

SENTINEL V

OPERATION MANUAL



P/N 95D-6002-00 (June 2013)

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TABLE OF CONTENTS

CHAPTER 1 - AT A GLANCE	1
Conventions Used in this Manual	2
Contacting TRDI	2
Sentinel V Features	3
Available Options	5
Computer Considerations	6
Power Considerations	7
Connecting to the ADCP	8
Using the Wireless Connection	8
Wireless Connection Common Issues	10
Connecting to another ADCP	14
CHAPTER 2 – USING READYV	15
ReadyV Interface Features	16
Using the Home Panel	18
Creating and Saving Scenarios	19
Opening a Scenario	20
Deleting a Scenario	20
Using the Measurement Setup Panels	21
Error Messages	21
Scenario Settings	21
System Setup	22
Water Profile Parameters	22
Timing	24
Scenario Timing	24
Ensemble Timing	24
Resources	25
Using the System Panel	26
Setting the Date and Time	27
Sensors	28
Built-in Tests	30
Using the Maintenance Panel	31
ReadyV Log Files	32
Using the Deployment Panel	33
Starting or Stopping Deployments	34
Using the Data Recorder Panel	35
Using Download Managers	36
Running ReadyV Locally	37
Silverlight Options	37
CHAPTER 3 – USING READYVLITE	39
ReadyV Lite Features	40
Connecting to a Sentinel V with ReadyV Lite	41
Using the ReadyV Lite System Page	42
Using the ReadyV Lite Setup Page	43
Using the ReadyV Lite Maintain Page	45
Using the ReadyV Lite Deploy Page	46
Connecting to another ADCP	47
CHAPTER 4 - INSTALLATION	49
Attaching the Handle	50
Mounting the Instrument	51
WorkHorse to Sentinel V Mount Adapters	52
Connecting Cables and Dummy Plugs	53
Connecting the External Battery Case	54

Cable Wiring Diagrams	55
Using Bottom Mounts	56
Using Buoy Mounts and Load Cages	58
Using an Over-the-Side Mount	59
Example of an Over-the-Side Mount	60
Over-the-Side Mounting Special Considerations	60
Routing Cables	61
CHAPTER 5 - MAINTENANCE	63
Parts Location Drawings	64
Inspecting the ADCP	67
Disassembly and Assembly Procedures	68
Disassembling the Sentinel V	68
Removing the End-Cap	68
Removing the Transducer Head Assembly	69
Reassembling the Sentinel V	70
Replacing the End-Cap	70
Replacing the Transducer Head Assembly	71
Replacing the Sentinel V Battery	72
Replacing the Battery Pack	72
Replacing Individual D-cell Batteries	73
Replacing the External Battery Case Packs	75
Calibrating the Compass	76
Troubleshooting a Low Calibration Score	81
Restore to Factory Defaults	81
Periodic Maintenance	82
Replacing the O-Ring	82
Filling the Pressure Sensor Cavity with Oil	84
Zero the Pressure Sensor	85
Cleaning the Thermistor Cover	85
Replacing the Desiccant	86
Replacing the Captive Nuts	87
Replacing the Battery Springs	88
Replacing the Battery Separators	88
Installing Firmware Upgrades	89
Preventing Biofouling	90
Removing Biofouling	91
CHAPTER 6 - TROUBLESHOOTING	93
Troubleshooting Communication Issues	94
Troubleshooting Wireless Issues	94
Troubleshooting a Built-In Test Failure	95
Troubleshooting Data Problems	96
Troubleshooting ReadyV Issues	96
Screen is Partially Cut Off	96
Can Not Download Data	96
Using an Ethernet Connection	98
Open the Transducer	98
Connecting to the ADCP	98
Replacing the Transducer Head Assembly	99
CHAPTER 7 - RETURNING SYSTEMS TO TRDI FOR SERVICE	101
Shipping the ADCP	102
Returning Systems to the TRDI Factory	103
Returning Systems to TRDI Europe Factory	104
CHAPTER 8 - SPECIFICATIONS	107
Outline Installation Drawings	113

APPENDIX A - NOTICE OF COMPLIANCE	133
Date of Manufacture.....	134
Environmental Friendly Use Period (EFUP)	134
WEEE.....	134
CE	135
Material Disclosure Table.....	136
APPENDIX B - GPL COMPLIANCE NOTICE	137
GPL Compliance	138
GNU General Public License	138
GNU Lesser General Public License	143

LIST OF FIGURES

Figure 1.	Sentinel V100 5 Beam Overview with Battery Pack	3
Figure 2.	Sentinel V20 with D-cell Batteries and Optional End-Cap Connector	4
Figure 3.	Using the ReadyV Wireless Connection	10
Figure 4.	Home Panel	18
Figure 5.	System Panel – Connected	26
Figure 6.	System Panel - Local	26
Figure 7.	Set the Date and Time.....	27
Figure 8.	Pitch, Roll and Heading	28
Figure 9.	Raw Pitch.....	29
Figure 10.	Raw Roll.....	29
Figure 11.	Deployment Panel	33
Figure 12.	Data Recorder Panel.....	35
Figure 13.	Silverlight Options	37
Figure 14.	Handle	50
Figure 15.	Mounting the Instrument.....	51
Figure 16.	Example Sentinel V End-Cap Mount.....	51
Figure 17.	81D-5000 Mounting Clamp Adapter Kit	52
Figure 18.	81D-5001 End-Cap Mounting Plate Adapter Kit	52
Figure 19.	Removing the End-Cap Connector Dummy Plug	53
Figure 20.	Connecting the External Battery Case	54
Figure 21.	73D-3101 – External Battery Case Cable with 8-pin Connector	55
Figure 22.	73D-3102 - External Battery Case Cable with 6-pin Connector	55
Figure 23.	Example of a Teledyne RD Instruments PVC Bottom Mount	56
Figure 24.	Example of a Bottom Mounted ADCP	56
Figure 25.	Trawl Resistant Bottom Mount	57
Figure 26.	Deep-Water Mount	58
Figure 27.	Buoy Mount with External Battery	58
Figure 28.	Subsurface Buoy	58
Figure 29.	Buoy Mount.....	58
Figure 30.	Load Cage	59
Figure 31.	Example of an Over the Side Mount	60
Figure 32.	Do not use Zip-Ties Directly on Cables	61
Figure 33.	Cables Protected with Abrasion Resistant Sleeving	62
Figure 34.	Sentinel V Assembly Overview	64
Figure 35.	Sentinel V Exploded View (Battery Pack)	65
Figure 36.	Sentinel V Exploded View (Individual D-cell)	66
Figure 37.	Transducer View	67
Figure 38.	End-Cap View	67
Figure 39.	Replacing the End-Cap	70
Figure 40.	End-Cap Mounting Hardware.....	71
Figure 41.	Battery Pack	73
Figure 42.	D-cell Battery Replacement.....	74

Figure 43.	External Battery Case Exploded View	75
Figure 44.	Calibrating the Compass	76
Figure 45.	Standard Compass Calibration Overview	78
Figure 46.	Optional Compass Calibration Overview	80
Figure 47.	Using the O-Ring Removal Tool	83
Figure 48.	Filling the Pressure Sensor Cavity with Oil	84
Figure 49.	Zero the Pressure Sensor	85
Figure 50.	Thermistor and Pressure Sensor	85
Figure 51.	Replacing the Captive Nuts	87
Figure 52.	Individual D-cell Battery Compartment	88
Figure 53.	Updating the Firmware	89
Figure 54.	Biofouling on a Sentinel V ADCP	91
Figure 55.	Ethernet Connection	98
Figure 56.	Power I/O Cable Connection	98
Figure 57.	96D-6001 Sheet 1	114
Figure 58.	96D-6001 Sheet 2	115
Figure 59.	96D-6001 Sheet 3	116
Figure 60.	96D-6001 Sheet 4	117
Figure 61.	96D-6001 Sheet 5	118
Figure 62.	96D-6002 Sheet 1	119
Figure 63.	96D-6002 Sheet 2	120
Figure 64.	96D-6002 Sheet 3	121
Figure 65.	96D-6002 Sheet 4	122
Figure 66.	96D-6003 Sheet 1	123
Figure 67.	96D-6003 Sheet 2	124
Figure 68.	96D-6003 Sheet 3	125
Figure 69.	96D-6003 Sheet 4	126
Figure 70.	96D-6003 Sheet 5	127
Figure 71.	96D-6004 Sheet 1	128
Figure 72.	96D-6004 Sheet 2	129
Figure 73.	96D-6004 Sheet 3	130
Figure 74.	96D-6004 Sheet 4	131
Figure 75.	96D-6005 Sheet 1	132

LIST OF TABLES

Table 1.	Supported Operating Systems and Browsers	6
Table 2.	Blank Distance, Range, and Cell Size	23
Table 3.	Compass Calibration Score	81
Table 4:	Sentinel V ADCP Spare Parts	82
Table 5:	Sentinel V ADCP Repair Kits.....	82
Table 6:	High Bandwidth Water Profiling	108
Table 7:	Low Bandwidth Water Profiling	108
Table 8:	Sentinel V Range	109
Table 9:	Sentinel V Bandwidth	109
Table 10:	Profile Parameters.....	109
Table 11:	Echo Intensity Profile	109
Table 12:	Transducer and Hardware	110
Table 13:	Standard Sensors.....	111
Table 14:	Environmental Specifications	112
Table 15:	Sentinel V Battery Power Specifications	112
Table 16:	Outline Installation Drawings	113
Table 17.	Toxic or Hazardous Substances and Elements Contained in Product.....	136

June 2013

- Changed input power from +9 to 24VDC to +12 to 20VDC.
- Updated graphics to show longer housing.
- Added table showing supported operating systems and browsers.
- Added IP address 192.168.0.2 to Wireless Connection section.
- Corrected sign convention for the Pitch and Roll table on page 29.
- Updated the ReadyV Lite chapter.
- Updated specifications and outline installation drawings.
- Updated Troubleshooting section.

December 2012

- Changed time the network is available after power up from three minutes to two.
- Updated ReadyV system panel screen capture.
- Added ReadyV Lite chapter.
- Added battery Velcro® strap and updated exploded system views.
- Added creating, opening, and deleting scenario files.
- Added Sentinel V Bandwidth specification.
- Updated description for range.
- Updated applying antifouling paint section.
- Added minimum screen resolution to Computer Considerations section.

March 2012

- Updated Maintenance panel screen capture and log file descriptions.
- Added Recommended Minimum Blank Distance table.

February 2012

- Updated Wireless Connection Common Issues section.
- Updated compass calibration procedure.
- Updated Starting and Stopping Deployments section.
- Updated figure 10 raw roll signs/headings.
- Updated System Setup panel (Orientation removed).
- Changed name of VWeb to ReadyV.
- Added Appendix B - GPL Compliance Notice.

December 2011

- Initial release of the manual.

EXCLUSIONS AND OMISSIONS

- Manual covers Sentinel V only.
- Manual includes wireless connection only.
- ReadyV does not have any native support for Windows 8® Internet Explorer 10 Metro Browser. Any ReadyV requests made through the Metro browser is forwarded to the Windows 8 Internet Explorer 10 Desktop browser.
- Users may need to turn off their browser pop-up blockers (either built-in or third party) in order to access ReadyV.

FIRMWARE HISTORY

See the README.TXT file on the V Series Documentation CD.

NOTES

Chapter 1

AT A GLANCE



In this chapter, you will learn:

- Sentinel V ADCP features
- What options are available?
- What type of computer do I need?
- What are the ADCP power requirements?
- How do I connect to the ADCP?

Conventions Used in this Manual

Conventions used in the Sentinel V Series Acoustic Doppler Current Profiler (ADCP) Operation Manual have been established to help learn how to use the system quickly and easily.

Menu items are printed in bold: click **Collect Data**. Items that need to be typed by the user or keys to press will be shown as <F1>. If a key combination were joined with a plus sign (<ALT+F>), press and hold the first key while pressing the second key. Words printed in italics include program names (*Velocity*) and file names (*default.plan*).

Code or sample files are printed using a fixed font. Here is an example:

```
Maintenance Log:
Compass calibrated: - 11/11/11
Pressure sensor zeroed: - 11/11/11
Battery last changed: - 11/11/11
O rings last changed: - 11/11/11
Desiccant last changed: - 11/11/11
Silicone oil last changed: - 06/01/11
Battery springs last changed: - 07/09/11
Firmware version: 47.xx
Factory maintenance serviced: - 05/12/11
```

There are two other visual aids: Notes and Cautions.



This paragraph format indicates additional information that may help avoid problems or that should be considered in using the described features.



This paragraph format warns the reader of hazardous procedures (for example, activities that may cause loss of data or damage to the Sentinel V Series ADCP).

Contacting TRDI

If you have technical issues or questions involving a specific application or deployment with the instrument, contact our Field Service group:

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Sentinel V Features

The Sentinel V is designed for several-month autonomous current profile deployment from temporary or permanent mounting in the ocean, near-shore, harbors, and lakes.

The Sentinel V Series ADCP consists of an ADCP, battery pack or individual D-cell batteries, microSDHC memory card, and software. Both battery capacity and memory can be increased with upgrades for longer deployments. The Sentinel V Series ADCP requires the addition of a Windows® compatible computer to configure the ADCP and replay collected data.



Figure 1 and Figure 2 only show two of the options and models available with the Sentinel V Series ADCP (see [Available Options](#)).

After a deployment, systems need to be cleaned thoroughly before the touch sensor will work.

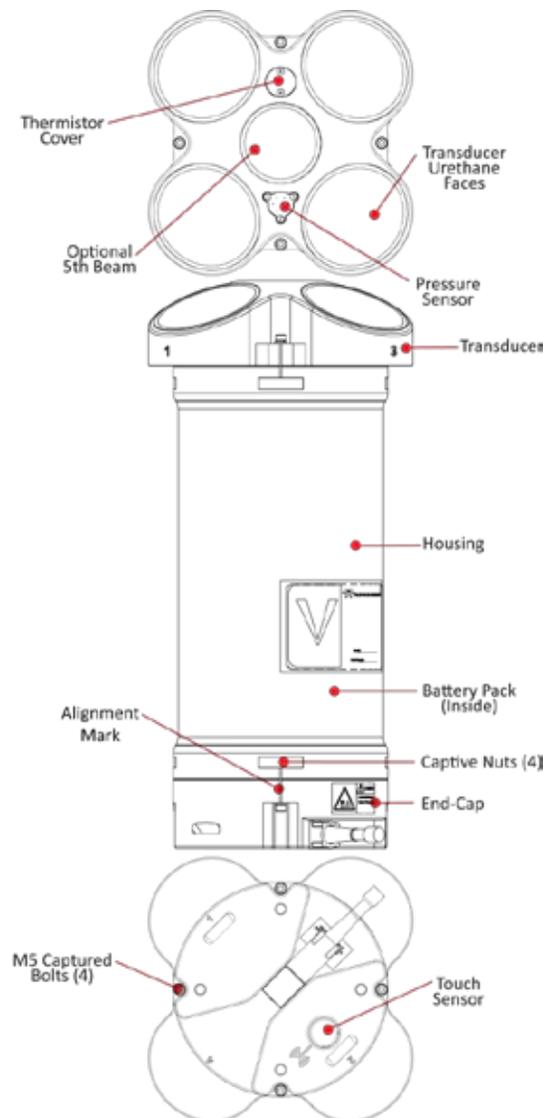


Figure 1. Sentinel V100 5 Beam Overview with Battery Pack

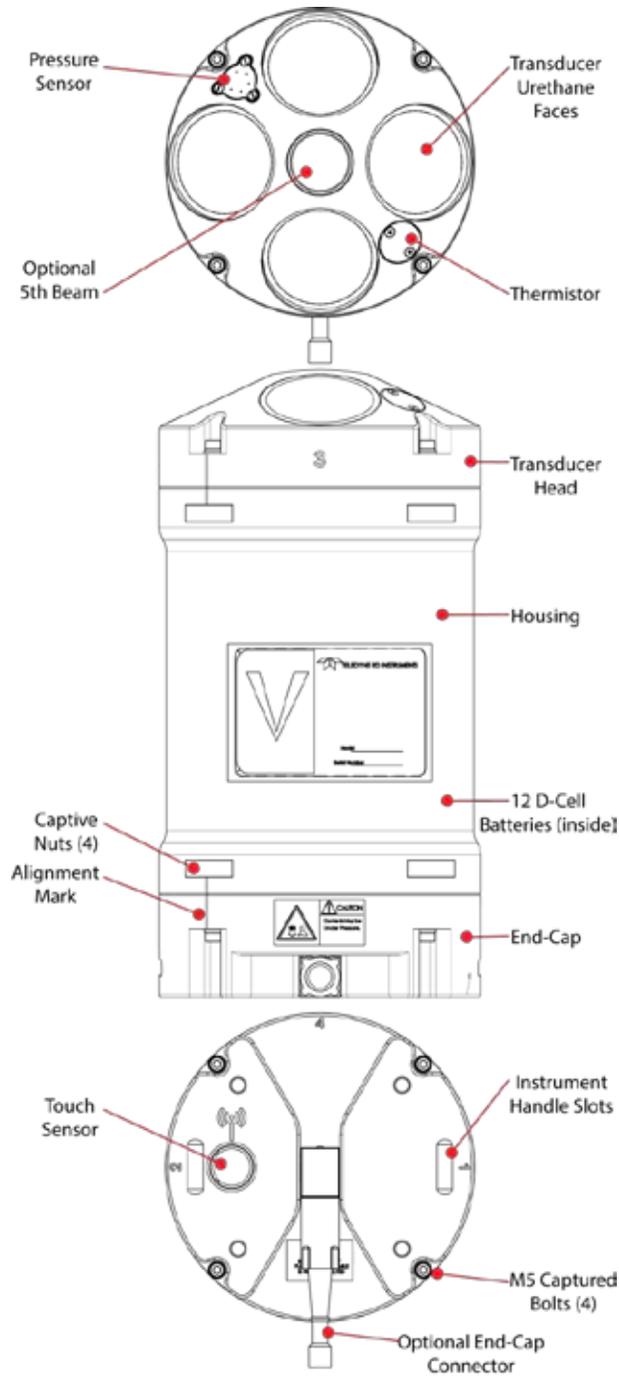


Figure 2. Sentinel V20 with D-cell Batteries and Optional End-Cap Connector

Available Options

The following section explains the different options available for Sentinel V Series ADCPs. See the [Parts Location Drawings](#) for more information.

- **Transducer** – The standard nominal ranges are 20m (1000 kHz), 50m (500 kHz) and 100m (300 kHz). See the [Outline Installation Drawings](#) for dimensions and weights.
- **Vertical Beam** – an optional 5th beam is available.
- **End-Cap** – The End-Cap consists of an IEEE 802.11b/g/n WLAN wireless communications Touch Sensor and an optional underwater electrical connector.
- **End-Cap Connector** – The optional connector can be straight or right-angled. See the [Outline Installation Drawings](#) for end-cap configurations.
- **Internal Batteries** – The Sentinel V can use either pre-assembled battery packs or 12 D-cell batteries. The battery pack housing uses a pack of 36 D-cell alkaline batteries in series, physically configured as three stacks of 12 cells for a nominal voltage level of 18 VDC. The D-cell battery configuration housing uses 12 D-cell alkaline batteries in series, for a nominal voltage level of 18 VDC.
- **External Battery Case** – The optional external battery case holds two pre-assembled battery packs for a nominal voltage level of 18 VDC.
- **AC Adapter** – The optional AC adapter provides 18 VDC.
- **Housing** – The standard Sentinel V Series ADCP housing allows deployment depths to 200 meters. See the [Outline Installation Drawings](#) for dimensions and weights. The housing type and length will depend on if it uses battery packs or individual D-cell batteries.
- **Memory** – The Sentinel V includes a microSDHC memory card. There is no maximum memory limit; Contact TRDI support for a list of supported memory cards.
- **Pressure Sensor** – The pressure sensor (standard 30 Bar) measures water pressure (depth).

Computer Considerations

TRDI designed the Sentinel V Series ADCP to use a Windows® compatible computer. The built-in ReadyV user interface configures the ADCP and data is displayed through TRDI's *Velocity* program.

Minimum Computer Hardware Requirements:

- Desktop, Laptop, or Netbook computer (see Table 1 for operating system)
- Screen resolution above 1024x768 (see note)
- Internet Browser (see Table 1 for supported browsers)
- Mouse or other pointing device
- Wireless 802.11b/g/n WLAN Interface



Many laptops and netbooks today have built-in WLAN. If not, then a WLAN adapter is required. Most wireless enabled laptops will be automatically enabled. Consult the instruction manual for your specific device if you are not sure how to do so.

Laptops running on Windows XP® may have display issues when using a screen resolution of 1024x768. A workaround is to change the zoom level in the browser so that the entire ReadyV screen is visible.

ReadyV does not support Windows 8 Internet Explorer® 10 Metro browser. Users may need to turn off their browser pop-up blockers (either built-in or third party) in order to access ReadyV.

