Firmware Update Release Notes: GNSS Simulation

GSG-5 and GSG-6 Series Version 8.3.1 Release Notes

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Version 8.3.1 – September 1, 2021
Features include:

- New signal GPS L1C (license option OPT-L1C required).
- Added support Beidou PRNs 37-63 with user-supplied RINEX files. (Example scenario and RINEX files are available with StudioView v. 5.5.1.0). PRNs 1-5 & 59-61 considered GEO satellites (transmitting D2 navigation messages on B1I/B2I/B3I), this currently cannot be changed.
- External attenuation setting limit increased up to 50 dB
- Repeatability of propagation environment simulation: each run of same scenario now produces same environment effects, several units running same scenario do the same allowing to do spoofing test combined with environment simulation.
- Beidou B1C & B2a: changed method of almanacs distribution over transmitted messages making resulting message sequence shorter (more like it is in live sky signal)
- Beidou B1I/B2I/B3I: transmit all almanacs in D2 navigation message. This allows to get almanacs for entire constellation (including high PRN satellites) faster than it could happen with D1 messages only.

Fixes include:

- RINEX observations could be saved with offset of 1 second (e.g. at seconds 01, 31 instead of 0 and 30) when save interval was bigger than one second (e.g. 30 seconds).
- More reliable synchronization for real-time unit control when using SCPI-raw mode.
- A satellite could be missing in NMEA GSV sentence (in SOUR:SCEN:LOG? command output) when another satellite was unhealthy.
- Correct URLs to RINEX files on CDDIS server after files extension change Dec 1, 2020.
- When absolute power of a signal is modified, its relative power now is reset to zero.
- GPS L1CA could be erroneously forced "on" when a scenario didn't have it enabled but had another GPS signal enabled.
- In some conditions ionosphere fields in navigation messages could be filled with 'garbage' or crash could happen when user-supplied or downloaded RINEX files didn't contain ionosphere correction parameters.
- Allow page ID to be zero in navbits modification events for Beidou B1C, Beidou B2a, GPS L1C. This allows to modify all pages with single event.
- Fix GLUT values in default GLONASS files to smaller values so that together with GPUT they better match tauGPS in default GLONASS almanacs.
- Beidou B1I/B2I/B3I: not all pages were previously transmitted in D2 navigation messages stream.
- Optimize RAM memory usage for long-running scenarios to prevent possible crash due to out of memory.

Version 8.2.1 – December 4, 2020

Features include:

- New variants of SOUR:SCEN:POW command:
    - SOUR:SCEN:POW? <freqband>
    - SOURce:SCENario:POWer <FreqBand>,ON|OFF
    - SOURce:SCENario:POWer <FreqBand>,<decimal>
- New variants of ABSPOWER event are implemented:
    - <time> PRN <satid> SIGNAL <signal> ABSPOWER <on/off/value>
    - <time> PRN <satid> FREQBAND <freqband> ABSPOWER <on/off/value>
    - <time> CHANNEL <channel> SIGNAL <signal> ABSPOWER <on/off/value>
    - <time> CHANNEL <channel> FREQBAND <freqband> ABSPOWER <on/off/value>
    - <time> SYSTEM <system> FREQBAND <freqband> ABSPOWER <on/off/value>
    - <time> SIGNAL <signal> ABSPOWER <on/off/value>
    - <time> FREQBAND <freqband> ABSPOWER <on/off/value>
- SCPI command SOUR:REFPOWER now can be used during simulation: power of each signal will be shifted keeping inter-signal power offsets unchanged (when possible).
- Support RTCM MSM messages (MSM3 and MSM7)
- Support navigation data downloading from CDDIS archive over FTP-SSL protocol (in place of recently disabled FTP on the server).
- Added support for downloading GPS data from serenad-public.cnes.fr and ftp.glonass-iac.ru
- Possibility to zeroize GNSS time scales offsets ("Options->Advanced options" screen).
- Possibility to disable SSL/TLS certificates validation (enabled by default). Can be used to download navigation data from the sites with expired certificates. (Options->Interface and reference -> Network -> Download server -> Check certificate).
- Added diagnostics into execution log when automatic conversion of RINEX v2 to v3 fails due to non-conformant header in the input RINEX file.
- File download attempts (source URL and result) will be indicated in execution log, when "ephemeris" setting of scenario is set to "Download".

Fixes include:

- Fixed bug with not saved non-zero satellites count after pressing EXIT twice while editing scenario
- Fixed incorrect display of south latitude in format of "degree.fraction" on scenario status screen
- SCPI queries "SOUR:SCEN:POW? <SatID>, <Signal>" and "SOUR:SCEN:POW<Channel>? <Signal>" with <Signal> referring to non-L1 signal could erroneously return "OFF" when L1 band of the channel was off.
- SCPI query and command "SCPI:SOUR:POW" assumed frequency band to be L1 when not specified. Now 'main' (default) signal of constellation will be used instead. That is L1 signal for all systems except IRNSS where it is L5.
- Satellite events could be propagated to duplicated (multipath) satellites despite they were specified only for normal (original) satellites.
- NMEA trajectories containing non-integer seconds in timestamps could produce erroneous speed jumps on display and doppler jumps in generated signal.

