SENTINEL V

REAL-TIME
SERIAL
ETHERNET
DEPLOYMENT GUIDE

TELEDYNE RD INSTRUMENTS
Everywhereyoulook™

RT

P/N 95D-6033-00 (September 2017)

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Preparing the ADCP

PREPARING THE ADCP INCLUDES THE FOLLOWING STEPS:

- Checking you have all of the Sentinel V Real-Time parts
- Installing the documentation and software CD
- Registering Velocity software

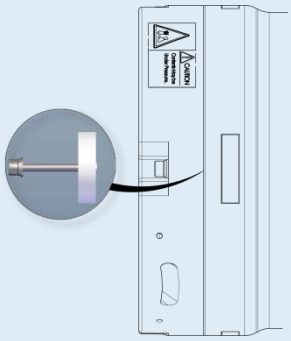
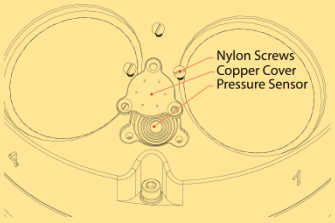
Identifying what's in the Box

Included with the Sentinel V system:

Kit	Part Number	Name	Description
Configuration	S20 S50 S100	Sentinel V SC or RT ADCP with transducer cover	Sentinel V Self-Contained (SC) or Real-Time (RT) ADCP. Depending on housing type: • Sentinel V battery packs are shipped inside the system but not connected. • Sentinel V with D cells are shipped without batteries inside the system. • Sentinel V with no battery housing uses external power.
	See the packing slip for more information on system configuration		SC systems use wireless communications for setup and deployment. This means the system only requires battery power to operate the system. RT systems use serial or Ethernet communications for setup and deployment. This means an end-cap with connector, an underwater cable, and DC power are required to operate the system.
Accessories Kit	97D-7000-00 or 97D-7002-00	Shipping Case	Shipping case with foam inserts.
	81D-6002-00	Handle	The handle makes it easier to carry the Sentinel V ADCP. Attach it to the slots on the ADCP's end-cap.
	75DK6001-00	Tools and Spare Parts kit	See Tools and Spare Parts for a list of parts included in this kit.
	95D-6037-00	Sentinel V SC and RT Roadmap	Use this sheet to determine where to start on setting up the Sentinel V SC and RT system.
Documentation Kit	95D-8001-00	Sentinel V Documentation and Software CD	This CD has PDF versions of all of the Sentinel V documentation and software including the Sentinel V SC and RT Operation Manual. Please read the manual and the SC and RT Deployment Guides!
	95D-6016-00	Compass Calibration Guide	Printed sheet with instructions on how to calibrate the compass. A PDF version is included on the documentation CD.
	95Z-8005-00	Velocity Activation Code	Activation code that unlocks the Velocity software. Waves processing requires a waves enabled activation code.
	95D-6015-00 95D-6033-00	Deployment Guide	A printed copy of the RT and SC deployment guides.

Tools and Spare Parts

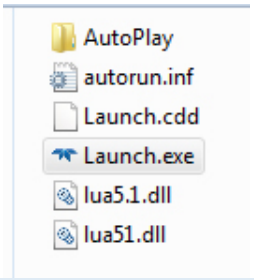
A set of tools and spare parts are included with the system (located in the canvas bag).

Part Number	Description	Where Used
81D-6003-00	O-ring tool	Use the O-Ring tool to remove the 2-163 housing O-ring. 
2-163	2-163 O-ring	The housing O-rings (one each end) prevent the system from flooding.
5020	Silicone lubricant, 4-pack	Lightly coat the 2-163 O-ring with lubricant before installing the O-ring on the housing.
DES2	Desiccant bag	Used inside the housing to prevent water condensation.
6958A14	4mm Hex key	Used to attach the end-cap to the housing. 
81D-4002-00	Captive Nut	
81D-4003-00	M5 Captured bolt with washers	
75DK6009-00	Silicone oil fill kit with syringe, needle, needle cover, and 1 oz. of silicone oil.	Used to fill the Pressure Sensor with oil. **Note that the sensor is NOT filled when shipped and must be properly filled with oil prior to deployment.**
3/16BLADE	Screwdriver	Used to remove the Pressure Sensor cover.
M3X0.5X8FHN	Black nylon flat head screw	Used to hold the pressure sensor cover in place 

Installing Documentation and Software

The Sentinel V Real-Time system includes a CD with the documentation and all software needed for the Sentinel V RT and SC system.

