



DeepView 4.x

3.3 Side Scan Sonar at Sea

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Introduction

This document is a user guide on how to use the DeepVision sonar system at sea. It provides all of the essential information needed about how to use the sonar system. When using a DeepVision sonar system at sea you need to be cautious of the dangers that may occur. This document will deal with safety precautions when using a sonar system at sea, so that you will be fully prepared for the task.

If you are new to the DeepView software it is recommended that you read the user guides concerning the DeepView software before reading this guide. For the best experience when using the DeepVision sonar system, it is recommended that are well acquainted with how to use the DeepView software environment.

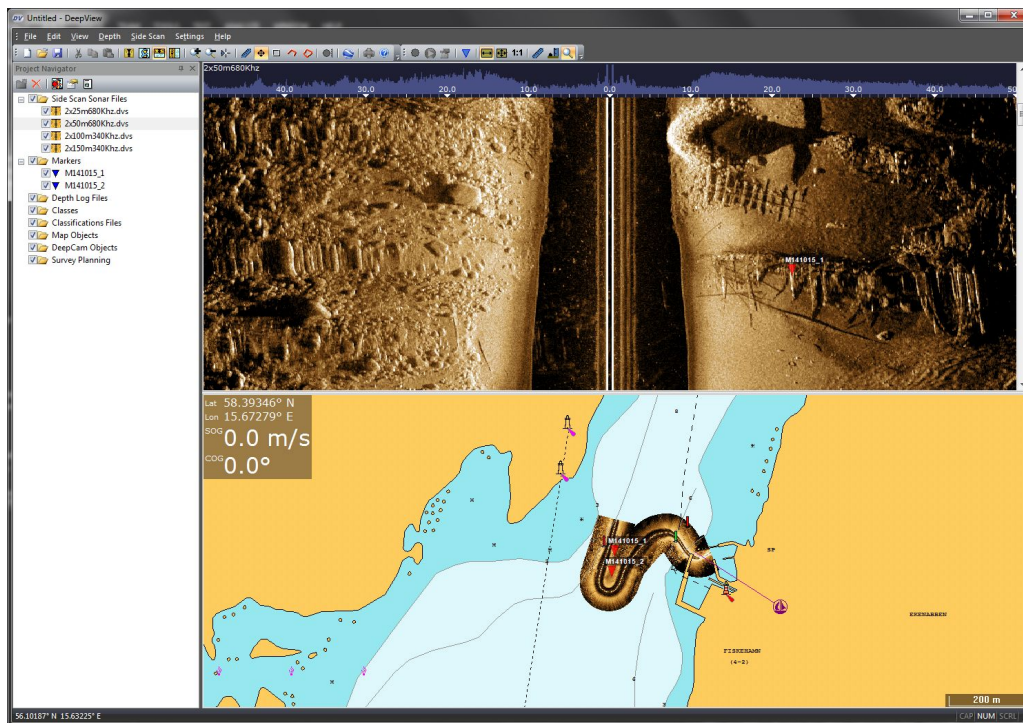


Figure 1: The DeepView software environment.

Equipment



Figure 2: A standard DeepEye towfish sonar system. The different parts are presented below.

The DeepVision sonar system consists of the following items:

1. PC with the DeepView software installed. Please verify that the computer meets the minimum system requirements listed in the *PC Requirements* section below.
2. Surface unit (such as SU1-USB).
3. Sonar unit (Figure 2 depicts a DeepEye towfish). Note: the sonar unit may be another sonar unit, such as the hull mounted system HM680D.
4. Tow cable. Required when using a towfish. **It is important to only use cables specifically designed to be used underwater as towcables.**

A GPS unit is required for all features to be available, either an internal GPS in your computer or an external GPS connected via a USB port. This is not displayed in Figure 2 but it is necessary for drawing a mosaic in Map View, Navigation etc.

