



IGS REAL-TIME SERVICE

Introducing the IGS Real-time Service (RTS)

The International GNSS Service (IGS) Real-time Service is a GNSS orbit and clock correction service that enables precise point positioning (PPP) at worldwide scales. The RTS products enable applications such as scientific testing, geophysical monitoring, hazard detection and warning, weather forecasting, time synchronization, GNSS constellation monitoring, imagery control and many other public-benefit applications.

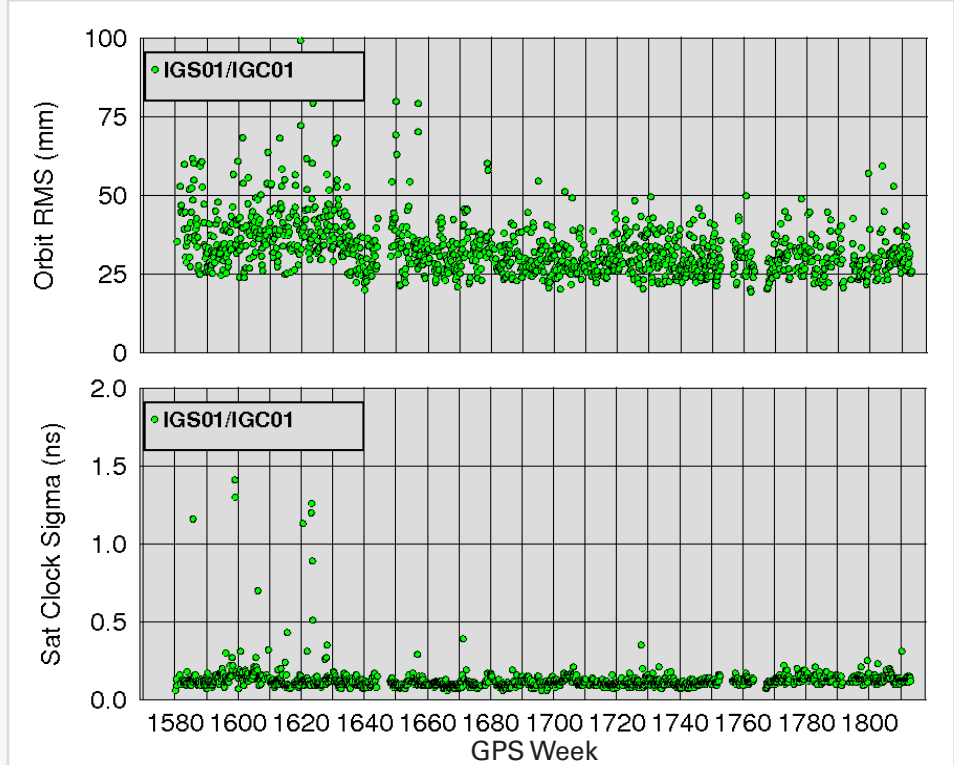
The RTS is made possible through partnerships with Natural Resources Canada (NRCan), the German Federal Agency for Cartography and Geodesy (BKG), and the European Space Agency's Space Operations Centre in Darmstadt, Germany (ESA/ESOC). Support is provided by 160 station operators, multiple data centers, and 10 analysis centers around the world.

Service Mission and Benefits

The International GNSS Service (IGS) has ensured open access, high-quality GNSS data products since 1994. These products enable access to the definitive global reference frame for scientific, educational, and commercial applications – a tremendous benefit to the public. Through the Real-time Service (RTS), the IGS extends its capability to support applications requiring real-time access to IGS products.

RTS Products

The RTS Products consist of GNSS satellite orbit and clock corrections to the broadcast ephemeris, as well as data streams from a global network of high-quality GNSS receivers.



IGS Real-time Clock Combination of IGS01 (compared to IGS Rapid)

The RTS products are distributed as RTCM SSR correction streams broadcast over the Internet using the NTRIP protocol. The corrections are expressed within the International Terrestrial Reference Frame 2008 (ITRF08). The initially offered products include GPS-only correction streams, as well as an experimental GPS+GLONASS correction stream that is anticipated to be fully integrated within the RTS in the near future.

RTS Infrastructure

RTS is based on the IGS global infrastructure of network stations, data centers and analysis centers that provide the "world's standard" high-precision GNSS data products. Operational responsibility for the

generation of the official RTS combination products lies with the IGS Real Time Analysis Center Coordinator (RTACC), currently the European Space Agency's Space Operations Centre in Darmstadt, Germany (ESA/ESOC).

The RTS product streams are combination solutions generated by processing individual solutions from participating Real-time Analysis Centers (RTAC). The effect of combining the different RTAC results is a more reliable and stable performance than that of any single AC's product.

For more information, please visit the RTS website [<http://rts.igs.org>] or contact the IGS Central Bureau [cb@igs.org]



IGS Quality of Service

The IGS continuously monitors the accuracy of its products through intercomparison of results between Analysis Centers. IGS strives to deliver its products on a highly available basis as shown below. Due to the volunteer nature of IGS, availability of products is not guaranteed.