To install the Sentinel V Documentation and Software CD:



1. Insert the CD into the drive and follow the browser instructions on the screen. If the browser does not start automatically, complete steps 2 through 3.
2. Use Windows Explorer® to open the CD drive folder.
3. Double-click on the *launch.exe* file. Follow the browser to view or copy the documentation to your computer.

Many companies require that Autorun is disabled. Double-click on *Launch.exe* to start the browser on all TRDI software and documentation CDs.

4. Click **Start**, **All Programs**, **Teledyne RD Instruments** to locate the installed documentation and software.

Registering Velocity

When you purchase the *Velocity* software, you will receive an Activation code that unlocks the software.

To activate *Velocity*:

- On the License Registration screen, enter your activation code (*xxxx-xxxx-xxxx-xxxx*). Click the **Activate** button. Click the **OK** button and then **OK** once more to close the License registration screen.

The Velocity Activation Code sheet is located in the documentation kit.

Quick Review

Check that you have all of the Sentinel V Real-Time parts.	If you are missing parts, contact TRDI support rdifs@teledyne.com or call +1 (858) 842-2700.
Check that the software and documentation is installed.	If the CD browser does not automatically start, double-click on the *launch.exe* file. The software and documentation CD will install the Velocity, Sentinel V RT Utilities, and the Sentinel V documentation.

Connecting to the ADCP

CONNECTING TO THE ADCP INCLUDES THE FOLLOWING STEPS:

- Identifying System Configuration
- Connecting the cables
- Listening for the long beep when connecting power
- Connecting to the system using Sentinel V RT Utilities

Identifying RT System Configuration

How do I know if the system is RS-232, RS-422 or Ethernet?

Look for a label next to the product label.

= RS-232

= RS-422. If the RT system is configured for RS-422, use a RS-422 to RS-232 converter when connecting to the serial port (the serial port on the computer must match the serial communications of the Sentinel V system).

= Ethernet

What type power does my system need?

Depending on the type of housing the system is configured with, the ADCP may use a battery pack, lithium battery pack (optional), individual D cell batteries, external power only, or both external power and batteries.

The AC Adapter runs on any standard AC power and supplies +18 VDC, 24 watts to the ADCP through the end-cap connector. The Sentinel V batteries can be connected or disconnected. If the adapter's input voltage is greater than the battery voltage, then the ADCP will draw all power from the AC adapter even if the battery is installed and connected. Use the AC Adapter when testing the ADCP to conserve the battery power.

This guide assumes using only external power. If you need to install batteries, see the Sentinel V SC_RT Operation manual, chapter 4.

Connecting to the ADCP

The Sentinel V Real-Time ADCP includes an external serial RS-232 or RS-422 cable connector or Ethernet on the end-cap. The system also includes the 802.11b/g/n WLAN interface and a built-in user interface for firmware upgrades.

To set up the Sentinel V Real-Time ADCP:

1. Connect the I/O cable to the Sentinel V Real-Time ADCP.
2. Attach the I/O cable to the computer's communication port.
3. Connect the AC Power Adapter to the power connector or use the banana plugs from cable 73D-6021-00 to power the unit with a different power supply (voltage not to exceed 20V). You should hear one long beep when power is connected.

