



Timing your Data in HYPACK® and HYSWEEP® SURVEY Programs

By Joe Burnett

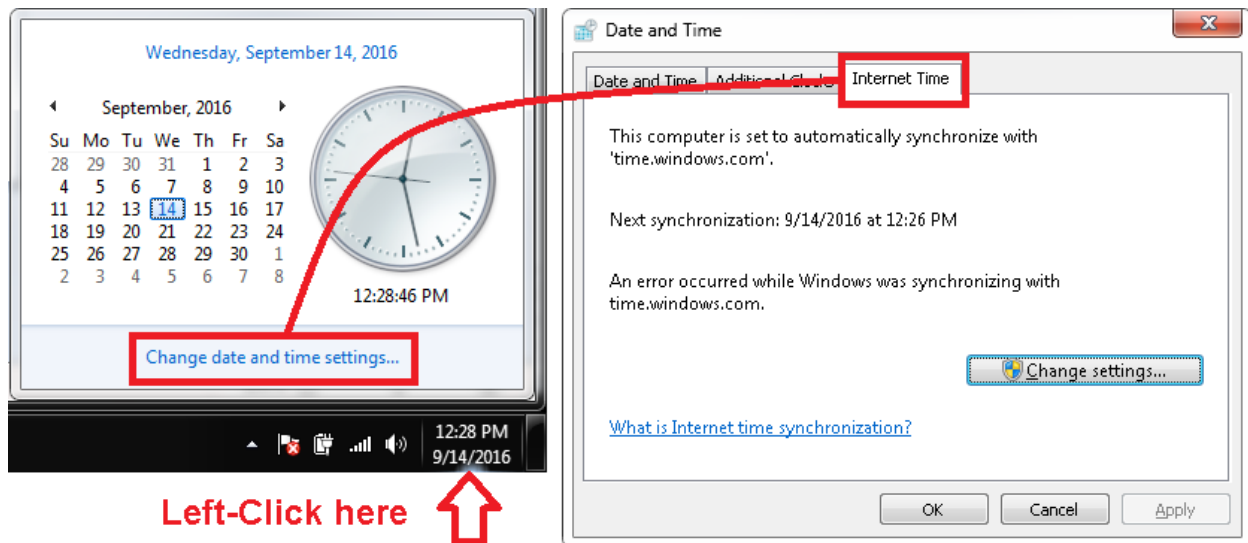
There are a few, subtle, but important differences about the way timing is handled between the HYPACK® and HYSWEEP® SURVEY programs. These are differences that you need to know and understand, when setting up your HARDWARE configurations.

COMPUTER CLOCK TIME

There are very few devices that output embedded timestamps in their data packets. Because of this, HYPACK®, originally, always defaulted to using the computer clock for timing. Not long after, we found that the computer clock was very bad about letting its time 'drift', to the tune of approximately 6 to 15 seconds every day.

If you were to leave your computer turned off for several days or weeks, when you start it back up, you might find that the computer clock time does not agree with the correct time of day, by a few minutes or more. This is why the Windows® OS has a handy little feature to synch the computer clock time with an Internet time server.

FIGURE 1. Synchronizing with the Internet Time



Notice now “This computer is set to automatically synchronize with “time.windows.com”

This is all well and good, but, typically, you are not connected to the Internet when you are surveying, so the computer clock does not get synchronized.

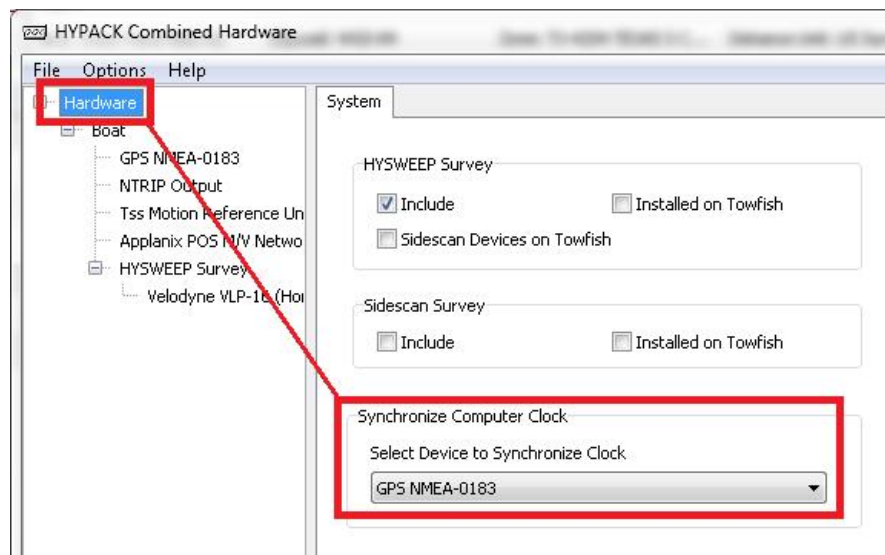
VERITIME

This is why HYPACK® developed the Veritime clock, which uses a time server that keeps very accurate timing. The HYSWEEP® SURVEY program uses this Veritime clock to minimize the drift.

