

NORTEK SIGNATURE 1000 ON WIREWALKERS

Technical Note

PROGRAMMING TIPS

Utilizing a high frequency ADCP on a WW is a fantastic way of obtaining incredibly high vertical resolution over long ranges. However, Mounting an ADCP on a WW (or other moving platform) presents a few unique challenges. For instance, the profiler is moving vertically in both depth and time, and the system may be drifting in the horizontal. Additionally, strong wave orbitals may also be a source of velocity contamination, particularly when the profiler is near the surface. Orbital contamination is particularly challenging to correct and it's been shown that a down-looking ADCP with detailed post processing similar to that used for lowered ADCPs is the best fit for achieving the best data quality. While side looking ADCPs have been used and proven useful, the down-looking configuration appears to be more ideal, and therefore the subject of this tech note.

The Nortek Signature1000 is offered with a large variety of options, not all of which are ideal for use with a WW. There is no way we can cover all configurations, so we've presented some basic principles and common settings. However, this note contains tips; it is not intended to be a replacement for the actual manual. Users should rely on the Nortek Signature Series Operations Manual to fully understand the capabilities of the instrumentation. We assume you are familiar with connecting to the unit and will be using Nortek's Signature Deployment software, which walks you through the setup steps.

The first step is to identify that your Signature1000 configuration is ideal for use on a WW. The following is a brief guide on some of the necessary options,

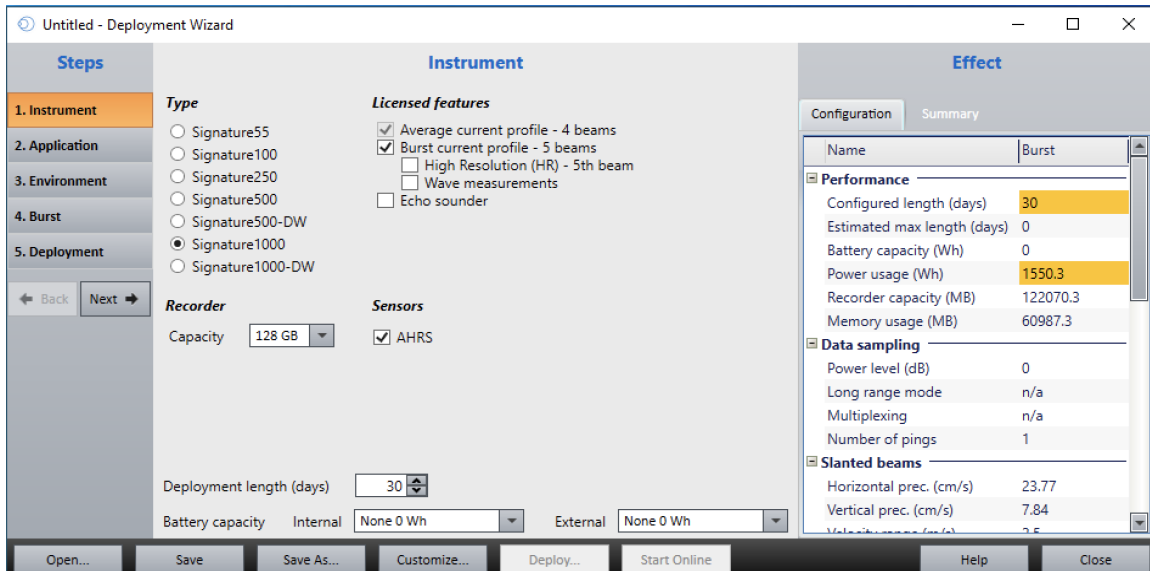
“BURST” FIRMWARE: Required for the LADCP-like post processing techniques.

OTHER FIRMWARE: Optional and not addressed in this tech note. However, note that that waves firmware does not work from vertically moving platforms like the WW.

RECORDER CAPACITY: As large as possible is recommended to avoid being memory limited.

AHRS: The internal Attitude and Heading Reference System replaces the standard compass/tilt sensors and is essential for removing mooring/profiler motion from the raw data.

