Vectrino Profiler

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This Quick Guide provides you with the basic information you need to get the Vectrino Profiler up and running as quickly as possible. The sensor is an extremely powerful tool for flow measurement. It is a seemingly simple system but requires consideration of many different parameters to produce the highest quality data. The biggest key to its successful use if an understanding of the basic concepts of its operation and the potential problems that can occur. Experience with the system is an important factor as well, and the value of test deployments cannot be overemphasized. We encourage you to consult the Vectrino Profiler User guide (available within the software) to get a more profound knowledge covering both the sensor- and software capabilities. You will also find lots of useful information at the Nortek web: **www.nortekgroup.com**

Preparation

- Install the software located on the USB memory stick. The Vectrino Profiler acquisition software requires Java virtual machine (JVM) to operate (download from www.java.com if not prompted by the software).
- Using the enclosed cables, plug in the AC adapter, and connect the Vectrino Profiler cable and USB converter to the USB port on your computer. At high sampling rates (above 60 Hz), the driver parameters need to be tuned to provide an adequate display rate for the application software. Without this tuning, higher sampling rates will result in a sporadic display update. Please refer to the **SW User Guide**, in the software (click Help) for more information.
- Start the Vectrino Profiler software.
- Click **Communication > Connect > Vectrino**
- Select the appropriate serial port and port speed (baud rate) and press **Apply**. It is recommended to use a **baud rate of 937500** for optimized performance. You may take this opportunity to provide a specific "Instrument Name" for your device. This may help differentiate instruments if you have several in the same experiment.
- Run a Probe check in accordance with the procedure described in the **Vectrino Profiler User Guide** to verify that the instrument is working as expected.
- Test the measurement quality with the Probe Check function: Open **Configuration;** tick the **Probe Check** and **Start Data Collection**. Make sure the instrument is submerged in water during this test.

Configuration

- Click the **Configuration** button to activate the dialog for configuring the instrument velocity settings, bottom check settings and disk file parameters. A description of each submenu and each parameter can be found in the **SW User Guide.** Extra attention should be given to the Velocity range parameter. Read more about Weak Spots below.
- When the parameters are adjusted, press **Apply** and/or **OK** and accept the changes.
- By using the **Open/Save** commands in the File menu the configuration parameters can be saved to a *.nts file at any given time and reloaded when it is time to deploy the instrument.

Getting Started

- Data can be displayed by clicking the **Start Collecting Data** button.
- After data collection has started, the button switches to **Stop Collecting Data**. The button switches back to Start mode when the instrument has been verified to complete collecting data.
- The display window shows profiling and time series graphs for data currently being collected. A status display is shown on the upper right of the panel. This shows four lights used to display status information while collecting data (run status, collection status, connection status, and instrument status). Hovering the mouse over each status light will display more detailed information.
- **Save to Disk** can be enabled either before data collection is started or during data collection. The preferred mode is enabling before starting collection.

Bottom Check

In addition to velocity measurements, the backscatter signal can be used to determine the instrument elevation above the bottom. A high intensity echo is produced when the transmit pulse hits the bottom. The central transducer of the Vectrino Profiler includes a transmit/receive switch allowing profiles over the full elevation range of the instrument to be collected. The bottom check feature collects a profile over a selected range and finds the maximum peak within this range. A quadratic fit to the peak is used to determine the associated distance to the bottom. Bottom check data is interleaved with the velocity data and can be sampled at a rate of up to 10 Hz (dependent upon velocity sampling rate). The bottom check simplifies the data analyses by allowing all the velocity data points to be referenced to the bottom position. It is very important to adjust the **Gain Reduction** option such that the return signal strength is below approximately -10 dB to get accurate bottom measurements (see software manual for more information).

Mounting Guidelines

- Make sure that there are no obstructions between the sensor and the focal point (sampling volume) located about 5 cm from the center transducer.
- The sensor is a pulse coherent system which means it is susceptible to pulse interference when measuring near boundaries. This interference is called "Weak spot" and should be avoided. More information about this can be found in the Comprehensive Manual – where a table presenting the distances where weak spots can occur can be found.
- Consider the effects of large objects on the flow itself. The flow disturbance is greatest directly downstream in the wake behind the object.
- All acoustic transducers must be submerged during data collection. Operating the Vectrino when the transducers are out of water will not cause any damage. For side-looking probes; it is possible to collect 2D data with only the lower receiver arms (and center transducer) submerged.
- The best quality is achieved if the main flow direction is perpendicular to the transmit axis. Flow directly into the transmit axis should be avoided.
- Make sure your mounting structure is stable. Small vibrations in the mounting can generate large accelerations in the data.
- The sensor is not designed to be used in saline environments, and using it outside lab may cause corrosion on the probe. If used in saline waters, make sure to use it for only short periods and clean it properly with fresh water after the measurements are done.