ZDA TIME

Using the Veritime clock was *good*, but we wanted to be *better*. That is when we became aware that the ZDA message from the GPS contained the time that the GPS position was actually calculated. If you set up your GPS to output the ZDA message at 1 Hz (ONLY 1 Hz!!), and tell the HARDWARE program to 'Synchronize Computer Clock' with the GPS NMEA-0183 device, HYPACK® will modify the computer clock every one second during your Survey operation and keep it in time with GPS time (UTC Local, based on the Windows® Time Zone setting).

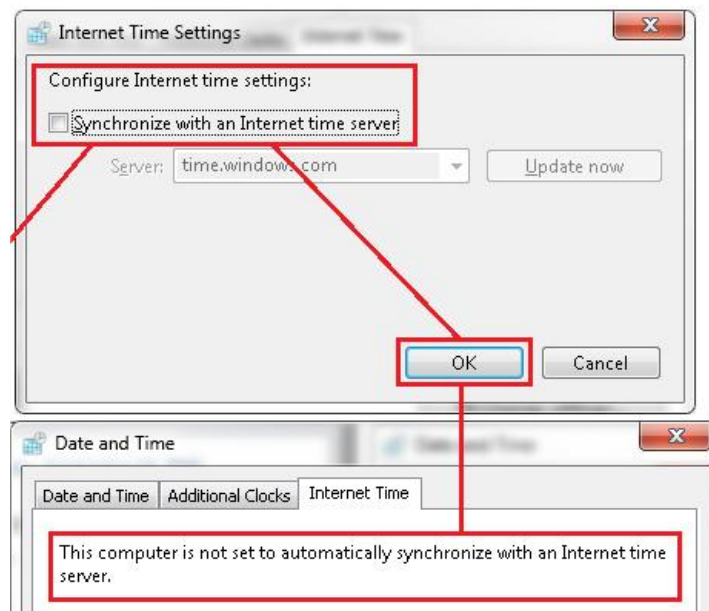
FIGURE 2. Synchronizing the Computer Clock to the GPS



When you select the option to synchronize the computer clock, in HYPACK® HARDWARE, you *must* go back into the Windows® Clock setup, and *turn off* the option to synchronize to the Internet Time Server:

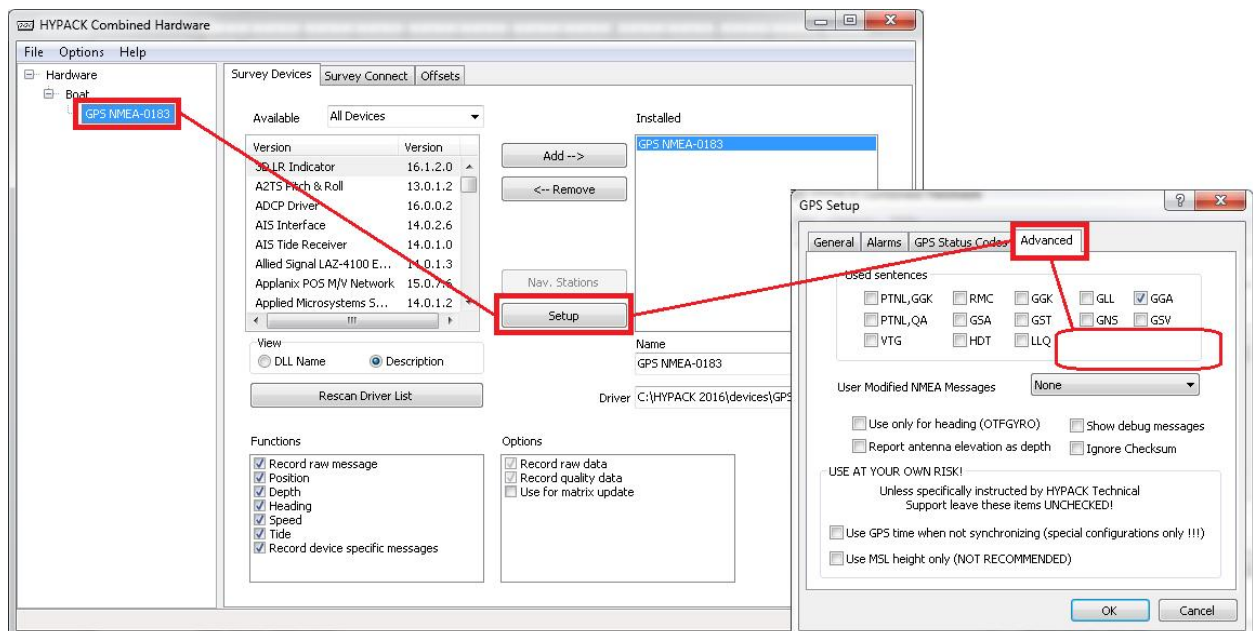
1. From the Internet Time tab in Figure 1, click [Change Settings].
2. Deselect the Synchronize with an Internet time server option and click [OK].