- Doppler offset and doppler change effects for multipath satellites were not working correctly.
- Handle unknown HOW time values (0.9999e+9) in downloaded or custom GPS RINEX files. Previously ephemeris records with such values could be processed incorrectly preventing scenario start.
- Additional validation of GLONASS ephemerides:
    - discard ephemerides with invalid frequency slots or frequency slots from previous version of the ICD.
    - Put a warning into execution log if frequency slot from almanac doesn't match the one from ephemerides.

- When "Simulate Now" mode is configured don't prevent scenario start when validity of navigation data on the servers in the Internet is close to expiration.

Version 8.1.1 – June 15, 2020
Features include:
- Released new option BDS3 supporting the following signals
  - Beidou B1C (OPT-BDS3)
  - Beidou B2a (OPT-BDS3 + OPT-L5)
- Added support for new signal Beidou B3 (OPT-BDS + OPT-L6)
- Changed 1PPS output behavior – 1PPS signal is only output when a scenario or signal generator is running
- Changed default NTP server to pool.ntp.org
- Subframe 4 page 17 could have invalid data due to 0xAA pattern used to fill the subframe. Now subframe 4 page 17 is filled with valid text message "GNSS-SIGNAL-SIMULATOR".
- New parameter available in options menu – TGD simulation. Used to enable or disable TGD for all satellites in the simulation.
- Implemented new variants of SOUR:SCEN:POW commands. Full set of supported variants is now:
  - Queries:
    - SOURce:SCENario:POWer?
    - SOURce:SCENario:POWer? <satID>[,<freqband>|<signaltype>]
    - SOURce:SCENario:POWer[n]? [<freqband>|<signaltype>]
    - SOURce:SCENario:POWer? <SatSystem>[,<freqBand>]
    - SOURce:SCENario:POWer? <SignalType>
  - Commands:
    - SOURce:SCENario:POWer ON|OFF
    - SOURce:SCENario:POWer <satID>,ON|OFF[,<freqband>|<signaltype>]
    - SOURce:SCENario:POWer <satID>,<decimal>[,<freqband>|<signaltype>]
    - SOURce:SCENario:POWer IMM,<satID>,ON|OFF[,<freqband>|<signaltype>]
    - SOURce:SCENario:POWer IMM,<satID>,<decimal>[,<freqband>|<signaltype>]
    - SOURce:SCENario:POWer <SatSystem>,ON|OFF[,<freqband>]
    - SOURce:SCENario:POWer <SatSystem>,<decimal>[,<freqband>]
    - SOURce:SCENario:POWer <SignalType>,ON|OFF
    - SOURce:SCENario:POWer <SignalType>,<decimal>
    - SOURce:SCENario:POWer[n] ON|OFF[,<freqband>|<signaltype>]
    - SOURce:SCENario:POWer[n] <decimal>[,<freqband>|<signaltype>]

Fixes include:
- Fixed bug that could cause a crash when logging QZSS CNAV ephemeris (error occurred on ephemeris switch)
- Fixed a bug that caused satellites to be disabled on second day of NTP scenario
- Corrected an error that could cause L2P signals to be disabled when used in VTS

Version 7.5.1 – January 8, 2020
Features include:
- GLONASS ephemeris switches are logged in execution log
- Improved RINEX correctness checking
- Ignored RINEX records are logged in execution log

- CNAV data set switches are logged in execution log
- CNAV message 30 is now sent
- RINEX download source for Galileo added: CNES (serenad-public.cnes.fr).
  - Source not suitable for "Simulate Now."
- Improved speed of observation file logging
- SBAS message types transmitted are logged in execution log
- Increased number of points allowed in NMEA trajectories (from 12000 to 50000)
- Satellites with invalid or unhealthy records in RINEX file will have a lower case letter on front panel display

Fixes include:
- RTCM Message Improvements
  - TGD correction is taken into account when calculating range differences
  - Fixed a multithread synchronization issue that could result in damaged RTCM
  - Messages 1004 and 1012 now transmit corrections for all satellites, even if they are transmitting L1-only
  - Order of messages are now fixed: 1002, 1004, 1006, 1010, 1012, 1033
  - Fixed a bug that caused damage messages in certain cases
- Fixed Beidou time calculation at leap second
- Improved synchronization on VTS system simulators
- Fixed NTP start time for looping scenarios
- Fixed antenna pattern application when RSG license is not present and 6DOF trajectory is used
- Improved MSAS correction simulation
- Fixed a bug that caused ephemeris validation to be skipped in signal generator mode
- Galileo E5a FNAV navigation logging
  - Changed page and subframe indexes changed to 1-based
- Fixed SCPI query sour:scen:tropo?

Version 7.3.1 – April 2, 2019
Features include:
- Added SBAS L5 signal simulation
- New syntax for power events added
  - <time> system <system-name> abspower [on|off|<power>]
  - <time> system <system-name> abspower [on|off|<power>]
  - <time> system <system-name> relpower [<power>]
- Keyboard can now be used for control and data entry in web interface
- Improved Galileo simulation
  - More frequent change of almanacs
  - IODa and almanac reference time derived from reference time of ephemeris
  - Reject user provided Galileo ephemeris records where TOE is not a multiple of 60 seconds
  - E5b health status could be wrong if it was overwritten by data from another satellite
- All default scenarios have date moved to 2022
- Generated new Beidou ephemeris to avoid gaps in validity intervals

Fixes include:
- IRNSS/NavIC simulation improvements
  - Corrected almanac data
  - Added support for PRN 8 and PRN 9
  - Updated default data based on live sky signal transmission
- Fixed a bug that could cause a time jump or unsynchronized TOW information in certain Galileo scenario configurations
- Improved simulation of GLONASS leap second

