

ID, 1-D One-dimensional

2d, 2D, 2-D Two-dimensional

2 DRMS, 2drms

Two dimensional (or distance) root mean square; analogous to a 2D 2-standard deviation statistic. 2DRMS represents a 2-dimensional ellipse containing 95% (or greater) of the independent, uncorrelated position points in a measurement distribution. It may also represent the 2D, 2σ accuracy of a navigation system.

3D, 3-D Three dimensional

Absolute Positioning

Positioning mode in which a position is identified with respect to a well-defined coordinate system, commonly a geocentric system (i.e., a system whose point of origin coincides with the center of mass of the earth).

A/C Aircraft

Accuracy (in GPS)

The degree of conformance between the estimated or measured position, velocity, and/or time of a GPS receiver determination and its true position, time and/or velocity using an accepted standard. Radionavigation accuracy is usually presented as a statistical measure of error and can be characterized as follows:

- **Predictable Accuracy** - The accuracy of a radionavigation system's position solution with respect to the geodetic, or the most accurately known, position information. Both the navigation system position solution and the reference information must be based upon or converted to the same measurement datum.
- **Repeatable Accuracy** - The accuracy with which a user of a navigation system can return to a position. The position is one whose coordinates have been measured at a previous time with the same navigation system.
- **Relative Accuracy** - The accuracy with which a user can determine position relative to that of another user of the same navigation system at the same time. For real time applications, this normally requires the use of a data link between both user systems.

ACSM American Congress of Surveying & Mapping

ACU Antenna Control Unit

A/D Analogue/Digital [or Analogue to Digital (converter)]

ADC Analogue to Digital Converter

ADF Automatic Direction Finder

ADI Altitude Direction Indicator

ADR Accumulated Delta Range

ADS Automatic Dependent Surveillance

AE Antenna Electronics

AEEC Airlines Electronic Engineering Committee

AES Aerospace and Electronics Systems Society

AFB Air Force Base

AFCRL Air Force Cambridge Research Laboratory (now Phillips Laboratory)

AFGD Air Force Geophysics Directorate (was AFCRL)

AFI Automatic Fault Indication

AFS Air Force Station

A/G Air to Ground

AFSCF	Air Force Satellite Control Facility
AGD	Australian Geodetic Datum
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
AIMS	Airspace Information Management System
ATCRBS	Air Traffic Control Radar Beacon System
AJ	Anti-Jamming
AKM	Apogee Kick Motor (See "Apogee")

Almanac

A data file for a given constellation that contains coarse orbit information for all satellites. At times the almanac is considered to also include clock corrections and atmospheric delay parameters but these are provided in separate subframes of the GPS data message. The almanac is transmitted by GPS satellites to facilitate rapid satellite acquisition by GPS receivers.

Almanac Data

A set of parameters similar to the more precise ephemeris data, used for approximating the GPS satellite orbits.

Ambiguity or carrier cycle ambiguity

The number (N) of whole carrier signal wavelengths(cycles) between a GPS satellite and a GPS receiver or a defined part of the path. This is important in the use of relative carrier phase measurement techniques.

Analog or Analogue

A type of transmission characterized by variable values representing information, contrasted with the typical binary or n-ary characteristics of digital data. A clock with moving hands is an analog device, whereas a clock with electronically displayed numbers is a digital device. Modern computers are invariably digital, but when they communicate over telephone lines, their signals normally must be converted to analog form using a modem (a modulator/ demodulator). The analog signal is converted back to a digital form before being delivered to the destination computer.

Anti-Spoofing

Anti-spoofing (A-S) in GPS is the process whereby the P-codes used in the precise positioning service (PPS) are encrypted. The resulting encrypted codes are known as the Y-code. The Y-codes can be used only by receivers with decryption capability. This mode of operation provides protection to equipped GPS user equipment from signal spoofing, or the transmission of signals replicating the true GPS signals, by adversaries and others. The use of these signals can cause hazardous and misleading information to GPS users unless anti-spoofing methods, such as signal encryption, are employed.

Anywhere Fix (GPS)

The ability of a GPS receiver to start position calculations without being given an approximate location and time.

AoA	Analysis of Alternatives
AOC	Analysis of Output
AOL	Airborne Optical Laser
AOPA	Aircraft Owners and Pilots Association
APL	Airport pseudolites

Apogee (GPS)

The point in the elliptical orbit of a satellite that is the greatest distance from the center of the earth.

Application Software

These programs accomplish the specialized tasks of the user, while operating system software allows the computer to functionally operate as designed. A computer-aided dispatch system is application software, as are word processing and graphics programs.

APT	Asia Pacific Telecommunity
ARCS	Automatic Route Control System
ARNS	Aeronautical Radionavigation Service (a band in the radio spectrum)
ARINC	Aeronautical Radio, Inc.
ARTCC	Air Route Traffic Control Center (FAA facility)
A-S	Anti-Spoof (see "Spoofing")
ASAT	Anti-Satellite
ASCII	American Standard Code for Information Interchange
ASIC	Application Specific Integrated Circuit
ASOS	Automated Surface Observing System
A&T	Acquisition and Technology
ATC	Air Traffic Control
ATE	Automatic Test Equipment
ATM	Air Traffic Management

Atomic Clock

Any of a variety of highly stable, precise and accurate timekeeping devices that are based typically on the state transition behavior of particular elements such as cesium, hydrogen and rubidium in their gaseous phase.

ATON	Autonomous Navigation
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Attenuation

Reduction in the strength or amplitude of a signal.

Automatic Vehicle Location, AVL

A type of system to track or automatically locate a vehicle.

Availability

The percentage of time over a defined interval that the services of a navigation system can be used within a particular coverage area while meeting specific user requirements. Signal availability is the percentage of time that navigational signals transmitted from external sources are available for use and meet specific operational performance requirements.

AVCS	Attitude and Velocity Control System
AVL	Automatic Vehicle Location
AVLN	Automatic Vehicle Location and Navigation
AWOS	Automated Weather Observing System

Bandwidth

The range of frequencies included in a radio signal, usually specified as greater than a given power level (such as a half power level, or – 3dB.) It is expressed in Hertz (Hz) with the relative power level at band extremes normally specified.

