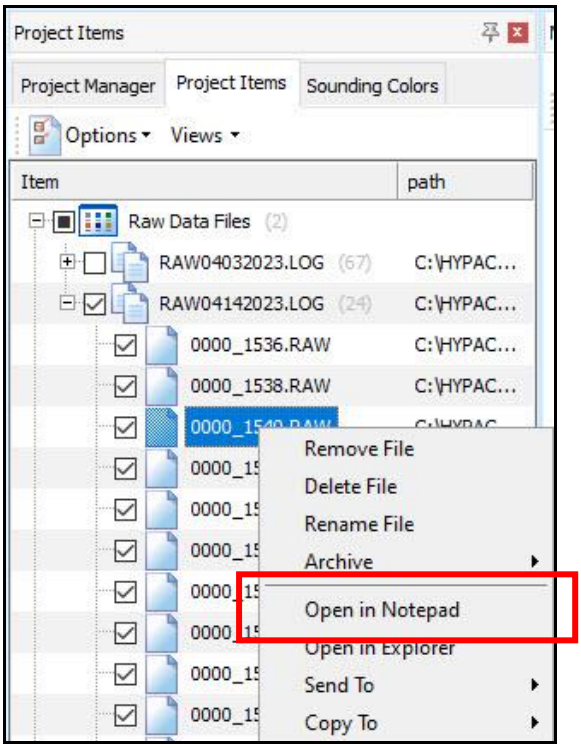
Testing for Timing Errors - Checking the Driver Setup for the CEESCOPE™ and CEE ECHO™ when using HYPACK.

Owing to the unique time-stamped data output of the CEESCOPE™ and CEE ECHO™, HYPACK software offers several ways to configure hardware drivers for these devices. If ancillary equipment is used, such as a heave sensor or side scan sonar, driver configuration may be different versus an echosounder-only setup. However IN ALL CASES, the HYPACK RAW file must show a consistent timebase, with the data message recorded time increasing as the data are written. We recommend that the driver setup be checked prior to each survey. This document explains how incorrect driver setups may be detected by recording and checking a test RAW file. Even if data are recorded with incorrect driver setup, HYPACK has a tool to correct the time error.

The CEESCOPE™ and CEE ECHO™ can generate a precise GNSS-derived time stamp that is usually applied to every line of data and each binary echogram ping packet. The POS time stamp as applied to GNSS data output by the CEESCOPE is shown below. Time is expressed in seconds past midnight based on the CEESCOPE system time. HYPACK refers to the special CEE GNSS output as a “User Modified NMEA Message”.

POS 42649023 $GPGGA,015055.00,3338.9114522,S, 15109.8404898, E,4,14,0.8,2.074,M,23.20,M,02,0006*45

To check that no HYPACK timing errors are present, first record about 10-20 seconds of RAW data. Then, inspect the RAW file by a right click on the RAW file and “Open in Notepad”:



This example below shows a correctly configured hardware setup. The incoming messages will repeat based on the output rate of each device. The device / driver number is listed as 0, 1, 2….

The time of the data record is column 3 in seconds past midnight. This time may be either PC time or time from the CEESCOPE echo sounder and may or may not be synced to GNSS time. In this document, it is not important to discuss the driver setup options as the same conditions must be achieved independent of the driver selection.

The key messages used in data processing are:

EC1 – Echosounder EC depth single channel (1), dual channel (2)