- Fixed GGA sentence to correctly reflect total number of satellites in use
- Corrected issue that could cause multipath signals from previous scenario to appear in the next run scenario in certain cases
- Corrected power change for frequency band – now all signals in band will be adjusted instead of only one signal type

Version 7.2.7 – February 19, 2019
Added support for new hardware board revision

Version 7.2.6 – November 30, 2018
Features include:
- Interface type settings preserved when performing factory reset via SPCI command

Fixes include:
- Fixed FEC encoding for CNAV and SBAS messages
- Corrected error in QZSS Subframe 5, SV_ID field

Version 7.2.5 – November 2, 2018
Features include:
- Introduced UNECE R-144 option (OPT-UNR)
- Added NAVBITS support for IRNSS
- Added subframe logging
  - IRNSS L5
  - Galileo E1, E5a, E5b
  - GLONASS L1, L2
  - GPS L2C, L5
  - QZSS L2C, L5
  - SBAS
- Updated list of available WAAS satellites
- Added event to change absolute power of an individual satellite system
- Added new variants of "SOUR:SCEN:POW?" query
  - "SOUR:SCEN:POW?" - returns "ON" if at least one signal in scenario has power turned on
  - "SOUR:SCEN:POW? <Satellite system>"
  - "SOUR:SCEN:POW? <Satellite system>,<Frequency band>"
- New support for comments in event and scenario files using # symbol
- Execution Log now contains the scenario stop time

Fixes include:
- Multiple fixes for IRNSS simulation
  - Corrected CRC Computation
  - Implemented proper ephemeris switching
  - Fixed wrong PRN ID AL field for message 7
  - Corrected delta lsf field in message 9
- Corrected simulation of P1 field in GLONASS string 1
- Events at elapsed time zero will be applied
- Fixed 1 second NTP time sync error (was introduced in 7.2.1)

Version 7.2.1 – October 1, 2018
Features include:

- Branding changed from Spectracom to Orolia
  - StudioView version 5.2.1.4 or later is required to communicate with GSG after upgrade
  - Web interface branding changed
  - Response to IDN query will return OROLIA rather than SPECTRACOM
  - Startup splash screen shows new graphic
- New leap second settings
  - Auto - The number of leap seconds is set by the date of the scenario
  - RINEX – The number of leap seconds is set by the RINEX header in the specified file
  - Fixed – User can set a custom value
- Elevation mask allowed value is lowered to -89. A simple obscuration check is done to ensure satellites are not visible if blocked by the Earth.
- GSG will not include ionosphere or troposphere effects when simulated vehicle is above ionosphere or troposphere.
- Added support for Beidou D1 and D2 subframe logging.
- Optimized use of download data in Simulate Now mode, especially on day boundaries.
- Added igs.bkg.bund.de ftp site as a source for download ephemeris.

Fixes include:
- Fixed a bug in GLONASS N4 and NA fields calculation
- Doppler calculations optimized for orbital trajectories. 10Hz update rate may still be a limiting factor in orbital trajectories.
- Fixed an issue that could cause disabled satellite when trajectory is close to navigation satellite.
- Fixed an issue that could cause receiver to drop satellite on spontaneous switch of ephemeris.
- Fixed an issue that could cause CNAV fields greater than 32 bits long to have wrong MSBs
- Corrected BDS subframe transmission timing that caused issues with some Qualcomm chipsets.
- Fixed a bug that caused multiple noise jammers to not be created when specified in scenario.
- Prevented a crash condition that could occur with a fixed number of satellites was selected and no valid navigation data was available.
- Fixed a bug in SBAS handling when UDREI field in fast corrections record is UDREI_NOT_MONITORED.
- Corrected a bug for GPS satellites that caused the wrong subframe to be transmitted after a week boundary was crossed (including GPS 2019 rollover week tests).

Version 7.1.5 – March 19, 2018
Features include:
- Updated supported SBAS satellites
- SBAS satellites can be selected by PRN number from a list of known satellites
- Updated default Galileo navigation data
- Added additional eCall scenario to allow first fix from GPS before Galileo-only test (OPT-ECL)
- Extended duration of eCall sensitivity test (OPT-ECL)
- Updated eCall dynamic trajectory (OPT-ECL)
- Simulation accuracy improvement for Beidou and Galileo – gravitational constants and angular velocity of Earth refined
- Improved position accuracy by selecting ephemerides using time of transmission
- Simulate MSAS corrections
- Made it easy to switch between SBAS/Others signals in Signal Generator configuration
- New SCPI command to change/enable/disable power of satellites of specific system
- Added SCPI command to turn off RF Signal of individual satellites

- Updated the QZSS file server URL

Fixes include:
- RINEX records with TOC not a multiple of 16 are rejected
- Timeout happens on PC side while waiting response to some RSG commands over USB
- Crash if SBAS Modulated signal selected in Signal Generator
- "Klobuchar" and "off" values were doubled in ionospheric mode menu
- Interference channel for modulated and unmodulated interference power was not set correctly
- Fixed crash if a satellite type (block) doesn't support certain signal and all other signals are off
- Sensor name parameter in SCPI commands is now case insensitive

