

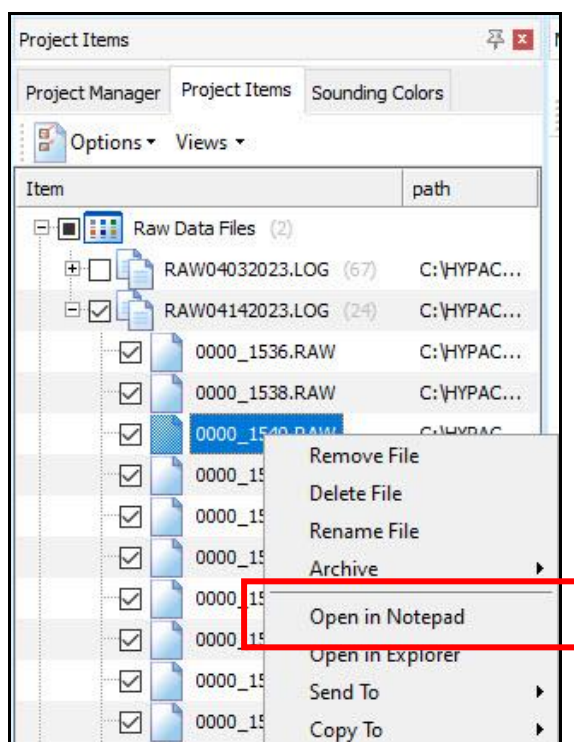
Testing for Timing Errors - Checking the Driver Setup for the CEESCOPE™ and CEE ECHO™ when using HYPACK.

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

```
0000_1211.RAW - Notepad
File Edit Format View Help
RAW 0 43864.617 4 330897.11335 -1172025.13027 -23.32600 191104.60000
GYR 0 43864.617 329.270
MSG 0 43864.617 $GPGGA,191104.60,3308.9711335,N,11720.2513027,W,1,10,1.4,11.374,M,-34.70,M,,*5B
MSG 0 43864.617 $GPRMB,229.270,T,329.270,M,0.019,N,0.035,K,A*2D
POS 0 43864.819 468523.350 3667913.510
QUA 0 43864.819 7 2.000 1.400 10.000 1.000 2.940 1.870 3.000
RAW 0 43864.819 4 330897.11282 -1172025.12983 -23.49900 191104.80000
MSG 0 43864.819 $GPGGA,191104.80,3308.9711282,N,11720.2512983,W,1,10,1.4,11.201,M,-34.70,M,,*5D
GYR 0 43864.835 106.588
MSG 0 43864.835 $GPRMB,106.588,T,106.588,M,0.099,N,0.184,K,A*2E
EC1 1 43864.831 0.000
MSG 0 43865.007 $GPZDA,191105.00,26,04,2023,,*68
POS 0 43865.039 468523.409 3667913.414
QUA 0 43865.039 7 2.000 1.400 10.000 1.000 2.840 1.810 2.880
RAW 0 43865.039 4 330897.10768 -1172025.12598 -24.08900 191105.00000
GYR 0 43865.039 129.665
MSG 0 43865.039 $GPGST,191105.00,4.13,2.88,1.74,-11.9990,2.84,1.81,6.83*73
MSG 0 43865.039 $GPGGA,191105.00,3308.9710768,N,11720.2512598,W,1,10,1.4,10.611,M,-34.70,M,,*56
MSG 0 43865.039 $GPRMB,129.665,T,129.665,M,0.075,N,0.139,K,A*2A
EC1 1 43865.030 0.000
POS 0 43865.212 468523.493 3667913.287
QUA 0 43865.212 7 2.000 1.400 10.000 1.000 2.840 1.810 2.880
RAW 0 43865.212 4 330897.10081 -1172025.12059 -24.67800 191105.20000
MSG 0 43865.212 $GPGGA,191105.20,3308.9710081,N,11720.2512059,W,1,10,1.4,10.022,M,-34.70,M,,*5A
GYR 0 43865.212 154.555
```