Baseline

A baseline consists of the three dimensional vector between a pair of GPS stations. Also, the vector distance between two points.

Base Station (GPS)

A base station is a GPS receiver at a known position specifically established to collect differential correction data for other GPS receivers in a given region. Base station data is used to calculate the errors relative to its known position which are provided to other users. The “relative difference” between the base station’s known position and the position calculated from GPS satellite signals become the basis for the corrections provided to other GPS receivers. Corrections can be transmitted in real-time, or used during later post-processing. A base station is also called a reference station.

BBS Computer Bulletin Board Service

BCD Binary Coded Decimal

BIH Bureau International de L’Heure

BIPM International Bureau of Weights and Measures (Bureau de Poids et Mesures).

Bit A binary 1 or 0 or one of the two states possible in a binary digital sequence.

Block I, II, IIR, IIF Satellites or Spacecraft (S/C)

The various generations of GPS satellites: Block I spacecraft (S/C) were developmental satellites that began launch in February, 1978; Block II and IIA S/C are operational spacecraft used to populate the 24 operational slots in the NAVSTAR baseline constellation; Block IIR and IIR-M S/C are replenishment satellites; and Block IIF S/C are the follow-on generation of GPS S/C.

BPSK Bi-Phase Shift Keying

bps Bits Per Second

BTS Bureau of Transportation Statistics

C3I Command, Control, Communications and Intelligence

C/A-Code Coarse/Acquisition-Code

CAA Civil Aviation Authority (UK)

CAD Computer Aided Design

CADC Central Air Data computer

Carrier

The fundamental unmodulated RF signal. A radio signal having frequency and amplitude that may be varied from a reference value by modulation.

Carrier-Aided Tracking

A signal processing technique that uses certain characteristics of the GPS carrier signal (especially its Doppler shift) to provide a low noise signal for aiding the pseudorandom codes.

Carrier Frequency

The frequency of the unmodulated fundamental signal. The GPS L1 carrier frequency is 1575.42 MHz.

Carrier Phase Measurement

Relating to the relative phase difference measurement between two or more GPS carrier signals.

Cartesian/Geocentric Coordinates

A system of defining position which has its origin at the center of the earth with the x- and y-axes in the plane of the equator. Typically, the x-axis passes through the meridian of Greenwich, and the z-axis coincided with the agreed upon value for the earth’s axis of rotation.

CDMA Code Division Multiple Access

CDU Control Display Unit

CEP Circular Error Probable

CEPT European Conference of Posts & Telecommunications

Cesium Clock (Cs Clock)

An atomic clock based on the atomic transitions in gaseous cesium. Cesium Beam Automatic Standard Clock)

Channel

A channel of a GPS receiver consists of the signal and operations on the signal from a single GPS satellite.

Chip

The period or interval of time to transmit either a "0" or a "1" in a binary sequence. An integrated circuit.

Chipping rate

The bit rate, or rate at which binary digits are produced. Expressed as chips per second (cps). For example, the C/A-code chipping rate is 1.023 Mcps.

CGIC Civil GPS Information Center (at the NAVCEN, Alexandria VA)

CIGNET Cooperative International GPS Network

CGSIC Civil GPS Service Interface Committee

Circular Error Probable - CEP

In a circular normal distribution, the radius of the circle that contains 50 percent of all the random samples in a 2-D region.

CIS Conventional Inertial System

Clock bias

The difference between the GPS receiver clock's time and GPS time as established by the control segment.

Clock Offset

The difference in the time reading between two clocks.

Cm Centimeter

CMOS Complementary Metal Oxide Semiconductor

C/No Carrier Energy to Noise Density Ratio

CNS Communications, Navigation and Surveillance

Coarse/Acquisition-Code

The coarse/acquisition-code is modulated onto the GPS L1 signal. This code is a sequence of 1023 pseudorandom binary bits modulated on the GPS carrier at a chipping rate of 1.023 Mcps, resulting in a code repetition period of 1 millisecond. The code was selected to provide good acquisition properties. Also known as the "civil code since it is the only GPS signal generally used by the civil community."

Code Division Multiple Access - CDMA

A method of frequency reuse whereby many radios use the same frequency but each one has a unique code. GPS uses CDMA techniques with Gold codes to obtain excellent cross-correlation properties.

Code Phase GPS

GPS measurements based on the pseudo random code [C/A or P(Y)] as opposed to the use of the carrier of the signal.

Comm Communications

Continuous Tracking Receiver

A receiver design which includes four or more channels to simultaneously track four or more satellites.

Control Point

A point at which coordinates have been assigned that are of an agreed upon confidence level.

Control Segment

A world-wide network of GPS monitor and control stations responsible for maintaining the the accuracy of satellite positions, clocks, and health.

CONUS Continental United States (48 states, not including Hawaii or Alaska)

Coordinate System

One of a number of systems used to represent positions in space. Examples are latitude/longitude/altitude and state plane coordinates.

CORS Continuously Operating Reference Station

Cos Cosine

CRPA Controlled Radiation (reception) Patterned Antenna

CPFF Cost Plus Fixed Fee

CPM See Carrier Phase Measurement

Cps Chips per second

CRT Cathode Ray Tube

Cs Cesium

CS *Control Segment*

CSOC Consolidated Space Operations Center (at Schriever AFB, Colorado Springs, CO)

CW Continuous Wave

Cycle Slip

A discontinuity in the measured carrier phase usually resulting from a temporary loss-of-lock in the carrier tracking loop of a GPS receiver.

DAC Digital to Analog Converter

Data Message (GPS)

A message included in the GPS signal which reports the observed satellite's ephemeris, or predicted path, clock corrections and health. Includes almanac data that provides approximate information on the paths of other satellites and other status information.

Db Decibel

Datum

A datum is a horizontal or vertical reference system for making survey measurements and computations. Horizontal datums are frequently ellipsoids. Improving technology has led to more precise values for the geographic points over time; to use recently collected data in conjunction with preexisting data, it is necessary to match datum and coordinate systems between the data sets. Some examples of datums are NAD-27 and WGS-84 (North American Datum 1927, World Geodetic System, 1984).