Version 7.1.1 – December 19, 2017
Features include:
- Power offsets between different signal types can now be user defined
- Updated web interface links for Spectracom website
- Updated eCall scenarios (OPT-ECL)
- Implemented Galileo signal changes to work with certain Qualcomm chipsets
- New SCPI Commands for configuring power offsets:
  - SOURce:ABSPOWer
  - SOURce:RELPOWer
  - SOURce:REFPOWer
- SOURce:SCENario:POWer command now accepts ON and OFF as arguments
- Front panel power levels are shown with .1dB resolution

Fixes include:
- Prevented a lockup condition when scenario is started with circle diameter of zero
- Fixed an issue that could cause more satellites to be generated than the requested number
- Corrected specific case that would cause looping of NMEA trajectories to fail
- Proper use of QZSS almanac data
- Corrected doppler initialization for circle trajectory
- Moved eCall scenarios start positions to land
- HV option is again displayed in the Options menu
- Fixed SCPI and event file power level control of interference signals
- Correct SBAS file loading

Version 7.0.5 – July 19, 2017
Features include:
- SBAS satellites have a fixed power offset of -2.5dBm to the GPS satellites
- Smoother ephemeris data set transitions
- New eCall scenarios added (OPT-ECL)

Fixes include:
- Circle trajectory can be used in anticlockwise direction again
- Fixed bug that prevented setting the number of SBAS satellites
- Corrected wrong observation ID for Galileo
- Fixed Gravimeter sensor calculation error
- Improved EGNOS correction performance
- Fixed looping of RSG trajectories
- Fixed a bug with GPS almanac for PRN > 25

Version 7.0.2– April 25, 2017

Features include:

- Introduced eCall option (OPT-ECL)
- PDOP is now displayed on the front panel (previously HDOP was displayed)
- Allowed changing of signal mode (modulation) while signal generator is running (modulated/PRN/unmodulated)
- Added support for velocity profile in signal generator

Fixes include:

- Corrected bug that prevented selecting multiple constellations in signal generator mode
- Fixed setting of GLONASS frequency slot in signal generator when both unmodulated GPS and GLONASS signals are selected

Version 6.7.7– March 1, 2017

Features include:

- Current number of leap seconds when using default data set to 18
- Added support for Galileo E6B/C signals

Fixes include:

- Improved lever arm calculations

Version 6.7.5 – February 14, 2017

Features include:

- Execution log now contains the board and channel mapping of each signal generated during a scenario
- Introduced new log for subframe information
- Updated default NTP to UTC offset value to 18
- Galileo generation improvements
    - Added possibility to specify Galileo almanacs
    - Fixed IODa in subframe data
    - Improved generation of almanacs from ephemerides - The almanac is generated from the ephemeris having time of clock closest to the time of almanac
    - SVID is set to zero in subframe data, if the corresponding SV is not included in the constellation
    - Fixed iono parameters in subframes
    - Fixed satellite health parameters in subframes

Fixes include:

- Corrected the times in the data logs so they are all aligned
- Fixed a lockup condition that could occur when NTP time is selected and scenario start is cancelled
- Fixed infrequent packet loss problem causing TCP retransmissions
- Improved USB operation that caused errors when files were transferred

Version 6.7.3 – November 15, 2016

Fixes include:

- Corrections to GSG-5 licensing

Version 6.7.2 – November 11, 2016

Fixes include:

- Corrections to GSG-61 signal generator operation

Version 6.7.1 – November 2, 2016

Features include:

- New Troposphere model – DO-229
- Support for TLE file format

- Added new parameter to prn and channel power events to keep noise setting the same when power is adjusted
- Implemented advanced log feature with support for RSG and satellite data
- All RSG queries are available without RSG license
- GSG-61 model introduced
- Added display of imperial values and UTC time to the front panel display while scenario is running
- Spaces are allowed around commas used as delimiters in SCPI arguments
- Multiline responses for raw SCPI mode now always contain newline symbol after the last line
- New scenario parameter allows the user to set all power offsets between constellations to zero

Fixes include:
- Corrected application of SBAS NAVBITS events
- Improved performance of SBAS corrections
- Fixed a bug that caused a unit crash when downloading observation files
- Signal generator corrected to generate multiple constellations simultaneously
- SOURce:SCENario:DATEtime SCPI command can be used to set the time to NTP
- Fixed the ability to set the date/time and position while scenario is not running
- Corrected RINEX observation file generation for QZSS
- Updated list of supported SBAS satellites
- Implemented a workaround for the GSG dropping from the network
- Improved web interface to prevent it from becoming inaccessible
- Fixed a bug that caused SCPI requests to time out
- Removed unnecessary newline symbols in NMEA log

Version 6.6.5 – June 7, 2016
Fixes include:
- Corrected event file usage in looping scenarios

Version 6.6.3 – May 8, 2016
Fixes include:
- Fixed a bug that prevented calibration verification in manufacturing

Version 6.6.1 – April 22, 2016
Features include:
- NMEA handling is redesigned. Interpolation is done internally; external interpolation of the trajectory is no longer a requirement.
- Increased precision of lever arm and ECEF coordinate entries
- Subframes are now synchronized across all GPS satellites. All GPS satellites transmit the same subframe/page at the same time.
- Introduced OPT-TLM allowing the TLM word to be set to all 1's in the unit, applied to all simulations
- Introduced OPT-HPWR to allow the maximum power available from the GSG to increase to -50dBm
- Environment propagation models can be selected from the front panel
- Return Link Service testing for Galileo is supported
- RSG file trajectories can be looped within a scenario
- New SCPI command for rebooting the unit remotely
  - SYSTem:REBOOT