There are two types of the DeepVision sonar systems, the DeepEye towfish sonar system and the hull mounted sonar system. Figure 3 and 4 displays how the system is connected depending on if it is a towfish or a hull mounted sonar system. The difference in the connection between the two types of sonar systems is the cable between the sonar unit and the surface unit. If you are interested in switching between these setups, you easily do this by switching the sonar unit and this cable.

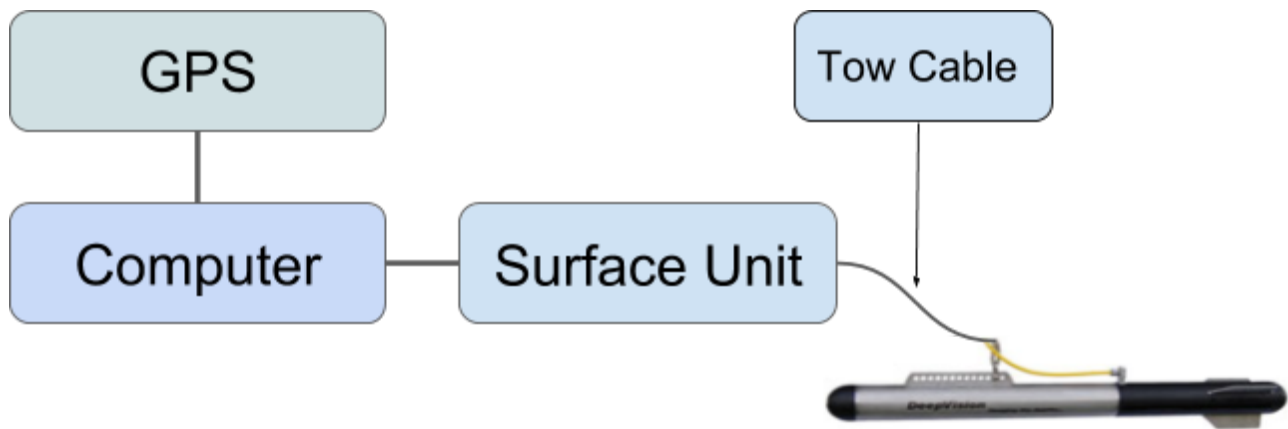


Figure 3: The DeepEye towfish sonar system.

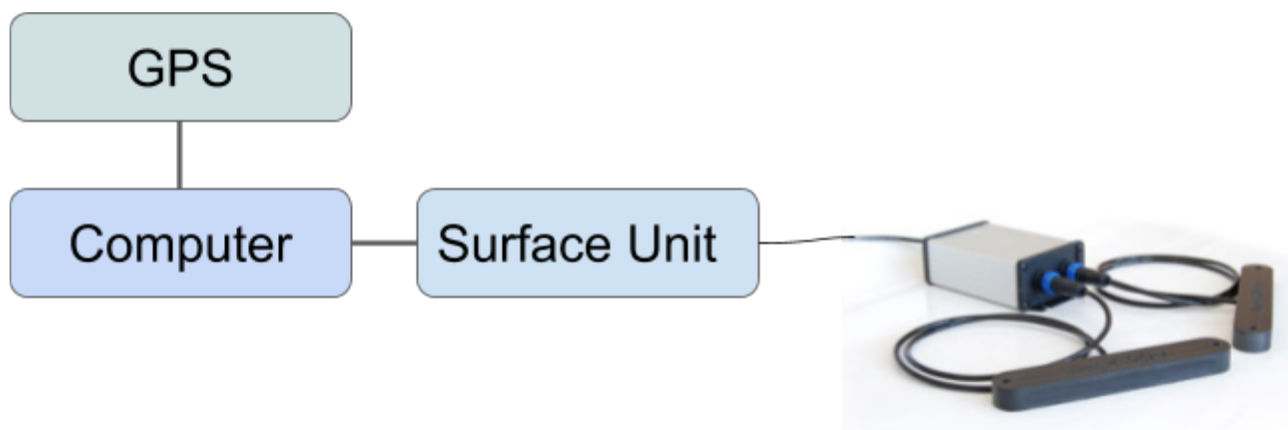


Figure 4: The hull mounted sonar system.