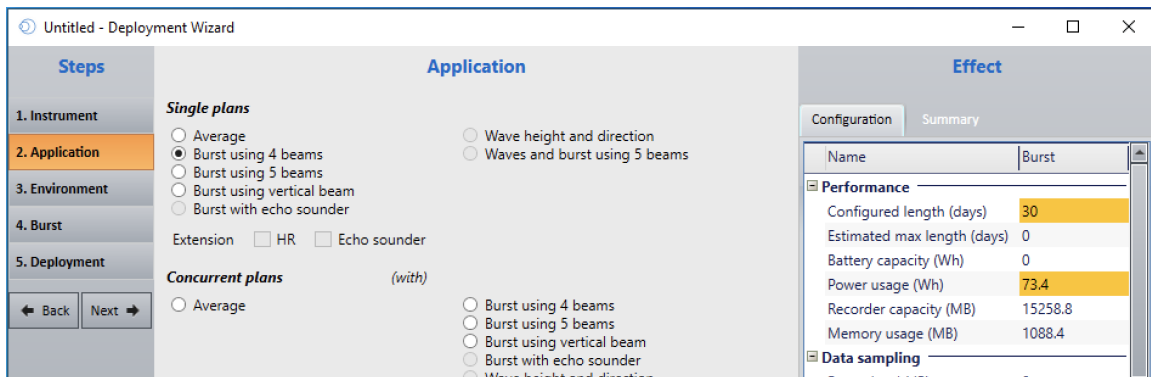
FORM FACTOR: Due to the reduced size, the short (aka no-battery) housing is generally recommended. However, the standard housing also works well; although, with the configurations presented here, the internal 90Wh battery is only sufficient for deployments up to ~3 days.



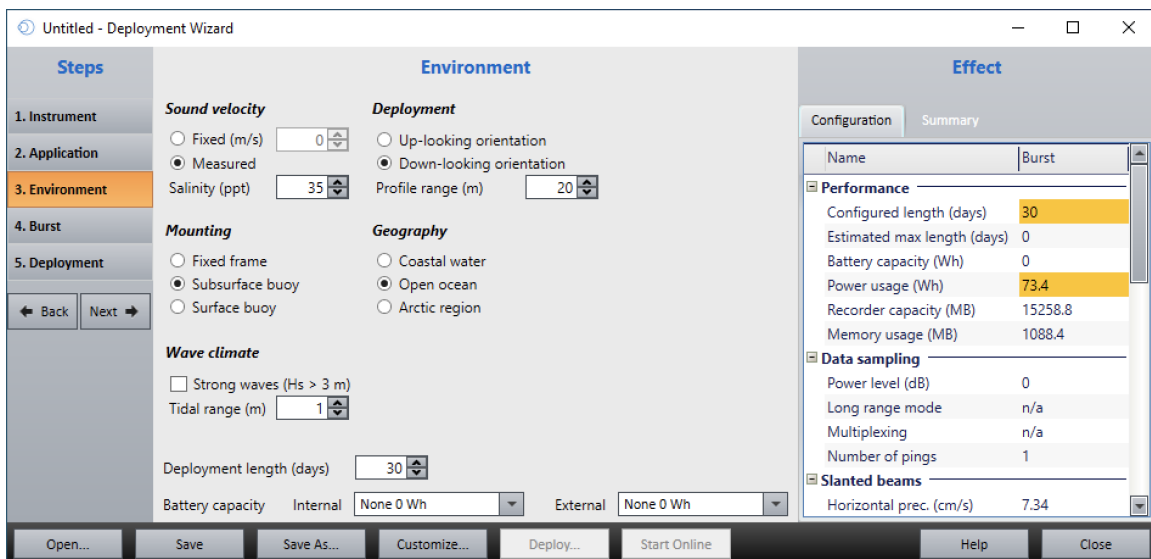
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On the Application step, choose **SINGLE PLANS** = "Burst using 4 beams".



On the Environment step, choose appropriate values for your **SOUND VELOCITY** and use the following image and notes as a guide for the other settings.



DEPLOYMENT: Choose "downlooking orientation" with 20m range

MOUNTING: Due to other settings, this doesn't really matter, although "Subsurface" is probably the most appropriate.

GEOGRAPHY: This affects the performance predictions. Use "Open Ocean" for WWs profiling to >50m and "Coastal" for ≤50m deployments.