Fixes include:
- Corrected a bug that caused that GLONASS 4 year interval number to be incorrect after rollover
- Update of start time from NTP is now correct when stopping a scenario and immediately restarting it

Version 6.5.3 – December 21, 2015

Features include:

- QZSS and GPS ephemeris and almanac files can now be downloaded from the JAXA server

Fixes include:

- Fixed a problem that caused GLONASS only scenarios to have the wrong date
- Corrected a bug that could cause ephemeris download to fail

Version 6.5.1 – September 14, 2015

Features include:

- New environmental propagation models: Urban, Suburban, Rural
- SCPI command added for changing signal generator mode
- Added support for RINEX v2.12 file types
- ANTEX files are accepted to support PPP testing

Fixes include:

- Noise BW properly set in GSG-55 licensed units
- NMEA correctly outputs speed over ground
- Fixed a bug that caused signal generator to lock up when SBAS signal type was selected
- Adding SBAS in a scenario will correctly generate only 1 of each satellite

Version 6.4.3 – July 13, 2015

Features include:

- Separate fields for NTP server address and data download server address
- New signal generator mode – PRN code modulation ON, data modulation OFF
- Default data and NTP offset are updated to reflect the current GPS-UTC offset – now 17
- The GN talker ID for RMC and GGA NMEA sentences is now accepted for trajectory files

Fixes include:

- Correct power level set when commanded via SCPI
- Corrected GLONASS almanac time when user navigation files are used

Version 6.4.1 – May 27, 2015

Features include:

- Support for IRNSS L5 constellation generation (OPT-IRN)
- Support for QZSS L2C and L5 (OPT-QZ, OPT-L2C, OPT-L5)
- Trajectories can now be defined using 6 Keplerian elements
- Added YUMA Almanac support for QZSS
- Default constellation updated to support newly launched block IIF satellite
- Improved calculations when only position information is given as trajectory
- Added SCPI commands to support closed circle trajectories
  - TURNRATE – similar to RATEHEADING command, but the given rate will be used as an average heading around full circle, and heading will be changed each step in order to maintain a closed circle
  - TURNRADIUS – specifies value of circle radius in meters
- Added SCPI command to query SV position
  - SVPos? – query a satellite's ECEF position
- Added SCPI commands to query pseudo-range and Doppler of each satellite
  - DOPPler? – query a satellite's Doppler
  - PRANge? – query a satellite's pseudo-range for a frequency band
- Added confirmation when stopping a running scenario
- Default RINEX data is now available to user from StudioView File Manager or web interface files

- User can now specify the sequence of CNAV messages

Fixes include:

- Fixed a bug that could cause a crash if the user trajectories directory is empty
- Improved *Simulate Now* satellite generation through UTC day rollover
- Improved L2C and L5 CNAV message update
- Heading on front panel shows correct value even when speed is very small
- Fixed BeiDou GEO satellites' residuals jump
- Changed web server to eliminate issues with the web UI locking up
- Fixed a bug that caused the simulator to disable satellites when it should not

Version 6.3.5 – April 13, 2015

Features include:

- Support for new GSG hardware revisions

Fixes include:

- Corrected BeiDou day numbering for BeiDou-only leap second testing
- Corrected how GLONASS ephemeris is transmitted during GLONASS-only leap second
- Fixed an issue that caused a unit lockup when a BeiDou scenario is running for more than 20 hours.

Version 6.3.1 – February 28, 2015

Features include:

- GSG Front Panel Menu has been redesigned. All items are still available/settable from the front panel, but the menu arrangement has changed. The basic scenario parameters are more accessible and the advanced features are now submenus.
- SP3 format now supported for defining constellation
- IRNSS L5 signal available in the signal generator (OPT-IRN)
- Future Leap Second value, week number, and day of week are read from RINEX 3 header file if given
- New SCPI command to check synchronization of time between GSG and NTP server
- Simulate Now can use files generated by SecureSync (instead of internet source)
- Added Navbits support for Galileo
- Updated RSG Engine to include more realistic movement model
- Improved NTP time synchronization
- New SCPI commands have been introduced to allow entry of PRY rates and attitude in degrees
- TLM value updated to reflect current value in the GPS signal
- Improved SCPI-raw performance
- Scenarios are now available for RTCM 11000.3 Marine testing
- TDG (timing group delay) set to a non-zero value

Fixes include:

- Corrected carrier phase observations for GPS L5
- Corrected RTCM messages to include initialization of carrier phase advance (due to ionosphere)
- Fixed an error that could cause Simulate Now to lose synchronization in scenario runs of greater than 1 day
- Corrected a bug that caused *OPC? to fail to block commands when issued in the first seconds of a scenario start
- Fixed an issue that caused HDOP value in NMEA sentences to be updated only when view 2 or higher was shown on front panel during running scenario.
- Fixed a bug that set max power level at -67.3dBm instead of -65dBm

- NOTE: Requires min v2.04 to be installed first

Version 6.2.7 – January 22, 2015
Limited Release
Features include:
- Removed auto start confirmation pop-up from GSG-51

Version 6.2.5 – December 1, 2014
Limited Release
Features include:
- Added Navbits support for BDS and SBAS signals
- QZSS L1-SAIF signal introduced (OPT-QZ)