PC Requirements

We want our customers to have the best possible experience when working with the DeepVision sonar system. These are the recommended minimum PC requirements to ensure proper performance while using the system:

- 2.5 GHz Pentium or equivalent
- 4 GB RAM
- Screen resolution: 1024x768 or higher
- 32 bit color
- Operating system: Windows 7 or later
- A sunlight readable monitor

Preparations

Before using your DeepVision sonar system there are some preparations you need to do both concerning your DeepView software and DeepVision sonar system.

Install the DeepView software

To use the DeepVision sonar system the DeepView software must be installed on your computer. The recommended minimum requirements for the computer are listed above in PC Requirements. To install the DeepView software, follow the instructions in the user guide *1 System Requirements and Installation*.

A license for the Side Scan module is required to be able to use the DeepVision sonar system. Contact DeepVision if you are interested in purchasing a license. For more information about how to add licenses, read the user guide *1 System Requirements and Installation*.

Connect the surface unit

The surface unit is the link between the Side Scan sonar and the computer. To install the surface unit perform the following instructions to make sure that the surface unit gets properly installed.

- Connect the computer to the internet.
- Connect a USB to Mini-USB cable to the surface unit. Connect the surface unit to a USB port on your computer. The sonar unit should not be connected at this point.
- The computer will start to install the surface unit drivers. **It is important that you wait until this is done! This could take several minutes, but do not pull out the surface unit while the installation is in progress.**
- When the surface unit is correctly installed, you can proceed with connecting the Side Scan sonar.

Connect the towfish

When connecting the towfish it is important that the connectors are completely dry. **Never connect a wet connector.** If it is wet, soak it in distilled water and let it dry.

If the towfish has been used in salt water, make sure to wash it with fresh water directly afterwards. This is to get rid of the salt molecules while they are still dissolved in the water. If the salt is not washed away, the towfish will corrode faster. The salt may get crystallized if not washed away. This may cause the cable connection to leak. This is also the case if there are dirt particles in the connector. Make sure that the connector is free from dirt and salt before usage.

After checking that the connectors are dry and free from dirt, you can connect the tow cable to the towfish and the surface unit. There is a red dot on both the cable ends and the cable inputs.

The connectors are self-locked when connected. To check that the connector is locked in the correct position, pull gently in the tow cable lockers. See Figure 5 for an illustrated description.

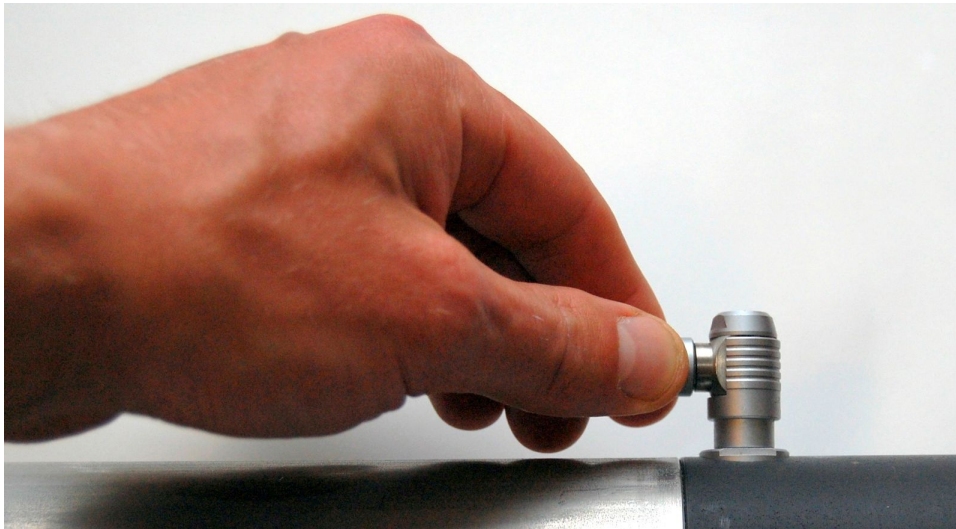


Figure 5: Pulling the cable locker to make sure it is locked.

