

## The impact of the GPS anomaly on January 26<sup>th</sup> on MEINBERG GPS receivers

During decommissioning of the satellite SVN-23 the GPS control segment has obviously uploaded corrupted data which caused the UTC correction parameter to be wrong. This set of parameter consisting of a static offset, a linear term, a reference time and leap second information is used to relate GPS system time to coordinated universal time (UTC).

Normally the A0 parameter which represents the static offset of GPS time to UTC (excluding the number of leap seconds) at time of upload is about a few nanoseconds. After upload of the flawed data this parameter jumped to about -13.7us. Obviously not all satellites have been loaded with the almanac data causing this problem - this is quite normal as the satellites have to be in sight of a ground station while they're revolving.

Here at the Meinberg R&D lab we observed that some satellites were transmitting correct UTC A0 parameter and some others were transmitting the corrupted values. The table below shows data received from of a set of satellites that were tracked at the same time around 8:00 UTC on 26<sup>th</sup> of January.

PRN	RAWSBFW6	RAWSBFW7	UTC.WN	UTC.T0 [s]	UTC.A0 [us]
9	3FFFF1B3	E3800017	0	0	-13.696030
7	BFFFFFFEA	BFD3967B	89	319488	-0.000931
2	7FFFFFFD5	7FD39644	89	319488	-0.000931
6	FFFFF18C	23800028	0	0	-13.696030
23	FFFFF18C	23800028	0	0	-13.696030
PRN	- the satellites PRN Number				
RAWSBFW6	- RAW data of sub frame word 7				
RAWSBFW7	- RAW data of sub frame word 8				
UTC.WN	- truncated week number of UTC parameter reference time				
UTC.T0	- TOW of UTC parameter reference time				
UTC.A0	- A0 parameter of UTC data				

Depending on the satellite that was used to update the UTC parameter in a Meinberg GPS receiver the device either used the faulty or the correct parameter set. This constellation resulted in an A0 parameter flipping between 1ns and -13.7us which caused the UTC time to step back and forth by 13.7us.

The large time offsets triggered an emergency brake mechanism within the oscillator control loop that caused it to enter a coarse time setting algorithm which inserted this 13.7us as a time step for a certain time. After the situation has normalized the Meinberg receivers returned to regular operation without requiring any manual action by the user.