low Earth Orbit satellites orbit from 160 to 2000 km above the earth and take approximately 1.5 hrs for a full orbit and only cover a portion of the earth's surface

LHCP – Left Hand Circular Polarisation.

LAN – Local Area Network is a computer network that covers a small physical area

Leased Line – A dedicated circuit typically supplied by the communications company.

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**LNA – Low Noise Amplifier** – This is a preamplifier between the antenna and the earth station receiver. For maximum effectiveness, it must be located as near to the antenna as possible and is usually connected to the antenna receive port.

**LNB – Low-Noise Block** – A low-noise block (or LNB) is the receiving device mounted on the feed of satellite dishes, which collects the radio waves from the dish. [LNB Page](#).

**LNC– Low Noise Converter**

## **M**

**MEO – MEO satellite orbits** are located above LEO and below GEO satellites and typically travel in an elliptical orbit over the North and South Pole or in an equatorial orbit

**Mesh Network** – Topology whereby a remote VSAT location communicates with another remote location without routing through the hub

**MF-TDMA – Multiple-Frequency Time Division Multiple-Access** is a broadband access method where different data streams are put into different slots that are separated by both frequency and time

**MIR – Maximum Information Rate** is the theoretical maximum amount of bandwidth available to a subscriber, typically expressed in kilobits per second

**Modem** – A piece of network equipment containing a modulator and demodulator for receiving or transmitting satellite signals

**Modulation** – The encoding of a carrier wave by amplitude or frequency or phase

**Modulator** – A device which modulates a carrier

**Multicast** – Multicast is a subset of broadcast whereby the signal can be sent to many sites within a defined group, but not necessarily to all sites in that group

**Multicast FastPath** – iDirect feature that allows the transmission of the same data to a select group of workstations, improving multicast performance by bypassing most regular processing and forwarding the data directly to the Ethernet port

**Multi-Channel Demodulation (MCD)** – iDirect feature on certain line cards (e.g. XLC-M) that allows multiple TDMA or SCPC channels to be received by a single line card, improving hub scalability

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Multiplexing – Sending multiple signals or streams of information on a carrier simultaneously transmitting on a single signal

## **N**

Narrowband – Refers to satellite communications of 128 kbps or lower (per Frost & Sullivan)

NOC – Network Operations Center is a centralized location where control over operation of a network is managed and monitored

Noise – Any unwanted and unmodulated energy that is always present to some extent within any signal

NMS – Network Management System is the hardware and software that monitors and controls a satellite network

NTP – Network Time Protocol is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks

## **O**

ODU – Outdoor Unit – An ODU is the equipment located outside of a building and includes the satellite antenna or dish, a low noise block converter (LNB), and a block-up-converter (BUC). The LNB converter amplifies the received signal and down converts the satellite signal to the L band (950 MHz to 1550 MHz), while the BUC amplifies the uplink transmission when the antenna is transmitting.

OSS – Operational Support System refers to network systems dealing with the telecom network itself, supporting processes such as maintaining network inventory, provisioning services, configuring network components, and managing defaults

Outbound – Transmission of a signal from the satellite to an antenna. In a network it is typically referred to as the transmission from the hub to a satellite to a remote router

## **P**

PBX – A Private Branch Exchange is a telephone exchange that connects a private enterprise or organization to the public switched telephone network

PCMA – The Paired Carrier Multiple Access (PCMA) Hub Cancellor is a satellite signal canceller that maximizes the capacity of satellite networks by using ViaSat's patented PCMA technology to reduce satellite bandwidth as much as 50 percent

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**PDU** – Power Distribution Unit is a device fitted with multiple outlets designed to distribute electric power, especially to racks of computers and networking equipment located with the data center

**Phase-Locked Loop (PLL)** – A type of electronic circuit used in a wide variety of telecommunications equipment. PLL circuits generate an output signal which is phase-locked to an input signal, leading to more stable output frequencies that are less affected by noise and temperature. For example, the frequency output from a PLL LNB will be more stable than the output from a regular LNB

**Polarization** – A technique used by satellite operators to reuse the satellite transponder frequencies when transmitting these signals to Earth. Two methods are possible: linear and circular. To successfully receive and decode these signals on earth, the antenna must be outfitted with a properly polarized linear or circular feedhorn to select the signals as desired

**PSK** – Phase Shift Key is a digital modulation scheme that changes the phase of the carrier wave

**PSTN** – Public Switched Telephone Network is an international network for public circuit-switched voice telephony

## **Q**

**QEF** – Quasi Error Free is a condition where the transmission system or storage medium used to transfer a signal has a relatively low bit error rate

**QoS** – Quality of Service provides priority and guarantees a certain level of network response time and other performance factors for each application and user

**QPSK** – Quadrature Phase Key Shifting is a modulation scheme that uses four phases

## **R**

**Rain Fade** – Decrease of satellite signal strength due to rainfall. This occurs typically at Ku and Ka Band frequencies due to its increased sensitivity to noise temperature