Differential GPS Positioning- DGPS

A technique used to improve positioning or navigation accuracy by canceling the common components of positioning error between a known location and a remote location. This is accomplished in near real-time by the transmission of a differential correction to the remote receiver by the use of a data link.

Digital

Generally, information is expressed, stored and transmitted by either analog or digital means. In a digital form, this information is seen as information in a binary (or n-ary) sequence.

Dilution of Precision - DOP

The multiplicative factor that relates ranging errors to position errors caused by the geometry of the user and the set of satellites in view at the time. Standard terms for the GPS application are: GDOP: Geometric (3 position coordinates plus clock offset in the solution) PDOP: Position (3 coordinates) HDOP: Horizontal (2 horizontal coordinates) VDOP: Vertical (height only) TDOP: Time (clock offset only) RDOP: Relative (normalized to 60 seconds).

Distance Root Mean Square - drms

The root-mean-square value of the distances from the true position in a collection of measurements. As typically used in GPS positioning, 2 drms is the radius of a circle that contains 95 percent of a large set of independent measurements.

Dithering

The deliberate introduction of digital noise. This is the process the DoD used to add inaccuracy to GPS signals to induce Selective Availability.

Doppler-Aiding

A signal processing strategy that uses measured Doppler shift data to help the receiver smoothly track the GPS signal, providing a more precise measurement of velocity and position.

Doppler Shift

The apparent change in the frequency of a signal caused by the relative motion between the transmitter and receiver.

<i>D to A, D/A</i>	Digital to Analog
<i>DARPA</i>	Defense Advanced Research Projects Agency
<i>DBw, dBw</i>	Decibels Relative to a Watt
<i>DBm, dBm</i>	Decibels Relative to a milliwatt
<i>Deg</i>	Degree
<i>DGPS</i>	Differential GPS
<i>DL</i>	Data link
<i>DMA</i>	Defense Mapping Agency (Now NIMA)
<i>DME</i>	Distance Measuring Equipment
<i>DOC</i>	U.S. Department of Commerce
<i>DoD, DOD</i>	U.S. Department of Defense
<i>DOI</i>	U.S. Department of the Interior
<i>DOJ</i>	U.S. Department of Justice
<i>DOP</i>	Dilution of Precision (See Dilution of Precision)
<i>DoT, DOT</i>	U.S. Department of Transportation
<i>DPR, dPR</i>	Differential pseudorange
<i>DPRC</i>	Differential pseudorange correction
<i>DR</i>	Delta Range or Dead Reckoning, Deduced Reckoning
<i>DRMS</i>	Distance Root Mean Square
<i>DRS</i>	Dead Reckoning System
<i>DSARC</i>	Defense Systems Acquisition Review Committee
<i>DTC</i>	Dry Term Correction (in troposphere)
<i>DT&E</i>	Development, Test and Evaluation

Earth-Centered Earth-Fixed Coordinate System, ECEF

A Cartesian coordinate system where the x-direction is in the direction of the intersection of the prime meridian (Greenwich Longitude) with the equator. The z-axis is the agreed upon direction of the Earth's spin, or the earth's geographic polar, axis. The y-axis is in the direction of advance of a right-handed screw when the x-axis is rotated in the direction of the z-axis. The position vectors rotate with the earth and all positions in this reference frame are relative to the rotating earth (e.g., the fixed Latitude and Longitude) coordinate system.

Eccentricity

The ratio of the distance between foci of the ellipse to the major axis distance. Or, the ratio of the distance from the center of an ellipse to a foci divided by the semi-major axis distance.

<i>EC</i>	European Commission
<i>ECDIS</i>	Electronic Chart Display & Information System
<i>ECEF</i>	Earth-centered, Earth-fixed
<i>ED</i>	European Datum
<i>EDM</i>	Electronic Distance Measurement
<i>EFIS</i>	Electronic Flight Instrument System
<i>EIRP</i>	Effective Instantaneous Radiated Power

Elevation

The height above a reference point or the distance measured normal to a reference frame. For example, altitude is frequently considered as the height above mean sea level, or the vertical distance above the geoid.

Elevation Angle

An angle measured above and relative to the horizon.

Elevation Mask Angle

Usually a user definable angle (in degrees) below which data measurements from a satellite will not be used. The mask angle value is typically set to avoid excessive degradation of the signal from the effects of the ionosphere, troposphere and multipath.

<i>ELINT</i>	Electronic Intelligence
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Ellipsoid

In geodesy, a mathematical figure formed by revolving an ellipse about its minor axis. It is often used interchangeably with spheroid. Two quantities define an ellipsoid, the length of the semi-major axis (a) and the flattening, $f = (a - b)/a$, where b is the length of the semi-minor axis. Prolate and triaxial ellipsoids are usually described as such.

Ellipsoid

A solid figure for which all plane sections through one axis are ellipses and through the other are ellipses or circles.

Ellipsoid Height

The measure of vertical distance above the ellipsoid. Not the same as elevation above sea level.

<i>ELVs</i>	Expendable Launch Vehicles
<i>EM</i>	Electromagnetic
<i>EMC</i>	Electromagnetic Compatibility
<i>EMCON</i>	Emission Control
<i>EMD</i>	Engineering Manufacturing Development
<i>EMI</i>	Electromagnetic Interference
<i>EMP</i>	Electromagnetic Pulse

EOL End of Life

Ephemeris

The predictions of current satellite positions transmitted to the user in the data message. A list of accurate positions or locations of a celestial object as a function of time. Available as "broadcast ephemeris" or as post-processed "precise ephemeris."

Ephemeris Parameters

A set of parameters used in defining the orbit of a celestial body or of a satellite

Epoch

The initial or recurring start time for a process.

EPS Electrical Power System

ERP Effective Radiated Power

Error Budget

A breakdown or listing of statistical errors for various contributors, which, when combined together, make up the total expected error for a process.

ESA European Space Agency (headquartered in Noordwijk, The Netherlands)

ESGN Electrically Suspended Gyro Navigator

ETA Estimated Time of Arrival

ETRF European Terrestrial Reference Frame

EU European Union

EW Electronic Warfare

FAA U.S. Federal Aviation Administration (part of the Department of Transportation)

FANS Future Air Navigation Systems (prior activity of ICAO)

Fast-Multiplexing Channel (GPS receiver)

see Fast-switching channel

Fast-Switching Channel (GPS receiver)

A single channel receiver that rapidly samples the pseudoranges of a number of GPS satellites. "Fast" usually means that the switching time is sufficiently fast (typically 2 to 5 milliseconds) to recover the data message.