FIGURE 3. Turning Off Synchronization with the Internet Time Server



NOTE: In HYPACK® HARDWARE, in the Advanced tab for your GPS setup, there is no option to select the ZDA message. This is done, by design, so that users do not mistakenly, disable the ZDA selection. The GPS driver is automatically looking for the ZDA message.

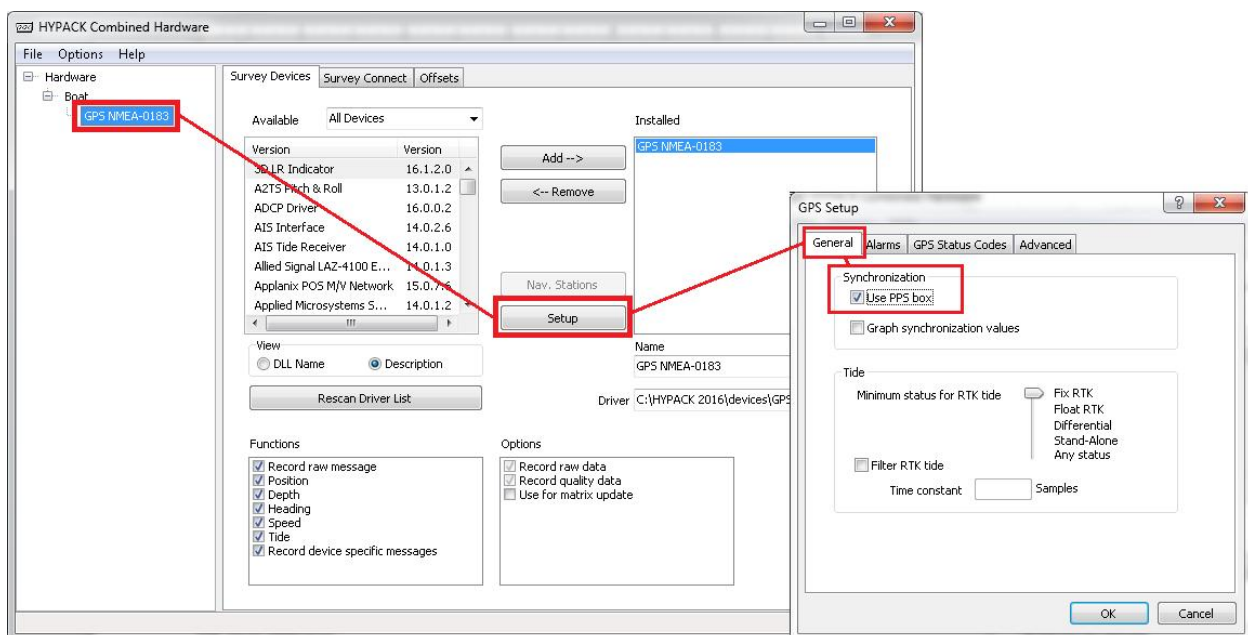
FIGURE 4. Selecting GPS Messages—ZDA is not an option; it is always read.



1PPS PULSE

Using the time from the ZDA message was *better*, but we wanted to use the *best*. We found out that there was a minuscule delay in the time between when the GPS position was calculated, and when the ZDA message was actually created. This is when we figured out that the 1PPS Pulse (a simple 2 microsecond tone burst) from the GPS, was on the exact time when the GPS position was calculated. Using this, in conjunction with the ZDA time information, would now give us the most accurate timestamp for the GPS position data, and we could also synchronize the computer clock with it.