When a towfish or hull mounted sonar system is correctly connected, the recording button, play button and properties buttons will switch from being gray to being colored. For some users, these buttons may already be slightly colored. In that case, the colors of the buttons will get more intense after connecting the sonar system.



Figure 6: The recording, play and recording properties buttons.

Adjust the shackle position

It is important that the towfish is positioned horizontally while immersed in water. To assure a correct horizontal position you can adjust the position of the shackle. If this is not possible, it is better if the nose points slightly down than slightly up, as the towfish is more stable pointing downwards than pointing upwards.

Another purpose of the shackle is to relieve the cable connector from any tension asserted by the cable. Make sure that this is the case by pulling the cable forward. As you do this, no forces should affect the cable connector. See Figure 7 for an illustrative description.

Always check that the cable grip is firmly attached to the cable before running the sonar system. If you do not perform this, the cable connector may get permanently damaged and unusable for future work.

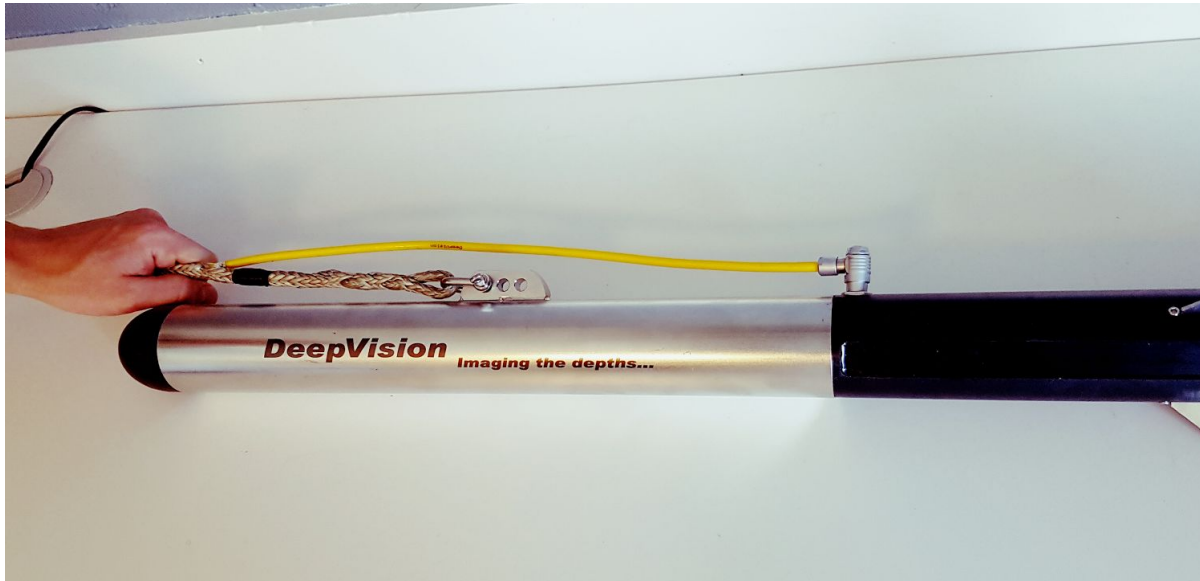


Figure 7: Cable grip check. The cable is pulled forward without any forces being applied on the cable connector.

Quick check before using your sonar system

Here are some quick steps that you always should perform before using your DeepEye towfish system at sea.

- Check that there is no visible damage on the cable or cable grip.
- Verify that there are no forces applied on the cable connector as you pull the cable forward. The shackle must divert all forces from the cable connector.
- The cable grip must be firmly attached to the cable.