Table 1. Supported Operating Systems and Browsers

Operating System	Internet Explorer 10	Internet Explorer 9	Internet Explorer 8	Internet Explorer 7	Internet Explorer 6	Firefox 3.6+	Safari 4+	Chrome 12+
Windows 8 Desktop	ü*	×	×	×	×	ü	×	ü
Windows Server 2012	ü*	×	×	×	×	ü	×	ü
Windows 7	×	ü	ü	ü	×	ü	×	ü
Windows 7 SP1	×	ü*	ü	×	×	ü	×	ü
Windows Server 2008 SP2	×	×	×	ü	×	ü	×	ü
Windows Server 2008 R2 SP1	×	ü*	ü*	×	×	ü	×	ü
Windows Vista	×	ü	ü	ü	×	ü	×	ü
Windows XP SP2, SP3, Windows Server 2003	×	×	ü	ü	×	ü	×	ü
Macintosh OS 10.5.7+ (Intel based)	×	×	×	×	×	ü	ü	×

* Supports 64-bit mode

× Not Supported

Power Considerations

Use the following section to determine the power requirements for the Sentinel V Series ADCP.

- The Sentinel V uses +18 VDC to operate.
- Depending on the type of housing Sentinel V is configured with, the ADCP may use a battery pack or individual D-cell batteries.
- If the Sentinel V is configured with the optional end-cap connector, then external power can be used. The voltage must be +12 to 20 VDC. The optional AC power adapter provides +18 VDC.

Transmitted Power

For the Sentinel V, a fresh battery provides +18 VDC. Batteries spend most of their life at a nominal voltage of +14 VDC. Using 18 VDC will increase the range by 5 to 10% depending on conditions.

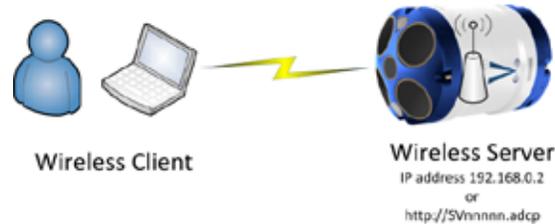
Power on Cycle

The power supply or battery pack must be able to handle the inrush current as well. Inrush current is the current required to fully charge up the capacitors when power is applied to the Sentinel V Series ADCP. The capacitors provide a store of energy for use during transmit. The inrush current is as high as 0.8 Amps RMS at 9.2 VDC. The ADCP will draw this amperage until its capacitors are fully charged. If the power supply or battery pack limits the current or the power drop on the cable is significant, then the power on cycle will take longer. It can take up to three minutes. When power is applied, there is one long beep followed by a short beep 10 to 15 seconds later. The power must not shut down during the inrush current draw, as this may not allow the Sentinel V Series ADCP electronics to start.

Connecting to the ADCP

The Sentinel V ADCP includes an 802.11b/g/n WLAN interface and a built-in user interface called ReadyV. The Sentinel V Series ADCP acts as the *server*, along with the connected computer (laptop, tablet, or desktop computer) known as the *client*.

The ADCP's DHCP server IP address is 192.168.0.2 or use the WLAN address <http://SVnnnnn.adcp> (where *nnnnn* is the five or six character Sentinel V serial number shown on the product label).



If the computer does not include a built-in 802.11b/g/n WLAN interface, use a USB adapter. Only one ADCP at a time may be connected. To switch to another ADCP, first disconnect, and then reconnect to the next ADCP.

Using the Wireless Connection

To connect to the ADCP:

1. Prepare the ADCP by [connecting the battery](#). After power is applied (long beep), there is a 10 to 15 second delay before the network is available (short beep). The WLAN is available after power up for two minutes.



Sentinel V battery packs are shipped inside the system but not connected. Connect the battery and seal the Sentinel V before deployment.

Sentinel V with D-cells are shipped without batteries inside the system. Install the batteries and seal the Sentinel V before deployment.

2. Start the wireless network device on the laptop if it is not automatically enabled. This may be a built-in wireless connection on a laptop or a USB wireless adapter.



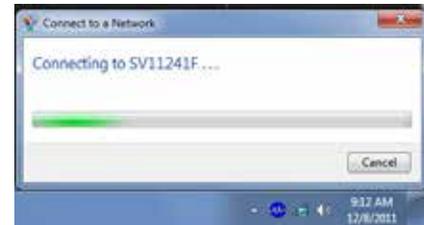
The screen shots in this manual were made with Windows® 7. Depending on the operating system and wireless adapter type, your wireless screen may look different. These differences do not affect the performance of ReadyV.

3. Place a finger over the Touch Sensor. This starts the ADCP's WLAN for two minutes.

Steps 3 through 5 must be completed in two minutes to connect to the ADCP. After two minutes, the ADCP's WLAN will turn off. In the event that the ADCP's WLAN turns off before the connection is complete, simply start from step 3 again.



- a. Click on the wireless access-point icon (📶) in the Windows® system tray or if using a wireless USB adapter, start the adapter's interface.
- b. Click the Refresh icon (↻) or use the wireless adapter's interface to search for connections. A list of available wireless networks will appear in the window. Sentinel V ADCPs will show as *SVnnnnn* (where *nnnnn* is the five or six character serial number shown on the product label). Repeat step 3 if needed.
- c. Select the ADCP on the list by clicking it and then click the **Connect** button.
- d. The Connecting to a Network message appears.



- e. If prompted to select a Home, Work, or Public network, click **Cancel** to close the page. The **Set Network Location** page is not needed.
4. Open a browser on the laptop (*Internet Explorer®*, *FireFox®*, *Google Chrome®*, or other browser).
 5. Enter the ADCP's IP address **192.168.0.2** into the address bar or enter **http://SVnnnnn.adcp** (where *nnnnn* is the five or six character Sentinel V serial number shown on the product label).



The DHCP server IP address 192.168.0.2 works for all ADCP serial numbers.

The address is not case sensitive - enter *SVnnnnn* or *svnnnnn*.

The http:// does not need to be typed on most browsers.

Add the Sentinel V to the browser's Internet Favorites or Favorites bar for future connections.

6. The ReadyV [Home](#) panel opens. It can take up to 30 seconds for the Home panel to display.



If prompted to update Microsoft Silverlight®, accept the upgrade and restart from step 3 once the upgrade is complete. Internet access is required to update Silverlight®.

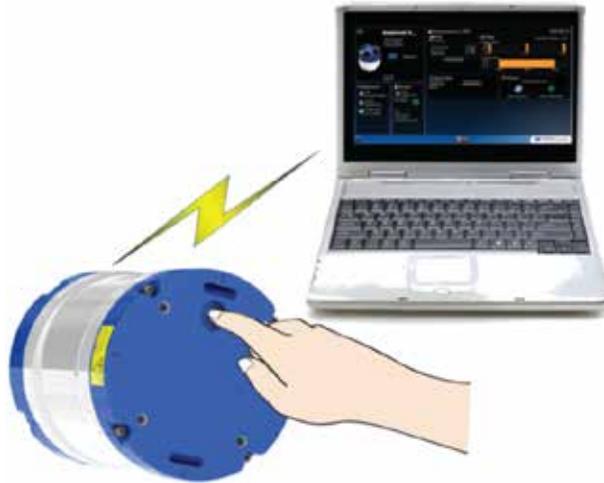


Figure 3. Using the ReadyV Wireless Connection

The Touch Sensor is NOT a button! Just place a finger into the cavity to activate the sensor. After power is applied (long beep), there is a 10 to 15 second delay before the network is available (short beep). Wait for the short beep before trying to connect.

The ADCP's WLAN is available after power up for two minutes. Placing a finger over the Touch Sensor starts the WLAN for another two minutes. Once connected, the WLAN will remain on. Each time the Touch Sensor is touched, a short beep should be heard.

Only one ADCP at a time may be connected. To switch to another ADCP, first disconnect, and then reconnect to the next ADCP.

Once ReadyV starts, if no keys are pressed for five minutes, the ADCP will disconnect. After waiting two more minutes, the ADCP will power down. Use the Touch Sensor to restart.

After a deployment, systems need to be cleaned thoroughly before the touch sensor will work.



Wireless Connection Common Issues

The ADCP does not appear on the list of devices:

The ADCP may have timed out. Place a finger over the Touch Sensor again. There is a short beep indicating that the WLAN is enabled on the ADCP. The ADCP's WLAN will remain on for two minutes after the short beep. It may take several attempts to connect.

Another computer may already be connected to the ADCP. Only one computer may be connected to an ADCP at a time.

The ADCP does not have power – connect the battery. After power is applied (long beep), there is a 10 to 15 second delay before the network is available (short beep). Wait for the short beep before clicking the Refresh icon (↻).

If the touch sensor is blocked with biofouling, thoroughly clean the sensor cavity first (see [Removing Biofouling](#)).



There are no ADCPs on the list of devices:

Start the wireless network device on the laptop if it is not automatically enabled. This may be a built-in wireless connection on a laptop or a USB wireless adapter.

Look for a hardware switch or special function key on the laptop that can turn the wireless radio on or off. Consult the instruction manual for your specific laptop if you are not sure how to do so.

If the computer uses an external wireless adapter, make sure the adapter is working correctly and is attached and installed properly.

Try using a different USB wireless adapter.

*The ADCP is connected, but ReadyV does not start:*

Windows 7 may indicate it is connected and the signal strength is excellent even if the wireless connection is lost due to the ADCP going to sleep.

Click on the wireless access-point icon (📶) in the Windows® system tray and click on the ADCP connected to. Click the **Disconnect** button and then click the **Connect** button to reconnect to the network.

*The ADCP is on the list, but connection fails:*

If the ADCP appears on the list but the laptop fails to connect to it, Windows® 7 may have kept the name on the list because it connected to that network in the past. In other words, *this does not mean that the network is actually available*.

Touch the Wireless Touch Sensor to start the network. Listen for the two beeps: the first one confirms the sensor detected your finger and the second beep confirms the wireless network is ON. Placing a finger over the Touch Sensor starts the network for two minutes. Try to connect again.

If the touch sensor is blocked with biofouling, thoroughly clean the sensor cavity first (see [Removing Biofouling](#)).

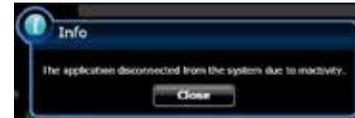
If there are no beeps, make sure that the ADCP is properly powered.



ReadyV Timed-out; the ADCP wireless is ON but refreshing the web page does not work:

Once the instrument is deployed and no keys are pressed for five minutes, a warning message is displayed, and after another two minutes of no keys being pressed the wireless connection is turned off on the ADCP. Clicking **Close** at the ReadyV info message will leave ReadyV running in the *Offline-Planning* mode (see [Running ReadyV Locally](#)).

To run ReadyV again and connect to the ADCP, then first close the internet browser page or the browser tab which was running ReadyV and then restart the connection.

**When the browser is opened, there is a page not found error:**

Make sure the IP address **192.168.0.2** is typed in correctly.

Try using the ADCP's WLAN address <http://SVnnnnn.adcp> into the address bar (where *nnnnn* is the five or six character Sentinel V serial number). The address is not case sensitive.

Some browsers may open a search page if the <http://> portion in the address bar is not entered.

Check the network connection.

If the computer has both a network cable and wireless, try unplugging the network cable.

**What type of network should be selected?**

Windows 7® may display a **Set Network Location** page (Home network, Work network, or Public network page) after connecting to the ADCP.

This page is not needed. Click **Cancel** to close the page.

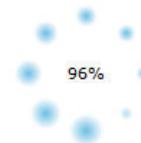
**There is a blank white page when the ADCP's address is entered:**

This is normal. It can take up to 30 seconds for the [Home](#) panel to display. Wait for the page to open.

Click on the **Refresh Page** button on the browser.

Close the browser and reopen.

Try using a different browser.



The connection was lost:

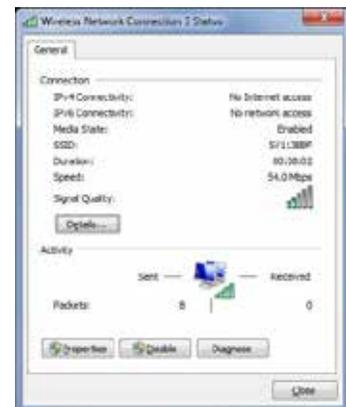
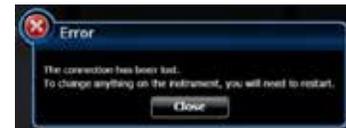
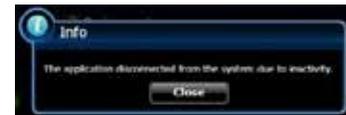
Once ReadyV starts, if no keys are pressed for five minutes, the ADCP will disconnect. After waiting two more minutes, the ADCP will power down. First close the internet browser page or the browser tab which was running ReadyV and then use the Touch sensor to restart.

Use the Touch sensor and refresh the browser page. If that does not help, the wireless connection was lost. Click on the wireless access-point icon (📶) in the Windows® system tray and check the connection.

If the [firmware](#) was just updated, the browser must be closed and the wireless network must be restarted.

Make sure there are no other devices interfering with the ADCP, such as microwave ovens, cordless phones, or other wireless devices.

Make sure the ADCP is within the wireless range of the computer (typically within 100 feet). Try moving the ADCP closer to the computer. If there is a wall between the ADCP and the computer, try placing the ADCP and computer in the same room. Click the wireless access-point icon (📶) on the status bar and check the signal strength by right-clicking on the connection and selecting **Status**.

**The Maintenance or Recorder panels are not available:**

If the [System](#) panel shows **Offline – Planning**, the ADCP may have timed out or lost the connection. Close the internet browser page or the browser tab which was running ReadyV and restart the connection. If that does not help, the wireless connection was lost. Click on the wireless access-point icon (📶) in the Windows® system tray and check the connection.

See [running ReadyV locally](#).

**“You need to upgrade your version of Silverlight” message appears:**

If prompted to update the version of Microsoft Silverlight®, accept the upgrade and restart the connection once the upgrade is complete. Internet access is required to update Silverlight®.

Right-click on any ReadyV screen and select **Silverlight** to open the Microsoft Silverlight Configuration screen. Use this screen to configure or update Silverlight®.

Silverlight® is available on <http://www.microsoft.com/silverlight/>



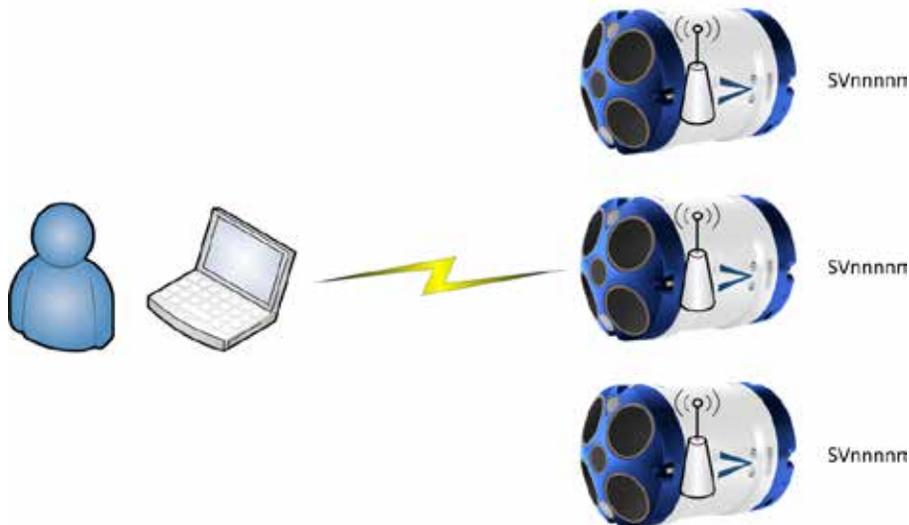
Connecting to another ADCP

To connect to another ADCP:

1. Click on the wireless access-point icon (📶) in the Windows® system tray and select the ADCP on the list that is connected.
2. Click the **Disconnect** button.



3. Now connect to the next ADCP.



Only one ADCP at a time may be connected. To switch to another ADCP, first disconnect, and then reconnect to the next ADCP.

Chapter 2

USING READYV



In this chapter, you will learn:

- ReadyV Interface features
- How to use the Home panel
- How to use the Measurement Setup panel
- How to use the System panel
- How to use the Maintenance panel
- How to use the Recorder panel

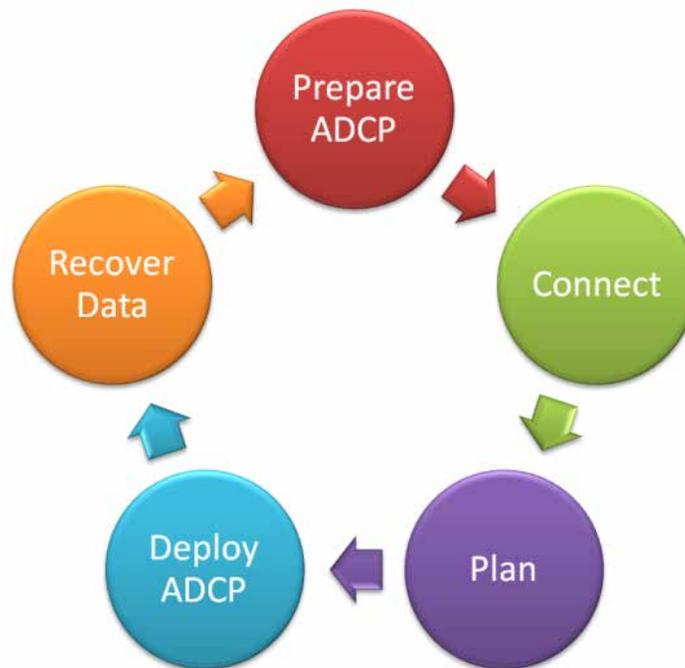
ReadyV Interface Features

Onboard Software. The ReadyV software used to configure, deploy, and recover data is resident on the ADCP. All that's needed to communicate with the ADCP is a computer of opportunity and a web browser.

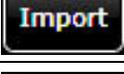
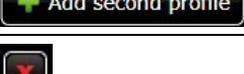
High-speed wireless data download. Wireless functionality allows quick data downloads and instrument reconfiguration. This feature also allows for wireless setup and software/firmware updates.

Intuitive Interface. ReadyV has a user-friendly interface for pre-deployment planning to configure the Sentinel V for deployment, running all pre-deployment tests, and starting the deployment properly configured for the task at hand.

Onboard Maintenance Log. When was the last time the compass was calibrated? The batteries changed? O-rings replaced? Now this information and more can be stored on the Sentinel V itself, for ready access whenever connected to the instrument.



ReadyV uses the following icons and buttons:

Icon	Description
	Click on the Home button on any panel to return to the Home panel.
	Displays a help screen.
	Once the deployment planning is complete, use this button to deploy the Sentinel V ADCP.
	If the ADCP is deployed, click this button to stop the deployment.
	Battery individual D-cell icon.
	Battery pack icon.
	AC Power input icon.
	Custom power input icon. Select this type power input and enter the maximum battery capacity in watt hours.
	Displays the amount of recorder space.
	Click the New button to load a measurement template.
	Click the Import button to load a scenario (*.plan) into Velocity.
	Click the Export button to save the scenario (*.plan) to the computer.
	Click to add a water profile.
	Click to delete one of the water profiles or a saved scenario.

Using the Home Panel

Once the computer is [connected to the ADCP](#), the Home panel opens and shows an overview of the Sentinel V ADCP configuration.

Each section on the Home panel acts as a link to the respective panel ([System](#), [Maintenance](#), [Data Recorder](#) and [Measurement Setup](#)). As the mouse is hovered over a section, it will change to a lighter blue and the mouse pointer will change to the hand icon (☞). Click to go to the panel.



Figure 4. Home Panel

Creating and Saving Scenarios

To create a scenario:

1. Click the **New** button on the **Home** panel (see Figure 4) to use a measurement template. Select a template using the Up/Down triangles. The star icon (★) indicates the currently selected scenario.
2. Click the **Save** button to save the measurement scenario or **Cancel** to return to the previous settings. If a measurement file with the same name already exists, it will be overwritten.



Selecting one of the templates will overwrite the settings. For example, selecting the **Coastal Mooring Template** and clicking **Save** will save the scenario as **Coastal Mooring** with the default settings from the template.

Changes are saved to the scenario whenever the **Save** button is selected in any of the panels.

Always use the [Scenario Settings](#) panel to change the name of the scenario and add a description for future use.

3. Use the Measurement Setup panels to adjust the scenario settings.
 - Use the [Scenario setting](#) panel to name the deployment, select an icon, and enter a description.
 - Click on the [System setup](#) panel to change how the system will be set up during the deployment.
 - Click on the [Water profile](#) panel to change how the water profile will be set up during the deployment.
 - Use the [Resources](#) panel to verify power and data recorder requirements for the deployment.
4. Click the **Export** button on the **Home** panel to save the selected scenario (*.plan) to the computer. On the **Save As** dialog, name the deployment scenario file (*.plan). Click the **Save** button.



Use a local drive or network drive that is always accessible when exporting and importing *.plan files. ReadyV will “remember” the last drive used and if it is not available, may appear to hang.

Although not recommended, *.plan files can be manually edited with any ASCII/plain text editor such as NotePad®.



Editing the *.plan file using a text editor will allow items that if set incorrectly can cause the data to be bad and uncorrectable even in post processing.

Do not edit *.plan files in Microsoft Word®.

Opening a Scenario

To open a saved Scenario:

1. To open a scenario, click the **Import** button. On the Open dialog, select the deployment scenario file (*.plan). Click the **Open** button.
2. Use the Measurement Setup panels to adjust the scenario settings if needed.
3. If changes are made, click the **Export** button to save the selected scenario (*.plan) to the computer. On the **Save As** dialog, name the deployment scenario file (*.plan). Click the **Save** button.

