GRAFNAV/GRAFNET™ VERSION HISTORY

What is new with Version 8.20.0522?

Available: May 2009 [update]

Bug Fixes:
- RIN2GPB.DLL was not loading on some computers, leading to problems with the *Raw GNSS to GPB* and *Download Service Data* utilities. This issue has been resolved.
- Problem where *Export Wizard* would not output in any grid except UTM is now resolved
- Support for compressed RINEX format has been updated to incorporate newest changes to format
- Fixed issues surrounding the launching of baselines from GrafNet or GrafNav Batch into GrafNav

What was new with Version 8.20.0427?

Available: April 2009 [release]

New Features:
- The new *Project Wizard* allows users to easily step through the process of creating a new project. The *Wizard* automatically detects the user's raw data types, converts them to GPB and, if requested, downloads nearby service station data.
- EGM2008 geoid now available in WPG format
- New *Trajectory Status* plot is available for NovAtel users logging position records

Improvements:
- Handling of manufacturer/user files has been modified to better support Windows VISTA users
- *Download Service Utility* now loads much quicker than previously
- Improved satellite rejection and base satellite selection in differential processor
- Improved handling of satellite antenna offset in PPP processor
- Users can now easily add their static PPP solution to *Favourites*
- The *Map Window* and all data plots use new drawing method that provides much better support for high-rate and/or long data sets

Decoders:
- NovAtel OEMV users can create GrafNav-readable trajectory files from 7 different position records
- NovAtel OEM4/OEMV decoder now supports MARKnTIMEB and MARKnPVAB records
- For Leica 1200 receivers, support has been added for the new measurement record (#119)
- Support for the RTCMV3 raw data format has been added
- Improved handling of GLONASS data in GPB2RIN.DLL
- RIN2GPB.DLL now handles L2C data properly

Bug Fixes:
- Fixed bug where *Select From Favorites* would not work if master GPB file did not contain position

What was new with Version 8.10.3124?

Available: December 2008 [update]
Bug Fixes:
- Fixed a bug that caused auto-update feature to fail for users whose offset from GMT is zero
- Fixed a bug where GLONASS processing would sometimes fail in the reverse direction
- Fixed plotting issues for data collected after GPS week 1500

What was new with Version 8.10.2428?

Available: May 2008 [update]
New Features:
- To ensure maximum PPP solution accuracy for both old and new surveys, start/end dates are now supported for precise clock and ephemeris sources. Final MIT precise ephemeris and clock products are currently the default, whereas CODE files will be given higher priority for surveys prior to November 2006. This ensures that a final high data rate clock will be downloaded for older surveys.

Bug Fixes:
- Corrected bug in PPP processor affecting older files. In some cases, the wrong satellite offset may be applied
- Modified software to support future week numbers more effectively
- Corrected a small bug in the CurveFit model used to smooth coordinates during export
- Corrected bug in fixed static solution for L2 only processing

What was new with Version 8.10.2313?

Available: March 2008 [update]
New Features:
- To ensure manufacturer data files such as *Favourites*, download stations, satellite offsets, DCB corrections and antenna models remain current, this version can automatically download these files from NovAtel's server twice per month

Bug Fixes:
- PRN 32 issues in ARTK have been corrected. The previous version ignored this satellite in ARTK.
- PRN 29 was launched in early January, and the latest manufacturer files need to be downloaded to utilize the correct antenna offset for this satellite
- In certain cases, the KAR enable/disable button did not work properly from the *KAR* options tab. This issue has been corrected.
- Corrected problem where forward solution was not being produced during simultaneous dual-direction processing in GrafNet
- The problem where disabled master stations would incur an error during tropospheric bias estimation has been corrected

What was new with Version 8.10.2110?

Available: January 21, 2008 [release]
Processing Engine:
- Advance RTK™ (ARTK) employs NovAtel's proprietary on-the-fly (OTF) engine, which has the ability to fix at a longer distance, while the time required to fix is much shorter than GrafNav's existing KAR algorithm. Generally, ARTK also has fewer failed fixes than KAR and tends to produce a lower separation between forward and reverse trajectories.