**RF** – Radio Frequency is the electromagnetic frequencies for wireless transmission that is above the audio range and below infrared light; typically used in the satellite industry in the context of RF equipment (antenna system and BUC)

**RIP** – Routing Information Protocol is a dynamic routing protocol used in local area and wide area networks

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**Router** – A device connected to the modem and the antenna on one side and the computers and other LAN devices on the other side. It forwards IP packets based on network layer information and enables applications such as VoIP, Video and data

**RTTM** – Real Time Traffic Management is an iDirect feature set that is designed to enable high-quality transmission of voice applications that are less tolerant to delay or jitter that can occur on satellite links

## **S**

**Satellite** – Communications satellites orbit the earth and transmit and receive radio signals from earth stations

**SCADA** – Supervisory Control and Data Acquisition is the system that monitors and controls industrial or facility based remote devices

**Single-Channel-Per-Carrier (SCPC)** – A satellite access method that dedicates one channel to each remote site, sometime used for very high capacity links. See also TDMA

**Signal To Noise Ratio (S/N)** – The ratio of the signal power and noise power. The higher the number the better the quality

**Single Hop** – Transmission of information from one remote site to another antenna. Typically it describes the path between two remote stations in a mesh network. Single hop occurs when transmission is passed from one remote directly to another mote without having to go to the hub (double hop)

**SNG** – Satellite news gathering typically done from a transportable unit (truck or mobile entity) to transmit video and voice feeds back to the studios

**Space Segment** – The portion of the satellite bandwidth and transmission power assigned to the communication network

**Spot Beam** – A spot beam is a satellite signal that covers a concentrated geographic area so only antennas in that area will receive the signal

**Spread Spectrum** – Eliminates adjacent satellite interference by spreading the signal over the available bandwidth to enable extremely small antennas or phased array antennas in mobile operations

**Star Network** – Topology whereby a remote VSAT location communicates with another remote location by routing through the hub

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**Symbol Rate** – Symbol Rate (SR) is the number of symbol changes per second made to the signal according to the modulation coding method (ModCod) used, each symbol represents 1, 2, 3, 4, etc. bits of transmission rate data. Symbol Rate Calculation Formula

## T

**TCP** – Transmission Control Protocol is a core Internet protocol that is a higher level protocol often combined with IP

**TDM** – Time Division Multiplex is a type of digital multiplexing in which two or more signals are transferred simultaneously as sub-channels in one communication channel, but are physically taking turns on the channel through several recurrent timeslots of fixed length

**TDMA** – Time Division Multiple Access is channel access method that allows applications or users to share the same frequency by dividing the full bandwidth into specific timeslots

**Transponder** – Receives outbound signal at the satellite and amplifies the signal before retransmitting it to an earth station

**TRANSEC** – Transmission Security secures VSAT transmissions with encryption to prevent from interception and exploitation

## U

**Unicast** – Transmission between a single sender and a single receiver over a network. Contrast with Multicast, which is transmission between a single sender and multiple receivers.

**Uplink** – Transmission of a signal from the remote router to a satellite to a hub

## V

**VLAN** – Virtual LAN is a group of hosts that simulates a LAN although they are not located locally on the same network switch

**VNO** – Virtual Network Operators lease hub space from HNOs while keeping complete control of their network and their remotes. iDirect offers this capability by assigning each VNO operator its own line cards and NMS servers and protocol processors. The VNO commissions, controls and operates its remote sites in the proprietary network as if it owns a physical hub

**VSAT** – Very Small Aperture Terminal is an antenna that is typically less than 3 meters in diameter

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Vertical Polarisation – Type of linear polarisation where the electric field is approximately aligned with the local vertical plane at an on-ground transmission or reception point

## **W**

WAN – Wide Area Network is a computer network that covers a broad area that connects multiple remote locations

WGS – Wideband Global Satcom is a satellite communication system used by the U.S. Department of Defense

## **X**

X band -uplink 7.9- 8.4 GHz, downlink 7.25 – 7.75 GHz

The X band is used mainly for military communications and Wideband Global SATCOM (WGS) systems. With relatively few satellites in orbit in this band, there is a wider separation between adjacent satellites, making it ideal for Comms-on-the Move (COTM) applications. This band is less susceptible to rain fade than the Ku Band due to the lower frequency range, resulting in a higher performance level under adverse weather conditions. Satellite Frequency bands in detail.

X-Polarisation – A more precise definition of horizontal linear polarisation. X-polarisation is defined with respect to a particular direction from the satellite towards the earth, allowing precise calculation of the polarisation alignment angle for any given geographic location

## **Y**

Y-Polarisation – A more precise definition of vertical linear polarisation. Y-polarisation is defined with respect to a particular direction from the satellite towards the earth, allowing precise calculation of the polarisation alignment angle for any given geographic location

## **Z**

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