Deleting a Scenario

To delete a saved scenario from the list:

1. Click the **New** button to open the Select scenario panel.
2. Select the scenario to be deleted using the Up/Down triangles. The star icon (★) indicates the currently selected scenario.
3. Click on the red **X** in the upper right corner of the list box to delete the saved scenario from the list.



The currently selected scenario and factory included scenario templates cannot be deleted.



Once the  button is clicked, the scenario file is deleted and cannot be recovered.

4. Click the **Cancel** button to exit the Select scenario panel.



Using the Measurement Setup Panels

Use the Measurement Setup panels to plan the deployment. Each section on the Measurement Setup panel acts as a link to the respected panel. As the mouse is hovered over a section, it will change to a lighter blue and the mouse pointer will change to the hand icon (☞). Click to go to that panel.



Error Messages

While entering parameters, if a value is entered outside the normal range, an error message appears. For example, entering 40 meters for the cell size displays an error because the cell size is too large. The error must be corrected before the setting can be saved.



Scenario Settings

Use the Scenario setting panel to name the scenario, select an icon, and enter a description. Click **Save** to save the settings or **Cancel** to return to the previous settings.



When a scenario is first created, it will use a default name. For example, selecting the **Coastal Mooring Template** and clicking **Save** will save the scenario as **Coastal Mooring** (see [Creating and Saving Scenarios](#)). Make sure to change the name of the scenario and add a description for future use.

Select Icon – Each scenario can have a different icon associated with it. Use the Up/Down triangles to select an icon from the list.

Scenario name – Enter the name of the deployment scenario.

Scenario description – Enter a description of the deployment scenario.

System Setup

Click on the System setup panel to change how the system will be set up during the deployment. Click **Save** to save the settings or **Cancel** to return to the previous settings.



ADCP depth – Enter the depth of the ADCP. The ADCP uses depth in its speed of sound calculations. If the pressure sensor is not available, then the ADCP will use this manual depth setting.

Salinity – Enter the salinity of the water. Fresh water is 0 and salt water is typically 35. Salinity is used to calculate the speed of sound. The speed of sound is used by the ADCP to scale the velocity data properly. If 0 is entered when deployed in 35 salinity water, the data will have a 3% velocity estimate error.

Magnetic variation – Enter the angle between true north and magnetic north, where a positive value means true north is east of magnetic north. As such, declination depends on geographic location. It also changes very slowly over time. The compass default is to output magnetic heading.



For the greatest accuracy, TRDI recommends checking the National Geophysical Data Center website (below) to find the declination angle based on the latitude and longitude:
<http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp>

Heading adjustment – Corrects for a physical misalignment between the ADCP's Beam 3 and the heading reference. Enter the heading alignment angle (referenced to Beam 3) used as a new zero reference for heading output.

Water Profile Parameters

Click on the Water profile panels to change how the water profile will be set up during the deployment. The Sentinel V ADCP can have two different water profiles. Each water profile can be set independently. If there is one water profile, the **Add second profile** button appears. If there are two water profiles, click the red **X** (🗑️) to delete a water profile. Click **Save** to save the settings or **Cancel** to return to the previous settings.



Select profile – Use the Up/Down triangles to select a water profile from the list. Each water profile can use a default setup or select **Custom** to enter parameters.



The **Standard deviation** shows the expected standard deviation of the velocity data stored in each ensemble being collected by the Sentinel V ADCP. Most users will want to minimize this value so that they obtain the best data possible (i.e. data containing the least amount of noise). Standard deviation is dependent on [cell size](#), the [Number of pings](#), [Ambiguity velocity](#), and the [Bandwidth](#).

Range – Select the range to measure. The default value shown in Table 2 is based on typical range possible based on the system frequency. The actual maximum range is dependent on the absorption in the water based on the Sentinel V ADCP frequency, the water salinity, water temperature and the actual deployment depth of the ADCP.

Cell size – Sets the cell size. Adjust the cell size as necessary as recommended in Table 2. A larger cell size decreases the standard deviation, but shallow water situations may need to use smaller cells to gather more data points.



It is not recommended to set the cell size below the minimum or above the maximum range shown in Table 2.

First Cell – The range from the transducer face to the middle of the first cell. The **Cell size** and the **Blank** primarily affect where it is located.

Number of cells – Sets the number of depth cells. The value will be calculated based on the **Range** and **Cell size**. The number of cells must be less than 255.

Blank – Moves the location of the first cell away from the Sentinel V ADCP transducer head to allow the transmit circuits time to recover before the receive cycle begins. The default value is based on system frequency and it is highly recommended to use this value. Setting a value below the default blank distance may show ringing/recovery problems in the first depth cells.



It is not recommended to set the blank below the default value shown in Table 2.

Table 2. Blank Distance, Range, and Cell Size

System	Blank Distance (Default)	Range (Default)	Cell Size (Default (Min – Max))
Sentinel V 100m (307.2kHz)	1.6m	100m	4m (1m - 8m)
Sentinel V 50m (491.52kHz)	1.0m	50m	2m (0.6m - 4.8m)
Sentinel V 20m (983.04kHz)	0.4m	20m	1m (0.3m - 2.4)

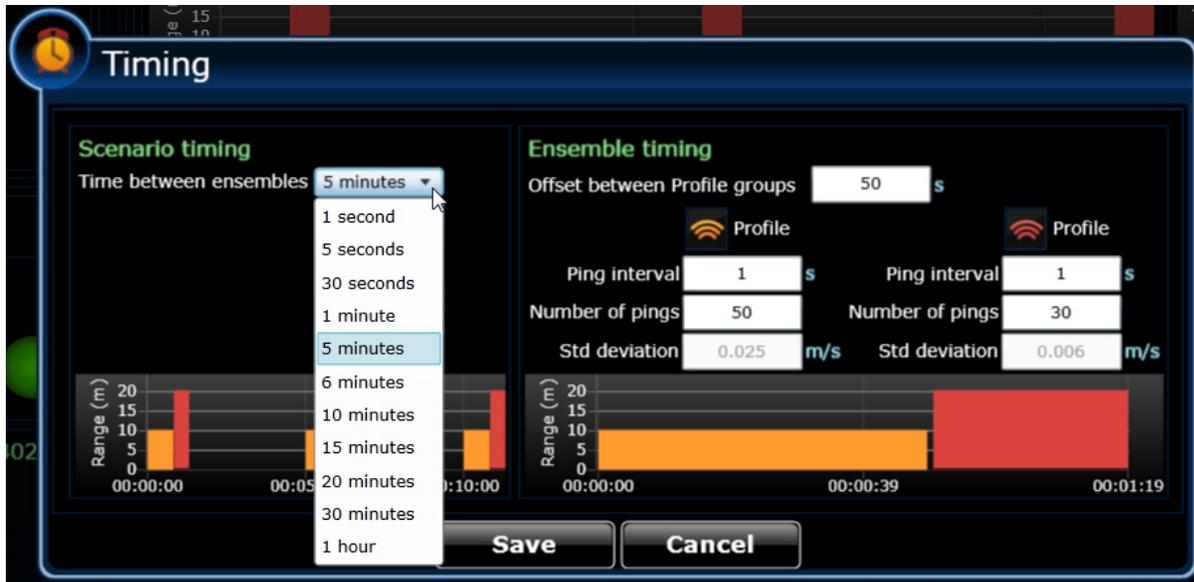
Ambiguity velocity – Ambiguity velocity represents the maximum relative velocity (Sentinel V ADCP motion plus the maximum actual water velocity) the ADCP can measure along a beam. Select one of the settings from the drop-down list. This must be set correctly to avoid ambiguity errors. Ambiguity velocity is used to improve the standard deviation: The lower the value of the ambiguity velocity, the lower the single-ping standard deviation.

Bandwidth – Sets the profiling bandwidth and sampling rate. Smaller bandwidths allow the ADCP to profile farther, but the [standard deviation](#) is increased by as much as 2.5 times.

Bandwidth	Sample rate	Standard deviation	Profiling range
High (25%)	High	Low	Low
Low (6.25%)	Low	High	High

Timing

Click on the Timing panel to change how the ADCP will ping during the deployment. Click **Save** to save the settings or **Cancel** to return to the previous settings.



Scenario Timing

Time between ensembles – Select a time between ensembles from the drop down list. Time is based on the start of one ensemble to the start of the next ensemble.



Time between ensembles applies to both water profiles.

Ensemble Timing

When two water profiles are used, set the **Offset between Profile groups** time to avoid ping collisions.

Ping interval – Sets the time per ping.

Number of pings – Adjust the number of pings to gather the desired Standard Deviation. To increase the expected accuracy of the velocity measurement (reduce the [Standard Deviation](#)), increase either the number of pings, [cell size](#), or both.

Resources

The Resources panel displays the power and data recorder requirements for the deployment.

Deployment duration – Enter the expected duration of the deployment from the time of the first measurement ping (either immediately or delayed). This duration *does not* instruct the Sentinel V ADCP to stop data collection; it is for estimating the battery usage and storage required.

Power source – Use the Up/Down triangles to select the power source from the list.



Using the System Panel

The System panel shows an overview of the Sentinel V ADCP configuration. The System panel will appear differently when [running ReadyV locally](#) or connected:

- When connected to the Sentinel V ADCP, ReadyV will detect what model system is connected and the memory capacity. The **Set Time** and **Tests** panels are available. The **Sensors** panel displays the sensor values.
- When ReadyV is running locally, the user must select the Sentinel V ADCP model number, power source, and memory capacity. The **Set Time**, **Sensors** and **Tests** panels are not available when running locally.



Figure 5. System Panel – Connected



Figure 6. System Panel - Local

Setting the Date and Time

Click the **Set Time** button to set the Sentinel V ADCP's clock.



The Set time panel is only available when connected to the ADCP.

To set the date and time:

1. Click on the calendar icon to set the date.
2. Enter the time and press the **Set Time** button.
3. Use the **Sync with PC** button to set both the time and date of the ADCP to match the time and date on the PC.
4. Click the **Close** button to return to the System panel.



Figure 7. Set the Date and Time



The real-time clock (date and time) within the Sentinel V is backed up by a super-capacitor that 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 for a longer period of time, then the clock will revert to the default value of January 1, 1970 and will need to be reset to the correct time.

Sensors

This section shows the raw pitch, roll and heading as received by the internal sensor. Temperature, depth and speed of sound are also displayed.



The Sensors panel is only available when connected to the ADCP.

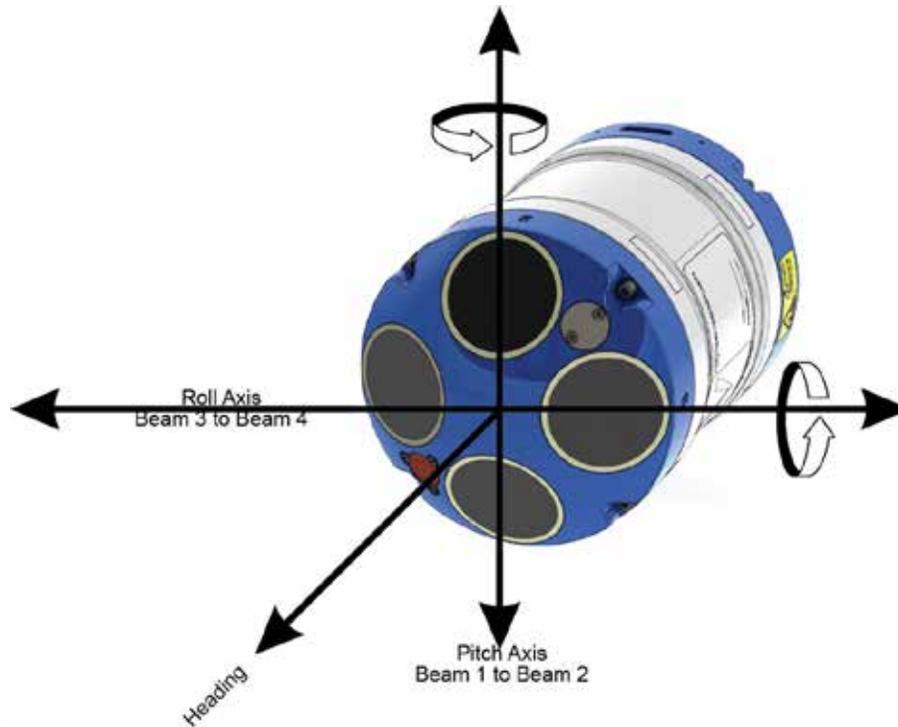


Figure 8. Pitch, Roll and Heading

Heading - When Beam 3 is pointed toward true north, heading = 0° .

Pitch (Tilt 1) - When the unit is pointed up or down, pitch = 0° . When the unit is on its side, pitch = $\pm 90^\circ$ (see Figure 9).

Roll (Tilt 2) - When the unit is pointed up or down, roll = 0° . When the unit is on its side, roll = $\pm 90^\circ$ (see Figure 10).

Raw (unprocessed) Pitch (Tilt1) and Roll (Tilt2) will behave as follow:

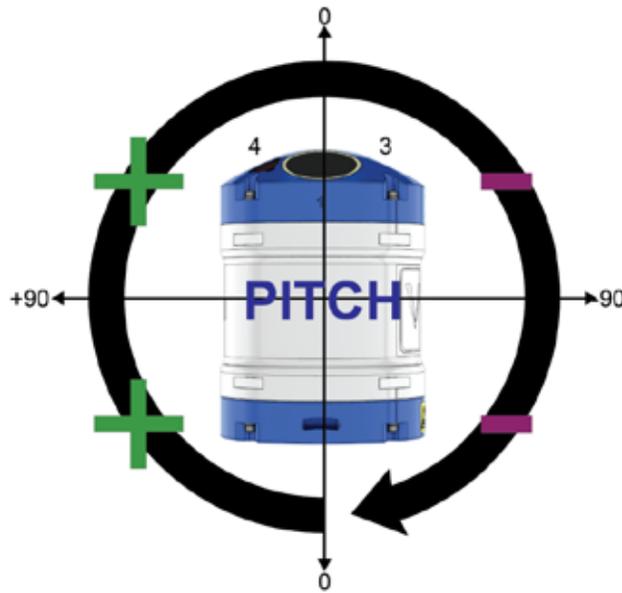


Figure 9. Raw Pitch

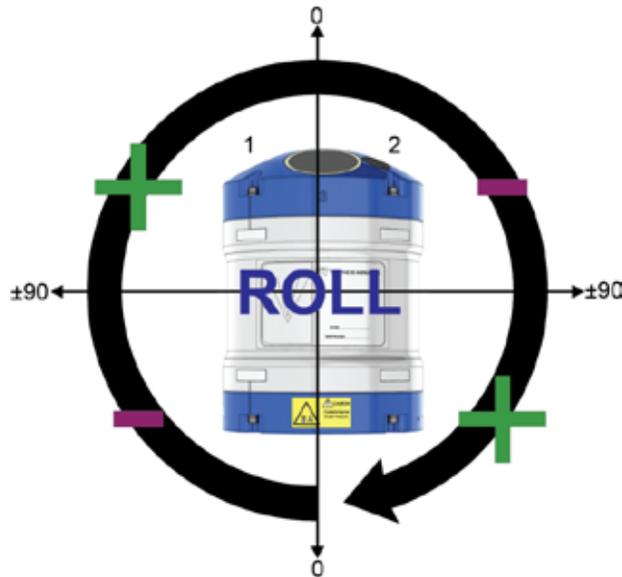


Figure 10. Raw Roll

The following table describes the sign convention for the Pitch and Roll:

Sign of Angle for a Unit Facing	Up	Down
Pitch (Tilt 1) - Beam 3 higher than Beam 4	+	+
Roll (Tilt 2) - Beam 2 higher than Beam 1	+	-

Built-in Tests

Use this to run the built-in tests on the Sentinel V ADCP. The built-in tests can help isolate problems to a major functional area of the Sentinel V ADCP. For troubleshooting information, see [Troubleshooting](#).



The Tests panel is only available when connected to the ADCP.

Test the ADCP:

- When the Sentinel V ADCP id first received.
- Before each deployment or every six months.
- When you suspect instrument problems.
- After each deployment.

To run the tests:

1. [Connect](#) to the ADCP.
2. On the [System](#) panel, click the **Details** button.
3. To run the tests and view the test results, click the **Run** button.
4. If a test fails, see the [Troubleshooting](#) section.



Using the Maintenance Panel

The Maintenance panel keeps track of when maintenance items were performed on the ADCP and saves [log files](#).



Click a panel to select a maintenance item:

- **Compass** – this starts the [compass calibration](#) procedure.
- **Pressure Sensor** – click this to [zero the pressure sensor](#). Zero the pressure sensor before every deployment.
- **Battery** – click this button to set the date that the [battery was replaced](#). Replace the battery before every deployment.
- **O-Ring** – click this button to set the date that the [O-Ring was replaced](#). The O-ring(s) should be replaced whenever the system is opened.
- **Desiccant** – click this button to set the date that the [desiccant](#) was replaced. The desiccant should be replaced whenever the system is opened.
- **Silicone Oil** – click this button to set the date that the [silicone oil](#) was replaced. The oil should be checked whenever the system is ready for a deployment.
- **Battery Springs** – click this button to set the date that the [battery springs](#) were replaced. The springs should be checked whenever the individual D-cell batteries are replaced.
- **Update Firmware** – this starts the [firmware update](#) procedure.
- **Factory Maintenance** – this button shows the date that the factory maintenance was performed. It will be updated once serviced by TRDI. Based on experience, TRDI knows that **most** ADCPs need to have the urethane inspected after two to three years of field use. Many users are not familiar with the early signs of urethane failure. The primary damage to the urethane is from bio-fouling and long exposure to the water and sun. Damage occurs on the surface of the urethane and at the edge where the urethane bonds to the cups. By returning the system every two to three years, TRDI can inspect it for early signs of urethane failure and repair it through our Factory Maintenance Service. At the same time, TRDI will make any necessary upgrades to boards, assemblies, and firmware. This routine service period, proper care, and general maintenance ensures optimal Sentinel V ADCP performance.

ReadyV Log Files

ReadyV creates several log files. Click the corresponding button to save a copy of the log file. Name the file and click **Save**. The maintenance and app log files can be opened with any text editor.

Log file name	Description
	Use the Save maintenance log to list the date and time maintenance items were completed.
	The Save app log lists any errors when ReadyV is started.
	The Save diagnostic log is intended for the TRDI engineers to debug issues that may be happening on the instrument. The log file will be saved in a *.gz format and can be e-mailed to TRDI engineers to aid in troubleshooting the instrument.
	Use the Clear fault log button to clear the fault log of all previous entries.



Use a local drive or network drive that is always accessible when saving log files. ReadyV will "remember" the last drive used and if it is not available, may appear to hang.

Using the Deployment Panel

The Deployment panel starts or stops the deployment. The Deployment panel can be accessed from any panel by clicking the **Deploy** button located on the bottom of the ReadyV screen.



This panel is available only when connected to the Sentinel V ADCP.



Figure 11. Deployment Panel

Select **Now** or **Later**:

- **Now** – The Sentinel V ADCP will start pinging as soon as the **Deploy** button is clicked.
- **Later** – Selecting the Later button and entering a date and time in this field enables a delay from the start of a deployment to the first water profiling ping. The Sentinel V ADCP will sleep from the time the **Deploy** button is clicked until the set time arrives.

Deployment checklist:

- **Compass** – The [compass should be calibrated](#) before deploying the system.
- **Pressure sensor** – The [pressure sensor should be zeroed](#) before deploying the system.
- **Battery** – The [battery should be replaced](#) before deploying the system.
- **System clock** – The [clock should be set](#) before deploying the system.

Resources checklist:

- **Deployment duration** – Shows the number of days entered on the [Resources](#) panel.
- **Power usage** – Shows the amount of power required for the selected deployment duration.
- **Recorder remaining** – Shows the amount of free space on the recorder card.
- **Deployment** – Shows the amount of space on the recorder needed for the deployment duration.
- **Max duration** – Shows the maximum number of days the ADCP can record data until the recorder is full.

Starting or Stopping Deployments

To start a deployment:

1. From any panel, click the **Deploy** button.
2. On the **Deploy** panel, click the **Deploy** button to start the ADCP pinging.



3. Click the **Close** button at the Successful message.
4. On the [Home](#) panel, verify that it shows **Deployed**.

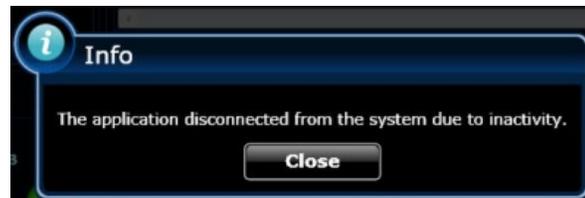
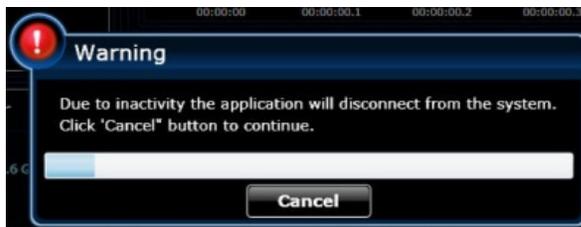


5. Close the browser page.



Once the instrument is deployed and no keys are pressed for five minutes, an inactivity warning is displayed, and after another two minutes of no keys being pressed the wireless connection is turned off on the ADCP. If **Close** is clicked at this ReadyV info message, this will leave ReadyV running in the *Offline-Planning* mode (see [Running ReadyV Locally](#)).

