

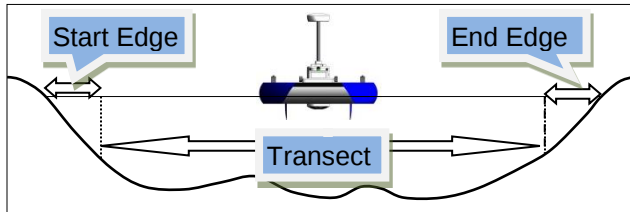
RiverSurveyor - Quick Start Guide

Working with RTK and DGPS



This is a quick reference guide to get started with the RiverSurveyor ADP system. For more detailed information, refer to the User Manual which can be found on the software CD or via **Start | All Programs | SonTek Software** after installation.

Measuring Discharge - Theory



The total discharge through a measurement section is computed based on the mean water velocity in the water column and the cross-sectional area. For the purposes of a measurement, the section is broken into three key components: the Start Edge, the Transect and the End Edge. These components are summed together to calculate the total discharge as shown below:

Discharge Measurement Facts and Tips

Site selection is a critical part of a discharge measurement and is fundamental to its success.

- Avoid possible obstructions and sites immediately downstream of bridges, gates and weirs
- Flow should be uniform with minimal turbulence
- Consider the ADP's profiling and depth specification (shown on the other side) and mounting depth.

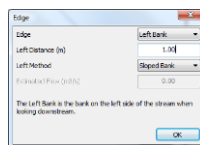
Key factors when making a discharge measurement:

- During the edge measurements, keep the vessel as stationary as possible.
- During the transect, maintain a constant vessel speed and direction.
- Ideally, any vessel movement should be slow relative to the water velocity, and changes in heading should be gradual and only when necessary.

Windows Software Data Collection

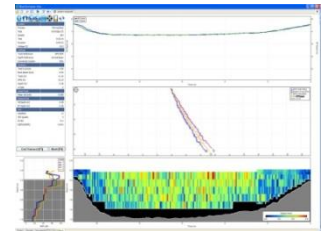
To collect discharge data using the Windows software:

1. Press the **Start** button (or **F5**) to start data collection. This does not record any data, but instead it allows the data from the system to be viewed in order to make sure the system is operating correctly. Make sure that all indicators (shown in the top left) are valid (blue or green, not red). Position the vessel at the start edge and make sure the system can collect 2 good cells of data.
2. Press the **Start Edge** button (or **F5**) and collect at least 10 edge samples. The Edge windows will be displayed showing both edges. Keep the vessel as stationary as possible during this time. Input the start edge information into the Edge



dialog that pops up and press OK.

3. Press the **Start Moving** button (or **F5**) and the Transect window will be displayed. Keep the vessel speed and direction constant as you cross the river.
4. When the vessel reaches the end edge press the **End Edge** button (or **F5**). Follow the same instructions as for the Start Edge (Step 2).
5. Press the **End Transect** button on completion of the end edge. This automatically opens a new data collection window so you can start a new measurement. The system is still running, so if you need to keep making measurements repeat steps 2 to 5 again or press the **Abort** button (or **F8**) to stop.
6. On completion of all your measurements, it is recommended to go to the System tab and **download** all your collected data files and **format** the recorder afterward.



GPS – An Overview

GPS uses a series of satellites that orbit the earth to determine the position of the GPS antenna on the earth's surface, with a high degree of accuracy. The antenna transmits the positional data to the RiverSurveyor system which is then automatically integrated into the data stream.

The uncertainty of the position is determined by:

1. **Atmospheric conditions** (e.g. rain, clouds, fog) can reduce quality
2. **Multi-path Error**: The signals from the satellites can be reflected by surfaces near the GPS receiver (such as canyon walls, trees and large structures or bridges). When this occurs the signals can experience interference and multiple reflections.
3. **GPS type**: Regular GPS has the lowest accuracy, followed by Differential GPS (or DGPS), and Real-Time Kinematic GPS (or RTK GPS) has the highest accuracy.

Key GPS terms used with the RiverSurveyor include:

- **Latitude** and **Longitude** are two numbers or coordinates that are used to describe locations on the Earth. Lines of constant latitude circle the Earth East-West. Lines of constant longitude circle the Earth North-South. Latitude and longitude are measured in degrees, minutes, and seconds.
- **Altitude** is the height of the GPS receiver above sea level.
- **Number of Satellites** is the number of visible satellites used in the computation of the receiver. Four satellites are required for the computation to produce valid results.
- **HDOP** (Horizontal Dilution of Precision) is the degree of uncertainty in the horizontal position of the GPS receiver.
- **Magnetic Declination** is the angular difference between true North and magnetic North and varies depending on the location of the survey site.