Note: When mounting; use the grooves to strap the sensor to the structure. Never use the probe stem as mounting point.

Proper mounting of the sensor is crucial for collecting quality data. Read more about this in the Mounting Guideline.

Seeding

In order to measure water velocities, the sound waves emitted by the center transducer must be reflected by scattering material suspended in the water. The velocity that is measured is consequently the velocity of the water, assuming the particles move with the same average speed as the surrounding water. If the instrument is to be used in a laboratory environment, one will need to add seeding. If you are unsure about the amount of particles to add, please check the Manual or contact us for further guidance.

Basic Principles

The Vectrino Profiler profiles the sampling olume over a 30 mm range and provides three-component velocity observations with a resolution as fine as 1 mm, and with a sampling rate as high as 100 Hz. The Vectrino Profiler can measure the distance to the bottom at rates of up to 10 Hz by interleaving bottom detection pings and velocity profiling pings. The Vectrino Profiler use separate transducers to transmit and receive the acoustic signal, and is thus a so-called bi-static sensor.

Software

New software provides enhanced capabilities such as real-time plots of velocity profiles, velocity standard deviation, energy spectra and color contour plots. The acquisition software is used to configure the instrument and to collect, save and display data in real time.

Proper visualization of data as it is being collected greatly facilitates the operation of the instrument, allowing early detection of incorrect configuration parameters or anomalous behavior of the instrument due to external factors.

The software is also capable of supporting multiple instruments simultaneously. Each instrument is provided with its own panel created in a separate tab.

Data Conversion

The **Data** Menu is used to export the proprietary binary data files into other formats.

- **Export Matlab** creates .mat files that are directly readable by Matlab and other common numerical analysis packages. Note that large data files will be broken down into smaller .mat files by the export process.
- **Export ASCII** creates ASCII data files that may be imported or read by other software applications (e.g. Excel).

Due to the amount of data produced, we consider the Matlab binary export to be the best option. The file can be read by most common numerical analysis packages and produces much smaller files than the ASCII export. For guidance in looking at the data, we recommend reading the FAQ's on single point and profiling Velocimeters and reference books or articles on data analysis techniques and methods.

Power and Communication

The Vectrino Profiler is shipped with a 12-pin connector and cable which supplies external DC power (12-48 V) and provides two-way serial communication with an external computer. The cable also provides synchronization options.

Synchronizing Multiple Instruments

Your Vectrino Profiler can serve as a master for other Vectrinos, or other sensors can control its sampling. This comes in handy when you need to use several instruments for a single set of measurements. A description on how to configure the instrument for synchronization can be found in the **SW User Guide**.

Troubleshooting

As most problems are caused by simple mistakes, please initially check if

- you have forgotten to power the system
- the connector has fallen out of the computer
- you are using the wrong serial port or baud rate

You may find that there is a lot of noise in the velocity data. This may be caused by

- not enough particles in the water
- the velocity range set too high
- the sampling volume located beyond the bottom
- reflection and reverberation conditions at the bottom
- probe malfunction. Test the probe with the Probe Check feature

When all obvious mistakes are ruled out, please turn to our **Troubleshooting Guide**. The FAQ site may also be helpful.

If the problem is still present contact Nortek support at support@nortekgroup.com

Underwater Connector			Termination	
Pin. no	Wire Color	Purpose	Pin	Description
1	White	Rx +	3	DB-9 connector, pins 1 and 5 are grounded.
2	Black	Rx -	8	
3	White/Grey	Tx -	2	
4	White/ Purple	Tx +	7	
5	Not Used			
6	White/Blue	Sync -		Terminal block
7	White/ Green	Sync +		
8	Not Used			
9	Not Used			
10	Not Used			
11	White/ Brown	Power Ground		Power Supply Connector
12	Black/Red	Power +		
Shield		Power Ground		Connected internally to Power Ground
Ref: N2100-304				

Wiring of Vectrino Profiler cable for RS485 communication.

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