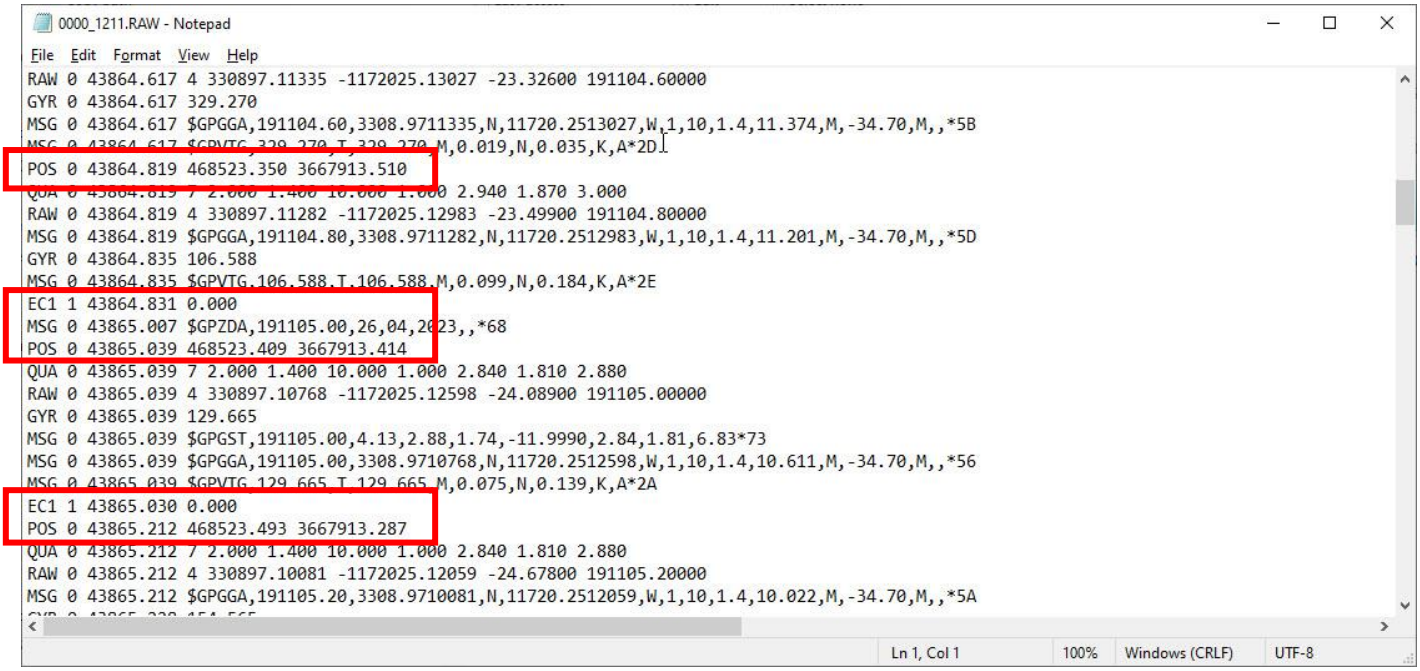
POS – Calculated XY position

Other messages are listed below. The time of these messages is not relevant in this discussion:

MSG – GPS NMEA message (used to determine POS)