General GPS Facts and Tips

Some important tips on the GPS options and their use:

- Compass calibration is **critical** for a good measurement
- Magnetic declination **must** be entered

- The system uses both the GGA (position-based fix) and VTG (Doppler-based velocity fix) NMEA strings
- The internal GPS data sampling rate is 10 Hz

SonTek DGPS Facts and Tips

The SonTek DGPS is the basic GPS option offered.

- Provides a sub-meter differential GPS solution
- Provides both GGA and VTG data
- Generally the **VTG** data is preferable for this option
- The GGA data may be differentially corrected
- Requires **6 or more satellites** in view
- Requires channel width of 20 m or more

RTK GPS Facts and Tips

The SonTek RTK GPS is the advanced GPS option offered.

- High precision (+/- 3 cm) RTK solution
- Receives RTK correction from the RTK Base Station
- The Base Station must be on to receive RTK quality data. The RiverSurveyor will continue to receive RTK quality data for approximately 45 minutes after the Base Station is turned off or is out of range.
- Provides both GGA and VTG data
- Generally the **GGA** data is preferable for this option
- Requires **8 or more satellites** in view
- Requires channel width of 1 m or more

SonTek (USB) Radio Range

SonTek supplies a 2 dBi gain antenna to be used with all PCMs. The default transmit power for all radios is 10 dBm. When used with this configuration, the ranges are:

- Base to Rover: 1000 m
- PC to Rover (via USB radio): 450 m
- Mobile to Rover (via Bridge): 200 m

Field conditions are variable and radio ranges can be affected by a number of environmental factors, transmit power and antenna gain.

Water is a strong absorber of radio frequencies in the 2.4 GHz range. As such, significantly improved radio performance can be achieved by raising antennas above the water surface as much as possible. SonTek provides external antennas as well as extension cables (for the DGPS and RTK configurations) for this purpose.



Where permitted by local regulations, customers may increase the transmit power of the radio to improve the range. It is YOUR responsibility to verify regional communication regulations and ensure you are abiding by them when you change either radio transmit power and/or antenna gain.

Troubleshooting Guide

Some general guidelines for troubleshooting the system:

- Check that all cables and antennas are properly connected
- Disable your computer's Bluetooth and Wi-Fi options as these may interfere with the SonTek USB Radio.

- Batteries should be fully charged (if rechargeable) or new (if alkaline)
- GPS antennas on the ADP and Base Station should have clear view of the sky
- Move away from bridges or structures to avoid multi-path errors with GPS signal.
- In some cases, it may take longer than 10 minutes for the RTK Base Station to achieve a GPS differential lock.

Software and Firmware upgrade

When upgrading software and firmware, it is strongly recommended that BOTH are upgraded to the most recent version at the same time. Differences in software/firmware may cause unforeseen issues.



PCM LEDs

The following table describes the light pattern for the different devices.

	USB Radio	PCM Radio	PCM GPS	Base Radio	Base GPS	Bridge
Initial system power up	●●	●●	N/A	●●	N/A	●●
Radio on Stand-by	Slow ●●	Slow ●●	N/A	Slow ●●	N/A	Slow ●●
Attempting Comm.	●●	●●	N/A	●●	N/A	●●
Available for Connection	●●	●●	N/A	●●	N/A	N/A
Connected	●●	●●	N/A	●●	N/A	●●
Waiting for Pairing Connection	N/A	●●	N/A	●●	N/A	N/A
GPS searching for sats	N/A	N/A	●●	N/A	●●	N/A
GPS Qual. 1 (RTK w/ base connection)	N/A	N/A	●●	N/A	N/A	N/A
GPS Qual. 1 (RTK w/o base connect.)	N/A	N/A	●●	N/A	N/A	N/A
GPS Qual. 5 or 2 (RTK)	N/A	N/A	●●	N/A	●●	N/A
GPS Qual. 1 (DGPS)	N/A	N/A	●●	N/A	●●	N/A
GPS Qual. 4 (RTK)	N/A	N/A	●●	N/A	●●	N/A
GPS Qual. 2 (DGPS)	N/A	N/A	●●	N/A	●●	N/A
Error	●●	●●	●●	●●	●●	●●

Technical Support

SonTek Technical Support is available 24 hours a day, 7 days a week.

Tel: +1-858-546-8327 Email: support@sontek.com
 Fax: +1-858-546-8150 Web: www.sontek.com