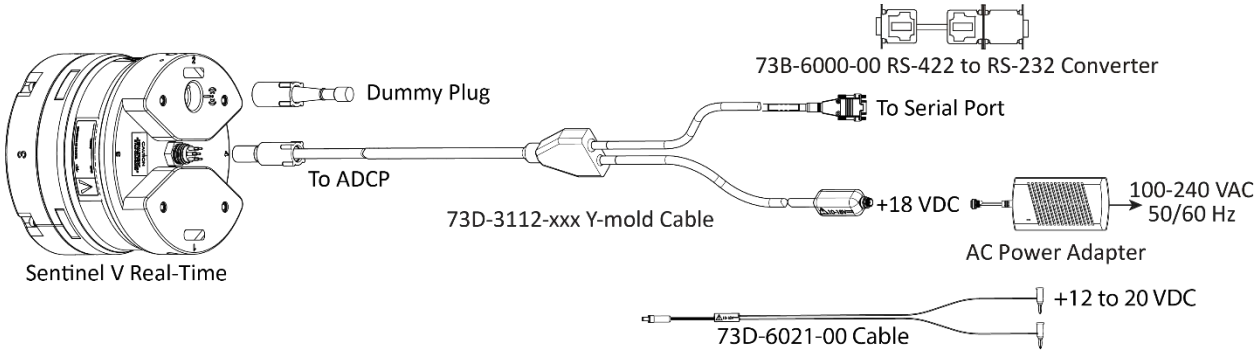


Figure 1. Sentinel V Real-Time Serial Connection

Your computer and the Sentinel V Real-Time Serial ADCP must both be set to the same communication setting. Use the RS-422-to-RS-232 converter if the ADCP is configured for RS-422 communications and your computer only has a RS-232 COM port.

There is a 10 to 15 second delay after power is applied before the serial port is available.

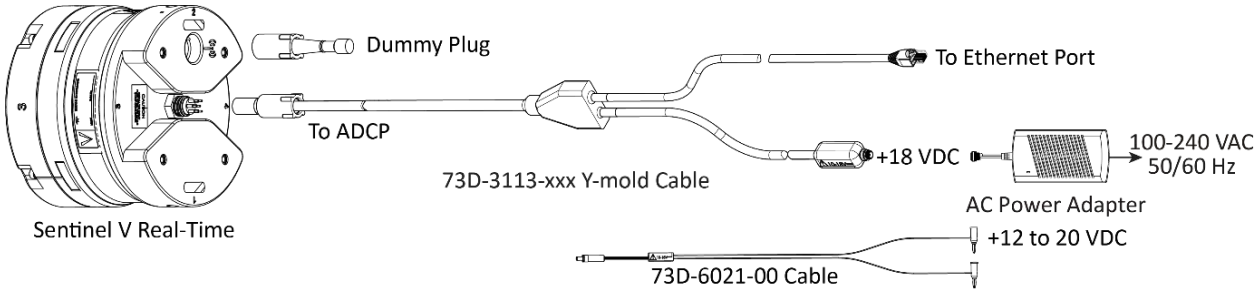


Figure 2. Sentinel V Real-Time Ethernet Connection

You should hear one long beep, a ~15 second delay and then two short beeps when power is applied. Wait for the short beeps before sending a break.

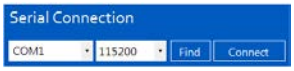
Using Sentinel V RT Utilities

To connect to the Sentinel V Real-Time ADCP using the Sentinel V RT Utilities software:

1. Select **New Serial Connection** or **New Ethernet Connection**.
2. Enter the ADCP's communication settings.

Serial Communications:

Select the **COM Port** and **Baud Rate** from the drop down lists.



Use the **Find** button if you are unsure of the Baud rate. This will try different Bauds until it can connect, but not different COM ports.

There is a 10 to 15 second delay after power is applied before the serial port is available.

Ethernet Communications:

Enter the **IP or host name**. For example, Sentinel V ADCPs host name is SV*nnnnn.adcp* (where *nnnnn* is the five or six character serial number shown on the product label).

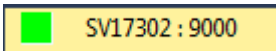
Use SV*nnnnn* if the network you are connecting to assigns the IP address.

Enter the **Port Number** 9000.