FCC U.S. Federal Communications Commission

FCC Fire Control Computer (JPO version)

FDE Fault Detection and Exclusion

FDI Fault Detection and Isolation

FHWA Federal Highway Administration

FIG Federation Internationale des Geometres

Figure of Merit (FOM)

An indication of the navigational quality of a military receiver, represented by a digit between 0 and 9.

FBM Fleet Ballistic Missile

FGCC Federal Geodetic Control Committee

FMI Flexible Modular Interface

Frequency Band

A particular range of frequencies in a region of the electromagnetic spectrum.

Frequency Spectrum

A range of frequencies associated with a signal. Also, the distribution of signal amplitudes as a function of frequency of the constituent signal.

FRA Federal Railroad Administration

FRP Federal Radionavigation Plan, published by the DoT. Available online.

FRPA-GP Fixed Radiation Pattern Antenna - Ground Plane

FTA Federal Transit Administration

FY Fiscal Year

GAAS Gallium Arsenide Semiconductor

Galileo

A navigation satellite system under development and implementation by the European Commission of the European Union, the European Space Agency and European industry. The Galileo system is planned for initial operation by 2008 and, although autonomous, is expected to be used primarily with GPS.

GATM Global Air Traffic Management (Air Force)

GDM General Development Model

GDOP See Geometric Dilution of Precision

GEO Geostationary Earth Orbit

Geodesy

The science related to the determination of the size and shape of the Earth, the location of points on the Earth, its gravity field, the properties of its interior and the time variations of these.

Geodetic Datum

A mathematical model designed to best fit part or all of the geoid. It is defined by an ellipsoid and the relationship between the ellipsoid and a point (or points) on the topographic surface established as the origin of the datum.

Geodetic Surveys

Global surveys done to establish control networks (comprised of reference or control points) as a basis for accurate land mapping.

Geoid

The particular equipotential surface that coincides with mean sea level and that may be imagined to extend through the continents. This surface is everywhere perpendicular to the force of gravity.

Geoid Height or Geoidal Height

The height above the geoid is often called elevation above mean sea level.

GES Ground Earth Station

GDOP Geometric Dilution of Precision See Dilution of Precision

GHz Gigahertz One billion Hz. $10 \text{ exp } 9 \text{ Hz}$.

GIS Geographic Information System

GLONASS

Global Orbiting Navigation Satellite System of the Russian Federation

The Russian Federation's equivalent to the American NAVSTAR GPS. GLONASS was designed to provide worldwide coverage. The GLONASS design has three orbital planes containing eight satellites each. The constellation has had only 8-12 S/C for the past several years (c.2004) and is not currently providing worldwide service.

GMT Greenwich Mean Time

GNSS

Global Navigation Satellite System

A system that incorporates GPS, GLONASS, Galileo and other space-based and ground-based segments to support global navigation, position determination and related measurements.

GPS

Global Positioning System

A DOD sponsored and operated constellation of satellites [baseline of 24 S/C but now (c.2004) with 27-29 S/C] orbiting the earth in 6 orbital planes at a nominal altitude of 10,898 nautical miles (or 20,190 km). GPS satellites transmit signals that allow the accurate passive determination of GPS receiver (antenna) locations. Receivers can be located at fixed locations, moving on the earth's surface, in the earth's atmosphere, or in low-Earth orbit. GPS is used in air, land, sea and space navigation as well as in mapping, surveying and other applications where precise positioning is necessary. The GPS civil signal is provided free to all properly equipped users on or near the earth who have a view (in general) of at least four satellites.

GPS ICD-200

The GPS Interface Control Document (ICD) is a U.S. government document that contains the technical description of the elements of the GPS signal and the interface between the satellites and the user.

GRS Geodetic Reference System

Handover Word, HOW Word

The second 30-bit word in the GPS data message subframes that provide GPS time data. It provides at six second (subframe) intervals the exact time for a particular spacecraft's transmission from the start of the current week, i.e., from midnight GPS time of the previous Saturday night. This is used for timing, including synchronization information for the acquisition of the P(Y)-code signal.

Hardware

The physical components of a system. It is also frequently considered as the physical part of a system that uses instructions to accomplish a task or operation. Reference is often made to computer "hardware" and "software". In this context, "hardware" consists of the computer (case, motherboard, drives, memory, etc), input and output devices and other peripheral equipment.

HD High Dynamic

HDOP See Horizontal Dilution of Precision

HDUE High Dynamic User Equipment

Hertz, Hz One cycle per second

HF High Frequency

HOL High Order Language (for computer programming)

HOW See Handover Word

HPA High Power Amplifier

Hrs, hrs Hours

HSI	Horizontal situation indicator
HV	Host Vehicle
Hz	Hertz
IAG	International Association of Geodists
ICAO	International Civil Aviation Organization
ICS	Initial Control System
ICD	Interface Control Document
IEC	International Electro-Technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IERS	International Earth Rotation Service
IF	Intermediate Frequency
IFF	Identification Friend or Foe
IFR	Instrument Flight Rules
IFRB	International Frequency Review Board
IGEB	Interagency GPS Executive Board
I-Level	Intermediate Level
ILA	International LORAN Association
ILS	Instrument Landing System
IMO	International Maritime Organization
IMU	Inertial Measurement Unit
INMARSAT	International Maritime Satellite Consortium, Ltd.
INS	Inertial Navigation System

Integrity

The ability of a system to provide timely warnings to users when the system should not be used for navigation.

Intelsat International Telecommunications Satellite Organization

Interface

A shared boundary that exists between various systems or programs. An interface is also frequently considered as the equipment or device that facilitates the interoperation of two or more systems, or system components.