GYR – Heading QUA – Satellite quality information

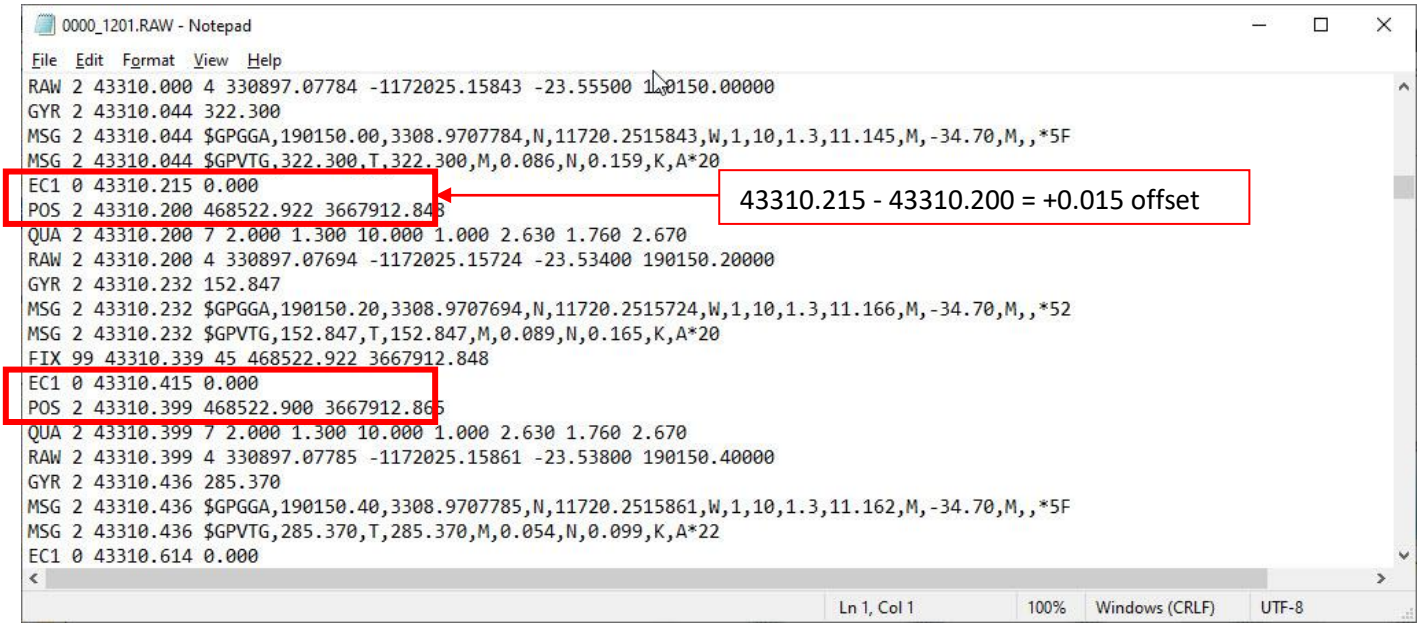
RAW – position data Lat / Long



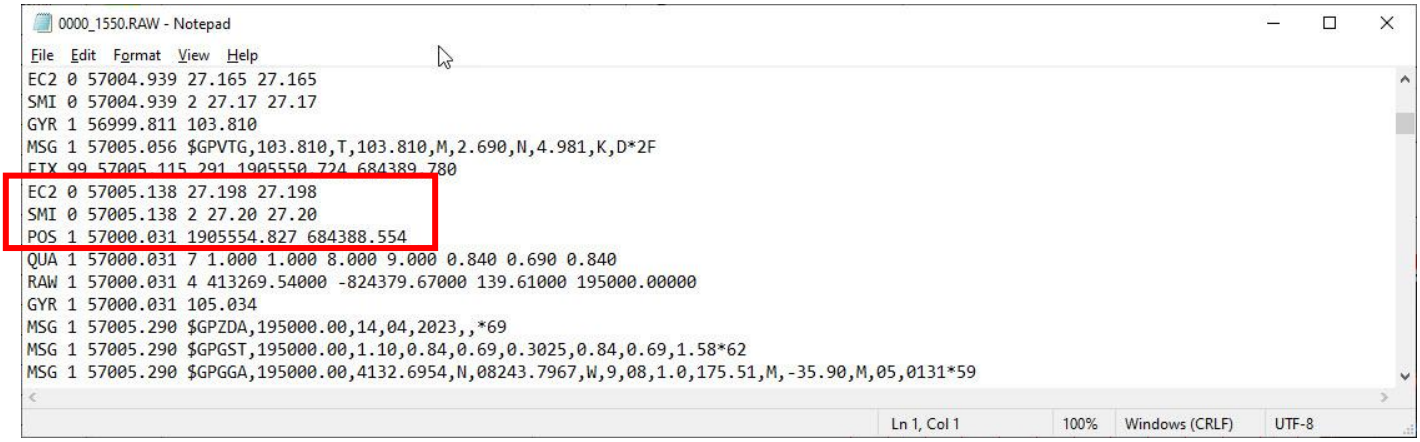
The EC1 and POS messages MUST ALWAYS increase in time as the file is written. If the time base used for the GNSS and echosounder drivers is the same then there is no way that a new RAW file message line can be written at a time earlier than the previous one.

If the driver setup is wrong, and different time bases are used, then it will cause data to go either backwards or forwards in time for one driver versus the other. SMALL TIME offsets might be undetectable. LARGE TIME offsets will cause the Single Beam Editor SBMAX to fail to load.