- Multi-pass PPP – The PPP processor now has the ability to refine the original solution with another pass. Accuracies can be improved significantly (~40% on the data sets evaluated), especially on trajectories with shorter observation times. The PPP processor also applies higher-order corrections, thereby further improving accuracies.
- Tropospheric bias correction – For high altitude or long distance data sets, much of the tropospheric error can be removed by the addition of a Kalman filter bias state. Such methods have often been problematic in differential mode, and we have solved this problem by using GrafNav's PPP processor to compute the tropospheric bias trajectory for each base station. This tool can also be used to check the base station coordinates.
- In multi-base mode, base stations can be rejected if the base-remote distance is longer than a user-defined tolerance
- Satellites with low C/N0 values can be rejected from the filter

Interface:
- Users can zoom in/out of the *Map Window* and plot windows using their mouse's scroll-wheel
- The *Map Window* can be displayed with a white background and can be copied to the clipboard
- In GrafNav and GrafNav Batch, users can create groups of plots that can be displayed using one operation. Multiple plots can also be selected.
- For GrafNav, there is now an API/DLL that has many of the same capabilities as the command line interface, but the calling application is provided complete feedback during processing and exporting. In addition, the calling program can halt processing at any time.
- For all plots, time and Y-axis ranges can be transferred from one plot to others
- A variety of HTML reports can now be generated, including from the command line and API
- GrafNav and GrafNet project data can be automatically displayed in Google Earth™
- In GrafNet, the network adjustment can now be executed automatically upon completion of processing
- GrafNet now supports station names up to 12 characters (increased from 8)
- *Select from Favorites* has been significantly improved such that nearby stations are shown in a list along with the distance and datum. Furthermore, antenna attributes can be stored and selected.
- Support for stereographic map projection
- GrafNav command line (and API) permits users to save all processing messages to a single log for later review
- *Export Wizard* has improved time zone selection for local times and ½-hour time zones are now supported
- Processing files can now be deleted recursively in subdirectories from a specified path
- Full support for ITRF2005
- Support for external DLL-based grid conversions
- Improved software registration

Decoders:
- For Leica 1200, better handling of outdated ephemerides
- For NovAtel OEMV, MARK2TIME record now supported
- For Trimble DAT, better handling of station names and more than 12 satellites
- For GPB2RIN, a command line version is now available and some bugs have been fixed

What was new with Version 7.80.2517?

Available: May 2007 [update]
Bug Fixes:
- Automatically removes duplicate ephemerides requested from OEMV using ONTIME trigger. Does not affect those using ONCHANGE trigger.
- Improved selection of GLONASS ephemerides

- For OEMV-2/3 pre-version 3.200, GLONASS ephemerides could have a corruption on the GPS-GLONASS clock difference on newer M-satellites. GrafNav now properly mitigates the problem.
- The *Export Wizard* would report the wrong week number and date on the second epoch after the week cross-over. This is now corrected.
- Height values above 1000 m stored in the *Favorites* were being rounded off to the nearest centimeter. Full millimeter resolution is now preserved.
- **Pause/Continue** button is now greyed out for PPP processing, as it is not supported
- *GPB to RINEX* decoder now has better week number handling. Also, SBAS satellites are no longer being detected as GLONASS satellites.
- Fixed round-off problem in *RINEX to GPB* decoder that would occasionally occur for 20 Hz data

What was new with Version 7.80.2315?

Available: March 15, 2007 [release]

PPP (Precise Point Processing) -- New!
- New embedded precise point positioning (PPP) processor, which permits dual frequency single point carrier phase processing without a base station. Although accuracies can vary depending on age of data, time length of collection, satellite geometry, frequency of cycle slips, receiver type, measurement quality and other factors, users can expect 10-40 cm kinematic accuracies and 2-10 cm static accuracies. Refer to this technical paper, available on-line, for more information.
- Precise ephemeris and clock files (necessary for PPP) can be downloaded the day following the survey from directly within GrafNav with the click of a button
- Will process forward, reverse and combine the directions
- Fully integrated into GrafNav to permit same plotting, display and export capabilities

Processing Engine:
- Enhanced GLONASS processing enables both GPS and GLONASS satellites to be used in KAR. This results in faster and more reliable KAR fixes and cleaner trajectory processing. The old style "float ambiguity mode" is also still preserved as an option
- Overall, GLONASS processing accuracies are improved over previous versions