I/O Input/Output

IOC Initial Operational Capability

ION U.S. Institute of Navigation

www.ion.org membership@ion.org <<mailto:membership@ion.org>>

IONDS Integrated Operational Nuclear Detection System

Ionosphere (iono)

The band of charged particles between the stratosphere and the exosphere at an altitude of 50 to 250 miles above the earth's surface which represent a non-homogeneous and dispersive medium for radio signals. The free electrons in the ionosphere refract radio waves resulting in delays and direction of arrival effects on signals traversing the ionosphere.

Ionospheric Delay

A wave propagating through the ionosphere experiences delay. Ionospheric phase delay depends on the electron content of the signal path through the ionosphere and relates to the carrier signals. Group delay also depends on the electron content and relates to the delays in the signal modulation (code) components. The phase and group delay are of the same magnitude but opposite in sign.

Ionospheric Refraction

The change in the propagation velocity and direction of a signal as it passes through the ionosphere.

IOT&E Initial Operational Test and Evaluation

IP Instrumentation Port

IR Infra-red

IRU Inertial Reference Units

ISU International System of Units

ITRF International Terrestrial Reference Frame

ITU International Telecommunications Union

IVHS Intelligent Vehicle Highway System

Jamming The interference with the reception of a desired signal typically by an intentional or unintentional signal or noise.

JCS Joint Chiefs of Staff

JGPSC Japan GPS Council

JPALS Joint Precision Approach and Landing System

JPO Joint Program Office (as in GPS JPO, El Segundo, California)

J/S Jamming/Signal (or Jamming to Signal) ratio

JSC Joint Spectrum Center Also, the NASA Johnson Space Center in Houston, TX.

JTIDS Joint Tactical Information Distribution System

Kalman Filter

A method for processing data to provide an optimal future estimate based upon multiple time-sequenced statistical measurements. Kalman filters typically employ numerical methods to provide an estimate for a time-varying signal in the presence of noise.

Kg Kilogram

KHz, kHz Kilohertz

Kinematic Surveying

Surveying that involves the rapid movement of the rover system relative to the stable reference or base station.

Km, km Kilometer

LAN

Longitude of the Ascending Node in orbital mechanics. Defines the earth Longitude at which an inclined orbit satellite crosses the equatorial plane in its motion from the Southern hemisphere to the Northern hemisphere. Also used for Local Area Network

LAAS Local Area Augmentation System

L-Band

The radio frequency band extending from about 1 to 2 GHz (1000 – 2000 MHz). The GPS carrier frequencies (1575.42 MHz for L1 and 1227.6 MHz for L2) are in the L-band.

L1 Signal

The primary L-band signal transmitted by each GPS satellite is centered at 1575.42 MHz. The L1 broadcast is modulated with the C/A and P(Y)-codes and with the navigation message. Future plans call for a new military signal (the M-code). This band is 24 MHz wide as authorized by the ITU.

L2 Signal

The secondary L-band signal is centered at 1227.60 MHz. The L2 signal carries the P(Y)-codes and the navigation message data and future plans call for a second civil signal (the C-code) and a new military signal (the M-code). This band is 24 MHz wide as authorized by the ITU.

L5 Signal GPS 3rd civil frequency, centered at 1176.45 MHz. This band is 24 MHz wide as authorized by the 2000 ITU WRC.

LCD Liquid Crystal Display

LD Low Dynamic

LED Light Emitting Diode

LEP Linear Error Probable

LF Low Frequency

LO Local Oscillator

LOP Line of Position

LOS Line of Sight

LORAN Long Range Navigation System

LO Local Oscillator

LRU Line Replaceable Unit

LRIP Low Rate Initial Production

Low SNR GPS

Low Signal-to-Noise Ratio GPS. Systems employing data aiding, integration and other techniques to obtain operation in poor signal areas, or in high noise areas, or both.

M Meter(s) or Mega (1,000,000)

m Meter(s) or milli (0.001)

μ Micro (one millionth)

MAGR Miniaturized Aviation GPS Receiver

MARAD Maritime Administration

Master Control Station, MCS

A computer processing and communications facility that gathers measurements from the Monitor Stations and uses this data to determine orbital elements, clock correction and related factors for the GPS satellites. (Located at Schriever AFB, Colorado Springs, CO)

Mb Megabit

MB MegaByte or millibar

mBar millibar

Mbps Megabits per second

MCMT Mean Corrective Maintenance Time

Mcps Megachips per second (Millions of chips per second)

MCS See Master Control Station

MD Medium dynamic

(MDT) - *Mobile Data Terminal*

A device, typically installed in a vehicle consisting of a small screen, a keyboard or other operator interface, and various amounts of memory and processing capabilities.

(MHz) Megahertz One million cycles per second

Microsecond One millionth of a second. Sometimes written as μsec .

MIDS Multifunction Information Distribution System

Millisecond One thousandth of a second

MLS Microwave Landing System

MLV Medium Launch Vehicle (e.g. Delta II)

mm Millimeter(s)

M max CT Maximum Maintenance Corrective Time

MMD Mean Mission Duration

MMLS Mobile MLS

M mean CT Maintenance Mean Corrective Time

Monitor Stations (GPS)

The worldwide group of stations used in the GPS control segment to track the satellites and obtain data on their clocks, orbital parameters and other information. Data collected at monitor stations are linked to a master control station where corrections are calculated. This correction data is uploaded to the satellites and provided to other parts of the system as needed.

MMR Multi-Mode Receiver

MOA Memorandum of Agreement

MOPS Minimum Operational Performance Standards

MOU Memorandum of Understanding

MP Manpack

MPS, mps Meters per second

Mrad, mRad Milliradian (0,001 radian)

M/S, mps Meters per second

Ms, ms, msec Millisecond

MSL Mean Sea Level

MSS Mobile Satellite Service

MTBF Mean Time Between Failures

MTBM Mean Time Between Maintenance (operations)

MVUE Man/Vehicular User Equipment

Multichannel Receiver

A receiver containing multiple channels, each of which can track one satellite continuously, so that navigation solutions are derived from the set of simultaneous measurements of pseudoranges and range rates.

Multipath Errors caused by the reflection or refraction of a signal that has reached the receiver antenna by two or more different paths. It is usually caused by one path being reflected from nearby structures or other reflective surfaces.

Multiplexing Channel

A single receiver channel that is designed to track more than one satellite signal by using a rapid sequencing process. See Fast Multiplexing Receiver.