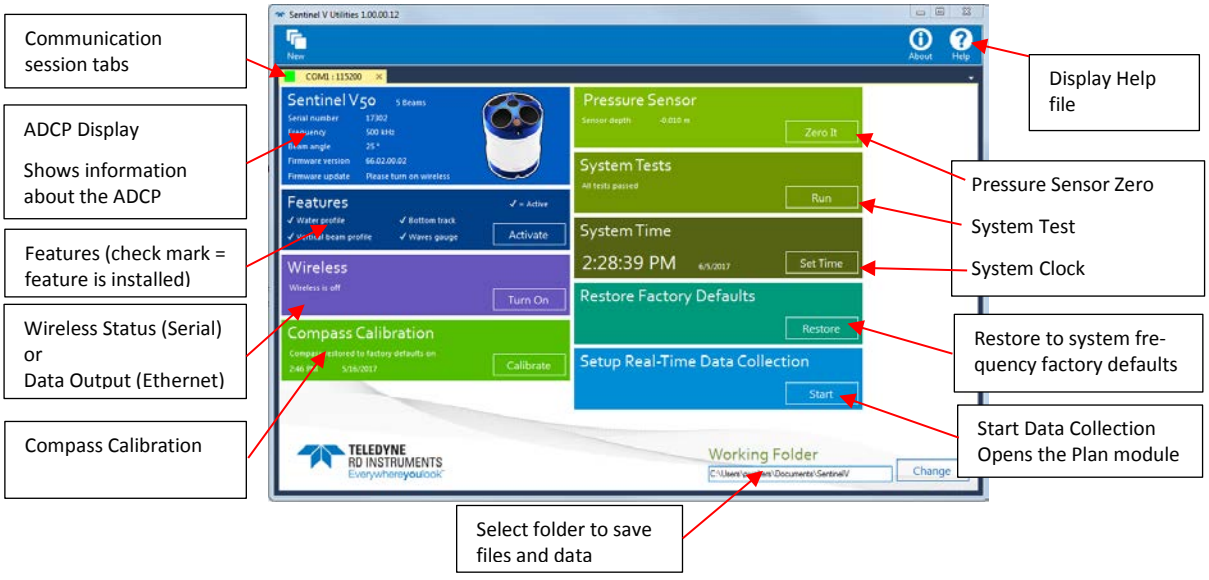
Select **TCP**.

There is a 10 to 15 second delay after power is applied before the Ethernet port is available.

3. Click the **Connect** button. Once connected, the button will change to **Disconnect** and the tab will show a green box.



4. The *Sentinel V RT Utilities* main screen will open.



For more information on *Sentinel V RT Utilities*, click the Help icon ( ) to open the Sentinel V RT Utilities Software help file.

Use the Sentinel V RT quick reference cards to help remember how to connect the Sentinel V system. A PDF copy is included when you install the software/documentation CD.

Quick Review

Check that you heard the long beep when power is applied.	If you did not hear the beep when the power was connected, read Chapter 5 in the Sentinel V Operation Manual. There is a 10 to 15 second delay after power is applied before the serial or Ethernet port is available.
If you have trouble connecting, click the **Find** button.	This will try different baud rates until it can connect, but not different COM ports.
Use the quick reference cards.	Use the Sentinel V RT quick reference cards to help remember how to connect the Sentinel V system. A PDF copy is included when you install the software/documentation CD.
Use the Sentinel V RT Utilities Help file.	For more information on *Sentinel V RT Utilities*, click the Help icon (Help) to open the Sentinel V RT Utilities Software help file.

Planning the Deployment

PLANNING THE DEPLOYMENT INCLUDES THE FOLLOWING STEPS:

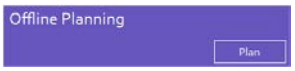
- Planning a deployment using Sentinel V RT Utilities

Plan Overview

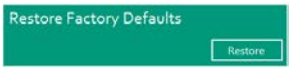
Sentinel V RT Utilities lets you enter known or "best-guess" values for the various Sentinel V Real-Time ADCP profiling parameters and shows predictions of expected results. This lets you play "what if?" with the input parameters to evaluate trade-offs you may have to make with regard to standard deviation, profiling range, and timing.

Sentinel V RT Utilities saves the profiling parameters, predicted consequences, and any notes you make in a command file. The file is intended to configure a Sentinel V Real-Time ADCP for a deployment; it is also a record of the system's configuration.

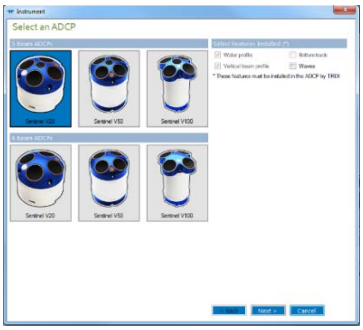
Sentinel V RT Utilities can be run at your desk without an ADCP present. At the New Connection screen, click **Offline Planning**.