To run ReadyV again and connect to the ADCP, then the internet browser page or the browser tab which was running ReadyV must first be closed. Then restart the connection.



To stop a deployment:

1. Click the **Stop** button to stop the ADCP pinging.
2. Click **Yes** to end the deployment. The data file being recorded will be closed.



Using the Data Recorder Panel

Use the Data Recorder panel to check the status of data files, recover data, and erase the recorder. To select a data file, click on it.

Status – Closed or Recording. To close a file, click **Stop** (see [Starting or Stopping Deployments](#)).



If a data file status is recording, the **Delete** and **Download** buttons do not appear.

Name – Shows the file name.

Size – Shows the file size.

Start Date – Shows the date and time the data file was created.

Stop Date – Shows the date and time the data file was closed.

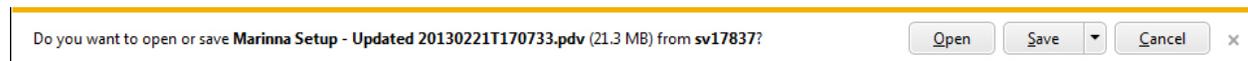
Duration – Shows the duration of the data file.



Figure 12. Data Recorder Panel

Delete all – Once the data has been recovered, the recorder can be erased by clicking the **Delete all** button. Click **OK** at the prompt. *Once erased, the data is not recoverable.* This process also reformats the recorder, so it may take a few minutes.

Download – Click on a data file or use the Up and Down arrow keys to select it. Click the **Download** button to save the data file to a folder on the computer. For Windows 7®, click on the triangle next to the **Save** button to select the folder where the data will be written.



Use a local drive or network drive that is always accessible when exporting and importing *.plan files. ReadyV will “remember” the last drive used and if it is not available, may appear to hang.



If the Save File dialog box does not appear, see [Can Not Download Data](#).

Delete – Click on a data file or use the Up and Down arrow keys to select it. Click the **Delete** button to delete the selected data file. At the prompt, click **OK**. *Once erased, the data is not recoverable.*

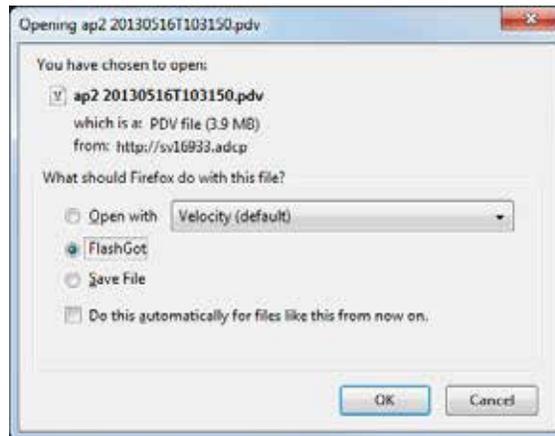
Using Download Managers

Based on the deployment setup parameters such as ping interval, number of bins, etc., and the duration of the deployment, the size of the data file to be downloaded from the Sentinel V ADCP can be in the order of gigabytes. While downloading a large data file from the Sentinel V, the user may close the browser by mistake or the ADCP may disconnect. In order to recover the data file download from such situations, TRDI recommends using a FireFox® download manager add-on called *FlashGot*®. This add-on will help resume downloads from the last point where the partial download left off. Using *FlashGot*, users may also configure the maximum download speed using any internal and most external download managers.



Although ReadyV file downloads will work on most external download managers and most browsers (see [Computer Considerations](#) for supported platforms), TRDI recommends using the latest version of Firefox® (<http://www.mozilla.org/en-US/firefox/new/>) and the *FlashGot*® plugin (<https://addons.mozilla.org/en-US/firefox/addon/flashgot/developers>).

Once *FlashGot*® is installed; when a data file is downloaded the following popup is observed:



Select the **FlashGot** option and click **OK** to download the file.



It may be noted that even though there are *FlashGot* extensions and plugins for other browsers such as Google Chrome® etc., TRDI has not tested the efficacy of the *FlashGot* plugin in other browser environments.

Running ReadyV Locally

ReadyV can be used without requiring access to the Sentinel V ADCP once it is installed.

When running ReadyV locally, only the [Measurement Setup](#) functions apply. The [Maintenance](#) and [Data Recorder](#) panels are not available. The [System](#) panel is used to set the Sentinel V ADCP configuration. When connected to the ADCP, ReadyV will automatically detect what model system is connected. When running locally, the user must select the Sentinel V ADCP model number, battery type and memory. The Set Time, Sensors and Tests sections are not available when running locally.

Use the **Import** and **Export** buttons to open and save scenario *.plan files. ReadyV can not save the settings to the ADCP when running locally. See [Creating a Scenario](#) and [Opening a Scenario](#) for details.



Use a local drive or network drive that is always accessible when exporting and importing *.plan files. ReadyV will “remember” the last drive used and if it is not available, may appear to hang.

To run ReadyV locally:

1. [Connect](#) to the Sentinel V ADCP and right-click on any screen.



2. Select **Install Sentinel V onto this computer**.



3. To remove the local interface, right-click on any screen and select **Remove this application**.



When the ADCP's firmware is updated, remove older local versions of ReadyV.

Silverlight Options

Right-click on any screen and select **Silverlight** to open the **Microsoft Silverlight Configuration** screen. Use this screen to configure or update Silverlight.

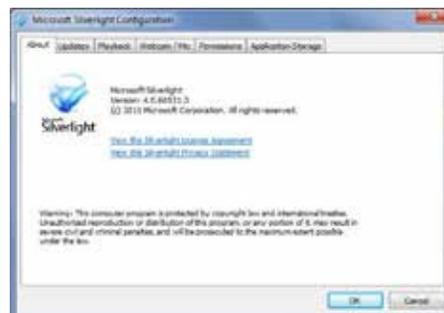


Figure 13. Silverlight Options

NOTES

Chapter **3**

USING READYVLITE



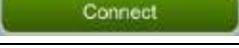
In this chapter, you will learn:

- ReadyV Lite features
- How to connect to a Sentinel V system
- How to use the System page
- How to use the Setup page
- How to use the Maintenance page
- How to use the Deploy page

ReadyV Lite Features

The *ReadyV Lite* app connects to Sentinel V devices both in ad-hoc and access point Wi-Fi modes. It can be downloaded for free for iOS 5.1 or later iPhone, iPod Touch, and iPads directly from the iTunes store (<https://itunes.apple.com/app/memix-pro/id569295634?mt=8>).

ReadyV Lite uses the following icons and buttons:

Icon	Description
	Click on the Connect button to connect or disconnect from an ADCP.
	Use the System page to view the system configuration. It also shows the recorder status and allows setting the system time.
	Use the Setup page to select a scenario and set the salinity, magnetic variation, and heading adjustment.
	Use the Maintain page to view and update when maintenance items are completed on the Sentinel V ADCP. The pressure sensor can be set to zero.
	Use the Deploy page to view the deployment checklist and to start and stop deployments.
	Use the button to see the options for the selected screen.
	Click this button to use the selected scenario.
	Use this button to zero the pressure sensor.
	Use this button to deploy the Sentinel V ADCP.
	If the ADCP is deployed, click this button to stop the deployment.
	Use this button to save changes.
	Use this button to cancel changes.
	Use this button to connect to an ADCP.
	Use this button to disconnect from an ADCP.

Connecting to a Sentinel V with ReadyV Lite

To connect to a Sentinel V ADCP:

1. Prepare the ADCP by [connecting the battery](#). After power is applied (long beep), there is a 10 to 15 second delay before the network is available (short beep). The WLAN is available after power up for two minutes. Use the touch sensor to start the WLAN again if needed.
2. On the iOS device, tap **Settings**.
3. Tap **Wi-Fi**.
4. Ensure that Wi-Fi is **On** and select a Sentinel V ADCP from the list. Each Sentinel V that is available is shown as SVnnnnn, where nnnnn is the ADCP's serial number. Tap the appropriate serial number to select the ADCP.



5. Start the *ReadyV Lite* app by tapping the icon.



6. On the **Connect** page, enter the Sentinel V ADCP serial number selected in step 3. For example, to connect to SV15696, type *SV15696*. If there is an error message, try *SV15696.adcp*.



7. Tap **Connect**. Once connected, the [System](#) page will open.

Using the ReadyV Lite System Page

The **System** page shows the system serial number, frequency, pressure rating, and firmware version. It also shows the recorder status and allows setting the system time.



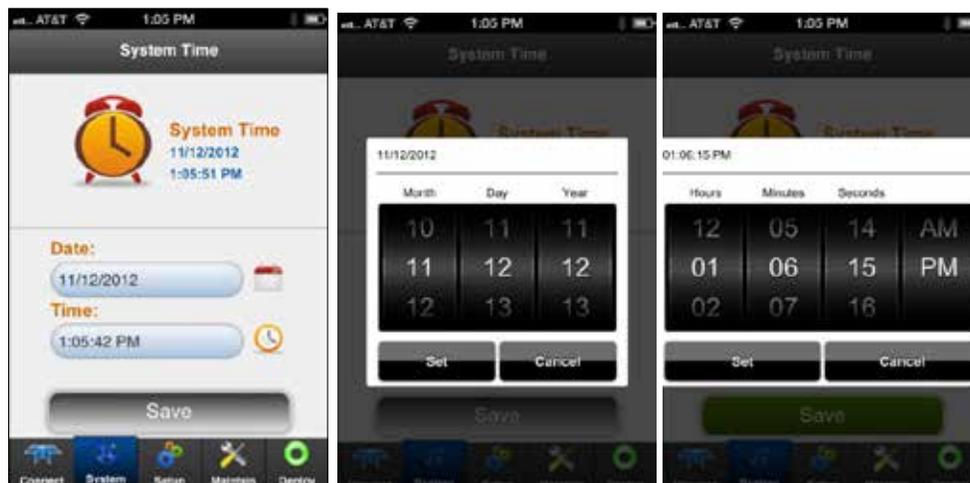
Recorder status:

The recorder section shows the used and available space on the recorder. If the ADCP is deployed, the **Status** will show as Recording – OK and the current file size and start date and a large **Stop Recording** button displays at the top of each page.

If the ADCP is not deployed, it lists information about the last file recorded, including file size and the start/end date and times.

To set the system time:

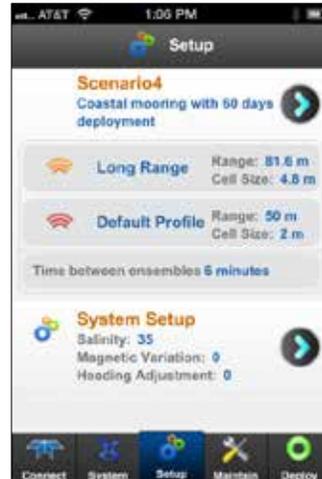
1. On the **System** page, tap the  arrow. Tap the **Date** or **Time** buttons.
2. Enter the correct date/time using the scroll wheels.
3. Tap **Set**.
4. Tap **Save**.



5. Once the date/time is set, ReadyV Lite returns to the **System** page.

Using the ReadyV Lite Setup Page

The **Setup** page allows selecting a scenario and changing the system setup for salinity, magnetic variation, and heading adjustment. The last saved scenario created in ReadyV will automatically be loaded when using ReadyV Lite.



To select a scenario:



Scenarios that were saved while connected to the Sentinel V with ReadyV are available for use with ReadyV Lite. See [Creating and Saving Scenarios](#) for details.

The last saved scenario in ReadyV will automatically be loaded when using ReadyV Lite.

1. Tap the top arrow  next to **Scenario**.
2. Tap the appropriate scenario from the list.
3. Scroll down and tap the **Use this Scenario** button.
4. Once the scenario is selected, ReadyV Lite returns to the **Setup** page.



To change the system setup:

1. Tap the  arrow next to **System Setup**.
2. Use the slider or tap the number to enter the **Salinity**, **Magnetic Variation**, and **Heading Adjustment**.
3. Tap the **Save** button.
4. Once the settings are saved or **Cancel** is selected, ReadyV Lite returns to the **Setup** page.



Using the ReadyV Lite Maintain Page

The **Maintain** page allows users to view and update when maintenance items are completed on the Sentinel V ADCP. The pressure sensor can be set to zero.



To set the date/time a maintenance item was completed:

1. Tap the  arrow next to the maintenance item.
2. Enter the correct date/time using the scroll wheels.
3. Tap **Set**.
4. Tap **Save**.
5. Once the setting is saved or **Cancel** is selected, ReadyV Lite returns to the **Maintain** page.

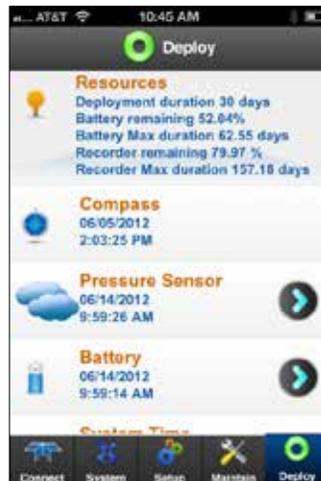
To zero the pressure sensor:

1. Tap the  arrow next to **Pressure Sensor**.
2. Tap the **Zero Pressure Sensor** button.
3. Once the **Zero Pressure Sensor** button or **Cancel** is selected, ReadyV Lite returns to the **Maintain** page.



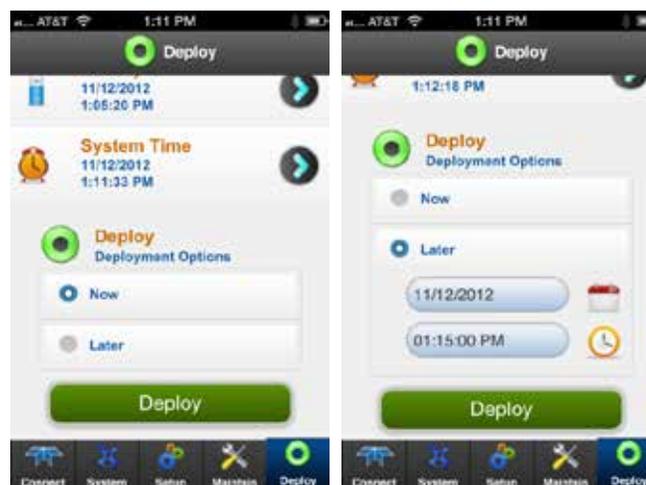
Using the ReadyV Lite Deploy Page

Use the **Deploy** page to view the deployment checklist and to start and stop deployments.



To deploy the Sentinel V ADCP:

1. Tap **Deploy** to open the Deploy page.
2. Select **Now** or **Later**:
 - **Now** – The Sentinel V ADCP will start pinging as soon as the **Deploy** button is tapped.
 - **Later** – Selecting **Later** and entering a date and time enables a delay from the start of a deployment to the first water profiling ping. The Sentinel V ADCP will sleep from the time the **Deploy** button is tapped until the set time arrives.
3. Tap the **Deploy** button.
4. Once the **Deploy** button or **Cancel** is selected, ReadyV Lite returns to the **Deploy** page.



To stop a deployment:

1. Tap **Deploy** to open the Deploy page.
2. Tap the **Stop Recording** button.
3. Tap **OK**.
4. Once the **OK** button or **Cancel** is selected, ReadyV Lite returns to the **Deploy** page.



Connecting to another ADCP

To connect to a different Sentinel V ADCP:

1. Tap the **Connect** tab.



2. Tap **Disconnect**. Now use the iOS device **Setting** page to select another Sentinel V ADCP to connect to (see [Connecting to a Sentinel V with ReadyV Lite](#)).



NOTE

Chapter 4

INSTALLATION



In this chapter, you will learn:

- How to attach the handle
- How to connect/disconnect the I/O cable
- How to connect the optional external batter case
- Cable wiring diagrams
- Available mounts for the Sentinel V

Attaching the Handle

The handle makes it easier to carry the Sentinel V ADCP.

To attach the handle:

1. Thread the ends of the handle through the slots on the end-cap.
2. Use the snap-links to attach the handle to the Sentinel V ADCP.



Figure 14. Handle

Mounting the Instrument

The preferred method of mounting the Sentinel V is using clamps that grip the circumference of the housing. The fallback method of mounting the instrument is to use the holes on the end-cap. See the [Outline Installation Drawings](#) for dimensions.

When clamping the Sentinel V to a mount, the clamp must not have a large gap between the front and rear clamp. Using this type of design can cause the housing to deform or even break if the clamps are over-tightened. This will cause the ADCP to flood.

Design clamps that fully surround the housing. Design the gap as small as possible so that when the clamp is fully tightened it will not deform the housing or cause excessive pressure on the housing.

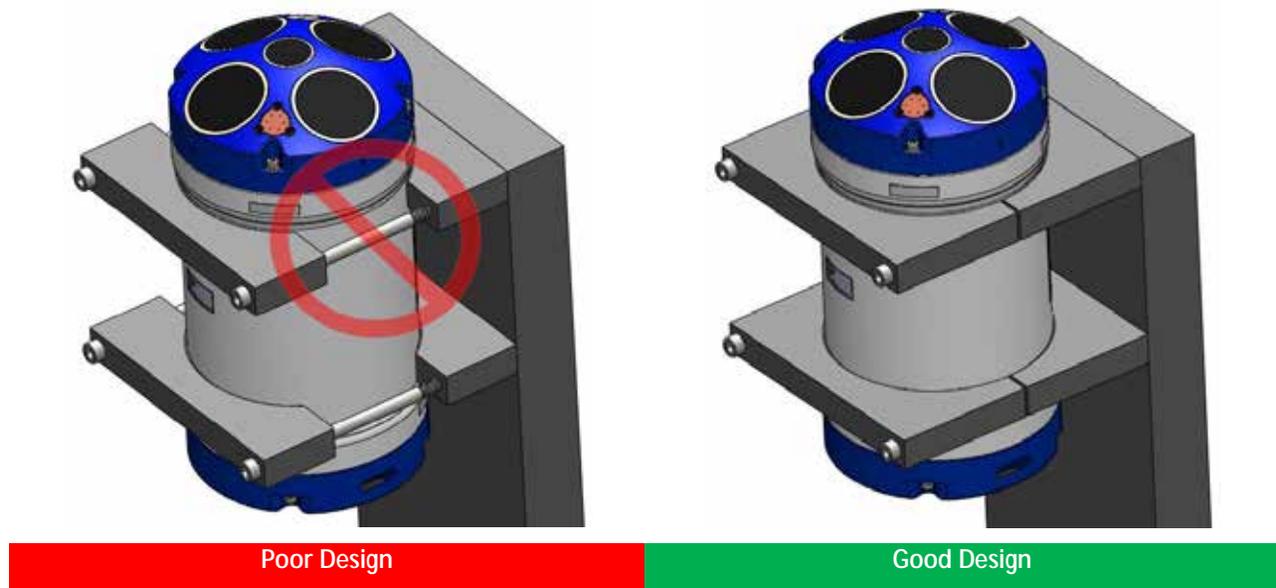


Figure 15. Mounting the Instrument

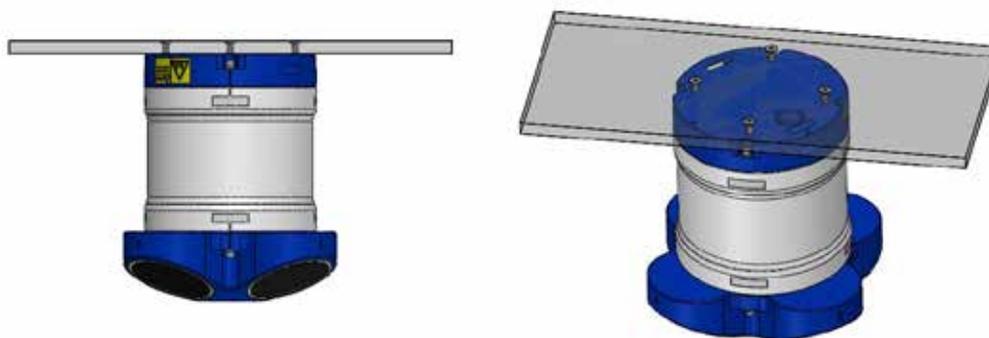


Figure 16. Example Sentinel V End-Cap Mount



Use M6x1.0 bolts.

Only use stainless steel hardware.

The maximum thru-hole diameter in the mounting plate is 6.85 mm (0.270 inch). Using a larger thru-hole could result in the threaded metal inserts on the end-cap being pulled out of the plastic end-cap.

WorkHorse to Sentinel V Mount Adapters

TRDI has designed two adapters to use an existing WorkHorse mount with the Sentinel V. The 81D-5000-xx adapter (where xx is available for different length housings) includes sleeves to make the Sentinel V fit into a clamp designed for Workhorse ADCPs. The rubber sleeves are textured on one side to provide a better grip on the ADCP and include adhesive on the other side so that the customer can either glue it to the instrument or their clamp. The 81D-5001 kit is a delrin plate with WorkHorse end-cap hole pattern.

