Using Post-Processed RAW GNSS Data Recorded on the CEESCOPE™ for Precise Surveys with HYPACK®

CEESCOPE™ RAW GNSS data files may be post processed to centimeter accuracy using a third party utility and then subsequently re-inserted into the original HYPACK survey project to improve GNSS positioning accuracy in x, y, and z.

The CEESCOPE™ echo sounder equipped with the NovAtel L1/L2 GNSS receiver is able to record raw GNSS data on its internal memory or connected USB drive. These data may be used to recompute a more accurate position after post-processing relative to a fixed base station. This feature is particularly useful when accurate position and elevation data is required for the survey deliverable however there is no ability to use an RTK base station with a real time corrections telemetry data link.

Lower grade real time GNSS data may be used during the survey for navigation purposes, however this position dataset may be replaced in post processing by the more accurate recomputed data. This requires the use of hydrographic software that allows this data replacement process, for example HYPACK®.

The first step is to export the data from the CEESCOPE™ and convert it to a Receiver Independent (RINEX) data format. The RINEX data may then be processed through a third party software package or service to recompute the positions after reference station corrections are added. This will create a PPK file. This file will typically be a csv or similar format of ASCII data. For insertion into the existing hydrographic survey dataset, the minimum requirement is position, height (if getting level corrections as well) and time. As the post processed, improved accuracy measurements need to be exactly matched to the uncorrected data the time stamp is a critical piece of information. Without a time stamp, there is no way to match up the data. A sample PPK file is shown below:

```
 Date       , Time         , Latitude          , Longitude        , Ellipsoid Hgt,
8/12/2015,0:16:44.000,-33.6309170389,151.1901549778,23.464
8/12/2015,0:16:45.000,-33.6309172528,151.1901546222,23.462
8/12/2015,0:16:46.000,-33.6309174639,151.1901542639,23.455
8/12/2015,0:16:47.000,-33.6309176667,151.1901538833,23.450
8/12/2015,0:16:48.000,-33.6309178111,151.1901534833,23.457
8/12/2015,0:16:49.000,-33.6309180000,151.1901530805,23.461
```

Once this data file is available, it may be added back into the original survey project. Using HYPACK, there are some points to note during the process:

- The Post Processed PPK file must extend beyond the survey time, i.e. start before and finish after the survey period.

- The GNSS antenna height may have been accounted for in processing the PPK file, so care needs to be taken that the offset is not applied twice (i.e. set HYPACK antenna height to 0.00 if needed).

- The GNSS quality filter that could exclude position data based on quality may need to change. Quality value 1 is good in PPK but bad in NMEA output, where value 1 denotes uncorrected data.

The original GNSS data is replaced by PPK file in HYPACK as follows:

1. Load HYPACK raw file into SBMax editor. Select "Use Post Processed GPS" and select "Configure".
2. Configure the parsing and data settings so HYPACK can read the text file with the correct columns identified. A time offset is required to convert the GNSS data to the local project time. GNSS heights may be corrected already or may need to be shifted from Ellipsoid height to Project Geodesy.
3. Load data to process and get started with processing as normal.