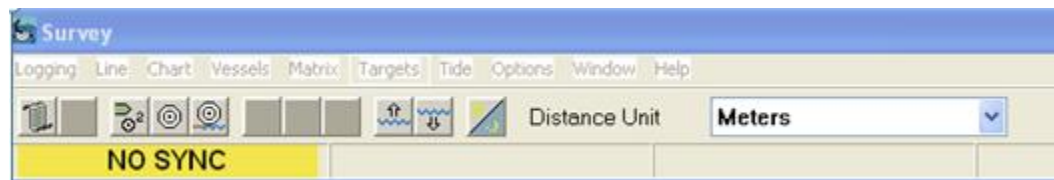
FIGURE 5. Synchronizing the Computer Clock with the PPS Pulse



NOTE: We performed extensive testing in the HYPACK office and found that using just the ZDA message for time-synching resulted in Latency values of only 10 – 30 milliseconds. Using the ZDA, in combination with the 1PPS Pulse resulted in Latency values of only 1 – 5 milliseconds.

IMPORTANT! When you use the Synchronize Computer Clock option in HARDWARE, and then go into the survey programs, you will immediately see a “NO SYNC” alarm in yellow. Do not be alarmed. This message will only last for about 20 – 30 seconds and then disappear. It takes the HYPACK® SURVEY program about 20 – 30 seconds to get the computer clock synchronized.

FIGURE 6. No Sync Error



HYPACK® SURVEY TIME

So, whether you are using Veritime, or ZDA, or ZDA with 1PPS for synchronizing your computer clock, with a few exceptions, HYPACK® SURVEY uses the computer clock time for the timestamps that it places on every piece of data received from every device that is configured in HARDWARE.

There are a handful of devices, that have “special” capabilities for timing. These few devices DO have embedded timestamps in their data packets, and HYPACK® gives you the choice to use the embedded timestamps for the data of that device, or to use the computer clock for the timing.

IMPORTANT! You will see in the following images, that there are warnings for selecting the embedded timestamps. These warnings make sure that you understand what is taking place with the timing of the data for this device.

When you select these options, you are telling the software that it will *only* use the embedded timestamps for the data from this device! *It will not use these timestamps for the timing of any other device.* Hence, the warning. It is recommended that you check the device configuration for each device for timing options.

FIGURE 7. Using Embedded Time Stamps—Novatel.dll (left) and GPS,dll (right)