WAVE CLIMATE: This section is used to tune the velocity and profiling ranges. Unchecked "strong waves" = velocity range of 2.5m/s, which is commonly used. Checking the box increases the velocity range to 5.0m/s which in turn results in noisier data but may be required in some very high energy cases. The Tidal range default of 1m is fine to use.

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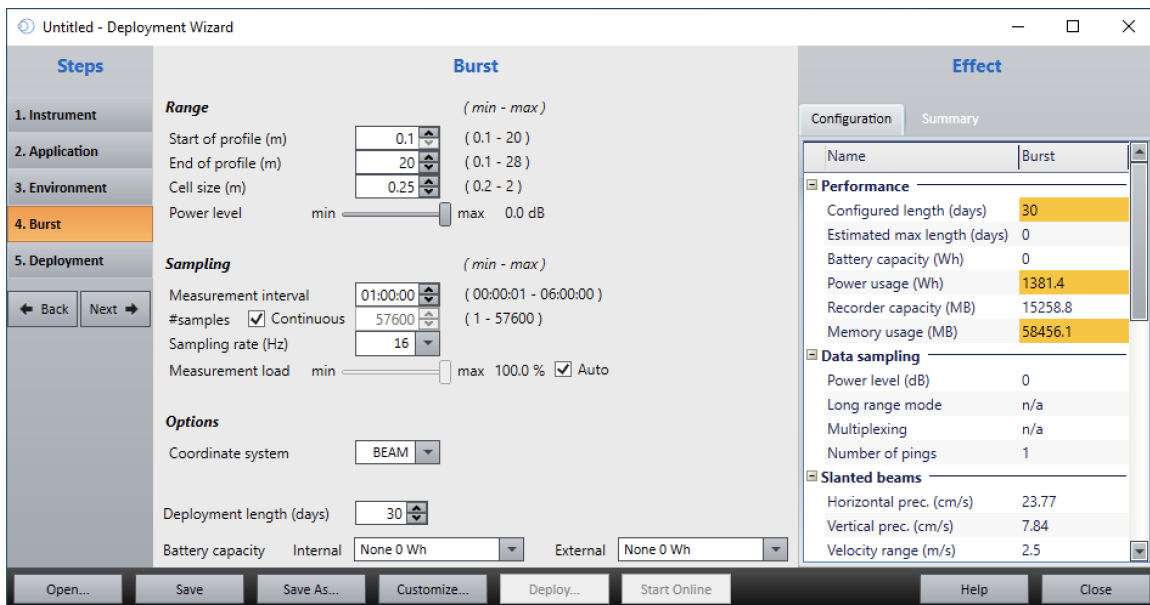
Use the following image as a guide for the Burst step. Key points here include,

RANGE: Small cells are ideal. 0.25m has worked well.

POWER LEVEL: Set to max for maximum profiling range.

SAMPLING: Set up "Continuous" sampling.

- Tick the "**Continuous**" box. Because there will be no gaps in the data, the interval and #samples values don't really matter.
- The **sampling rate** should be set to the fastest possible. The Signature1000 can output up to 16 pings per second.
 - At 16Hz, notice "Number of pings" = 1 (see effects sidebar). This means there is 1 ping every 1/16th of a second.
 - Reducing the sampling rate to <16 can be somewhat non-intuitive and should be combined with an adjustment of the Measurement Load slider.
 - For example, at 8Hz (the slowest we'd recommend), the "Number of pings" will increase to 2 and there will be no net gain in endurance. This is because there are still 16 pings per second; i.e. two pings averaged every 1/8th of a second.
- **Measurement Load:** For sampling rates <16, reduce the measurement load to a value that results in "Number of pings" = 1. This reduces the ping rate so that there is no internal averaging, power usage decreases, and endurance increases.