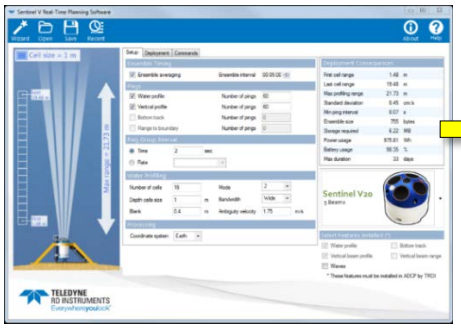
Use the **Restore Factory Defaults** button to set the ADCP to the system's frequency default settings. When the **Start** button is clicked, the plan module will open without running the Wizard.



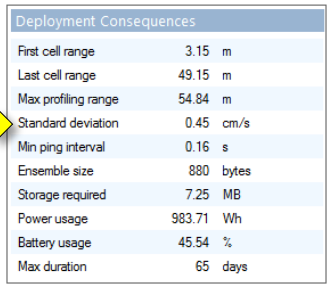
Sentinel V RT Utilities can plan a deployment and send the deployment commands while connected to the ADCP. On the main screen, click **Start**.



Click the **Wizard** button (Wizard) on the toolbar to start.



Plan Screen



Deployment Consequences		
First cell range	3.15	m
Last cell range	49.15	m
Max profiling range	54.84	m
Standard deviation	0.45	cm/s
Min ping interval	0.16	s
Ensemble size	880	bytes
Storage required	7.25	MB
Power usage	983.71	Wh
Battery usage	45.54	%
Max duration	65	days

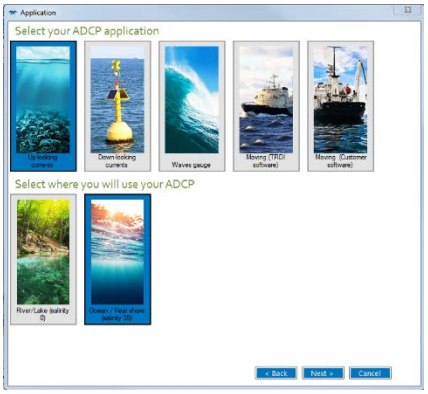
Deployment Consequences

For more information on planning a deployment, click the Help icon (Help) to open the *Sentinel V RT Utilities* software help file.

Using the Wizard

To create a command file:

1. Start *Sentinel V RT Utilities* and click the **Wizard** button ( ) on the toolbar.
2. Select the type of Sentinel V Real-Time ADCP and features. Click **Next**.
3. Select the Sentinel V Real-Time ADCP application and Salinity. Click **Next**.
4. Select the depth range you wish to measure.
5. Set the depth cell size. Click **Next**.
6. Enter how many battery packs will be used. Use zero for Real-Time deployments.
7. Select how many ensembles per hour you want to record.
8. Enter the expected duration of the Sentinel V Real-Time ADCP deployment. Click **Next**.
9. Review the consequences.
10. Click on the **Save** icon to save the command file.



The Waves feature must be installed in the ADCP and your Velocity registration code must include Waves in order to collect and process Waves data.

See the *Sentinel V RT Utilities* software help file for details on using the Wizard.

Quick Review

✔ Use the Plan wizard to create a command file.	For more information on *Sentinel V RT Utilities*, click the Help icon to open the help file.
✔ Save the command file.	
✔ Check that the resources for the deployment are acceptable.	
✔ If you are collecting Waves data, *Velocity* can only process waves data collected at 2 Hz.	The Ping interval must be set to 2 Hz. See Creating a Waves Data Command File in the *Sentinel V RT Utilities* Help file.
✔ If you are collecting data with VmDas, see the example shown in the Sentinel V RT Utilities help file.	Coordinate system MUST be set to **Beam** and the **Water profile**, **Vertical profile**, and **Bottom track** pings set to 1. Ensure that **Ensemble averaging** is unchecked and leave the Ping Group Interval set to **Time** to **2 seconds**.

Deploying the ADCP

DEPLOYING THE ADCP INCLUDES THE FOLLOWING STEPS:

- Setting the ADCP clock
- Testing the ADCP
- Checking all maintenance items were performed
- Calibrating the Compass
- Filling pressure sensor with oil
- Sending the command file to the ADCP

Pre-Deployment Checks

ReadyV has a user-friendly interface for running the pre-deployment tests and setting the Sentinel V real-time clock.