NAD-27

North American Datum of 1927. Obsolete horizontal datum of North America. NAD 27 depends upon an early approximation of the shape of the earth, known as the Clarke Spheroid of 1866, designed to fit only the shape of the conterminous United States, and utilizing a specific Earth surface coordinate pair as its center of reference.

NAD-83

The current North American Datum, 1983. NAD 83 relies on the more precise Geodetic Reference System of 1980 (GRS-80).

NAVD-88

North American Vertical Datum of 1988. Effort underway by the National Geodetic Survey (NGS) to readjust the North American Vertical Datum. The NAVD 88 readjustment, when completed, will remove distortions from the continent-wide vertical geodetic (height) reference system.

Nanosecond, nanosecond One billionth of a second. 10×10^{-9} seconds.

NANU Notice Advisory to Navigation Users

NAS National Airspace System

NASA National Aeronautics and Space Administration

Nav Message, Nav Data Message, Data Message, NAV-msg.

Navigation Message or Data Message

The navigation message broadcast by each GPS satellite at 50 bps on the L1 and/or L2 signals. This message contains data on system time, clock correction parameters, ionospheric delay model parameters, and the vehicle's ephemeris and health. The information is used to process GPS signals to give user time, position, velocity and the capabilities of the spacecraft..

NATO North Atlantic Treaty Organization

Nav Navigation

NAVSTAR

One of the names given to the U.S. GPS satellite constellation. NAVSTAR is an acronym for NAVigation Satellite Timing and Ranging.

The term NAVSTAR also has been used to designate specific spacecraft in the GPS constellation.

NAVWAR Navigation Warfare

NBS National Bureau of Standards (now NIST- National Institute of Standards and Technology))

NCA National Command Authority

NCO Number controlled oscillator. Also, Non Commissioned Officer

NDGPS Nationwide Differential GPS

NDB Non-Directional Radio Beacon

NDS Navigation Development Satellite

NET Not Earlier Than

NGS National Geodetic Survey

NHTSA National Highway Traffic Safety Administration

NIMA National Imagery and Mapping Agency (was DMA, Defense Mapping Agency)

NIST National Institute of Standards and Technology

<i>n.mi., nm</i>	Nautical mile
<i>NNSS</i>	Navy Navigation Satellite System (Transit)
<i>NOAA</i>	National Oceanic and Atmospheric Administration
<i>NOSC</i>	Naval Ocean Systems Center
<i>NOTAM, Notam</i>	Notice to Airmen
<i>NPA</i>	Non-precision Approach
<i>NRC</i>	National Research Council of the National Academies of Science and Engineering
<i>NRL</i>	Naval Research Laboratory
<i>NSA</i>	National Security Agency
<i>Nsec, ns</i>	Nanosecond (10 exp -9 seconds)
<i>NTDS</i>	Naval Tactical Data System
<i>NTIA</i>	National Telecommunications and Information Administration
<i>NTDS</i>	Navy Tactical Data System
<i>NTS</i>	Navigation Technology Satellite
<i>Nm, nm</i>	Nautical miles
<i>NUDET</i>	Nuclear detection system. An auxiliary payload on the GPS spacecraft.

Observation Period (GPS Survey)

The period of time over which GPS data is collected. In the survey field, it indicates the period during which data is simultaneously collected by two or more receivers.

<i>OBS</i>	Omni Bearing Select
<i>OCC</i>	Operational Control Center
<i>OCS</i>	Operational Control Segment or Operational Control System
<i>0 dBi</i>	0 decibels isotropic (unity gain) – the gain of an idealized omni-directional antenna
<i>OEM</i>	Original equipment manufacturer
<i>OMB</i>	Office of Management and Budget
<i>Orbit</i>	The path followed by a satellite or celestial body as it moves through space around a central force field.
<i>OSD</i>	Office of the Secretary of Defense
<i>P-Channel</i>	Precision code channel
<i>PCM</i>	Pulse code modulation
<i>P-code</i>	See Precise Code
<i>PDD</i>	Presidential Decision Directive (as in removal of S/A)
<i>PDF</i>	Probability Density Function

PDOP - Position Dilution of Precision (x, y, z)

A geometric dependent term expressing the relationship between the errors in user position and the errors in the ranging measurements to the satellites. PDOP is a function of the geometric configuration of satellites from which signals are derived for position (see DOP). PDOP typical values range between 2 and 4. They vary continuously since the satellites are continuously in motion providing a changing geometry.

PDOP Mask

Usually a user-definable upper limit for the PDOP that will be tolerated during collection of a dataset. If PDOP becomes greater than the pre-set limit, GPS data collection will be suspended or the data will be notated until the PDOP decreases below the limit.

Perigee

The point in the orbit of a satellite that is closest to the center of the earth.

Phase Lock

The technique where the phase of an oscillator signal is made to follow closely the phase of a reference signal. The receiver first compares the phases of the two signals, and then uses the resulting phase difference signal to adjust a reference oscillator.

PL See Pseudolite

PLGR Precise Lightweight GPS Receiver or P-code Lightweight GPS Receiver

PLL Phase-lock Loop

PLRS Position Location and Reporting System

PN, PRN Pseudo Noise (see pseudo random noise, PRN)

Point Positioning

A geographic position produced from one receiver in a standalone (or autonomous) mode.

Point Solution

An instantaneous position solution that uses current pseudo-range measurements from four or more satellites.

Position

The latitude, longitude, and altitude of a point or other designation for a point using three independent coordinates. An estimate of error is often associated with a position.

Post-Processed Differential GPS

Differential GPS operation in a post-processed mode employs data collection and computational techniques that do not require the base and rover receivers to have a data link connecting them. Each receiver independently records data. This data is later processed with data from other receivers taken during the same time period. The set of satellites used in later processing must be common to all receivers collecting data. Differential correction post processing software is used to combine and process the data collected.

Ppm, ppm Parts Per Million

PPS Precise Positioning Service

PR Pseudorange

PRC Pseudorange Corrections

PRE Pseudorange Error

Precise (or Precision) Code (P-Code)

The GPS precise, or precision code, is authorized primarily for military use. It consists of a very long sequence of pseudo-random binary bits that are biphase modulated on the GPS carriers at a chipping rate of 10.23 Mcps. These repeat about every 267 days. One-week segments of this code are assigned to the GPS spacecraft forming codes that have a one-week period.