Running the system

This section will guide you from when the towfish is immersed into the water until the recording is started.

Securing the cable

Before you immerse the towfish into the water the cable must be secured. This is done with a four-coil Prusik knot attached to the tow cable. **The Prusik knot must be attached at all time while the towfish is immersed in the water.** Figure 8 displays how the Prusik knot should be attached. If you do not know how to tie a four-coil Prusik knot, make sure to look it up.

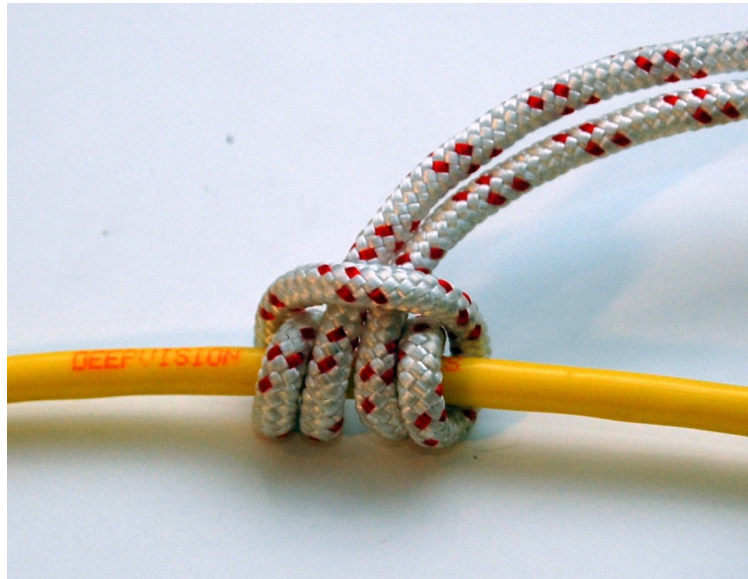


Figure 8: *The four-coil Prusik Knot.*


Setting the Depth

To set the height of the towfish, perform the following steps in order:

- Put the towfish into the water.
- Unlock the Prusik knot and adjust the cable until the towfish is at desired depth.
- Lock the Prusik knot.

Recording

To start your Side Scan recording, follow the instructions below:

- Start your DeepView software with the Side Scan module applied.
- Go to the recording properties of the Side Scan Sonar by pressing .
- Select the desired frequency, range and speed of the Side Scan. This is done by selecting one of the options in the Sonar Setup tab.