Utilities:
- *Mission Planner* now has support for GLONASS, while GPS and GLONASS almanacs can be downloaded easily within the *Mission Planner*. GLONASS almanacs can also be obtained from OEMV-3. GPS almanacs are also better supported by *Mission Planner*.
- GNSS data loggers for Windows and Windows CE now support GLONASS tracking for Javad and NovAtel
- *Export Wizard* now permits CurveFit trajectory output, which computes position, velocity and acceleration from carrier phase trajectory. Can be used for smoothing, more accurate acceleration and velocity output and for interpolation.
- Easier "point-and-click" access to antenna names related to RINEX files making it easier to select antenna types
- Sun's azimuth can now be exported along with Sun elevation
- Faster key checking and processing, especially for USB keys
- Horizontal position difference between the beginning and end of static sessions (with Move-To-Static) can be exported along with vertical difference, which is especially helpful for seismic applications
- *Download Service Data* utility supports YUMA and AGL almanacs.
- *Download Service Data* utility supports multiple sources for precise orbits and clocks attempting to download the most desirable files first.
- *GPBView* now fully supports GLONASS and L2C (for instance Doppler recomputed function)
- *GPBView* will now export a Google Earth KML file under the *File | Save ASCII* option
- *WLOG* now displays locktime and SNR values for both L1 and L2, if available (only the L1 values were displayed previously)

Decoders:
- Full support for GLONASS in *GPB to RINEX* and RINEX to GPB data converters
- GLONASS data is now extracted from NovAtel OEMV-3 and Leica 1200 (GG) receivers
- Full L2C support in processor and NovAtel OEMV, Leica 1200 and RINEX decoders
- OEM4/OEMV decoder will now transfer a fixed position entry into GrafNav base position
- Thales B-File decoder will now reject SBAS satellites for receivers operating with latest firmware
- Javad decoder can now extract data into the new GPB format and permits the clock bias to be recomputed, while Doppler can also be recomputed

Bug Fixes:
- When loading DEM input files, "deg min" and "deg min sec" inputs now work
- Antenna heights now being properly read in for static sessions
- GPGSA output string now writes out all PRN numbers (under the *File | Save ASCII* option of the *GPBViewer*)
- Improved handling of multiple SP3 and clock files
- Strange behavior from distance and azimuth tool has been corrected
- Corrected problem in GrafNet where processing direction not saved properly
- Decoder now properly computing the inclination when handling NovAtel almanac records, which allows for proper usage in the *Mission Planner*

What was new with Version 7.60.2425?

Available: April 25, 2006 [update]
GrafNav/GrafNet:
- Fixed issue in GrafNav Batch where static sessions not handled properly
- Remote antenna height problem fixed in GrafNav Batch (only affected static processing)
- Improved reading of SP3 files
- Improved re-drawing of UI windows if covered up by another application
- *Distance Separation* plot (in metres) now shows slope distance instead of horizontal distance
- Added command SKEW_TO_EPOCH which translates measurements to epoch time, which is useful for GrafMov project that have large clock offsets on moving base receivers
- Fixed problem in GrafNet where editing a checkpoint brought up a control point
- Improved display of type of control point in GrafNet
- *Ignore status* setting now copied from opposite direction if directions change due to adding or removing control points
- Fixed problem in KAR where program was sometimes crashing (very seldom happening)

WLOG:
- Supports U-blox
- Supports GLONASS measurements from Javad
- Improved support for client/server network communications
- Added command to input file that permits a reset of the GPS receiver every *n* hours
- Fixed issue with sending extra commands
- UTC offset now changed to 14 seconds

Inertial Explorer (beta):
- Transfer alignment now works with start/end times
- Improved support for varying data intervals in IMU data
- Improved ZUPT performance

What was new with Version 7.60.2209?