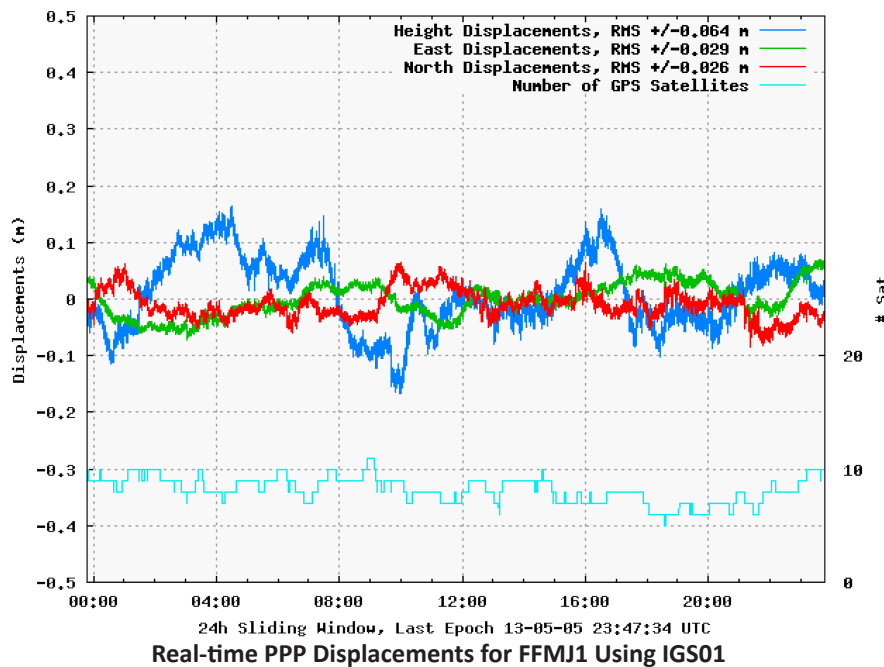
Content Description of the RTS Product Streams

The RTS products are disseminated in the form of RTCM SSR streams. The technical content of the RTS products is described in the Table below. The products, designated at IGS01/ICG01 and IGS02, contain corrections only for the GPS satellites. The experimental product, designated at IGS03, contains corrections for GPS and GLONASS. The RTCM v3 streams listed below may be used to support development and testing of real-time Precise Point Positioning (PPP) and related applications.

Information for Users

The RTS is supported by the IGS for free and open access by all users, as far as dissemination resources allow. RTS is initially offered as beta service for the development and testing of applications. The RTS is expected to be fully operational by the end of 2013.

As NTRIP is an RTCM open standard, no special licensing is associated with its use. Commercial entities interested in integrating RTS into their equipment should contact the IGS Central Bureau to for additional information and support. The RTS product streams are available through designated product distribution centers around the world. Users may register online through the IGS Real-time Service website.



GPS Satellite Ephemerides / Satellite and Station Clocks	Sample Interval	Accuracy	Latency	Continuity	Availability
Broadcast (for comparison)	Orbits Sat. Clocks	1s ~100 cm ~5 ns RMS; ~2.5 ns Sdev	real time	Continuous	99.99%
Ultra-Rapid (predicted half)	Orbits Sat. Clocks	15 min ~5 cm ~3 ns RMS; ~1.5 Sdev	predicted	4x daily, at 03, 09, 15, 21 UTC	95%
Ultra-Rapid (observed half)	Orbits Sat. Clocks	15 min ~3 cm ~150 ps RMS; ~50 ps Sdev	3-9 hours	4x daily, at 03, 09, 15, 21 UTC	95%
Rapid	Orbits Sat. & Stn. Clocks	15 min 5 min ~2.5 cm ~75 ps RMS; ~25 ps Sdev	17-41 hours	daily, at 17 UTC	95%
Final	Orbits Sat. & Stn. Clocks	15 min Sat: 30 s; Stn.: 5 min ~2 cm 75 ps RMS; 20 ps Sdev	12-18 days	weekly, every Thursday	99%
Real-time	Orbits Sat. Clocks	5-60 s 5 s ~5 cm 300 ps RMS; 120 ps Sdev	25 seconds	Continuous	95%

Note 1: Orbit accuracies are 1D mean RMS values over the three XYZ geocentric components. IGS accuracy limits, except for predicted orbits, are based on comparisons with independent laser ranging results and discontinuities between consecutive days. The precision is better.

Note 2: The accuracy (neglecting any contributions from internal instrumental delays, which must be calibrated separately) of all clocks is expressed relative to the IGS timescale, which is linearly aligned to GPS time in one-day segments. The standard deviation (Sdev) values are computed by removing a separate bias for each satellite and

Note 3: Availability :percentage of time that accuracy and continuity of service meet stated specification.

Stream Name	Description	Ref Point	RTCM Messages	Provider / Solution ID	Bandwidth (kbits)	Software
IGS01	Orbit/Clock Correction, Single-Epoch Combination	APC	1059 (5),1060 (5)	258 / 1	1.8/sec	ESA/ESOC
IGC01	Orbit/Clock Correction, Single-Epoch Combination	CoM	1059 (5),1060 (5)	258 / 9	1.8/sec	ESA/ESOC
IGS02	Orbit/Clock Correction, Kalman Filter Combination	APC	1057 (60), 1058 (10), 1059 (10)	258 / 2	0.6/sec	BKG
IGS03	Orbit/Clock Correction, Kalman Filter Combination	APC	1057(60), 1058(10), 1059(10), 1063(60), 1064(10), 1065(10)	258 / 3	0.8/sec	BKG
RTCM3EPH	Broadcast Ephemeris		1019(5), 1020(5), 1045(5)		6.0/sec	BKG/BNC

APC: Antenna Phase Center CoM: Center of Mass, (not compliant with current RTCM-SSR standard). The figures in brackets next to each RTCM message ID denote the message sample interval in seconds.

For complete product quality and performance information, please visit: <http://rts.igs.org/monitor/>