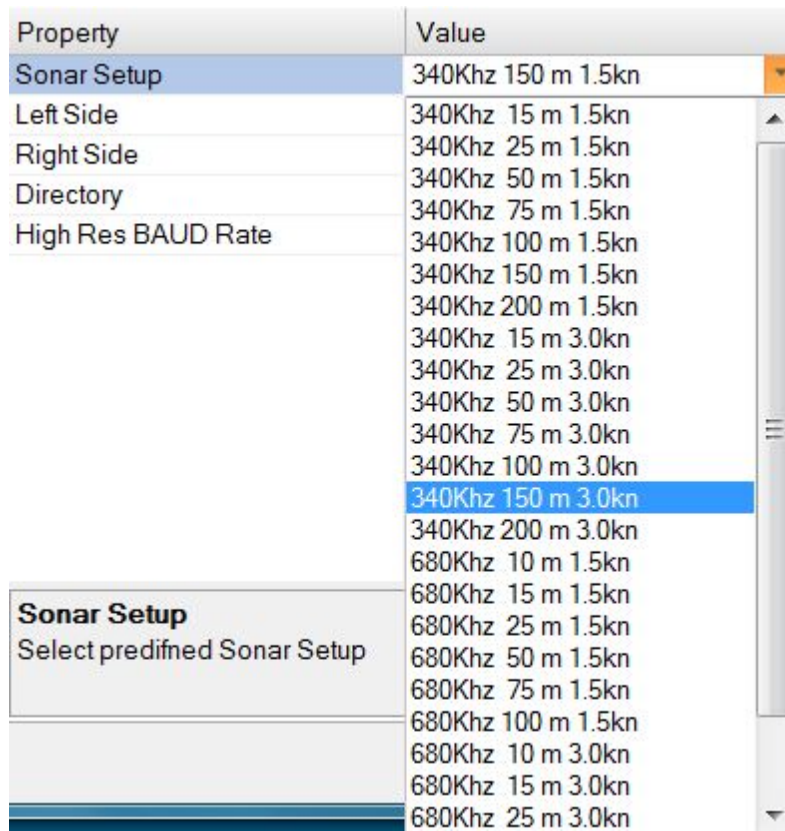





Figure 9: Sonar setup settings in recording properties for Side Scan.

- Select the sides of the sonar that should be active and the BAUD rate for the communication. 921600 bps is the recommended BAUD rate setting.
- Press the recording button, , to start recording Side Scan Sonar data to a file. To see the Side Scan data live in the waterfall view, press the play button .

A new Side Scan Sonar file is created when the recording is started. This file is automatically named with the current date and time and stored in the directory that is set in the recording properties. The recommended directory is "C:\DeepView\ScanData\", which is the default setting. It will also be added to your project and shown in the Project Navigator.

If you want to stop the waterfall view, this can be done without affecting the Side Scan Sonar data recording. To stop the waterfall view press the play button, . This is often useful when an interesting object appears and you want to place a marker or make further investigations.

Press the recording button as you record Side Scan Sonar data to stop the recording.

Safety

Even though the DeepVision sonar system is very user friendly and easy to use, there are some dangers you should be aware of while running the system. Most of the time, these are avoided by being observant and using common sense.



Catch bottom. When using a DeepEye towfish sonar system, the entire crew must be prepared that the towfish can get stuck in the bottom or other objects at any time. If you see that the towfish approaches the bottom in the waterfall view, reduce the depth of the towfish immediately. To minimize the risk of the towfish getting stuck, everybody onboard must be observant of the waterfall view at all times.



Propeller. Watch out for the propeller. Never put the towfish in the water while underway. The propeller might suck the towfish toward itself and both deal and take damage. While the towfish is in the water the cable must be secured so that it can never reach the propeller when the boat is underway. Watch out when turning so that the cable is not approaching the propeller.



Secure cable. When the towfish is immersed in the water, the cable must be secured at all times. If it is not secured, the towfish will continue to drop uncontrollably. Secure the cable with a four-coil Prusik knot. Read more about this in the *Running the system* section above.



Cable on deck. While the towfish is in the water, everybody on board needs to be cautious of the cable. Avoid sudden actions that may damage the cable.



The crew. It is important that everybody on board are aware of what is happening. Everybody should be cautious and do what is expected to minimize the risk of dangers. Always keep an eye on the cable and the waterfall view.



Turning. It is important to be aware when turning the boat with the towfish attached. The depth of the towfish will increase while turning. This means that the risk of hitting an object or the bottom increases. Deal with this danger by decreasing the depth of the towfish or increasing the speed. If you go faster the depth of the towfish will decrease, but the impact of a crash will be greater.



Freezing Prusik knot. If you are using the towfish at temperatures below 0°C, there is a risk of the Prusik knot freezing. If this happens the Prusik knot might not lock the tow cable and the towfish will drop down towards the bottom. You can avoid this by attaching another four-coil Prusik knot on the cable in the bow of the boat.



Cable kinking. It is important that you handle the tow cable in such a way that cable kinking is avoided. Cable kinking is when the cable stretches while it has taken a spiral shape. The risk of the cable to burst and get permanently damaged is increased in this shape. To avoid cable kinking it is recommended to coil the cable in the shape of an 8 or to use a cable reel.