Setting the ADCP Clock

The real-time clock (date and time) within the Sentinel V maintains the correct time while system power is removed. The clock will continue to maintain the date and time during power outages of 16 to 24 hours. If power is removed from the ADCP for a longer period of time, then the clock reverts to the default value of January 1, 1970 and needs to be reset to the correct time.

To set the ADCP's clock to match the PC time:

1. Setup the communication parameters between *Sentinel V RT Utilities* and the ADCP.
2. Click **Set Time**. Choose **Set Local** or **Set GMT**.
3. *Sentinel V RT Utilities* will set the clock to match the PC's time or GMT. Click **OK** at the **Clock set successfully** screen.

Testing the ADCP

To run the tests on a Real-Time system:

1. Start *Sentinel V RT Utilities* and connect to the Sentinel V Real-Time ADCP.
2. Click on the **Run** button.
3. Click **OK** at the **All tests passed** screen.

If the Pressure Sensor test fails, zero the pressure sensor and run the test again. If any other test fails, read Chapter 6 in the Sentinel V Operation Manual. The System Tests runs the pre-deployment test. If the test fails, go to the terminal mode and run the PA command.

Checking the Maintenance Items

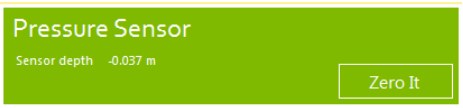
Before deploying the Sentinel V, ensure that the system is ready for deployment.

Read the Sentinel V SC_RT ADCP Operation Manual, Chapter 5 Periodic Maintenance section. Make sure all maintenance items are completed as needed.

Zero the Pressure Sensor

To zero the pressure sensor:

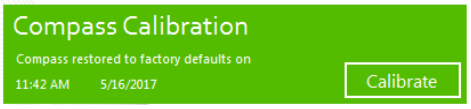
1. Setup the communication parameters between *Sentinel V RT Utilities* and the ADCP.
2. Click **Zero It**. This will zero the pressure sensor. Click **OK** at the **Zeroed pressure sensor successfully** screen.



Calibrating the Compass

The compass calibration is a sequence of 12 rotations and tilts used to correct for distortions in the earth's magnetic fields caused by permanent magnets or ferromagnetic materials near the Sentinel V. These magnetic field distortions, if left uncorrected, will create errors in the heading data from the Sentinel V.

1. Start *Sentinel V RT Utilities* and connect to the Sentinel V Real-Time ADCP.
2. Click Compass Calibration, **Calibrate** button.



For more information on compass calibration, click on the **Help** icon (Help) to open the Sentinel V RT Utilities help file.

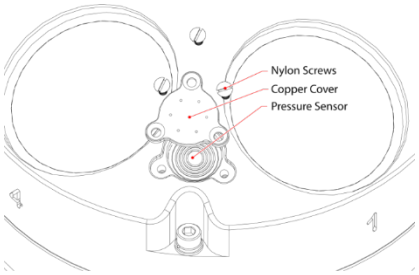
For a detailed explanation of the calibration procedure, see the Sentinel V SC_RT ADCP Operation Manual, Chapter 5.

A compass calibration should be conducted at each measurement location, and whenever the mounting fixture or ancillary equipment such as batteries are changed or rearranged.

Use the Compass Calibration Guide 11x17 laminated quick reference card included with the Sentinel V system. A PDF copy is included on the software/documentation CD.

Filling the Pressure Sensor Cavity with Oil

The pressure sensor cavity needs to be filled with oil before deployment to deal with both trapped air and long-term reliability of the pressure sensor. Use Dow Corning Q7-9120 Silicone fluid, 12,500 CST oil. A plastic bottle with silicone oil (part number 75BK6004-00) and a syringe with 10-gauge needle are included in the spare parts kit. The sensor cavity can be filled any time before system installation; however, care should be taken to keep the ADCP from high temperature during this time. High temperatures may cause the oil to leak.



The pressure sensor cavity is not filled with oil when shipped. This must be done before deploying the Sentinel V ADCP. The pressure sensor cavity should be checked and if needed refilled between deployments.

