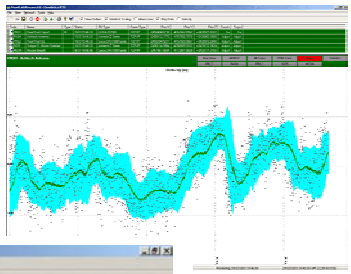
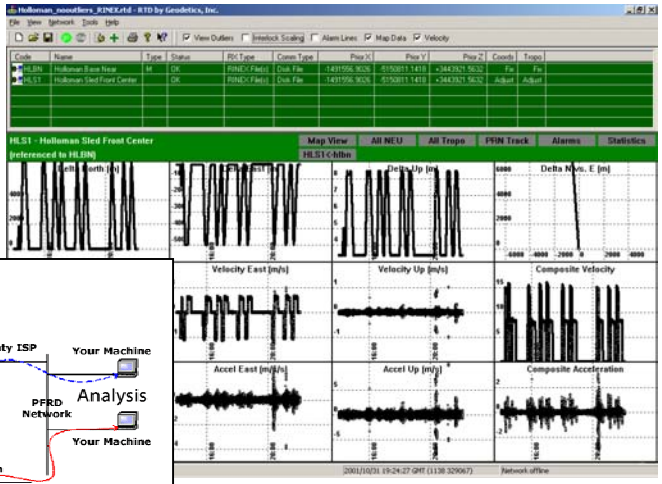
Geodetics Incorporated

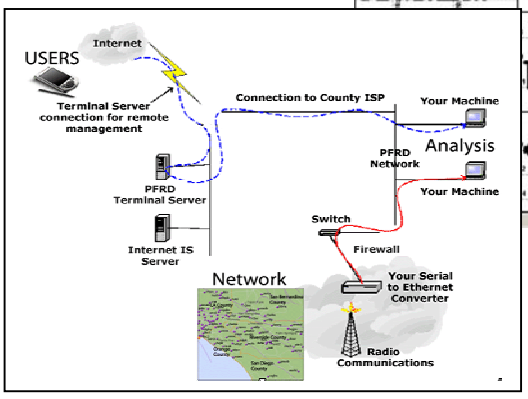
Real Time Dynamics (RTD) Family of Products

Real-Time High-Precision Multiple Static and Dynamic GPS Sensor Positioning and Navigation Systems

- Epoch-by-Epoch™ technology provides instantaneous integer-cycle phase ambiguity resolution and single-epoch initialization and re-initialization
- Modular and scalable systems customized to your needs
- GPS hardware and platform independent for mix and match
- Full suite of communication options
- Centralized control
- Unlimited rovers at extended ranges







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Real Time Dynamics (RTD) Family of Products

RTD-Net

A unique software solution for continuous monitoring of permanent GPS networks operating dual-frequency receivers. RTD-Net provides Epoch-by-Epoch™ (instantaneous) three-dimensional geodetic positions for a network of continuously operating GPS reference receivers.

This revolutionary advance in high-precision GPS analysis technology provides for robust real-time integrity monitoring and enhanced early warning capabilities. For the first time, the user can determine the state of the network independently at each instant in time. The "network epoch" is the basic building block of RTD-Net and the software can easily manipulate sequences of independent network epochs to automatically monitor changes in the state of the network. RTD-Net controls the GPS receivers, downloads raw data and reformats to RINEX. It analyzes the data, and generates alarms, statistics, reports and more.

- Computes instantaneous positions for all receivers in a network at each epoch.
- Carries out a full network adjustment of the data at each observation epoch, while modeling ionospheric, tropospheric and other factors.
- Centrally controls the GPS receivers, downloads data and converts to RINEX.
- Analyzes data, generates alarms, statistics and reports utilizing robust data collection and quality control.
- Downloads archives and manages data with a full suite of communication options.
- Distributes data (Web-based & ftp)
- Management tools - metadata input and process control; data visualization including residuals; system alarms.
- Accepts broadcast and precise GPS orbits
- IGS compatible – RINEX, SP3 orbit files, SINEX, etc.

RTD-Pro

Geodetics' flagship product is designed for real-time, high precision positioning of multiple roving objects.

RTD-Pro includes all of the capabilities of RTD-Net, and adds Server/Client connectivity to conventional RTK clients with RTCM messaging and provides instantaneous RTK from multiple base stations, for PDA-based wireless clients using the unique Geodetics Smart Client.

The RTD-Pro server delivers reference station data to conventional RTK rovers or to Geodetics' Smart Client via a wireless Internet connection using several modes:

Standard RTK mode delivers RTCM data from base receivers to RTK field users. The user can sequence between different bases to multiply determine his position.
Enhanced RTK mode delivers RTCM data from the server from the closest site in the network.
Smart Client mode communicates with RTD operating on a PDA, equipped with wireless communication. Unlike conventional network RTK (Standard and Enhanced), the positioning is performed on the PDA using Geodetics Epoch-by-Epoch™ technology and not in the receiver, and is compatible with any dual-frequency GPS receiver. Epoch-by-Epoch™ processing on the PDA makes the system ideal for a wide range of dynamic positioning applications.