Precise Positioning Service (PPS)

The most capable level of military dynamic positioning accuracy provided by GPS, typically using the P(Y)-codes in the dual-frequency mode. PPS is also frequently used in the single frequency mode (such as with the PLGR).

PRN Pseudorandom noise (modulation)

Pseudolite (shortened form of pseudo-satellite)

A ground-based transmitter that broadcasts a signal similar to that of a GPS satellite. Pseudolites are typically used to improve geometric solutions in a local area. The data portion of the signal may also contain differential corrections and other information (such as integrity) that can be used by receivers.

Pseudorandom Code, PRN code, PN code

A signal consisting of a sequence of binary bits that have random noise-like properties but which, in fact, have a well-defined deterministic sequence pattern.

Pseudorandom Noise Codes

A sequence of digital 1's and 0's that appear to be randomly distributed and have noise-like properties but are, in fact, generated with reproducible properties. An important characteristic of PRN codes is a low autocorrelation value for all delays except when the codes coincide. Each GPS satellite transmits unique C/A and P(Y)-code pseudorandom-noise codes.

Pseudorange

A distance measurement between a satellite and a receiver (antenna), based on the correlation of a satellite-transmitted code and the local receiver's reference (replica) code.

PSK Phase Shift Key

PTTI Precise Time and Time Interval

PVT Position, Velocity and Time

P/Y Code Precision-code or / Encrypted P-code

RAAN Right Ascension of the Ascending Node

RAIM Receiver Autonomous Integrity Monitoring

RAJPO Range Applications Joint Program Office (now RISPO)

Radionavigation

The determination of position, or of information relating to position and navigation by means of the propagation properties of radio waves. GPS is a method of radionavigation.

Range A distance between two points, such as between a satellite and a GPS receiver.

Range Rate

The rate of change in the distance (range) between a satellite and receiver or other range measurement. The range to a satellite continually changes due to satellite and observer motion. Range rate is determined by measurement of the Doppler shift of the satellite carrier signal.

R&D Research and development

Rb Rubidium. An element used in some types of atomic standard clocks.

Rcvr, Rec. Receiver

RDF Radio Direction Finder

RDSS Radio Determination Satellite Service

Real-Time Differential GPS

A position improvement process whereby a GPS receiver receives real-time correction data from another source in order to remove the effects of bias errors. One way to obtain correction data is by the use of a GPS receiver located at a known position (typically known as a base station). The GPS receiver at the known position computes, formats, and transmits corrections usually through a data link with each new GPS observation. The rover unit receives the GPS corrections and applies the corrections to its current observations. Other sources of correction data include satellite-based systems such as OMNISTAR, StarFire, CORS stations, etc.

Relative Navigation

A technique for determining position in which one or both of the position points may be moving. A data link is used to provide error data to the moving vehicles to improve real-time navigation.

Relative Positioning

The process of determining the relative difference in position between two locations. In the case of GPS, by placing a receiver over each site and making simultaneous measurements observing the same set of satellites at the same time. This technique allows the receiver to cancel errors that are common to both receivers, such as satellite clock and ephemeris errors, propagation delays, etc. **Reliability**

The probability of performing a specified function without failure under given conditions for a specified period of time.

RF Radio Frequency

RINEX

Receiver INdependent EXchange format. A set of standard definitions and formats that permits interchangeable use of GPS data from dissimilar GPS receiver models or post processing software. The format includes definitions for time, phase, range and other parameters.

RISPO Range Instrumentation System Program Office

RLG Ring Laser Gyroscope (type of INS)

RMS, rms Root Mean square

RNAV Area Navigation

RNPC Required Navigation Performance Capability

Rover Any mobile DGPS receiver used during a data collection session. The receiver's position can be computed relative to one or more stationary (reference) GPS receivers.

RPV Remotely piloted Vehicle

RSPA Research and Special Programs Administration of DoT

RSS, rss Root Sum Square

RT Remote Terminal

RTCA Radio Technical Commission for Aeronautics (Now RTCA, Inc.) Sets technical standards for avionics equipment.

RTCM

Radio Technical Commission for Maritime Services. Special Committee 104 of RTCM has established and periodically updates the data message format for the transmission and use of differential GPS broadcasts over data links to provide real-time and other corrections to GPS computed positions.

Rubidium Clock, Rubidium Atomic Clock

A stable and precise atomic clock based on the atomic transitions associated with gaseous rubidium.

SA See Selective Availability

SAC Strategic Air Command

SAMSO Space and Missile Systems Organization
S-band A microwave frequency band (in the 2-4 GHz region)
SBAS Space-Based Augmentation System

Satellite Configuration

The arrangement or state of the satellite constellation at a specific time, relative to a specific user or set of users. Occasionally used interchangeably with satellite constellation.

Satellite Constellation

The arrangement in space of a set of satellites. In the case of GPS, the fully operational constellation is currently composed of six orbital planes, each containing four or more satellites. GLONASS has three orbital planes which, when fully occupied, contain eight satellites each. Galileo tentatively plans to have three inclined orbits and one geostationary orbit and a total of 30 satellites.

Satellite Elevation Mask

A user definable elevation mask in degrees above the horizon in which spacecraft signals are not used by a GPS receiver. SVs at an elevation angle below the mask angle may be tracked, but data from them will not be used to compute positions. SVs near the horizon have larger error effects due to atmospheric and multipath conditions.

Selective Availability - SA

A DOD technique for distorting (or dithering) the GPS spacecraft time base and thereby corrupting the pseudorange and range rate measurements available to civil users. The purpose of this was to degrade the GPS navigation accuracy available to the civil community to a level of about 100 meters (2drms) in position. SA was set to zero on May 1, 2000 (EST) by Executive Order and there are commitments from the government that it will not be reinstated in the future.