Version 6.2.1 – October 31, 2014
Features include:
- Support for QZSS L1C/A (OPT-QZ)
- Support for GEO and IGSO BeiDou satellites (OPT-BDS)
- Support for Beidou B2 (OPT-BDS, OPT-L5)
- Support for Vehicle Silhouetting to block signals based on vehicle body (OPT-VIS)
- Support for Lever Arm (OPT-VIS)
- Multipath parameters can now be modified during runtime using SCPI commands or event files
- Pressing the 'Menu' button when the scenario is running displays the running scenario configuration
- STANAG tropospheric model is available
- IONEX files are accepted for custom Ionosphere models
- Navigation message modification can be done using event files
- Altitude is also displayed as Mean Sea Level on front panel and in NMEA log
- L5 band is supported by the ionosphere model
- RINEX Observations include phase data

Fixes include:
- Corrected multipath doppler offset implementation
- Corrected normalized sensor range
- Fixed a bug that caused linearaccelerometer to give the wrong direction
- Improved scenario startup time
- Starting altitude is handled correctly when using NMEA files
- Corrected PRYrate command so the orientation does not suddenly change when crossing 180degrees
- NOTE: Requires min v2.04 to be installed first

Version 6.1.1 – July 18, 2014
Features include:
- Support for Jamming simulation (OPT-JAM)
  - Added noise and sweep types of interference
  - Added location based jammer
- Support for sensor simulation (OPT-SEN)
  - Accelerometer
  - Linear Accelerometer
  - Gravimeter
  - Gyroscope
  - Odometer
  - Odometer3D
- Support for environmental models to block signals (OPT-VIS)

- Timing calibration file is accessible to the user if OPT-TIM is installed
- Run-time control of noise and unit power level from front panel
- Added capability to change navigation message bits to simulate errors
- YUMA almanac is accepted
- SCPI improvements
  - SatID can be given as an input for SOURce:SCENario:POWer
  - Added command for retrieving MAC address via SCPI
- Added possibility to add a random offset to multipath carrier phase at startup
- Option E6 has been renamed to L6 to support BeiDou B3 when available
- MAC address is now shown in the network settings menu
- Part number is displayed on the show system information screen
- Added ability to upload files to unit via web interface
- Signal Generator settings persist through a power cycle

Fixes include:
- When Observation logging is turned on, it is only for one scenario
- Fixed web interface presentation and operation in Internet Explorer
- RTCM messages are no longer available when a base station location is not set
- Fixed a bug that caused unit transmit power to change when a high power level interference signal was set
- Event files are limited to 4000 lines
- Improved SCPI-RAW over Telnet
- Fixed a bug that caused unsaved parameter changes to show in the scenario overview

- NOTE: Requires min v2.04 to be installed first

Version 6.0.4 – May 5, 2014

Fixes include:
- Fixed a bug that could cause unit to lock up when loading/starting/stopping scenarios
- Corrected Interference channel issue that could lead to all interference channels defaulting to GPS L1 C/A
- Corrected phi orientation in user antenna files
  - Phi is now anti-clockwise with phi 0 degrees pointing to the north
- NOTE: Requires min v2.04 to be installed first

Version 6.0.3 – April 17, 2014

Features include:
- SCPI-RAW allows sending of SCPI commands via Ethernet without using VISA or VXI-11
- New SCPI command allows user to disable altitude compensation
- RTCM 3.x message support for GLONASS
- Position can be set using the RSG SCPI commands when a scenario is loaded but not yet running

Fixes include:
- 2 SCPI commands updated for better performance
  - SOURce:POWer
  - SOURce:SCENario:DATEtime?
- Corrected minor coordinate format issue
- Corrected power levels with antenna pattern files
- Heading and RateHeading commands do not reset acceleration to zero
- NOTE: Requires min v2.04 to be installed first

Version 6.0.1 – March 13, 2014

Features include:
- BeiDou B1 (opt-BDS) capable
- RTCM 3.x message output capable (opt-RTK)
- Memory optimized to allow 4 constellations to be generated simultaneously
- Unit files can now be accessed via http (Web interface)
- RINEX Navigation files can be logged on the unit during a scenario run
- YUMA almanac is now generated automatically when a scenario is run
- Added the ability to independently control power levels for L1, L2, and L5
- Protocol enhancements
  - Added command to enable Galileo E5 in signal generator mode
  - Added commands to control power levels by frequency from protocol

Fixes include:
- GPS signals used as interference or in Signal Generator are no longer lost at the week rollover
- Corrected gains in antenna model GPS-703-GGG
- Corrected vertical acceleration RSG commands
- Corrected a geometry issue that affected position when traveling a large distance from scenario start position
- Abspower off event corrected
- GLONASS leap second is properly handled
- Protocol fixes
  - SOURce:PPSOUTput no longer requires full command text, shortened SCPI command is accepted
  - Datetime second format corrected
- NOTE: Requires min v2.04 to be installed first

Version 5.5.7 – December 20, 2013
Features include:
- Improved Simulate Now reliability
- Improved external triggering

Fixes include:
- Correct power level offsets that were not applied to different frequencies, codes, and constellations.
- Corrected L2C and L2P signal levels
- Corrected L2P(Y) signals
- Corrected 180 degree longitude entry
- Corrected GLONASS signal disappearing in signal generator mode after 2-5 hours.
- Corrected the PPS offset value in units with an older hardware configuration
- NOTE: Requires min v2.04 to be installed first

Version 5.5.5 – November 11, 2013
Features include:
- Improved observation files
  - Different files names for each observation file
  - More than one hour of observations data can be collected
- Support for record and playback to replay data recorded data the same day
- Galileo E5 capable

Fixes include:
- Galileo E1/E5 ranges corrected
- Corrected an issue that could cause the unit to lock up at a certain day and time of week

Known Issue:
- Power level offsets are not applied to different frequencies, codes, and constellations.