Available: February 9, 2006 [release]

GrafNav/Shared User Interface:
- Ability to process forward and reverse simultaneously. Result is a 45% speed improvement on dual CPU machines and 30% improvement on Xeon processors
- Antenna definitions can be used for station features and static sessions
- Two GrafNav project files (CFG) can be compared
- User can now set tolerances that determine when a static float solution passes or fails (good for seismic processing)
- *Hand* tool that can be used to pan map screen
- Much better support for non-metric units in map window (see *Settings | Preferences...*)
- Plots can be copied to clipboard much faster
- RMS, average, maximum and minimum statistics can be computed from plots
- Separate horizontal and vertical tolerances are now available for flagging outliers during export for short static session (seismic) processing.
- User can now export Sun's elevation (useful for photogrammetry applications)
- MJD time output now supported in *Export Wizard*
- There is now a new method for building local coordinate definitions. Since they are treated as grids, it is much easier to use them and they are also more flexible
- Now includes support for New Zealand and Oblique Mercator grids
- Datum transformations now support 14-parameter transformations (i.e. PPM, PPM-vel, translation, velocity, rotation and rotation-vel.)
- 14-parameter transformations can be solved for as well
- Software includes much better support for NAD83 $\leftrightarrow$ ITRF datum conversions
- Baseline and satellite processing statistics stored in binary value files (FBV/RBV) can now be exported to ASCII
- Initialization settings are now stored in program instead of windows directory
- Batch processor now prints map window

GrafNet User Interface:
- Re-designed user interface that is much more powerful
- New *Data Manager* window allows more intuitive control of project information
- Any loop tie can be computed by selecting stations or baselines forming a closed loop. This can be useful for determining erroneous sessions
- *Measurement* and *Advanced* settings can now be modified in GrafNet
- User can plot baseline statistics directly from GrafNet (no longer need to use GrafNav)
- GrafNet now supports separate horizontal and vertical control points. There is no longer a requirement to have at least one 3-D point
- Better traverse and session reports
- Improved traverse computation
- *Sessions* window replaced with an easy-to-use menu
- GrafNav's improved processing window is now implemented in GrafNet
- *Mission Planner* now accessible from GrafNet
- Multiple precise ephemerides now permitted for long static sessions
- User can specify observation GMT date to correct for GPS week number problems caused by conflicting or missing ephemerides
- Output of semi-major (*a*) and semi-minor (*b*) axes of error ellipses now uses proper unit scaling
- Improved computation of combined and other scale factors
- Output coordinates can be scaled by a factor during export (i.e. inverse combined scale factor)
- Users can control when float solutions are considered a pass
- Map can plot in grid coordinates and shows grid lines as well
- Improved map-printing capability

AutoNav (Automatic Processing Utility) -- New!
- New program that automatically performs the following tasks without user intervention:
  - Converts raw data to GPB
  - Downloads nearby base station data (CORS, IGS, etc…)
  - Converts and resamples downloaded data to proper interval
  - Base files can be stored for later re-use to avoid repetitive downloading
  - Processes data files
  - Combines directions
  - Exports using a user-specified profile
  - Users can setup an AutoNav project with the flexible dialog-based application
  - CFG and processing files can be saved for quality control and plotting within GrafNav

Processing Engine:
- Carrier phase data error detection is stricter and support for ultra-strict carrier rejection has been added
- *Very Low* distance PPM setting added for processing very long multi-base data
- Added support for new precise ephemeris format (SP3C)
- Individual satellite residuals can be written to binary value files for fixed static solutions (previously not possible)
- Better rejection of bad data for GLONASS processing
- Improved base satellite changing
- Better engine start-up for moving baseline processing

Utilities:
- *Download Service Data* now accepts command line parameters
- *Download Service Data* can utilize CORS hourly files for downloading within 24 hours for stations that produce them
- *Download Service Data* also shows azimuth to stations in addition to distance
- *Download Service Data* now supports passive FTP transfer
- *GPBView* can export position records in NMEA, ASCII and Waypoint's FSP format
- *Concatenate, Splice and Resample* can now interpolate data rates up to 1000 Hz
- Coordinate conversion utility can now output map scale and convergence, while also permitting user to enter epoch number for datum conversions
- *Favourites Manager* now stores Geodetic Reference Point (GRP) coordinates for IGS stations

Decoders:
- Javad now correctly determines PRN number for GLONASS satellites
- OEM4 supports additional records (specifically clock information)
- Trimble DAT converter has re-compute flag set correctly
- Antenna height and station name now read from Leica System 1200 and Trimble decoders
- All decoders support extended week numbering (to week 1724)
- RINEX→GPB decoder now allows GLONASS PRN offset to be specified
- Improved cycle slip detection for Thales (Ashtech) data
- Thales (Ashtech) decoder handles static/kinematic markers better
- Thales (Ashtech) decoder now automatically detects DG-16
- Septentrio decoder now supports external event marks