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.

```

0000_1201.RAW - Notepad
File Edit Format View Help
RAW 2 43310.000 4 330897.07784 -1172025.15843 -23.55500 190150.00000
GYR 2 43310.044 322.300
MSG 2 43310.044 $GPGGA,190150.00,3308.9707784,N,11720.2515843,W,1,10,1.3,11.145,M,-34.70,M,,*5F
MSG 2 43310.044 $GPVTG,322.300,T,322.300,M,0.086,N,0.159,K,A*20
EC1 0 43310.215 0.000
POS 2 43310.200 468522.922 3667912.848
QUA 2 43310.200 7 2.000 1.300 10.000 1.000 2.630 1.760 2.670
RAW 2 43310.200 4 330897.07694 -1172025.15724 -23.53400 190150.20000
GYR 2 43310.232 152.847
MSG 2 43310.232 $GPGGA,190150.20,3308.9707694,N,11720.2515724,W,1,10,1.3,11.166,M,-34.70,M,,*52
MSG 2 43310.232 $GPVTG,152.847,T,152.847,M,0.089,N,0.165,K,A*20
FIX 99 43310.339 45 468522.922 3667912.848
EC1 0 43310.415 0.000
POS 2 43310.399 468522.900 3667912.865
QUA 2 43310.399 7 2.000 1.300 10.000 1.000 2.630 1.760 2.670
RAW 2 43310.399 4 330897.07785 -1172025.15861 -23.53800 190150.40000
GYR 2 43310.436 285.370
MSG 2 43310.436 $GPGGA,190150.40,3308.9707785,N,11720.2515861,W,1,10,1.3,11.162,M,-34.70,M,,*5F
MSG 2 43310.436 $GPVTG,285.370,T,285.370,M,0.054,N,0.099,K,A*22
EC1 0 43310.614 0.000
Ln 1, Col 1 100% Windows (CRLF) UTF-8

```

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.

```

0000_1550.RAW - Notepad
File Edit Format View Help
EC2 0 57004.939 27.165 27.165
SMI 0 57004.939 2 27.17 27.17
GYR 1 56999.811 103.810
MSG 1 57005.056 $GPVTG,103.810,T,103.810,M,2.690,N,4.981,K,D*2F
FIX 99 57005.115 291 1905554.724 684388.780
EC2 0 57005.138 27.198 27.198
SMI 0 57005.138 2 27.20 27.20
POS 1 57000.031 1905554.827 684388.554
QUA 1 57000.031 7 1.000 1.000 8.000 9.000 0.840 0.690 0.840
RAW 1 57000.031 4 413269.54000 -824379.67000 139.61000 195000.00000
GYR 1 57000.031 105.034
MSG 1 57005.290 $GPZDA,195000.00,14,04,2023,,*69
MSG 1 57005.290 $GPGST,195000.00,1.10,0.84,0.69,0.3025,0.84,0.69,1.58*62
MSG 1 57005.290 $GPGGA,195000.00,4132.6954,N,08243.7967,W,9,08,1.0,175.51,M,-35.90,M,05,0131*59
Ln 1, Col 1 100% Windows (CRLF) UTF-8

```

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.