SC, S/C Spacecraft
SC-155 RTCA Special Committee on the Future CNS
SC-159 RTCA Special Committee on MOPS and MASPS for GNSS
SCAT-1 Special Category-1 Approach and Landing system
SCF Satellite Control Facility
SDOF, SDF Single Degree of Freedom
SESC Satellite and Environmental Service Center
SEP Spherical Error Probable
SI International System of Units
Sigma, σ Standard Deviation
SGLS Space-Ground Link, S-band system
SLAM Standoff Land Attack Missile
SLGR Small Lightweight GPS Receiver
SNR Signal-to-Noise Ratio. The measure of the signal power to the noise power, normally expressed in decibels. A higher number is desirable.

Space Segment (GPS)

The portion of the GPS system that is located in space. This includes the GPS satellites and any ancillary spacecraft that provide GPS augmentation data (i.e., differential corrections, integrity messages, etc.)

Spread Spectrum (GPS)

The received GPS signal is a wide-bandwidth spread spectrum signal at a very low power level (-160 to -166 dBW). The L-band signals are modulated with high-rate (1.023 and 10.23 Mcps) PRN codes. This spreads the signal energy over a much wider bandwidth than the signal information bandwidth.

Spherical Error Probable

The radius of a sphere within which there is a 50 percent probability of locating a point (or being located). SEP is the three-dimensional analogue of the two dimensional CEP.

Spheroid A solid figure generated by rotating an ellipse about either axis.

SPS See Standard Positioning Service

Spoofing (GPS)

The misleading of the user's GPS navigation determination by the use of signals that replicate GPS signals but are timed differently. In most cases, a receiver is unaware it is being spoofed.

Squaring-Type Channel

A GPS receiver channel that multiplies the received signal by itself to obtain a second harmonic of the signal. This signal does not contain the code modulation. Used in "codeless" receiver equipment.

Standard Deviation (Sigma)

A measure of the dispersion of random errors about the mean value. If a large number of independent, or uncorrelated measurements or observations of the same process are made, the standard deviation is the square root of the sum of the squares of the deviations from the mean value of all the measurements divided by the number of observations less one.

Standard Positioning Service, SPS (for GPS)

The GPS service available to the civil community and used for certain applications by the military Precise Positioning Service (PPS) user. It basically consists of the C/A-codes on L1. On a temporary basis, civil users have been authorized the use of "codeless" techniques, involving the P(Y)-codes at L2 and L1 to establish two frequency ionospheric correction data, primarily for aviation users in the WAAS program.

SPS Accuracy (GPS)

The normal civil positioning accuracy obtained by using the GPS C/A-code at the L1 frequency. Under selective availability conditions, guaranteed to be no worse than 100 meters 95 percent of the time (2 drms). Since SA was set to zero in May, 2000, SPS accuracy has been typically at the 5-10 meter level on a 2drms basis.

Static Positioning

Position determination accomplished with a stationary receiver. This allows the use of various averaging and differential techniques.

<i>STOL</i>	Short Take-Off and Landing
<i>STS</i>	Space Transportation System
<i>SUNS</i>	Small Unit Navigation System
<i>SV, S/V</i>	Space Vehicle or Satellite Vehicle
<i>SVN</i>	Space Vehicle Number (or Satellite Vehicle Number)
<i>TAC</i>	Tactical Air Command
<i>TACAN</i>	TACTical Air Navigation system
<i>TAI</i>	International Atomic Time
<i>TBA</i>	To Be Announced

TBD	To Be Determined
TD	Tokyo Datum
TDOF, TDF	Two Degrees of Freedom
TDOP	Time Dilution of Precision
TDRSS	Tracking and Data Relay Satellite System
TEC	Total Electron Content

Tropospheric Correction

The correction applied to the range measurements to account for tropospheric delay.

TT&C	Tracking, Telemetry and Control
TTFF	Time to First fix
TTSF	Time to Subsequent Fix
UDRE	User Differential Ranging Error
UE	User Equipment
USERE	User equivalent range error
UHF	Ultra High Frequency
UMTA	Urban Mass Transit Administration

Universal Time Coordinated (UTC)

An international, highly accurate and stable uniform atomic time system kept very close to Universal Time corrected for seasonal variations in the earth's rotation rate (UT2). Maintained by the U.S. Naval Observatory in Washington, D.C. GPS time is directly relatable to UTC by accounting for the leap seconds since midnight January 4, 1980, currently at 13 (c. 2004).

URE	User Range Error
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USGIS	U.S. GPS Industry Council
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
USN	U.S. Navy
USNO	U.S. Naval Observatory

User Segment

The portion of the GPS that can be directly interfaced by the user (e.g., GPS receivers). The controls and displays, including the GPS receiver, by which a receiver conveys GPS system information to the user.

UT	Universal Time
UTC	Universal Time Coordinated
URA	See user range accuracy.

User Interface

The hardware and operating software by which a receiver operator executes procedures on equipment (such as a GPS receiver) and the means by which the equipment conveys information to the person using it, i.e., the controls and displays.

User Range Accuracy - URA

The contribution to the range-measurement error from related error sources

UT	Universal Time
UTC	See Universal Time Coordinated
UV	Ultraviolet
VAFB	Vandenburg Air Force Base
VDOP	Vertical Dilution of Precision (z)
VFR	Visual Flight Rules
VHF	Very High Frequency
VHSIC	Very High Speed Integrated Circuit
VLSIC	Very Large Scale Integrated Circuit
VLBI	Very Long Baseline Interferometry
VLF	Very Low Frequency
VLSI	Very Large Scale Integration
VOR	VHF omni-range navigation system
VPA	Vehicle Power Adapter
VTS	Vessel Traffic Services
WAAS	Wide Area Augmentation System
WARC	World Administrative Radio Conference
WADGPS	Wide Area Differential GPS
WDOP	Weighted Dilution of Precision
WGS-72, 84	World Geodetic systems (1972 and 1984)

World Geodetic System (WGS)

A consistent set of parameters describing the size and shape of the Earth-derived from: the positions of a network of points with respect to the center of mass of the Earth; transformations from major geodetic datums; and the gravity potential of the Earth.

WGS-84 (World Geodetic System 1984)

The mathematical ellipsoid used as a reference datum for GPS since January 1987.

w.r.t., wrt	with respect to
WWDGPS	World Wide Differential GPS
Y-code	The encrypted version of the P-code.
YPG	Yuma Proving Ground