- NOTE: Requires min v2.04 to be installed first

Version 5.5.4 – October 25, 2013
Features include:
- Improved PPS timing calibration, allows special calibration option
- Aligned the NMEA log data to the whole second
- Improved response when querying unused channels

Fixes include:
- SBAS corrections applied to the satellite ranges
- Corrected SCPI commands for power adjustment when used with RSG option and without
- Corrected a bug that prevented a custom antenna gain pattern from taking effect unless 'enter' was pressed
- Corrected the number of digits in NMEA data timestamps
- Corrected transfer of binary files using SCPI
- SBAS satellite position correction

- NOTE: Requires min v2.04 to be installed first

Version 5.5.1 – July 8, 2013
Features include:
- Simulate 'Now' capable
- Galileo E1 capable
- Improved trajectory altitude handling
- Observations now support multiple frequency bands
- SV clock models implemented
- Added ability to load user selected SBAS files

- NOTE: Requires min v2.04 to be installed first

Version 5.1.13 – May 23, 2013
Fixes include:
- Corrected L2 power level issue.

- NOTE: Requires min v2.04 to be installed first

Version 5.1.11 – May 6, 2013
Fixes include:
- Patch to Linux kernel to address new USB part now being used.

- NOTE: Requires min v2.04 to be installed first

Version 5.1.9 – May 6, 2013
Fixes include:
- Corrected network bug that could cause unit to randomly drop from network
- Improved RSG synchronization with OPC
- Fixed an error that could cause satellites to be disabled due to a phase shift between P-code and C/A code

- NOTE: Requires min v2.04 to be installed first

Version 5.1.7 – April 30, 2013
Features include:
- Improved external trigger feature - only first trigger received is used
- Introduces single channel GSG-5 unit

Fixes include:
- 'Speed or altitude above regulation limits' error that can occur during a static scenario

- Improved synchronization for GSG-63/64 models
- Corrected GLONASS ranges
- NOTE: Requires min v2.04 to be installed first

Version 5.1.5 – April 10, 2013
Fixes include:
- Fixes GPIB bug that affects log? command
- NOTE: Requires min v2.04 to be installed first

Version 5.1.3 – April 02, 2013
Fixes include:
- Removes an error message that may show in GSG-5 licensed units
- NOTE: Requires min v2.04 to be installed first

Version 5.1.1 – March 18, 2013
Features include:
- Controlled TOA for Age of Almanac reporting by some receivers
- Default data leap second updated to 16
- NOTE: Requires min v2.04 to be installed first

Version 5.0.1 – February 22, 2013
Features include:
- Capability for new GPS signals L2c and L5
- Adds the ability to choose the satellite model for each GPS and GLONASS satellite
- Calibration date is stored in unit
- Improved options display – see which options are enabled and which are not in each unit
- Signal generator can output 1 each of GPS and GLONASS
- Adds the capability to add trial licenses for software options

Fixes include:
- Corrected error when antenna model is used with attitude changes
- Corrected the ephemeris data file calculation in signal generator mode
- Added fix for Garmin that would not use the signal if there was 0 clock error
- Improved the fan speed settings
- Improved NMEA file size and handling (improvement from 4.5/4.51)
- NOTE: Requires min v2.04 to be installed first

Version 4.51 – December 20, 2012
Fixes include:
- SBAS bug fix in v4.5 that would cause SBAS satellites to be disabled when the scenario is started.
- NOTE: Requires min v2.04 to be installed first

Version 4.5 - December 19, 2012
Features include:
- Capability for Real-time scenario generation feature
- Introduces new trajectory format, .traj files
- Repeatable trajectory capability
- Programmable PPS (configurable to 1, 10, 100, 1000 PPS)
- Reset (&Clean) factory defaults using SCPI protocol

Fixes include:

- Faster response to SOUR:SCEN:LOG? command
- NOTE: Requires min v2.04 to be installed first

Version 4.11 - October 23, 2012
Fixes include:
- Improved USB functionality

Version 4.09 - October 18, 2012
Features include:
- Change in signal generator mode to use af0 and af1 value from the RINEX ephemeris file.
- Execution log introduced on unit.
- NOTE: Requires min v2.04 to be installed first

Version 4.07 - September 28, 2012
Corrections include:
- L1L2-Iono model correction
- Signal duplication using events now works properly
- Multi-band antenna gain fixes
- Unit detects loss of external reference and reports error
- NOTE: Requires min v2.04 to be installed first

Version 4.05 – August 18, 2012
- Includes workaround for Topcon GRS-1 issue
 Corrections Include:
- Corrected a bug that can cause a 'Speed or altitude above regulation limits' error to occur in a static scenario
- Corrected a bug that caused interference signals to have -65dbm power level regardless of requested value
- Ensured all interference signals are shown in the scenario details when running
- Fixed an issue with GLONASS only scenarios where the next day's data did not load on long scenarios
- NOTE: Requires min v2.04 to be installed first