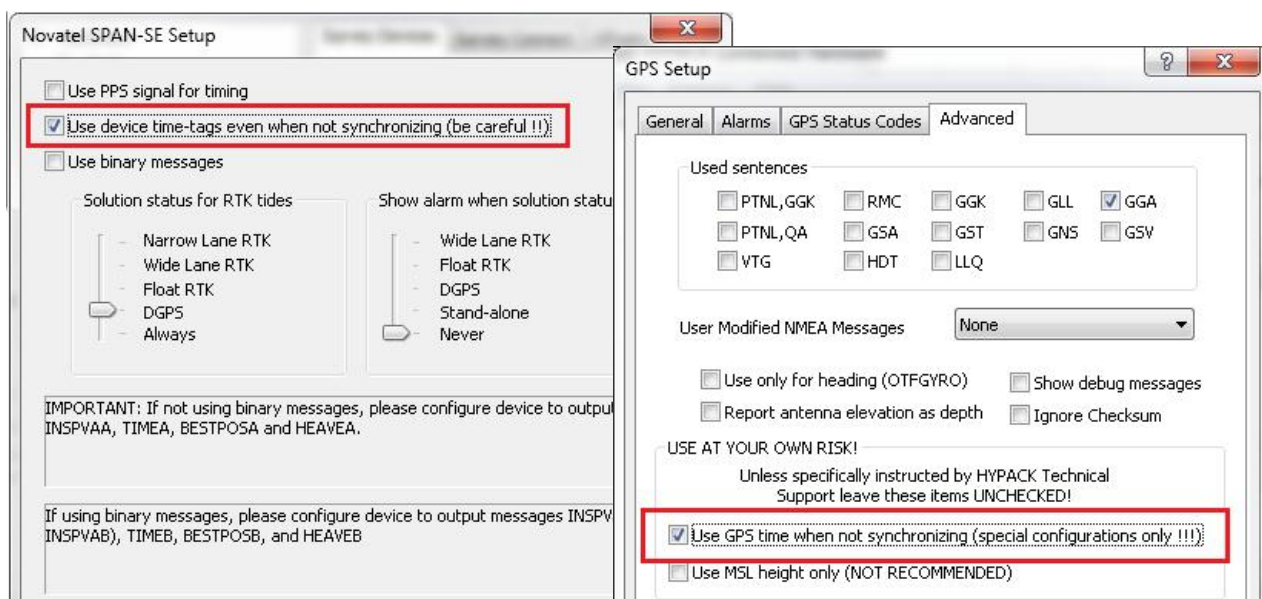
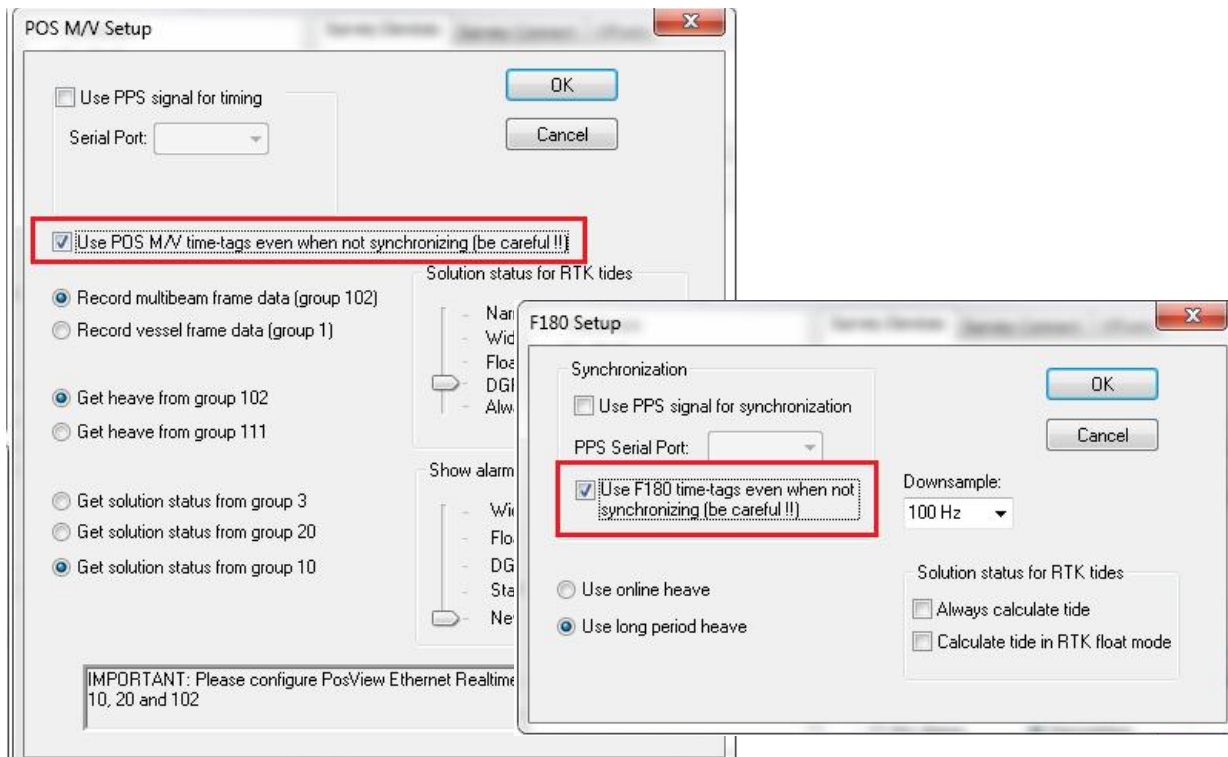


FIGURE 8. Using Embedded Time Stamps—POS MV (left) and F180 (right)



HYSWEEP® SURVEY TIME

This is the simple part. HYSWEEP® SURVEY always uses the embedded timestamps that are within the data packets from each device. It ONLY uses the computer clock timing, if there are no embedded timestamps in the data packets, which is typical of stand-alone MRUs and Heading devices.

Almost every multibeam and laser on the market today, *requires* that ZDA and 1PPS Pulse information are input into their topside units, so that their embedded timestamps are already set to that time.

When there are *no* embedded timestamps in the data packets, this is where the importance of synchronizing the computer clock with the ZDA, or ZDA and 1 PPS combination, becomes critical.

MORAL OF THE STORY

Getting the most accurate timing for *all* of your data will help ensure that latency is kept to a minimum. I will never say that there is *no* latency, even with the *best* of timing.