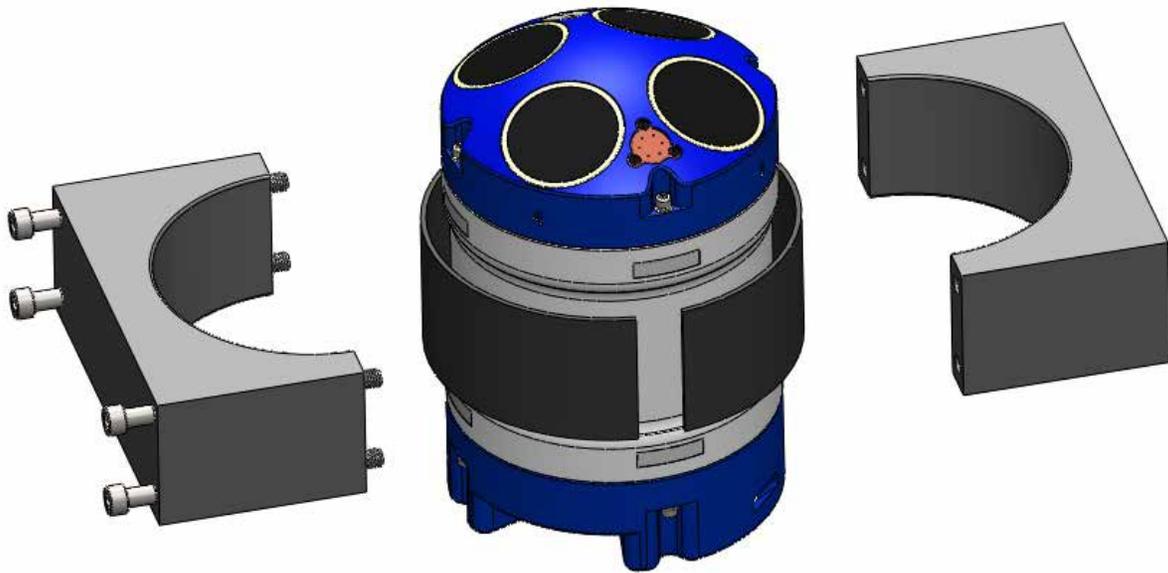


Figure 17. 81D-5000 Mounting Clamp Adapter Kit

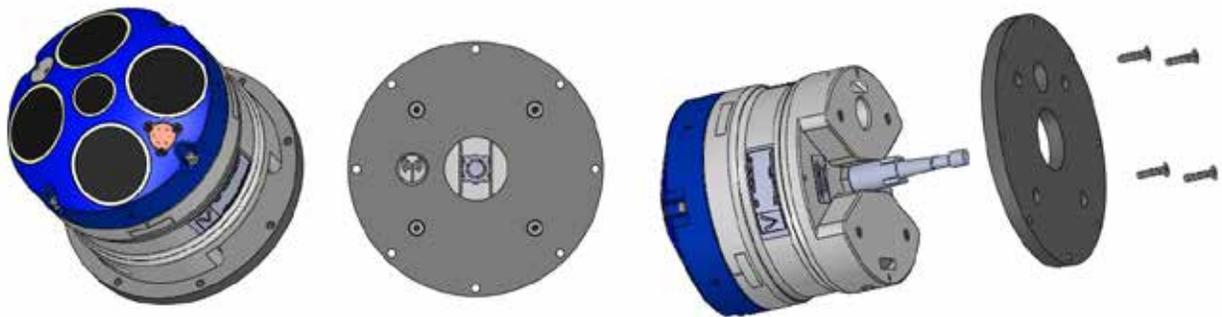


Figure 18. 81D-5001 End-Cap Mounting Plate Adapter Kit

Connecting Cables and Dummy Plugs

Sentinel V ADCPs can be purchased with the optional end-cap connector using either the right-angle or straight connectors.



The dummy plugs should be installed any time the cable is removed. Use the dummy plug when the Sentinel V ADCP is in storage or is being handled.

To Disconnect the Cable or Dummy Plug:

1. Turn the locking sleeve counterclockwise until it is fully loose and slides back.
2. Grasp the cable or dummy plug close to the housing and pull the cable or dummy plug straight out away from the connector.

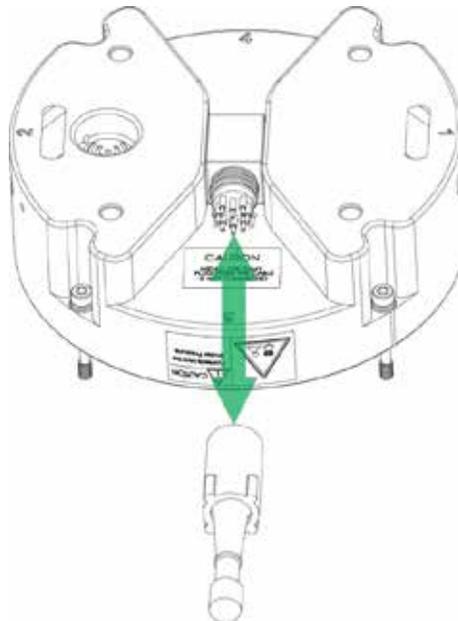


Figure 19. Removing the End-Cap Connector Dummy Plug

To Connect the Cable or Dummy Plug:

1. Spray lubricant on the rubber portion of the connector pins. This will help seat the connector.



Use light amounts of aerosol silicone (dry type) lubricant (such as from 3M) to help seat the cable connectors and to protect the neoprene rubber from deterioration. **Regular lubrication is required.**

2. Insert the dummy plug / cable onto the connector, rotating it until the keyed portions are properly aligned. While keeping a slight inward pressure on the cable connector and ensuring that the connector is straight, thread the locking sleeve onto the receptacle to complete the connection.



Do NOT use any tools to tighten the locking sleeve ring. It should only be "finger tight".

Connecting the External Battery Case

Sentinel V ADCPs can be purchased with the optional end-cap connector and an external battery case.



The dummy plugs should be installed any time the external battery case cable is removed. Use the dummy plugs when the Sentinel V ADCP is in storage or is being handled.

To connect the external battery case:

1. Remove the dummy plugs on the Sentinel V and external battery case (see [Connecting Cables and Dummy Plugs](#)).
2. Connect the external battery case cable.

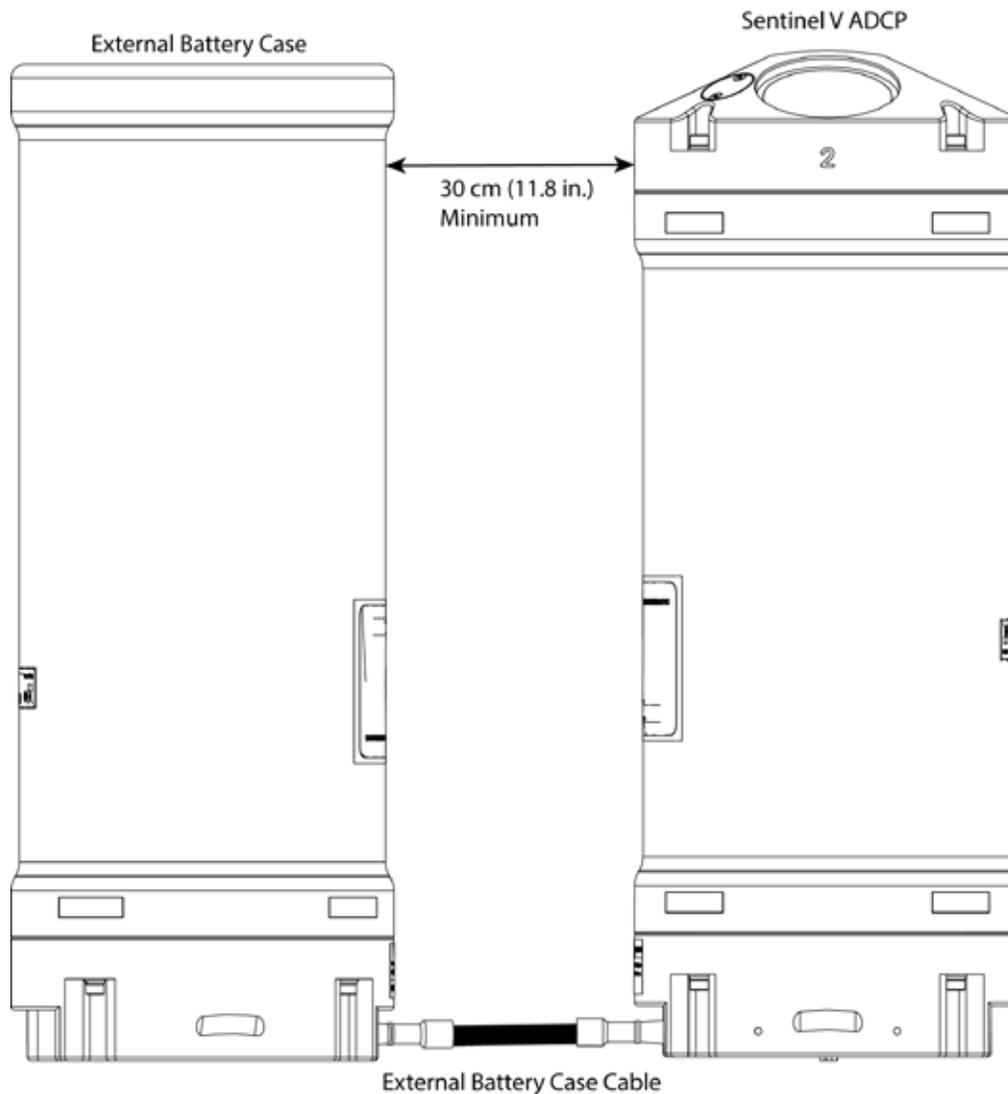


Figure 20. Connecting the External Battery Case



To avoid affecting the compass, place the external battery case at least 30cm (11.8 inches) away from the Sentinel V ADCP.

Cable Wiring Diagrams

This section has information on ADCP cabling. Custom configurations may not be shown here.

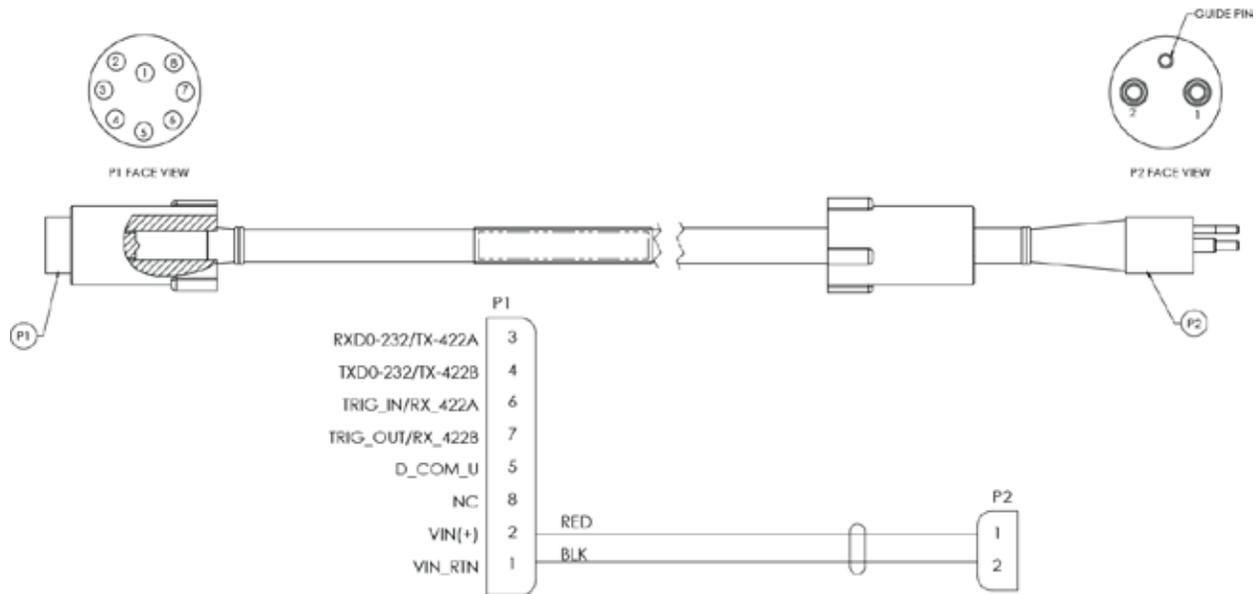


Figure 21. 73D-3101 – External Battery Case Cable with 8-pin Connector

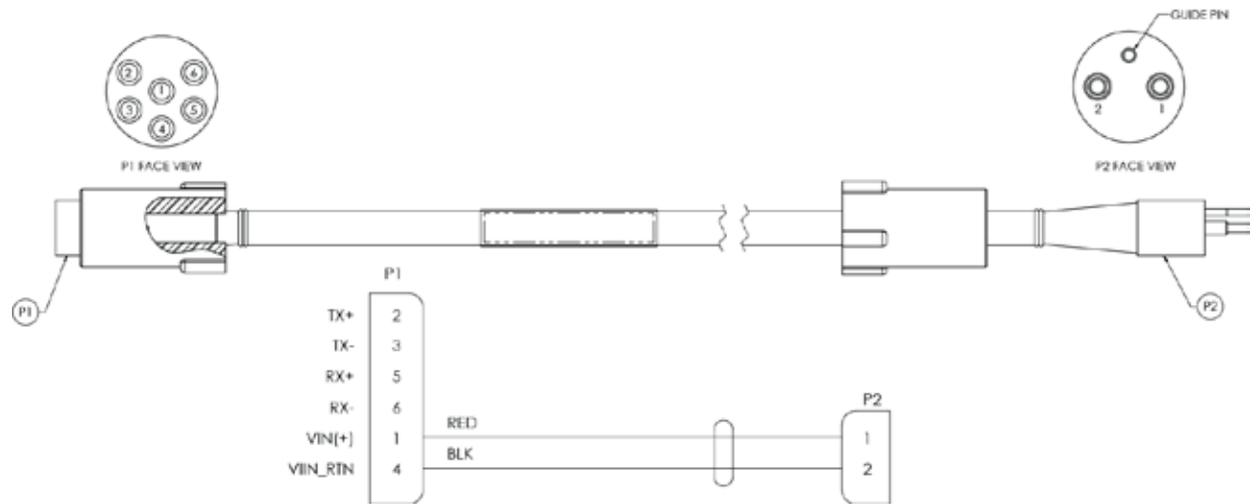


Figure 22. 73D-3102 - External Battery Case Cable with 6-pin Connector

Using Bottom Mounts

Bottom mounts can range from simple PVC frames to Trawl Resistant Bottom Mounts. Below is an example of some of the types of bottom mounts.



Figure 23. Example of a Teledyne RD Instruments PVC Bottom Mount

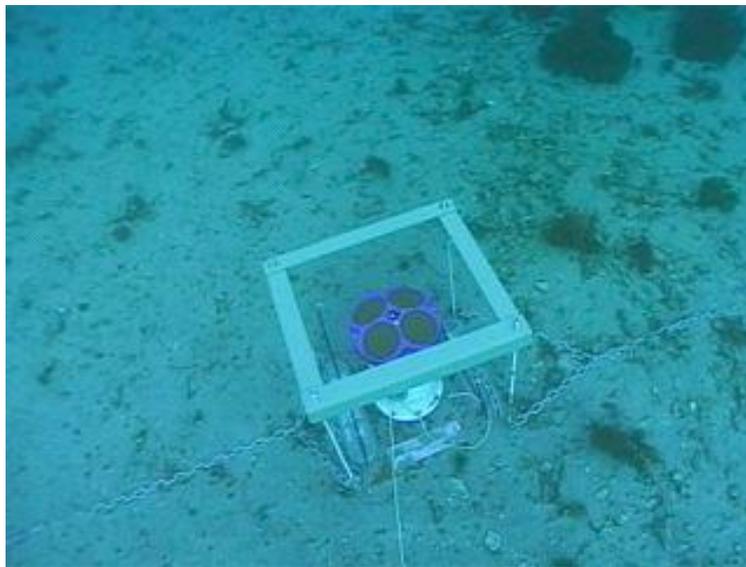


Figure 24. Example of a Bottom Mounted ADCP

Photo courtesy of John Skadberg, US Navy SPAWAR System Center in San Diego, CA. Sent to TRDI by Steve Monismith.

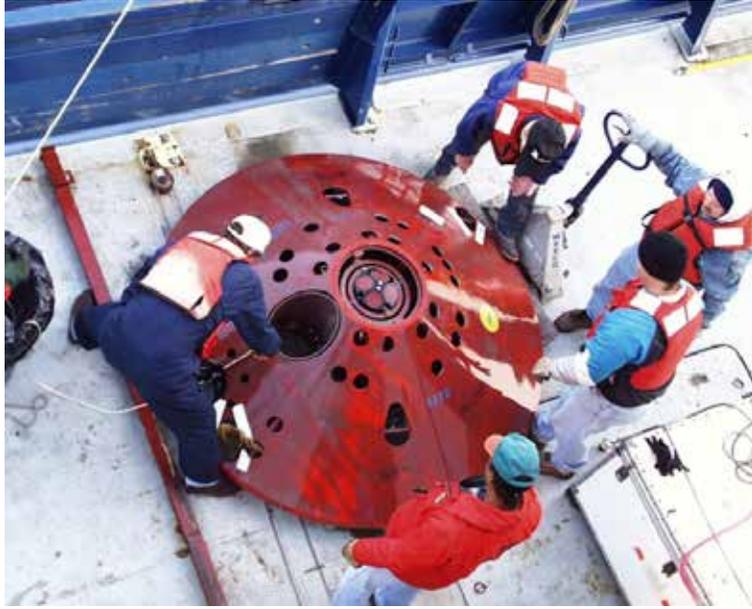


Figure 25. Trawl Resistant Bottom Mount

Photo courtesy of Maureen Wieler, Mooring Systems.

Using Buoy Mounts and Load Cages

Buoy mounts and load cage frames are designed to allow the Sentinel V ADCP to profile unobstructed by the mooring hardware. Below is a sample of some the types of buoy and load cage mounts available.

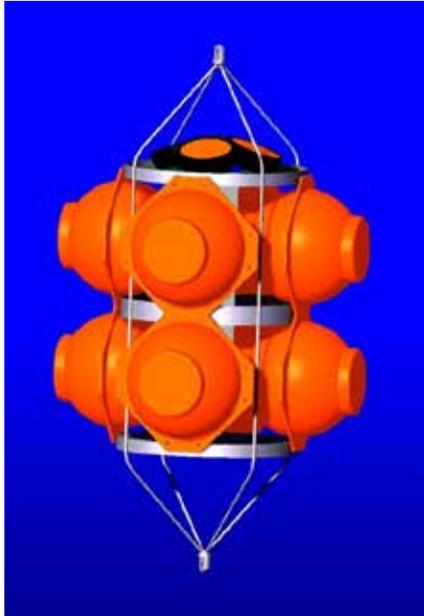


Figure 26. Deep-Water Mount

Photo courtesy of the Oceanscience Group.



Figure 27. Buoy Mount with External Battery

Photo courtesy of Maureen Wieler, Mooring Systems.



Figure 28. Subsurface Buoy

Photo courtesy of Patrick Lefeuve, Technicap. The Subsurface buoy was developed by BMTI and Technicap.



Figure 29. Buoy Mount

Photo courtesy of Flotation Technologies.



Figure 30. Load Cage
Photo courtesy of Angela Cates, UNM.

Using an Over-the-Side Mount

The over-the-side mount is common when the ability to move the Sentinel V ADCP from one platform to another is needed. The mount must be as rigid as possible to limit the amount of pitch and roll applied to the ADCP. Although the tilt sensor can measure a $\pm 90^\circ$ influence, anything beyond 15° will cause bias to the data that cannot be removed. No matter what mounting type used, the ADCP must be below the bubble layer. Bubbles will cling to the urethane faces of the ADCP and reduce the range to almost nothing. Usually a mount somewhere aft of amidship is used. A stern mount will cause all sorts of problems due to propeller wake, bubbles and turbulent water conditions.



Our transducer assembly is sturdy, but TRDI did not design it to withstand collisions with all floating objects. TRDI strongly suggests protecting the Sentinel V ADCP if this is a possibility.



Avoid using ferro-magnetic materials in the mounting fixtures or near the Sentinel V ADCP. They affect the compass. Use titanium or 316 stainless steel hardware.

Example of an Over-the-Side Mount

When mounting the Sentinel V ADCP to a platform, use the following sequence.

- Test the Sentinel V ADCP
- Align the compass
- Mount to the platform (see Figure 31).