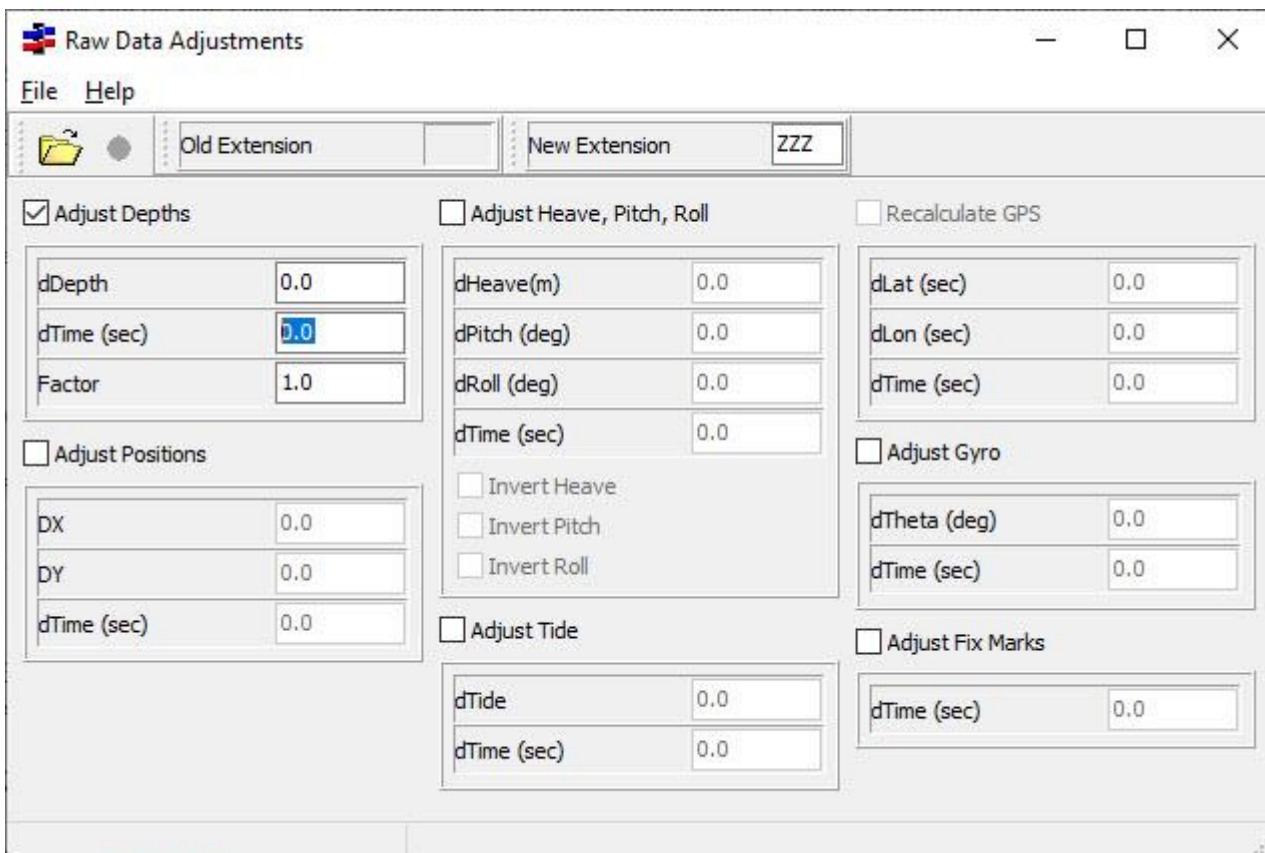
```

0000_1316.RAW - Notepad
File Edit Format View Help
QUA 2 22600.826 7 2.000 1.200 10.000 1.000 1.920 2.340 2.600
RAW 2 22600.826 4 330896.97397 -1172024.83784 -15.50500 201640.80000
GYR 2 22600.826 91.806
MSG 2 47800.837 $GPGGA,201640.80,3308.9697397,N,11720.2483784,W,1,10,1.2,19.195,M,-34.70,M,,*5A
MSG 2 47800.837 $GPVTG,91.806,T,91.806,M,0.023,N,0.043,K,A*25
EC1 0 47801.011 0.000
MSG 2 47801.026 $GPZDA,201641.00,26,04,2023,,*65
MSG 2 47801.026 $GPGST,201641.00,4.10,2.50,1.53,-56.8318,1.92,2.34,4.73*72
POS 2 22601.040 468527.887 3667910.935
QUA 2 22601.040 7 2.000 1.200 10.000 1.000 1.920 2.340 2.600
RAW 2 22601.040 4 330896.97425 -1172024.83741 -15.53500 201641.00000
MSG 2 47801.041 $GPGGA,201641.00,3308.9697425,N,11720.2483741,W,1,10,1.2,19.165,M,-34.70,M,,*5B
GYR 2 22601.040 41.906
MSG 2 47801.056 $GPVTG,41.906,T,41.906,M,0.033,N,0.061,K,A*24
FTX 99 47801.238 55 468527.887 3667910.935
EC1 0 47801.213 0.000
POS 2 22601.225 468527.634 3667911.853
QUA 2 22601.225 7 2.000 1.200 11.000 1.000 1.920 2.340 2.600
RAW 2 22601.225 4 330897.02391 -1172024.85387 -13.12300 201641.20000
GYR 2 22601.225 66.749
MSG 2 47801.275 $GPGGA,201641.20,3308.9702391,N,11720.2485387,W,1,11,1.2,21.577,M,-34.70,M,,*59
MSG 2 47801.275 $GPVTG,66.749,T,66.749,M,0.034,N,0.063,K,A*21
POS 2 22601.426 468527.614 3667911.834
QUA 2 22601.426 7 2.000 1.200 11.000 1.000 1.920 2.340 2.600

```

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.