- Tracks multiple moving objects within GPS networks.
- Serves conventional RTK clients with RTCM messaging.
- Provides initialization-free RTK from multiple base stations, for PDA-based "Smart" clients.
- Allows relative positioning between dynamic objects (no static base station required).
- Allows extended range through innovative single-epoch-based treatment of ionospheric and tropospheric effects, using "real" base stations.

RTD-Client

Geodetics RTD-Client works in conjunction with the RTD-Pro server or other network management system, which broadcast RTCM data, and delivers Epoch-by-Epoch™ positioning at the rover. Single-epoch initialization and re-initialization times makes the smart client approach ideal for many high-precision applications requiring real-time positioning of moving platforms (navigation), and makes precise GPS technology more accessible to "non-traditional" users as well as enhances emergency services and homeland security. RTD-Client technology is available in the Carlson SurvCE product and other PDA applications.

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RTD-Postprocess

GPS software designed for post processing of static and dynamic application data utilizing RINEX files from any type of geodetic receiver as well as files of recorded binary data from RTD supported receivers. The software processes GPS networks in session mode (multiple receivers) on an Epoch-by-Epoch ™ basis. The software can also accommodate moving reference stations, as well as simulate a real-time environment. The software includes numerous tools including extensive statistics.

RTD-L1

A robust real-time integrity monitoring system providing enhanced early warning capabilities for permanent local (up to 5km) GPS networks operating single-frequency receivers.

RTD-L1 has all the capabilities of RTD-Net, except for supporting L1-only GPS receivers.