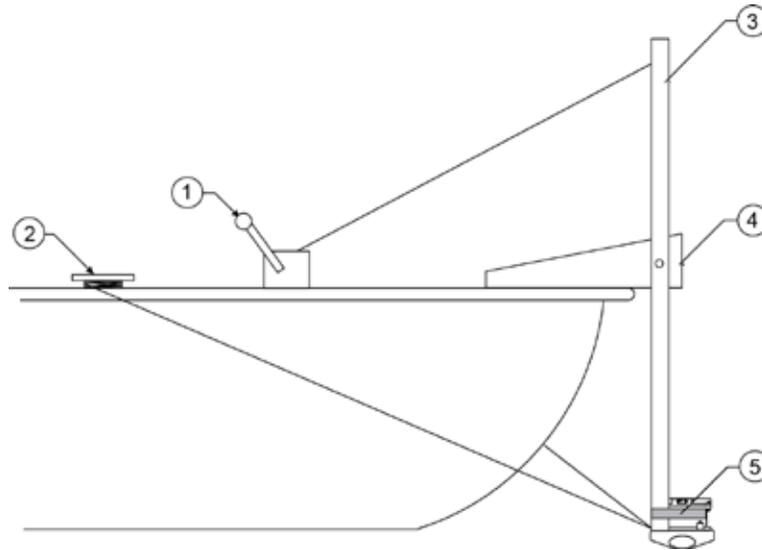


Figure 31. Example of an Over the Side Mount

1. Hand winch with cable or rope.
2. Boat cleat to tie off the lower end of the rotating arm.
3. Rotating arm. The rotating arm has to be strong to prevent vibration of the instrument which can cause false data readings and it must be non-magnetic to avoid interference with the compass.
4. Pivot housing.
5. Instrument clamps (see [Mounting the Instrument](#)).

Over-the-Side Mounting Special Considerations

Use the following suggestions when mounting the Sentinel V ADCP to a platform.

- It is desirable to rigidly mount the Sentinel V ADCP to the platform. Avoid the free spinning of the ADCP in this application. The ADCP must stay in the water at all times.
- The ADCP must be mounted deep enough so that turbulence caused by its movement through the water does not allow air bubbles to be attached to the transducer faces.
- Avoid mounting the ADCP near motors and thrusters. They cause air bubbles and will cause bias to the internal compass.
- Avoid mountings that will cause the ADCP to see severe accelerations.

Routing Cables

The optional External Battery cable connects to the Sentinel V. Teledyne RD Instruments delivers the cable with both connectors attached. Use care when routing this cable through bulkheads, deck plates, cable runs and watertight spaces. Make allowances in cable length and engineering design plans for cable routing. When necessary, use strain reliefs on the cables. Route the cable so:

- Install cables with the connectors attached.
- It does not have kinks or sharp bends. Do not exceed a bend radius of 75 mm (3 in.).
- The cable can easily be replaced if it fails.
- Protect the cable with abrasion resistant sleeving if zip-ties are used to secure it to structures (see Figure 32 and Figure 33). Secure the cables to the mounting structure in such a way that the cables do not move or vibrate.
- Secure all cables to the mounting structure in such a manor so that no forces are exerted on any connector. Secure the cable as close to the connector as possible without causing any stress to the connector.



Figure 32. Do not use Zip-Ties Directly on Cables



When attaching the Sentinel V ADCP cables to the mount, do not zip-tie the cables directly to the structure. Zip-ties slowly cut through the cable's outer jacket and cause leaks.



Notice the design of the clamps used to secure the battery housings. See [Mounting the Instrument](#) for clamp designs.

Always protect the cable when attaching it to structures. Use an abrasion resistant sleeving where a zip-tie is used to protect the cable.

Figure 33. Cables Protected with Abrasion Resistant Sleeving

Chapter 5

MAINTENANCE



In this chapter, you will learn:

- Where parts are located on the ADCP
- How to spot problems
- How to take the ADCP apart and put it back together
- How to replace the batteries
- How to do periodic maintenance items on the ADCP

Parts Location Drawings

This section is a visual overview of the inside and outside parts of the Sentinel V. Use the following figures to identify the parts used on the system.



Caution label on End-Cap



Wear safety glasses and keep head and body clear of the end-cap while opening. Any system that was deployed may have pressure inside the housing.



Normal maintenance does not require removing the transducer head. If the transducer assembly is removed, replace both the desiccant and O-ring.

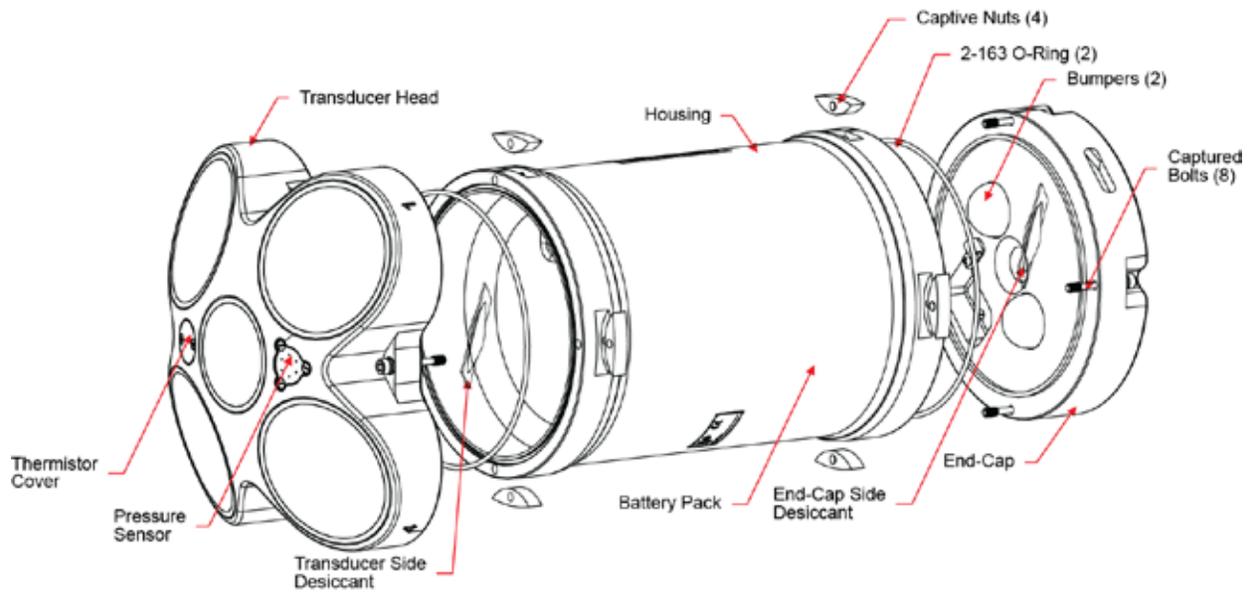


Figure 34. Sentinel V Assembly Overview

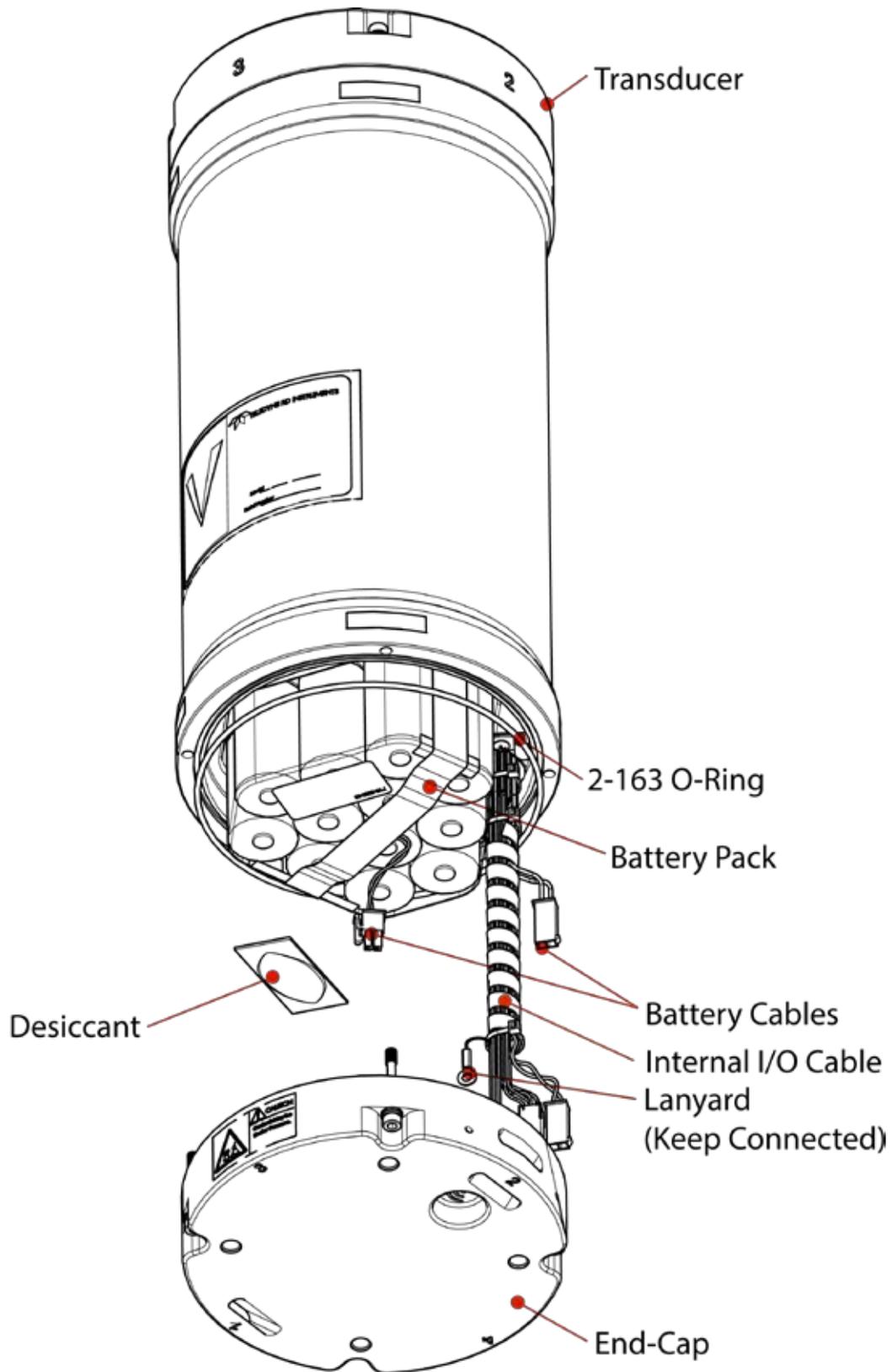


Figure 35. Sentinel V Exploded View (Battery Pack)

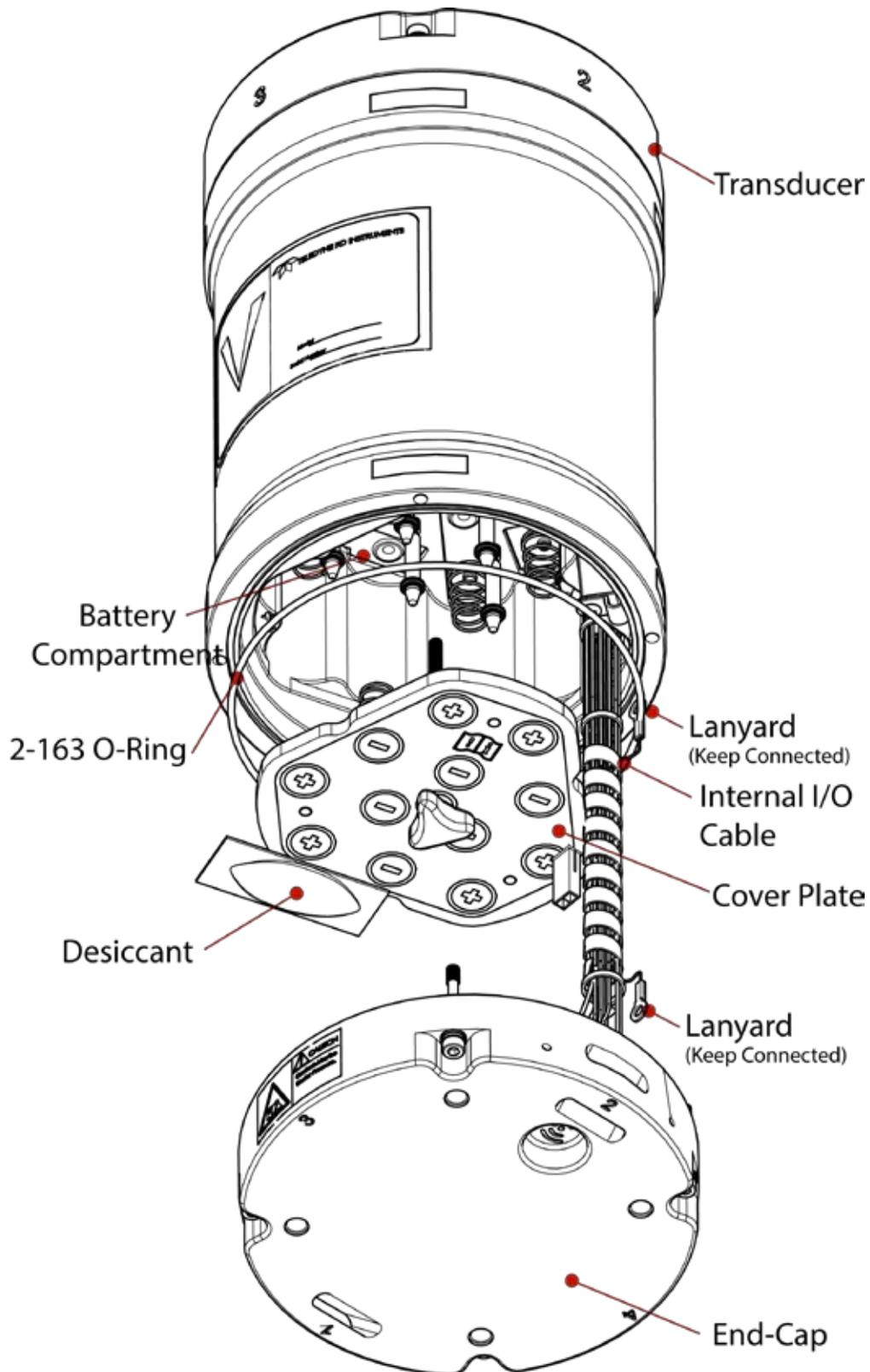


Figure 36. Sentinel V Exploded View (Individual D-cell)

Inspecting the ADCP

Inspect the Sentinel V ADCP to spot problems before and after each deployment:

- Thoroughly clean the exterior of the ADCP after retrieval. See [Removing Biofouling](#) for details.



After a deployment, systems need to be cleaned thoroughly before the touch sensor will work.

- Check the urethane coating on the transducer faces for dents, chipping, peeling, urethane shrinkage, hairline cracks and damage that may affect watertight integrity or transducer operation (see Figure 37).



The urethane coating is important to Sentinel V ADCP watertight integrity. Mishandling, chemicals, abrasive cleaners and excessive depth pressures can damage the transducer ceramics or urethane coating. Repair of the transducer faces should only be done by TRDI.

- Check the I/O connector(s) for cracks or bent pins (see Figure 38).



Repair of the connectors should only be done by TRDI.

The connector is made of rubber and as a general maintenance item TRDI recommends that the connector be replaced every five years or whenever visible signs of wear or corrosion appear.

- Check the cable connectors for cracks or bent pins. Inspect the full length of the cable for cuts, nicks in the insulation and exposed conductors.
- Check all bolts, washers and split washers for signs of corrosion. Replace if needed.



Figure 37. Transducer View
(5-beam model shown)



Figure 38. End-Cap View
(Right-angle connector shown)

Disassembly and Assembly Procedures

This section explains how to remove and replace the end-cap or transducer head to gain access to the Sentinel V electronics, batteries and digital recorder.

Disassembling the Sentinel V

If the ADCP was just recovered from a deployment, use caution when removing the end-cap or transducer head. If the system leaked, water may be inside the housing and under pressure. To avoid any possible injury always loosen the four bolts to allow any internal pressure to be vented from the system.



Caution label on End-Cap



Wear safety glasses and keep head and body clear of the end-cap while opening. Any system that was deployed may have pressure inside the housing.

Removing the End-Cap

To remove the end-cap:

1. Dry the outside of the Sentinel V ADCP.
2. Disconnect the I/O cable and install the dummy plug (for systems with an end-cap connector).
3. Lay the Sentinel V ADCP on its side on a soft pad.
4. Inspect the end cap bolts for any signs of damage such as bending, stretched bolts, crushed or deformed housing captive nuts, etc. These signs may indicate that there is internal pressure inside the system.
5. Using a 4mm Hex Key, loosen each of the M5 captured bolts (counterclockwise) until the O-ring seal is released.
6. **Allow the system the opportunity to vent while the bolts are loose.**



To avoid any possible injury ALWAYS loosen the four end-cap bolts to allow any internal pressure to be vented from the system.

7. Once any possible over-pressure has been released, completely loosen the four M5 retaining bolts.



The end-cap hardware will stay attached to the end-cap.

A lanyard connects the end-cap to the housing. This protects the internal I/O cable from being pulled too far away from the Sentinel V ADCP.

8. Carefully lift the end-cap away from the housing. Observe how the internal I/O cable is coiled inside the housing. It must be coiled the same way when replacing the end-cap.
9. Let the end-cap hang from the lanyard to the side of the ADCP. The lanyard protects the internal I/O cable from being pulled too far away from the Sentinel V ADCP.

Removing the Transducer Head Assembly



Normal maintenance does not require removing the transducer head. Use the following procedures only if directed to do so by TRDI Field Service personnel.

Sentinel V ADCPs contain Electro Static Sensitive Devices. Take accepted ESD prevention measures before opening the transducer head.

If the transducer assembly is removed, replace both the desiccant and O-ring.



For access to the Sentinel V internal battery, remove the end-cap assembly (see [End-Cap Removal Procedures](#)).

To remove the transducer assembly from the housing:

1. Dry the outside of the Sentinel V ADCP.
2. Disconnect the I/O cable and install the dummy plug (for systems with an end-cap connector).
3. Lay the Sentinel V ADCP on its side on a soft pad.
4. Inspect the transducer bolts for any signs of damage such as bending, stretched bolts, crushed or deformed housing captive nuts, etc. These signs may indicate that there is internal pressure inside the system.
5. Using a 4mm hex key, loosen each of the M5 captured bolts (counterclockwise) until the O-ring seal is released.
6. **Allow the system the opportunity to vent while the bolts are loose.**



To avoid any possible injury ALWAYS loosen the four end-cap bolts to allow any internal pressure to be vented from the system.

7. Once any possible over-pressure has been released, completely loosen the four M5 retaining bolts.



The transducer hardware will stay attached to the transducer assembly.

8. With an ESD ground-strap on, carefully lift the transducer assembly straight up and away from the housing until the internal I/O cable connector jack is accessible.



Only lift the transducer assembly enough so it can be disconnected the internal I/O cable. **There is no lanyard on the transducer side to protect the internal cable from being damaged.**

9. Gently pull the internal I/O cable connector to release it from the jack. Set the transducer head assembly (transducer face down) on a soft pad.

Reassembling the Sentinel V

To replace the end-cap or transducer head, proceed as follows. Use the [Parts Location Drawings](#) for parts identification.

Replacing the End-Cap

To replace the end-cap:

1. Stand the Sentinel V ADCP on its transducer face on a soft pad.
2. Clean the mating surfaces of the end-cap and housing with a lint-free cloth.
3. Inspect, clean and lubricate the O-ring on the housing (see [Replacing the O-ring](#)). Ensure that the O-ring is firmly pressed into the groove.



TRDI recommends using a new end-cap O-ring each time the ADCP is opened.

4. Replace the desiccant (see [Replacing the Desiccant](#)).
5. Check the internal I/O connectors are connected.
6. Place the end-cap on the housing, aligning the mating holes and the alignment mark embossed on the end-cap with the alignment mark embossed on the housing. When mating the end-cap with the housing flange, try to apply equal pressure to all parts of the O-rings. Make sure the O-ring remains in its retaining groove. As the end-cap is placed on the housing, check the cables are coiled around the inside of the housing and do not become pinched.



Check that no wires or any other object is pinched between the end-cap and the housing. **If the O-ring is not properly installed or if a wire or other object is pinched, the Sentinel V ADCP will flood.**

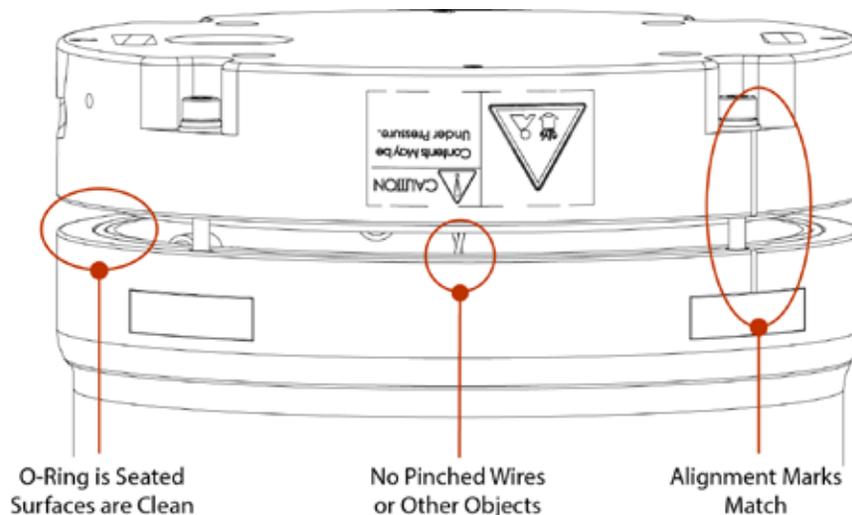


Figure 39. Replacing the End-Cap



If the Sentinel V ADCP uses an internal battery pack, the rubber bumpers on the end-cap hold the battery in place. Apply a bit of pressure to the end-cap to fully seat it as the end-cap hardware is tightened.