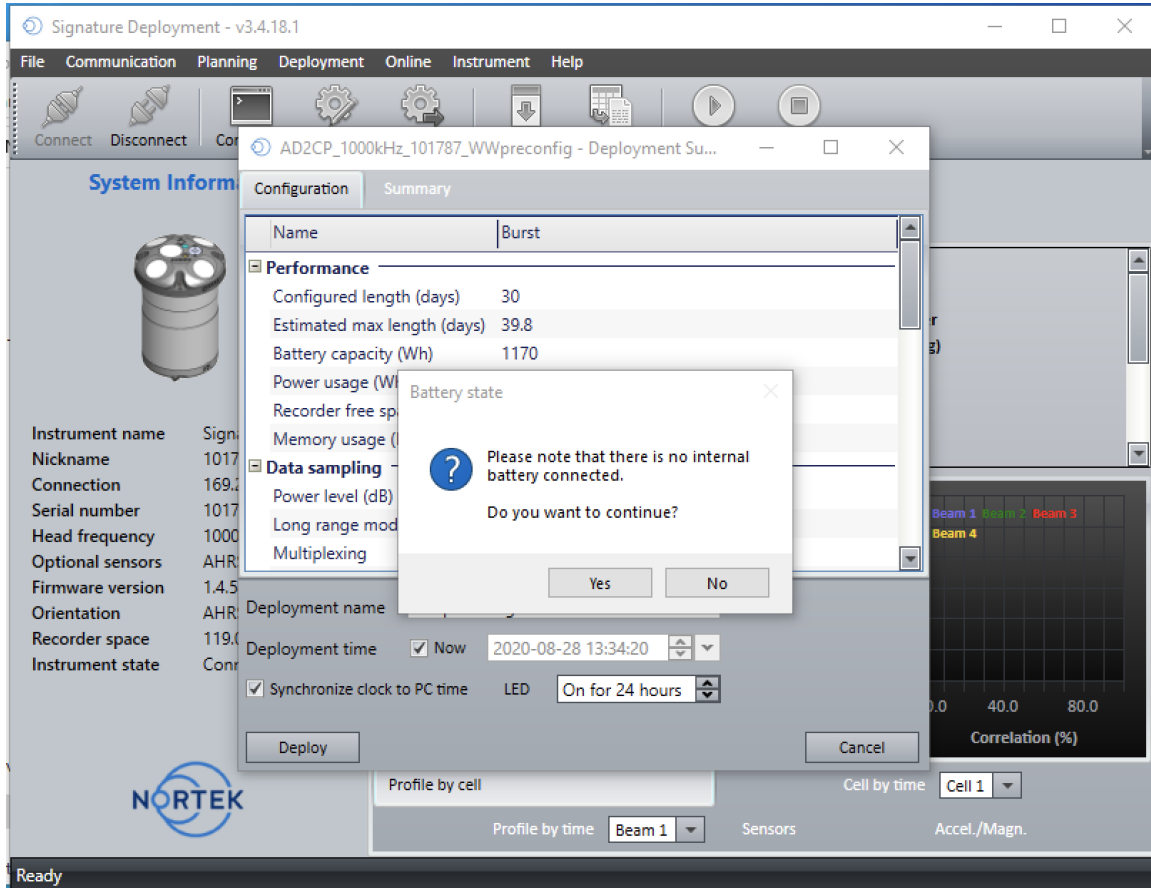
COORDINATE SYSTEM: Set to BEAM, i.e. the most "raw" form of data.

DEPLOYMENT LENGTH & BATTERY CAPACITY: Another useful tip is to set both the internal and external battery capacities to 0 Wh. As shown in the Effects pane in the image above, this allows you to see how many Wh of power will be required to meet your desired deployment length, based on the current sampling scheme.

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Once you DEPLOY the instrument, you may see a warning about no internal battery connected; this is expected if using the short housing. Please also note that DMO typically ships batteries inside their respective housings, but disconnected.



POWER REQUIREMENTS

We've found a Signature1000 performs best with a higher voltage battery pack. While the Nortek spec sheet states an operating range of 12-48V, a 12V battery spends much of its life below 12V and therefore won't be sufficient to keep operating the ADCP. DMO will typically supply a 21V or 24V power supply for integrated Signature1000s. Our 56 D-cell Batteries technical note contains additional information.

DATA PROCESSING

Data will need to undergo significant post-processing to remove vehicle motion and waves, etc. The most complete reference on this subject is the following paper,

Zheng, B., Lucas, A. J., Pinkel, R., & Boyer, A. L. (2021). Fine-Scale Velocity Measurement on the Wirewalker Wave-Powered Profiler, Journal of Atmospheric and Oceanic Technology.

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