Illegal area. It is not legal to run a sonar system everywhere. Make sure to check up the regulations of surveying in the area before you run the system. DeepVision is not taking any responsibility if you are surveying an area where it is illegal to record sonar data.

Practical advice when running the system

This section includes some practical tips when using the DeepVision sonar system. For instance, what height the towfish should be at, what speed and range you should use and how the depth and layback is affected by the speed. These are all tips that will increase the performance of your DeepVision sonar system.

Depth of the towfish

To produce high quality Side Scan Sonar images it is recommended to have the towfish at a distance of 10 - 15% of the Side Scan width above the bottom. For instance, if you use 100 meters range, the towfish should be 10 - 15 meters above the bottom.

Range and speed selection

Each time a sound wave has travelled the range distance and back, a new ping is sent. This results in that if you select a longer range, the travel time for the sound wave will be longer and fewer pings will be sent per second. Therefore, the resolution of the image will be lower if a long range is used compared to a shorter one.

Both the range and the movement speed is affecting the along track resolution of the waterfall view but not the across track resolution. In table 1 you see the resolution calculated depending on the recording range and the speed of the towfish.

		Speed knots					
		0.5	1	1.5	2	3	5
Range meter	30	1.0	2.1	3.1	4.1	6.2	10.3
	50	1.7	3.4	5.1	6.9	10.3	17.1
	70	2.4	4.8	7.2	9.6	14.4	24.0
	100	3.4	6.9	10.3	13.7	20.6	34.3
	150	5.1	10.3	15.4	20.6	30.9	51.4
	200	6.9	13.7	20.6	27.4	41.2	68.6
	250	8.6	17.1	25.7	34.3	51.4	85.7

Table 1: Along track resolution in cm.

The speed of the sonar also affects the resolution of the image. If the sonar moves fast, the resolution will be lower compared to a slower movement. This means that you can compensate the resolution of a long range recording by using a slower movement speed.

The across track resolution is set in the sonar setup so that the objects appearing in the waterfall view will be displayed according to their real form. This is done by dividing the image into a number of samples, which depends on the speed you have chosen. For example, if you have set the speed to 1.5 knots, each side of the water column will be divided into 1000 samples. If you double the speed to 3 knots, the number of samples will be halved to 500. It is therefore important to keep the speed that has been chosen in this setup selection, for the display of the waterfall view to be correct.

Depth and layback

The depth and layback of the towfish is highly dependent on the speed. If the speed is increased the towfish will be pulled up closer to the surface and get further away from the boat. In other words, the depth is decreased and the layback is increased as the speed of the towfish is increased.

The tables below displays the depth and layback, depending on the speed of the towfish and the length of the cable.

		Speed knots					
		0.5	1	1.5	2	3	5
Cable out meter	10	10	9	9	9	8	5
	25	24	24	22	20	14	8
	50	49	46	39	31	20	10
	100	98	81	58	43	25	12
	150	143	105	71	50	28	13
	200	186	124	80	55	30	14

Table 2: The depth in metres with the information of the speed and the length of the cable.

		Speed knots					
		0.5	1	1.5	2	3	5
Cable out meter	10	0	0	1	2	4	7
	25	1	4	8	12	18	22
	50	4	15	27	35	42	47
	100	17	51	73	83	92	97
	150	37	95	121	133	142	147
	200	63	141	171	183	192	197

Table 3: The layback in metres with the information of the speed and the length of the cable.

Splitting your recordings

The DeepView software is designed to handle many files. You can divide your record without taking the number of files in account.

While recording a Side Scan Sonar file, it is desirable to maintain the depth, direction and speed of the towfish as constant as possible. However, there are situations where these parameters need to be changed and if those situations are not handled correctly, this may affect your survey negatively. In these situations it is recommended that you divide the recording into different files by starting to record a new file. Common situations when you should start a new file are for instance:

- A parallel distance is to be recorded and you need to turn.
- The depth, direction or speed is changed, for example because of a curve.