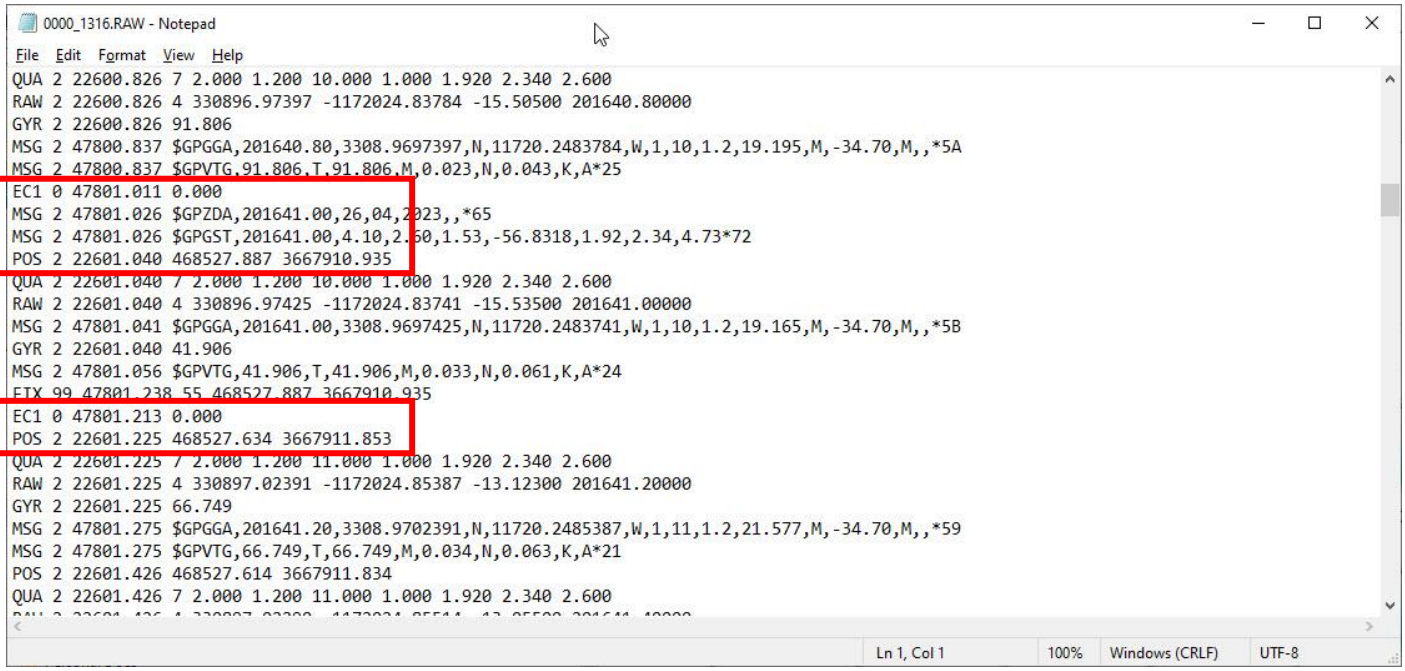
In the below example, a small time offset is seen with at least 0.015s error. The EC1 line is written before the POS line however the time of the message is 0.015s later. A small time offset like this might arise when the PC time is very recently synchronized with the Windows server and happens to be close to the time used by the CEE device, based on GPS time. This offset is unlikely to be noticeable in data editing, however the driver setup is still wrong.



In this next example, a larger time offset is seen with at least 5.017s error. This may be a result of using an acquisition PC that has not been connected to a Windows server (internet) for a long time, leading to a larger divergence from GNSS time. The single beam editor SBMAX will load this data however RAW and EDITED soundings will appear at different places on the map view and the offset will likely be obvious.