Version 4.01 – August 6, 2012
- Introduces GSG-62.
- Introduces GPS P/Pseudo-Y.
- Introduces GPS L2 and GLONASS L2.
Features include:
- Added ability to set scenario start time from an NTP server
- NMEA log data from unit contains more accurate SNR values
- Introduced user defined antenna patterns
- Arming and Triggering can now be done from the front panel
- The front panel keys can be locked out
- Introduced Scenario Relative power event
Corrections include:
- GLONASS RINEX file fixes
- Corrected a bug that would cause a crash if a scenario was started with zero satellites selected
- Corrected a bug that could occur in the transmit power menu after a factory reset
- Improved error message received when unit exceeds regulation limits
- Updated satellite identifiers returned by SOURce:SCENario:SATid[n]?
- GPIB setting now persists through a power cycle
- Updated 3GPP trajectory to correct for a jump sometimes seen when the trajectory repeats

- Calibration mode now outputs full power with zero attenuation
- Corrected an almanac issue that caused certain receivers to hang when reading almanac data for unhealthy sats
- NOTE: Requires min v2.04 to be installed first

Version 3.03 – April 30, 2012
-Allows for creation of GSG-53 GPS/GLONASS 4-channel simulator
Corrections include:
- GLONASS almanac fixes
- New coordinate formats on front panel display. Pressing the format button now changes between:
  1) Geodetics in DD MM.mmmm (current format)
  2) Geodetics in DD MM SS.ss
  3) Geodetics in DD ddddd
  4) EFEC in IIIIIII.ii (signed Integers)
- Antenna model fixes:
  o Fixed issue with signal levels growing over time when using patch antenna model
  o Corrected a minor issue in the cardioid antenna model algorithm
- Fixes to interference channels:
  o Changed the display of the interference channel to indicate whether it is a GPS or GLONASS CW signal
  o Correct an error that could cause the wrong frequency to be transmitted when selecting GLONASS slot 0
- Improvements to firmware update:
  o Update can be canceled while the file is being transferred but not once update has started
  o Firmware will check for free space and firmware file in the user partition temporarily as necessary
- SCPI protocol fixes:
  o Added proper wait time for SOURce:ONECHN:CONTrol stop command
  o Corrected GGA format from NMEA log query- removed extra field
  o Changed Elevation and Azimuth fields in GSV sentences to integers
- Other fixes:
  o Disabled the ability to create a multipath SBAS signal via an event file
  o Added an acknowledgement screen after reset to factory defaults is complete
- NOTE: Requires min v2.04 to be installed first
Version 3.02 – March 13, 2012
- Correction: Unit locks up on next reboot after manual calibration using calibration menu.
- NOTE: Requires min v2.04 to be installed first

Version 3.01 - February 29, 2012
- Corrections to the v3.00 release
- NOTE: Requires min v2.04 to be installed first

Version 3.00 - February 22, 2012
- GSG-56 introduced GLONASS support
New features include:
- RINEX Observation file logging,
- 10Hz NMEA trajectory support
- ECEF coordinate support
- Interference signals (GSG-55/56)
Bug fixes include:
- Time jump at day26
- USB improvements
- NOTE: Requires min v2.04 to be installed first

Version 2.09 – October 12, 2011
- Configurable gateway
- Configurable DNS
- HTTP proxy support to be used with download feature
- Because of above changes the "Interface and reference" menu has been reorganized
- Fix for "Garbage on the screen when scen/siggen is run/stopped many times from protocol"

- NOTE: Requires min v2.04 to be installed first

Version 2.08 - September 29, 2011
- Limits for Export restricted version changed to be greater than before
- Fix for "Every Thursday in 2011 (except a few in Jan2009) cause error"

- NOTE: Requires min v2.04 to be installed first

Version 2.07 - August 26, 2011
- External trigger can be used to synchronize several units
- Improved almanac handling
- Faster scenario start-up
- Web interface improvements
- Ublox and Trimble Force 22E receiver performance verified
- GSG-55E model name introduced
- A number of scenario replay and usability enhancements

- NOTE: Requires min v2.04 to be installed first

Version 2.06 – May 31, 2011
- Correcting for FPGA M9K Memory Block Read Issue, which caused severe problems for affected HW units
- Introducing Reset&Clean functionality
- Introducing Configurable gateway
- Introducing Export restricted version
- Introducing Dynamic navigation message updating and better leap second handling
- Usability improvements, e.g. Yes/No/Cancel dialogs and better error handling when parsing user uploaded scenario files
- Avoiding 'no ext ref' warning message, by giving the PLL extra time to lock. Esp needed by the 622 VCXO version.

- NOTE: Requires min v2.04 to be installed first

Version 2.05 - April 25, 2011
- Web interface reboot disabled during firmware update
- Front panel changes according the license

- NOTE: Requires v2.04 to be installed first

Version 2.04 - April 11, 2011
- Support for Web interface, unit front panel as a Web page.

- NOTE: Requires v2.03 to be installed first

Version 2.03 - April 6, 2011
- Support for configurable VCXO frequency
- First part for enabling web server interface

Version 2.02 – March 10, 2011

- Leap second feature added
- NMEA trajectory corrections with improved support data with only one of the GGA, RMC types present
- Changes in navigation message to correct for an issue seen with Rockwell receivers
- Protocol improvements, IEEE488.2 commands
- Corrected issue with verifying calibration data
- Corrected missing SBAS data behavior