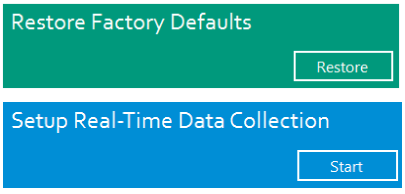
Removing the Transducer Cover

The Sentinel V Real-Time ADCP is shipped with a transducer cover to protect the transducer faces. Remove the cover when deploying the ADCP.

You MUST remove the cover to collect good data.

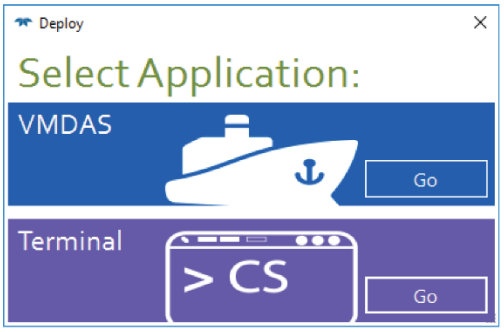
Deploying the ADCP

To send the command file to the Sentinel V Real-Time ADCP:



1. Start *Sentinel V RT Utilities* and connect to the Sentinel V Real-Time ADCP.
2. Use the **Restore Factory Defaults** button to set the ADCP to the system's frequency default settings. When the **Start** button is clicked, the plan module will open without running the Wizard.
3. Click **Start**. Open a plan file or use the **Wizard** to plan a deployment. TRDI strongly encourages developing the command files using the *Sentinel V RT Utilities* **Wizard**.
4. Click the **Deploy** button.

5. Choose the data collection application:

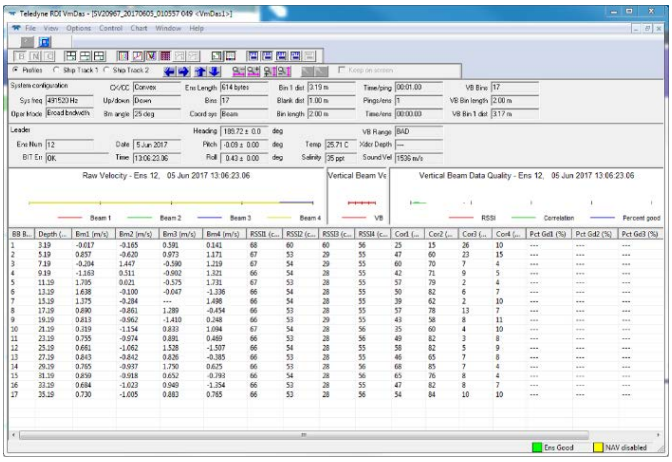


For moving vessel deployments, choose *VmDas.*

Click the **GO** icon () to start collecting data.

Note that *VmDas* will open in **Monitor** mode. When you exit *VmDas*, the ADCP will continue pinging. Remove power to the ADCP or connect again to the ADCP with *Sentinel V RT Utilities* to stop pinging.

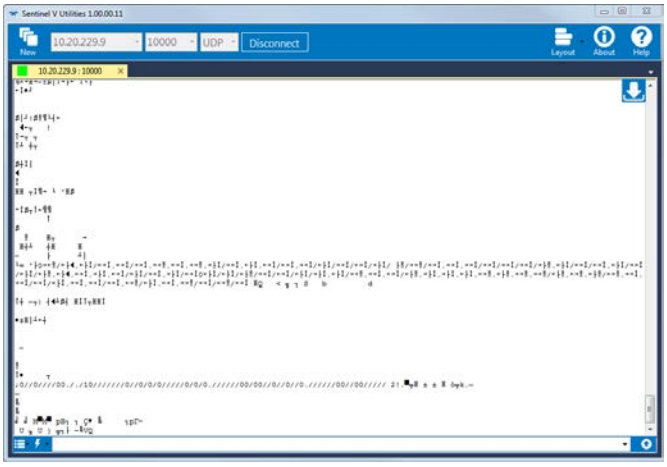
To customize the setup of *VmDas*, stop data collection and go to top menu bar to access the setup. For example, customers may need to turn on the use of GPS or an external heading/pitch/roll device, or turn on data export. See the VmDas User's Guide by clicking on the **Help** menu.



For testing or user provided software, select *Terminal*.

For Ethernet connections, note that the terminal mode will send data via **UDP**. In this mode, you can not send a **Break** to the ADCP. Remove power to the ADCP or connect again to the ADCP with *Sentinel V RT Utilities* to stop pinging.