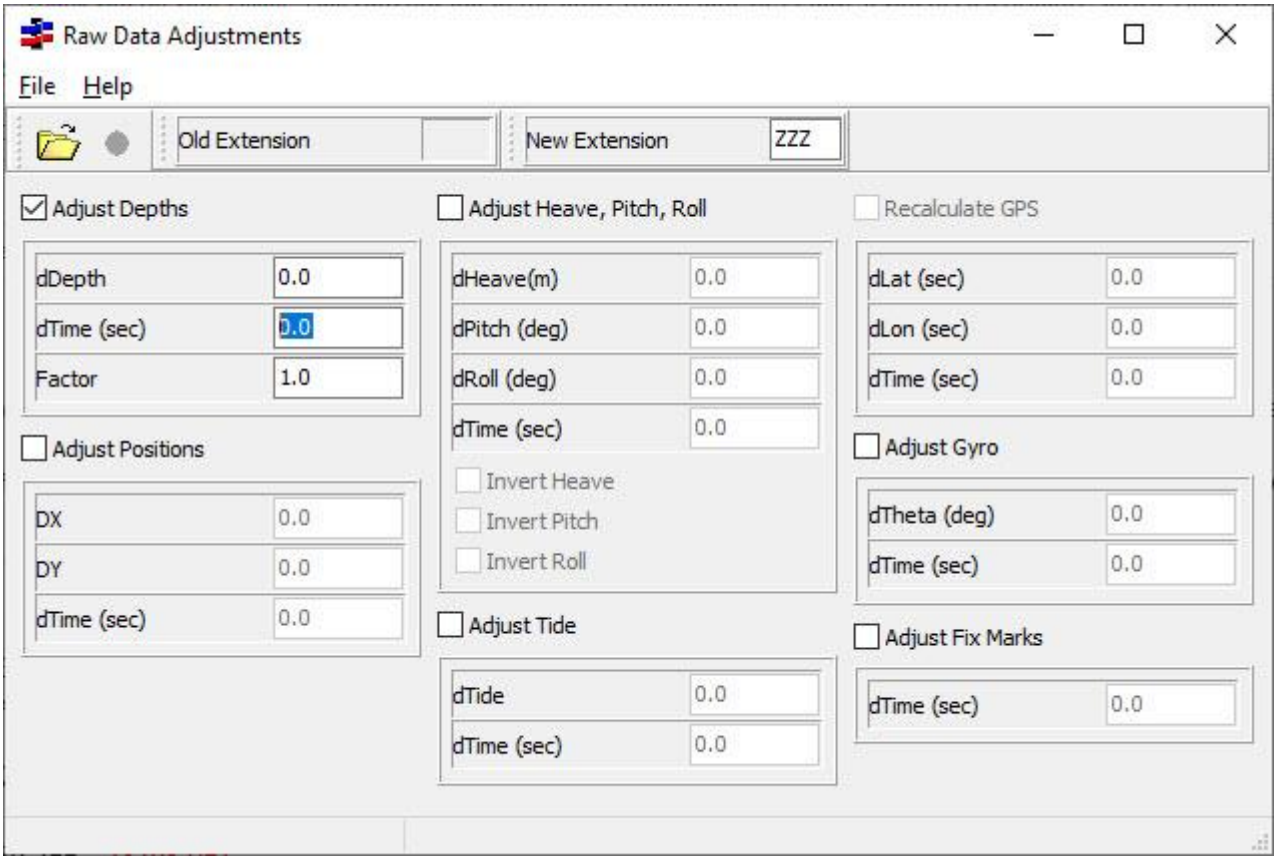


In the final example, a huge time offset is seen. This may be the result of the CEE device being set at UTC and the PC running on local time. The single beam editor SBMAX will likely be unable to load this data and will fail on startup.



If a timing issue is detected, consult CEE HydroSystems' latest setup guides posted on the CEE website "Knowledge Base", or contact CEE HydroSystems directly for assistance.

If data have been collected and the timing is determined to be in error, a simple fix is available. In HYPACK, go to: **Utilities / files work / RAW Data adjustments > adjust depths > dTime**



This will write new RAW files with the extension .ZZZ and it will NOT delete the original RAW files.