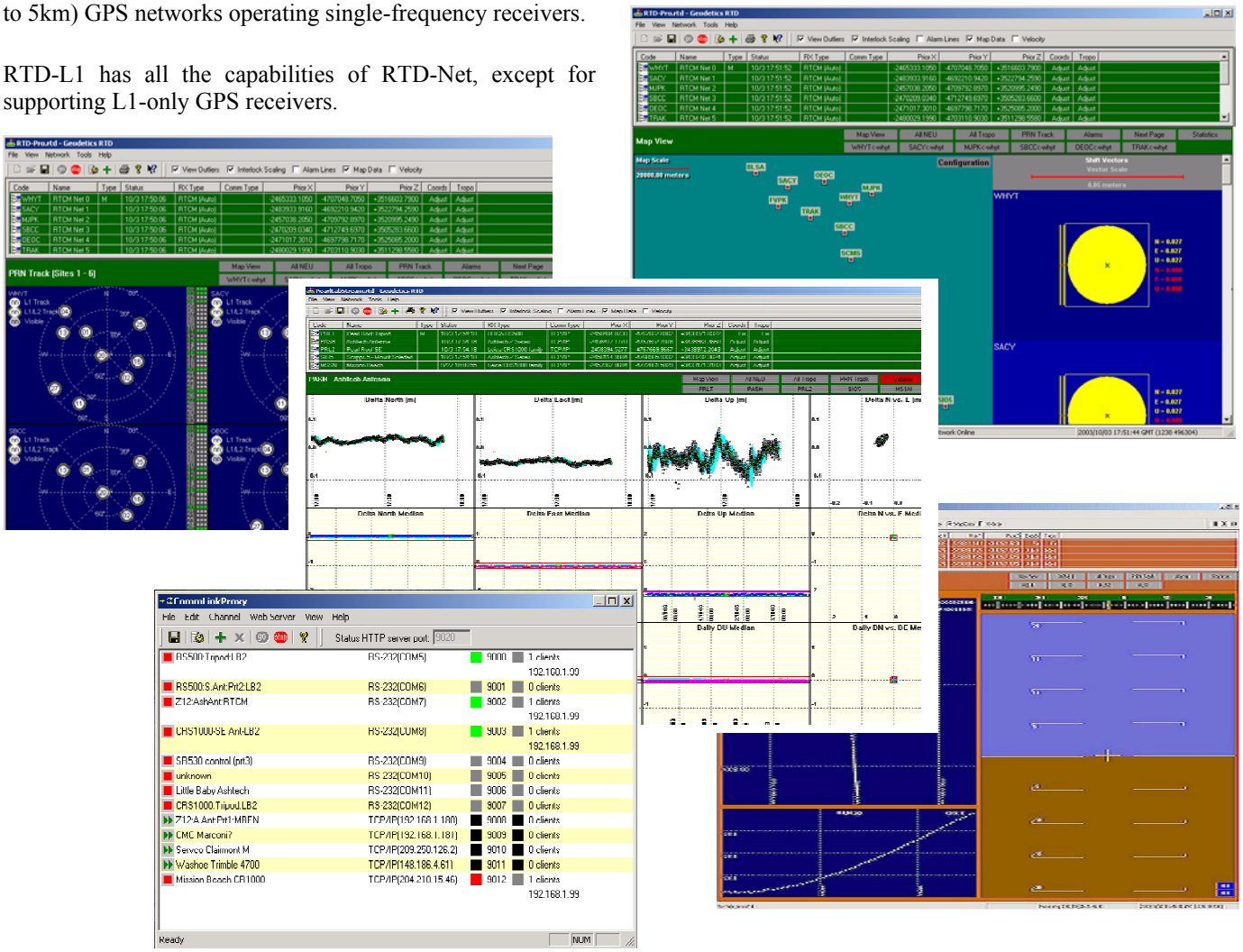
RTD-Data

A suite of communication solutions that controls GPS receivers, streams data in real-time, downloads data and converts to RINEX.

RTD-Data has all the capabilities of RTD-Net, except for the Epoch-by-Epoch™ positioning algorithms.

RTD-Vector

Attitude determination module utilizing three GPS receivers (two for heading only). This product can be used to solve for attitude (e.g. yaw, pitch, roll) in real-time.



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RTD Technical Specifications

Applications

Static geodetic networks, network RTK, deformation monitoring, aircraft approach and landing, precision agriculture, machine control, vehicle tracking, harbor navigation, robotics, GPS/INS integration, intelligent transportation, sports, fleet and product tracking, dwelling landslide alarm systems and location based content services.

Operational Modes

Real Time: Serial connection, dial-up modem, cellular phone, frame relay, radio modem, TCP/IP, wireless Internet.

Dial-Up/Polling: One or more modem(s) or TCP/IP connections for fast simultaneous data download.

Post-Process: RINEX from single-frequency and dual-frequency geodetic receivers.
Various raw data formats.
Precise ephemerides (SP3 format).

RTK: Standard Client - Supports conventional network RTK using RTCM V2.2. Allows for small deformation of base network.
Smart Client - Supports initialization-free (instantaneous), wide-area network RTK from multiple base stations, including ionosphere correction. Troposphere is estimated Epoch-by-Epoch™. Precise ephemeris obtainable by ftp in real time and dial-up modes.

Network Setup

User Interface: Intuitive, guides the user through the setup process. Includes full on-line help.

Backup: Multiple networks can be defined and saved.

Site Info: Comprehensive; names, coordinates as Cartesian or geodetic, position constraints, GPS receiver and antenna type.

Sensors: Leica CRS1000, RS500, MC500, and SR530, Ashtech (Thales Navigation) Z-12 and µZ, Trimble 4000 SSE, 4700/5800, NovAtel OEM4.

Data:

Site Logging: No PC required at the GPS sensor location.

Transfer: Continuous in Real Time operational mode. Dial-Up/Polling at user defined intervals as frequently as five minutes (Leica only).

Archive: Both raw and RINEX data formats. Stored in chronological directory structure. GNS file (binary log of single-epoch network solutions).

Replication: Automatic network or FTP transfer of data for archival and network or Internet FTP and Web access.

Utilities: RINEX file manipulation, site coordinates tool.

Data Base: Microsoft database functions (coordinates, antenna and receiver types).

Analysis

Algorithm: Proprietary Real-Time Network Analysis (RNA) module with the Epoch-by-Epoch™ positioning algorithms.

Solution: Independent position computation at each epoch in baseline or network mode.

Precision*: Single-epoch precision*:
± [10mm + 0.2 mm/km)] horizontal. 2 times less precise in vertical (1 standard deviation).

Range*: Station spacing (nearest neighbor): up to 50 km with dual-frequency receivers unconstrained, up to 250 km with constrained coordinates (for static networks), up to 5 km with single-frequency receivers.

Troposphere: Zenith path delay determined at each site for monitoring atmospheric water vapor content and short-term weather forecasting.

Network Analysis Output

Archive: GNS solution files for replay including Epoch-by-Epoch™ solutions.
SINEX solution files for network adjustment.

Visual Display: Plots of Epoch-by-Epoch™ solutions for position, velocity and acceleration. Map of site locations.

Logs: Status and solution statistics.

Alarms: User-specified alarm tolerances (automatic notification of operators).

RTK and DGPS Real Time Transmission

Formats: RTCM V2.2; Leica Binary.

Local: Available by connecting a radio and/or cellular phone to each GPS sensor.

PC Requirements (Each PC supports up to 30 GPS sites)

Processor: At least Pentium 450MHz with 128 MB RAM

OS: Windows 98, Windows NT 4.0 (or later), Windows 2000, Windows XP

Hard Drive: 500Mbyte, spare capacity recommended

Peripherals: CD-ROM drive, available serial and parallel ports, 800x600 pixel video card.

*Accuracy and station spacing are dependent upon GPS satellite system performance, ionospheric conditions, and other factors.

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