7. Check the housing captive nuts are not stripped or worn. Replace as necessary (see [Replacing the Captive nuts](#)). Captive nuts snap into place with the small bump facing the housing.

- Examine the end-cap assembly bolts and washers for corrosion; replace if necessary.

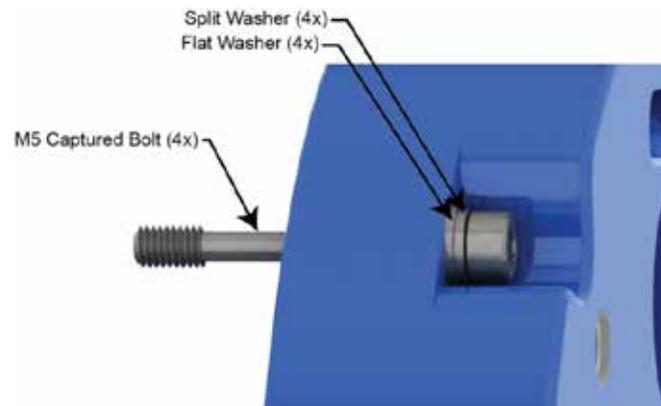


Figure 40. End-Cap Mounting Hardware

- Install all four sets of hardware until “finger-tight.”
- Tighten the bolts in small increments in a “cross” pattern until the split washer begins to flatten out and then use a torque wrench to tighten the bolts to the recommended torque value of 1.7 Nm (15 Pound-Force Inch).



Apply equal pressure to the O-ring as the bolts are tightened. If one bolt is tightened more than the others, the O-ring can become pinched or torn. A damaged O-ring will cause the system to flood.

Do not over tighten the bolts that hold the transducer, housing and end cap together. If the bolts are over-tightened, the plastic housing can crack or break. On the other hand, leaving the bolts too loose can cause the system to flood. Tighten the hardware to 1.7 Nm (15 Pound-Force Inch).

Replacing the Transducer Head Assembly

To replace the transducer head assembly:

- Stand the Sentinel V ADCP on its end-cap on a soft pad.
- Inspect, clean and lubricate the O-ring on the housing (see [Replacing the O-ring](#)). Ensure that the O-ring is firmly pressed into the groove.



TRDI recommends using a new transducer head O-ring whenever the ADCP is opened.

- Replace the desiccant (see [Replacing the Desiccant](#)). Ensure that the desiccant will not press on the electronics.
- Reconnect the internal I/O connector.
- Gently lower the transducer head/electronics assembly into the housing, aligning the mating holes and the alignment mark embossed on the transducer with the alignment mark embossed on the housing. When mating the housing with the transducer head flange try to apply equal pressure to all parts of the O-ring. Make sure the face O-ring remains in the retaining groove.



Check that no wires or any other object is pinched between the transducer head and the housing. If the O-ring is not in the groove or if a wire or other object is pinched, the Sentinel V ADCP will flood.

6. Examine the transducer head assembly bolts and washers for corrosion; replace if necessary.
7. Check the housing captive nuts are not stripped or worn. Replace as necessary (see [Replacing the Captive nuts](#)). Captive nuts snap into place with the small bump facing the housing.
8. Tighten all four sets of hardware until “finger tight.”
9. Tighten the bolts in small increments in a “cross” pattern until the split washer begins to flatten out and then use a torque wrench to tighten the bolts to the recommended torque value of 1.7 Nm (15 Pound-Force Inch).



Apply equal pressure to the O-ring as the bolts are tightened. If one bolt is tightened more than the others, the O-ring can become pinched or torn. A damaged O-ring will cause the system to flood.

Do not over tighten the bolts that hold the transducer, housing and end cap together. If the bolts are over-tightened, the plastic housing can crack or break. On the other hand, leaving the bolts too loose can cause the system to flood. Tighten the hardware to 1.7 Nm (15 Pound-Force Inch).

Replacing the Sentinel V Battery

One of the most often preformed maintenance tasks is battery replacement. The Sentinel V Series ADCP uses battery packs or individual D-cell batteries to provide power. The housing will be different lengths depending on the type of batteries used (see [Outline Installation Drawings](#) for dimensions and weights).

When the capacity of a battery pack is 50% used, the voltage falls to approximately 14 volts. However, keep in mind that this voltage is not an accurate predictor of remaining capacity. Batteries should be replaced when the voltage falls below 11 VDC.



Do not leave the battery pack inside the Sentinel V for extended periods. The battery may leak, causing damage to the electronics.

Sentinel V battery packs are shipped inside the system but not connected. Connect the battery and seal the Sentinel V before deployment.

Sentinel V with D-cells are shipped without batteries inside the system. Install the batteries and seal the Sentinel V before deployment.



Battery replacement induces both single and double cycle compass errors. The [compass should be aligned](#) after replacing the battery pack.

Replacing the Battery Pack

To replace the battery pack:

1. Remove the end-cap (see [Removing the End-Cap](#)).
2. Disconnect the black/red battery cable.
3. Place the ADCP on its end on a table/floor and lift the battery pack out of the housing by the battery handle. **Do not pull out the battery using the battery cable.**



Never pull on the black/red battery pack power cable to remove the battery pack. The cable will break and may cause the battery pack to short.

Do not drop the battery pack.



Use the battery handle to lift out the battery. Optionally, tip the ADCP on its side to slide the battery pack out.

4. Slide in the new battery pack. Make sure the I/O cable is not pinched by the battery pack.
5. Connect the battery cable.
6. Replace the desiccant (see [Replacing the Desiccant](#)).
7. Install the end-cap (see [End-cap Replacement](#)).
8. Use the [Maintenance](#) panel to set the date the battery was replaced.
9. Align the compass (see [Compass Calibration](#)).

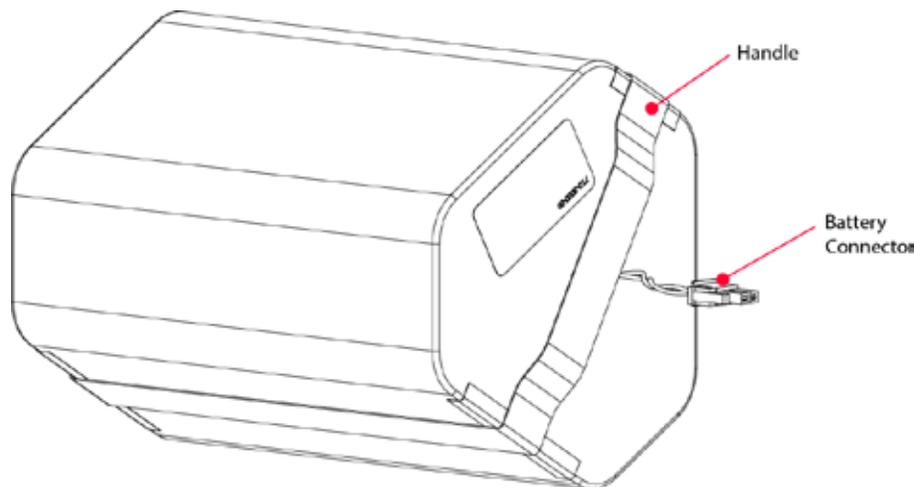


Figure 41. Battery Pack

Replacing Individual D-cell Batteries

The Sentinel V loose-battery housing uses 12 D-cell alkaline batteries.



Ensure that proper polarity is observed when installing batteries.

Do not mix old and new batteries.

Do not mix alkaline with non-alkaline batteries.

Do not use damaged batteries.

Do not mix batteries of different brands.

Do not use expired batteries.

Do not leave the batteries inside the Sentinel V for extended periods. The batteries may leak, causing damage to the electronics.

Store the batteries in a cool, dry location (0 to 21 degrees C).

To replace the D-cell batteries:

1. Remove the end-cap (see [Removing the End-Cap](#)).
2. Remove the battery cover plate by loosening the knob (rotate counterclockwise).
3. Slide out the used batteries.
4. Slide in the new batteries starting with the three batteries in the center with the negative side up. Next place the other three batteries with the negative side up. Place the last six batteries on the outer edges with the positive side up. See Figure 42 for battery orientation.

5. Ensure all batteries are fully seated by pushing them all the way down into the battery cavity.
6. Position the cover plate over the batteries.
7. Tighten the knob firmly to hold the batteries in place.
8. Replace the desiccant (see [Replacing the Desiccant](#)).
9. Install the end-cap (see [Replacing the End-cap](#)). As the end-cap is placed on the housing, check the cables lay flat and do not become pinched.



Check that no wires or any other object is pinched between the End-Cap and the housing. If the O-ring is not in the groove or if a wire or other object is pinched, the Sentinel V ADCP will flood.

10. Use the [Maintenance](#) panel to set the date the batteries were replaced.
11. Align the compass (see [Calibrating the Compass](#)).



Figure 42. D-cell Battery Replacement



Replace the three batteries in the center first to make it easier to maintain the proper spacing between batteries.

Replacing the External Battery Case Packs

To replace the external battery case battery packs:

1. Remove the end-cap (see [Removing the End-Cap](#)).
2. Disconnect the black/red battery cable on the top battery pack.
3. Tip the external battery case on its side to slide out both used battery packs and the rubber pad.
Do not pull out the batteries using the battery cables.



Never pull on the black/red battery pack power cable to remove the battery packs. The cable will break and may cause the battery pack to short.



Tip the external battery on its side to slide out the used battery packs.

4. Disconnect the black/red battery cable on the bottom battery pack.
5. Connect the battery cable to the bottom battery pack and slide it into the case. The battery pack cable of the bottom battery pack faces the bottom of the housing.
6. Slide in the rubber cushion on top of the bottom battery pack.
7. Slide in a second battery pack and connect the battery cable. Make sure the cable is not pinched by the battery pack.
8. Connect the battery cable to the end-cap connector.
9. Replace the desiccant (see [Replacing the Desiccant](#)).
10. Install the end-cap (see [End-cap Replacement](#)).
11. Use the [Maintenance](#) panel to set the date the battery was replaced.

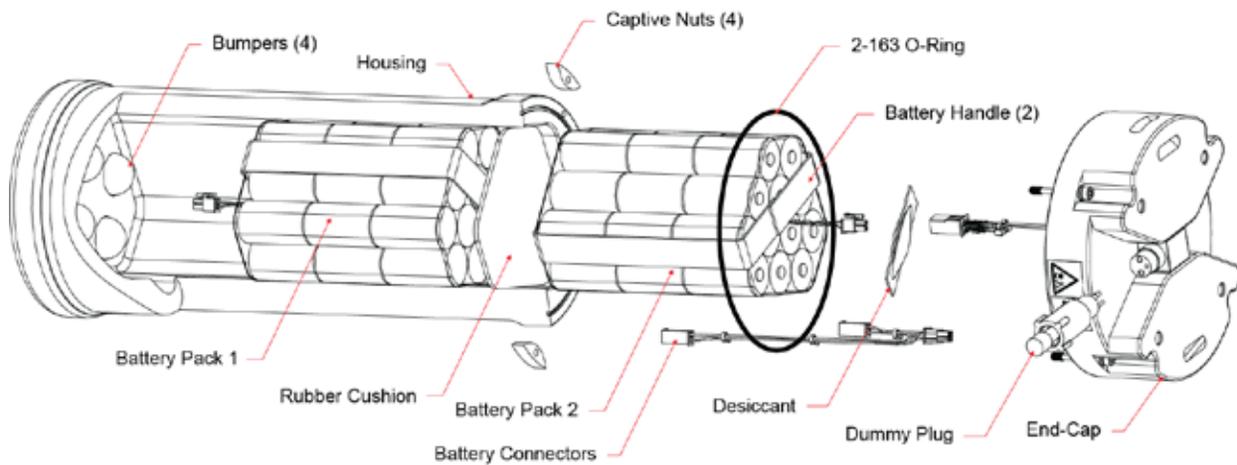


Figure 43. External Battery Case Exploded View

Calibrating the Compass

The compass calibration for the Sentinel V can be conceptualized as the Sentinel V inside a sphere with twelve equally spaced points located on the sphere. The twelve points are the data collected during the compass calibration to orient the compass in different positions relative to the earth's magnetic field. Each of the twelve calibration points has a large impact on defining the sphere correctly. The calibration score (Table 3) is a measure of how well the measured calibration points combine to represent a uniform and complete sphere.

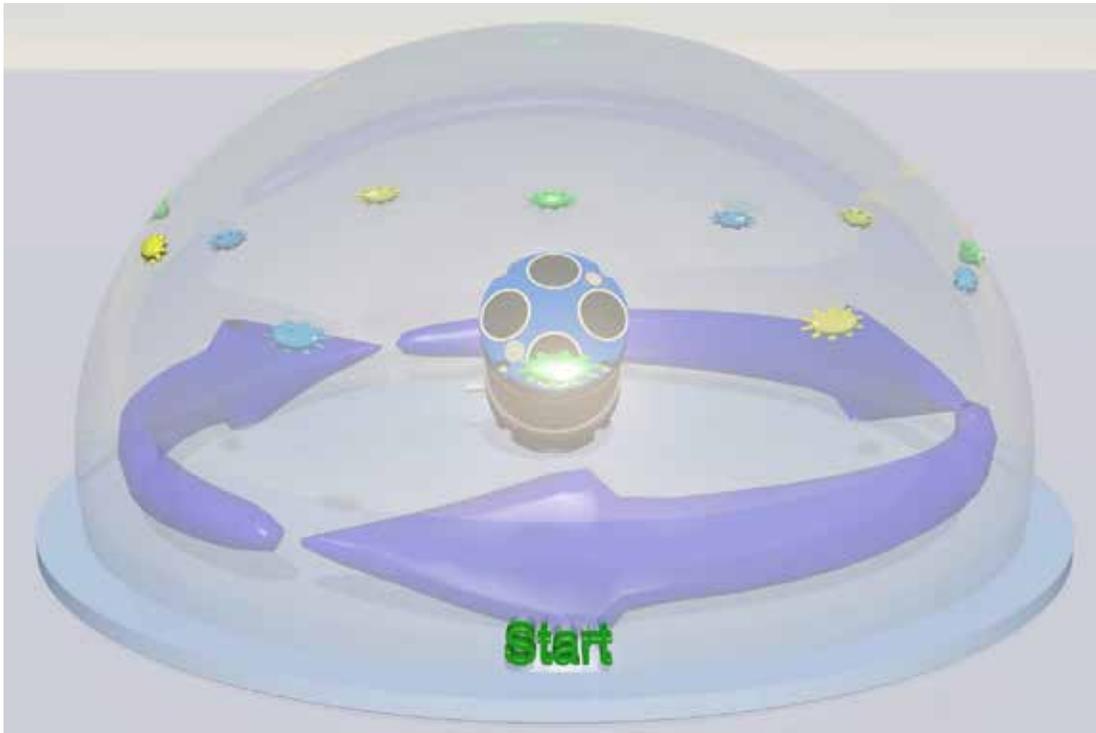


Figure 44. Calibrating the Compass

Be aware of the following items:

- The optimal angle of tilt during calibration is around 50 degrees. Less tilt during calibration is acceptable if the Sentinel V is not expected to be exposed to much tilt while deployed. This will be reflected in the z-coverage score.
- The Sentinel V cannot be adequately calibrated without tilting the system during the compass calibration. A single plane calibration is not advised.
- The precision of the tilt angle or heading during calibration are not critical. Tilts and headings can be off by 10 degrees or more for any step. “By hand” and “by eye” calibrations are possible (a calibration fixture is not required).
- The Sentinel V should be calibrated in the same orientation (beams-up/beams-down) as it will be deployed. Failure to do so will cause a 2 to 4 degrees RMS error on the compass reading which is outside of the specified heading accuracy for the Sentinel V.
- Calibration data points can be taken out-of-order if desired.
- The Sentinel V compass should be calibrated while mounted to the system or mounting structure whenever possible. The compass can negate hard and soft iron errors, but only if they are accounted for in the calibration.

- Results from the compass calibration are not stored inside the system or in any file.
- The Maintenance log will indicate that the compass calibration has been completed even if the compass calibration resulted in a failed condition.
- If the compass calibration results in a “fail” condition, ReadyV will automatically reject it and restore the factory calibration.
- The Sentinel V compass should be calibrated after all battery changes.
- Compass calibration should be performed free from ambient magnetic fields. Nearby steel, iron, magnets, and other magnetic fields will degrade the calibration and accuracy, and will provide a bad calibration score. The exception to this rule is if the system is purposely being calibrated while mounted to a structure or system, and that structure or system is being rotated / manipulated along with the Sentinel V during calibration.
- The Sentinel V checks for stability before it takes a calibration point. It should be held still in each position until the point is taken.
- Protect the Sentinel V surfaces from contact or abrasion during calibration.

To calibrate the compass:

1. Place the Sentinel V ADCP as far away from metal objects as possible. Use a soft pad to protect the ADCP during calibration.



Place the ADCP in the same orientation as it will be deployed.

2. [Connect](#) to the Sentinel V ADCP.
3. Use the [Maintenance panel](#) to start the compass calibration.



4. Orientate the ADCP so that beam 1 points at 0 degrees and tilt the ADCP approximately 30 degrees (beam 1 should be higher than beam 2) (see Figure 45). Click the **Take sample** button.
5. Rotate the ADCP to the positions as prompted, noting that these are not absolute heading directions, but rather relative headings referenced to the initial heading sample.



6. Once the calibration is complete the Sentinel V ADCP provides a calibration score that indicates the quality of the calibration (see Table 3). If the Calibration Score is 7 or lower, see [Troubleshooting a Bad Calibration Score](#) and start the compass calibration over.
7. Click the **Close** button to exit the compass calibration screen.

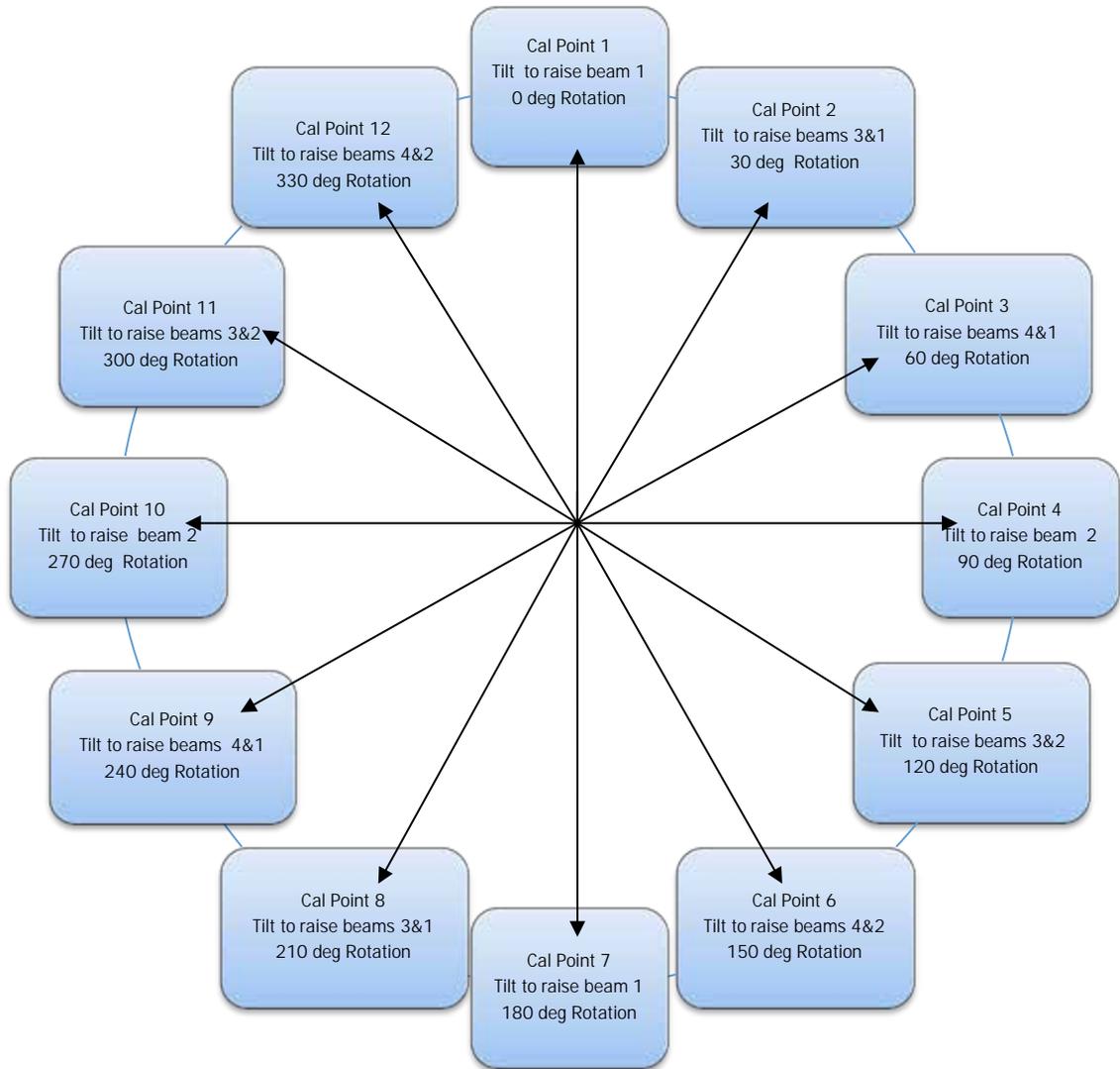


Figure 45. Standard Compass Calibration Overview

Optional Compass calibration:

The rotations and screen prompts do not have to be followed as long as twelve points are collected during the compass calibration to orient the compass in different positions relative to the earth's magnetic field.