For Serial RS-232 and RS-422 connections, send a **Break** () to stop the ADCP.



Quick Review

	
All maintenance items (as needed) were done including filling the pressure sensor with oil, zero pressure sensor, and compass calibration.	TRDI recommends that if you are having trouble calibrating the Sentinel V compass that you move the system and/or ensure the area around the system is clear of electrical equipment and ferrous materials. Read Chapter 3 in the Sentinel V Operation Manual for information on how to install/mount the ADCP for a deployment.
The transducer cover is removed.	You MUST remove the transducer cover to collect good data.
Use Sentinel V RT Utilities to send the commands to the ADCP.	See the Sentinel V RT Utilities software help file for detailed instructions.
When exiting *VmDas,* the Sentinel V ADCP will remain pinging.	Remove power from the system or connect again to the ADCP with *Sentinel V RT Utilities* to stop pinging.

Recovering Data

RECOVERING DATA INCLUDES THE FOLLOWING STEPS:

- Viewing data using the *Velocity* software

Opening a Data File with Velocity

When a **.PD0* (pd zero, not the letter o) file is opened, *Velocity* creates a matching **.pdv* and **.pjv* files depending on the options selected. The **.pdv* file is used to process data and the **.pjv* file contains the latest information about user selections for processing parameters and data displays.

The original *.pd0 file is never changed, moved, or overwritten.

To open a data file:

1. Click the **Home** button ( ) located in the top left corner.
2. Click the **Options** button and select the options. Data averaging is on by default.
3. Do one of the following:
   - Drag a data file onto the *Velocity* desktop icon. This will start *Velocity* and open the data file.
   - With the **Start** menu selected, on the **Starting actions** area, click **Open a data file** button.
   - Click the **Open** menu button.
4. After the file is opened, a mini preview of the data file will display at the top of the Velocity screen. Click the preview to switch to the session (if other files are opened).

Quick Review

Check and process the data	Click the **Help** button (Help) to access the Velocity User's Guide and quick start card. Read the Velocity User's Guide for information on checking and processing data.

Conclusion

Congratulations! You have completed the Sentinel V Real-Time Deployment Guide. Read the following chapters in the Sentinel V SC_RT Operation Manual for more detailed information.

Chapter 1 – Self-Contained Sentinel V Overview

This chapter includes an overview of the Sentinel V features, options, computer and power requirements, and connecting to the Sentinel V ADCP.

See the Self-Contained Quick Start Card PDF files installed with the Documentation and Software CD.

Chapter 1a – Real-Time Sentinel V Overview

This chapter includes an overview of the Sentinel V Real-Time features, options, computer and power requirements, and connecting to the Sentinel V ADCP.

See the Real-Time Quick Start Card PDF files installed with the Documentation and Software CD.

Chapter 1c – Switching RT and SC Modes

This chapter shows how a V Series Self-Contained (SC) ADCP can be converted to a Sentinel V Real-Time (RT) and vice versa.

Chapter 2 – Using ReadyV

This chapter covers each ReadyV panel in detail. ReadyV is only used when the system is configured for Self-Contained mode.

See the ReadyV Quick Start Card PDF file installed with the Documentation and Software CD if you will be using the Self-Contained mode.

Chapter 3 – Installation

Use this chapter to plan your installation requirements.

Chapter 4 – Maintenance

This chapter covers Sentinel V ADCP maintenance. Use this section to make sure the Sentinel V is ready for a deployment.

Use the Compass Calibration Guide 11x17 laminated quick reference card included with the Sentinel V system.

Chapter 5 – Troubleshooting

This chapter covers how to troubleshoot the Sentinel V ADCP. If the Sentinel V fails a built-in test or you cannot communicate with the system, use this information to help locate the problem.

Chapter 6 – Returning Systems to TRDI for Service

Use this information to obtain a Return Material Authorization (RMA) number if the Sentinel V ADCP needs to be returned to TRDI.

Chapter 7 – Specifications

This chapter includes specifications and dimensions for the Sentinel V ADCP (including outline installation drawings).

Chapter 8 – Commands

This chapter defines the Real-Time commands.

Chapter 9 - Output Data Format

This chapter explains the output data format used by the V Series ADCPs.