1. Place the Sentinel V ADCP as far away from metal objects as possible. Use a soft pad to protect the ADCP during calibration.



Place the ADCP in the same orientation as it will be deployed.

2. [Connect](#) to the Sentinel V ADCP.
3. Use the [Maintenance panel](#) to start the compass calibration.



4. Start with beam 3 pointed toward any direction. This will be the reference direction for the calibration, called **Start** (see Figure 46).
5. Tilt the Sentinel V to raise beam 1, and click the **Take Sample** button to take the 1st calibration point. Afterward, set it flat again.



The compass calibration screen prompts and Figure 46 will not match.

6. Rotate the Sentinel V 90 degrees, then tilt the Sentinel V to raise beam 2. Take the 2nd calibration point. Return it to flat.
7. Continue the process of rotating 90 degrees and alternating tilts to raise beam 1 and 2 for the 3rd and 4th calibration points.
8. Return to the "Start" position and then rotate the Sentinel V 30 degrees clockwise.
9. Tilt the Sentinel V to raise BOTH beams 3 & 1. Take the 5th calibration point. Return to flat.
10. Rotate the Sentinel V 90 degrees and tilt the device to raise beams 3 & 2. Take the 6th calibration point.
11. Continue the process of rotating 90 degrees and alternating tilts to raise beams 3 & 1 and 3 & 2 for the 7th and 8th calibration points.
12. Return to "start" position, and then rotate the Sentinel V 60 degrees clockwise.
13. Tilt the Sentinel V to raise both beams 4 & 1. Take the 9th calibration point. Return to flat.
14. Rotate Sentinel V 90 degrees and tilt the device to raise beams 4 & 2. Take the 10th calibration point.
15. Continue the process of rotating 90 degrees and the alternating tilts to raise beams 4 & 1 and 4 & 2 for the 11th and 12th calibration points.
16. Once the calibration is complete the Sentinel V ADCP provides a calibration score that indicates the quality of the calibration (see Table 3). If the Calibration Score is 7 or lower, see [Troubleshooting a Bad Calibration Score](#) and start the compass calibration over.
17. Click the **Close** button to exit the compass calibration screen.

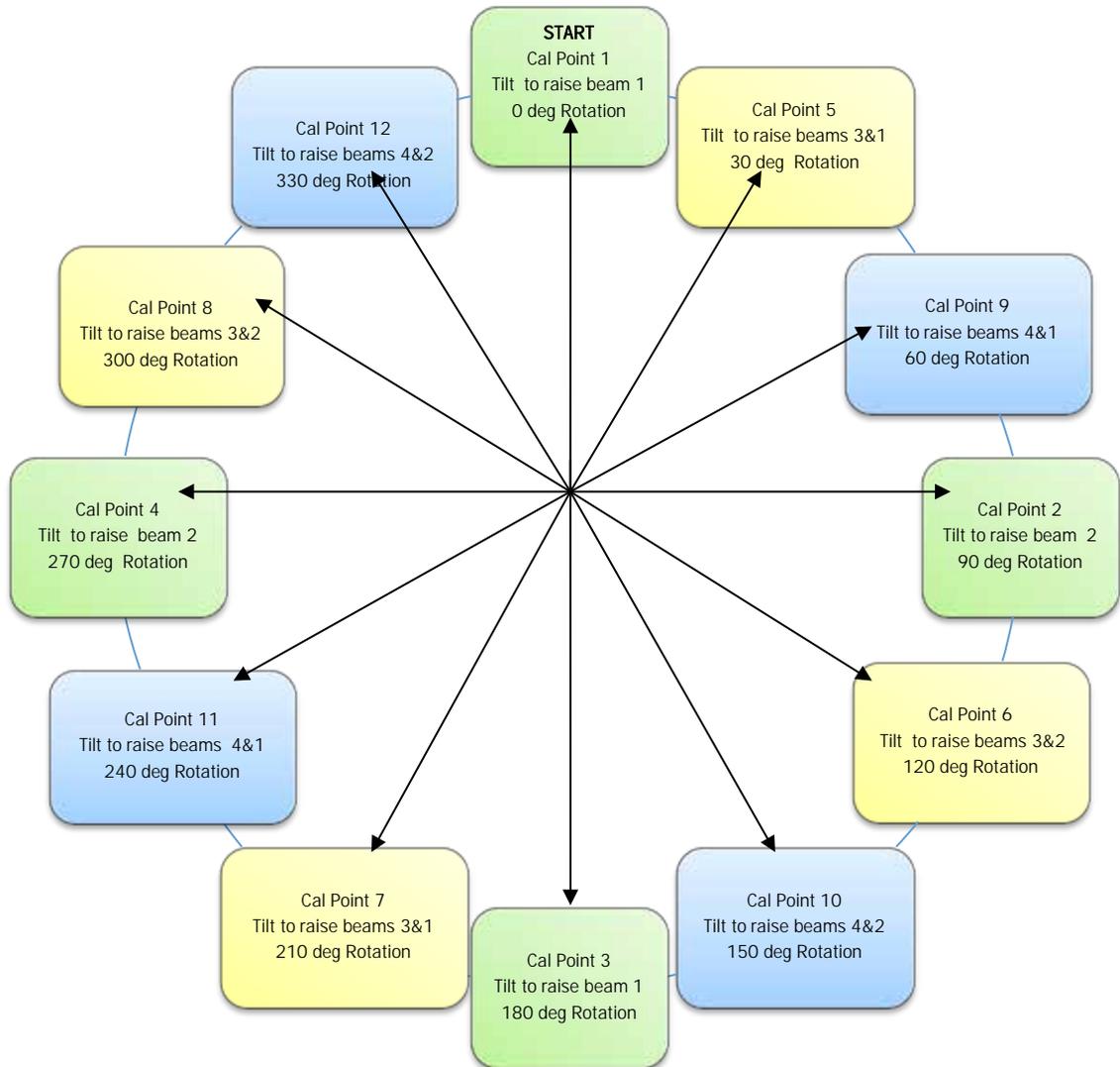


Figure 46. Optional Compass Calibration Overview



The same calibration points and rotations are used as the standard calibration, but the order is changed in the optional compass calibration method. The screen prompts will not match.



Table 3. Compass Calibration Score

Std Dev	SW Score	Messages	X-Y coverage	SW Score	Messages	Z coverage	SW Score	Message
0.01-0.03	10	Good field uniformity.	90-100	10	Good X-Y coverage.	>45	10	Good Z coverage. This is required for accuracy when the system is tilted
0.04-0.06	9		85-89	9		40-44	9	
0.07-0.09	8		80-84	8		35-39	8	
0.1-0.12	7	Moderate field uniformity. Accuracy may be outside of system specification.	75-79	7	Moderate X-Y coverage. Accuracy may be less uniform across full rotation and when tilted.	30-34	7	Moderate Z coverage. This will allow accuracy if used flat or at low tilt angles
0.13-0.15	6		70-74	6		25-30	6	
0.16-0.18	5	Poor field uniformity. Calibration should be repeated.	65-69	5	Poor X-Y coverage. Calibration should be repeated.	20-24	5	Poor Z coverage. The calibration should be repeated.
0.19-0.21	4		60-64	4		15-19	4	
0.22-0.24	3		55-59	3		10-14	3	
0.24-0.26	2		50-54	2		5-9	2	
> 0.26	1		<50	1		0-4	1	

Troubleshooting a Low Calibration Score

If the calibration score is low:

- If the **Standard Deviation** score is 7 or lower, make sure the area is clear of magnetic materials (steel, iron, magnets, changing magnetic fields). When in doubt, calibrate outside and away from metal, machines, and electronics.
- If the **X-Y coverage** score is 7 or lower, make sure the rotation directions and tilts are followed. A 30 to 50 degree tilt during calibration is desired. Over-tilting can also lower this score.
- If the **Z coverage** score is 7 or lower, it usually means the system was not being tilted enough during calibration (a score of 1 means the system was not tilted at all).

Restore to Factory Defaults

If the compass calibration fails after repeated attempts, use the **Restore to factory defaults** button. This will use the factory calibration of the compass module itself as it was shipped from the vendor, not a system level calibration at the time of manufacture at TRDI. This calibration will not take into consideration variables such as magnetic fields from batteries or mounting fixtures. The assumption is a factory calibration may be better than a failed field calibration result.

Periodic Maintenance

Periodic maintenance helps maintain the Sentinel V so it is ready for a deployment. Use the following table to order replacement parts.

Table 4: Sentinel V ADCP Spare Parts

Part No	Description	Where Used
2-163	O-Ring, EPDM, DURO 70	
5020	Silicone Lubricant, 4-Pack	See Replacing the O-ring
81D-6003-00	O-Ring Tool	
S-3905	Desiccant, Silica Gel, 5 GR, 1 1/16 X 2 3/4"	See Replacing the Desiccant
6958A14	Hex Key, 4mm, Long Arm	
81D-4002-00	Nut-Insert, Housing	See Disassembly and Assembly Procedures
81D-4003-00	Captured Bolt, Housing	
M3X0.5X8FHN	Screw, Flat Head, Nylon, Black	
75BK6004-00	Kit, Fill, Silicone Oil	See Filling the Pressure Sensor Cavity with Oil
71D-3000-00	Battery Pack, 18 VDC, 36 D-Cell	See Replacing the Battery Pack

Table 5: Sentinel V ADCP Repair Kits

Part No	Description	Where Used
75DK6001-00	Tools and Spares Kit	See Disassembly and Assembly Procedures
75DK6002-00	Battery Contact Replacement Kit	See Replacing the Battery Springs
75DK6003-00	Battery Separator Replacement Kit	See Replacing the Battery Separators

Replacing the O-Ring

TRDI strongly recommends replacing the O-ring whenever the Sentinel V ADCP is opened. Inspecting and replacing the O-ring should be done before sealing the ADCP.



There is no need to disconnect the end-cap cables or lanyard to replace the O-ring. The O-ring is large enough to stretch over the end-cap.

The O-ring sits in a dove-tail groove. This makes it less likely to fall out when the system is opened. Use the O-ring tool to pry it out of the groove. **Never use metal tools as this may damage the O-ring groove or the housing flange.**

The O-ring is size 2-163 for both transducer and end-cap.

To replace the O-ring:

1. Remove the end-cap or transducer head (see [Disassembly and Assembly Procedures](#)).
2. Insert the tip of the O-Ring tool on the inside edge of the groove and gently slide it around the groove perimeter to lift the O-Ring.

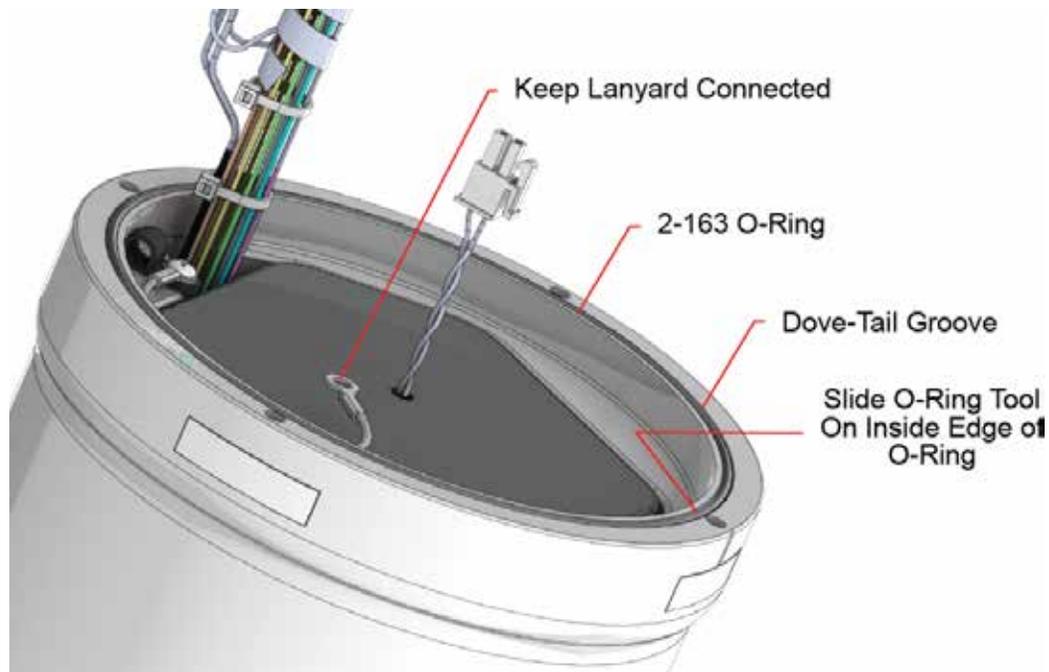


Figure 47. Using the O-Ring Removal Tool

3. Inspect the O-ring. When viewed with an unaided eye, the O-ring must be free of cuts, indentations, abrasions, foreign matter and flow marks. The O-ring must be smooth and uniform in appearance. Defects must be less than 0.1 mm (0.004 in.).



If the O-ring appears compressed from prior use, replace it. Weak or damaged O-rings will cause the Sentinel V ADCP to flood.

4. Clean and inspect the O-ring groove and the plastic housing flange. Also check the mating surface on the transducer and end-cap. Be sure they are free of foreign matter, scratches, indentations, and pitting.



Check the O-ring groove thoroughly. Any foreign matter in the O-ring groove will cause the Sentinel V ADCP to flood.

5. Lubricate the O-ring with a thin coat of silicone lubricant. Apply the lubricant using latex gloves. Do not let loose fibers or lint stick to the O-ring. Fibers can provide a leakage path. Slip the O-ring over the end-cap and press the O-ring into the groove.



Apply a very thin coat of silicone lube on the O-ring. Using too much silicone lube on the O-ring can be more harmful than using no O-ring lube at all.

6. Use the [Maintenance](#) panel to set the date the O-ring was replaced.

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. This fluid is supplied with the Sentinel V ADCP 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.

To fill the pressure sensor with oil:

1. Place the Sentinel V ADCP on its end-cap. Use a soft pad to protect the ADCP.
2. Use a straight-slot screwdriver to remove the three flat-head black nylon M3 screws on the pressure sensor and then lift off the pressure sensor cover.
3. Fill the pressure port cavity to the top with the oil. A plastic bottle with silicone oil (part number 75BK6004-00) is included in the spare parts kit.



Have an absorbent paper towel on hand to clean up any overflow that may occur.

4. Gently clean out the holes in the pressure sensor cover with a needle. If the holes become enlarged or the cover is corroded, replace the cover. The cover part number is 81D-4000-00.
5. Install the cover slowly, allowing time for the oil to pass through the holes. Tighten the screws "finger tight" 0.2 Nm (1.8 Pound-Force Inch). Do not over tighten as the threads on the plastic screws may strip. If this happens, replace the screw (spare flat-head black nylon M3 screws are included in the spare parts kit).



Use extreme caution to not touch or put any pressure on the face of the pressure sensor. The sensor face contains a sensitive membrane that can be easily damaged. If the membrane is damaged the pressure sensor will fail.

6. Use the [Maintenance](#) panel to set the date the oil was filled.



The Pressure sensor cavity should be checked and if needed refilled between deployments.

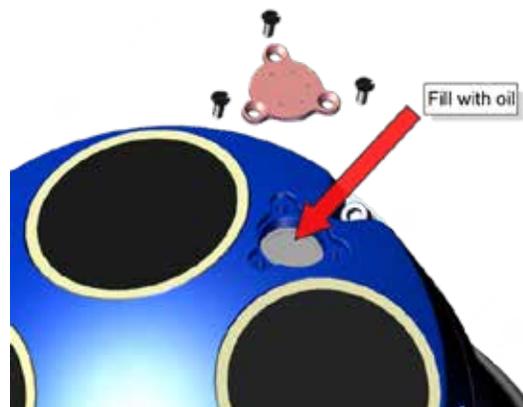


Figure 48. Filling the Pressure Sensor Cavity with Oil

Zero the Pressure Sensor

Use the Maintenance panel to zero out the pressure sensor at the deployment site. This must be done prior to deploying the Sentinel V ADCP in the water.

1. [Connect](#) and apply power to the system.
2. On the [Maintenance](#) panel, click **Pressure sensor**. This will zero it.
3. Click the **Close** button. The date and time the pressure sensor was zeroed will be updated.

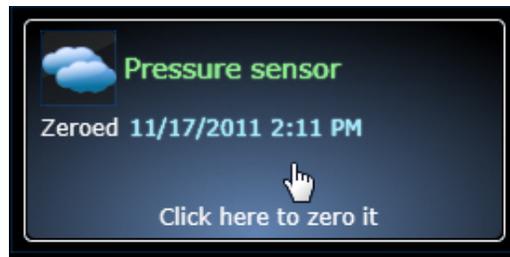


Figure 49. Zero the Pressure Sensor



Cleaning the Thermistor Cover

In order to respond quickly to changes in the water temperature, water must be able to flow over the sensor. Do not block the thermistor cover or paint over it with antifouling paint. Remove any biofouling as soon as possible.



The thermistor is embedded in the transducer head. The sensor is under a stainless steel cover that is highly resistant to corrosion.



Figure 50. Thermistor and Pressure Sensor

Replacing the Desiccant

Desiccant is used to dehumidify the housing interior. Desiccant is essential in deployments with plastic housings. The factory-supplied desiccant lasts a year at specified Sentinel V ADCP deployment depths and temperatures. Remember that desiccant rapidly absorbs moisture from normal room air. As a minimum, replace the desiccant whenever the ADCP housing is opened.



Do not open the desiccant bag. Contact with the silica gel can cause nose, throat and skin irritation.

Do not puncture or tear the desiccant bag. Do not use desiccant bags that are torn or open.



Desiccant bags are shipped in an airtight aluminum bag to ensure maximum effectiveness. There is a moisture indicator inside the bag. If the moisture indicator is pink, do not use the desiccant bag until it has been dried. TRDI recommends replacing the desiccant bag just before the deployment.

The Sentinel V ADCP housing has separate cavities for the battery and electronics. If the end-cap is removed, only replace the end-cap desiccant.

To replace the end-cap side desiccant:

1. Remove the end-cap (see [End-Cap Removal Procedures](#)).
2. Remove the new desiccant bag from the airtight aluminum bag.
3. Remove the old desiccant bag and install a new one. Place the desiccant bag between the battery pack or D-Cell batteries cover plate and the end-cap as shown in Figure 35 and Figure 36. Ensure that the desiccant will not interfere with other components when the instrument is closed.
4. Install the end-cap (see [End-cap Replacement](#)).
5. Use the [Maintenance](#) panel to set the date the desiccant was replaced.



Normal maintenance does not require removing the transducer head. If the transducer assembly is removed, replace both the desiccant and O-ring.

To replace the transducer side desiccant:

1. Remove the transducer head (see [Transducer Head Assembly Removal](#)).
2. Remove the new desiccant bag from the airtight aluminum bag.
3. Remove the old desiccant bag and install a new one. Place the desiccant bag inside the housing cavity as shown in Figure 35 and Figure 36. Ensure that the desiccant will not interfere with other components when the instrument is closed.
4. Install the transducer head (see [Transducer Head Assembly Replacement](#)).
5. Use the [Maintenance](#) panel to set the date the desiccant was replaced.

Replacing the Captive Nuts

To replace a captive nut:

1. Press one end of the captive nut to cause the other end to lift slightly out of the housing.
2. Gently pry out the captive nut using a sharp-edged plastic tool (recommended) or a flat thin screw driver.
3. Inspect the threads and make sure that these are not stripped or worn. If so, replace the captive nut.
4. Captive nuts snap into place with the plastic lip facing the housing.
5. Apply pressure on either ends of the captive nut as necessary to make it flush with the housing.

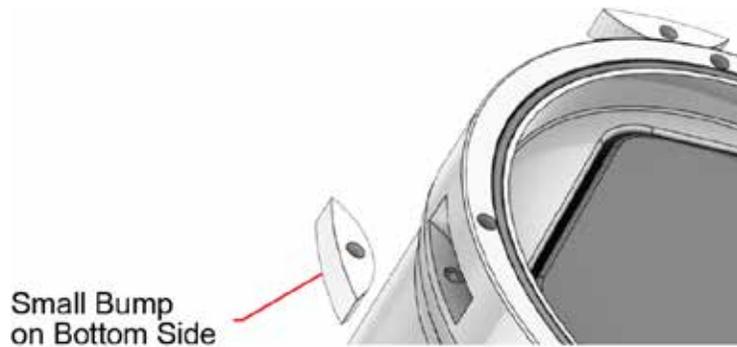


Figure 51. Replacing the Captive Nuts

Replacing the Battery Springs

Replace the individual D-cell battery springs when they break or become corroded. Order the battery spring replacement kit part number 75DK6002-00.



TRDI recommends replacing these springs every five years or whenever visible signs of wear or corrosion appear.

To replace the battery springs:

1. Remove the batteries.
2. Using a Phillips screwdriver, remove the screw holding the spring in place.
3. Install the new springs.
4. Replace the batteries.
5. Use the [Maintenance](#) panel to set the date the springs were replaced.

Replacing the Battery Separators

Replace the individual D-cell battery separator when they break or become worn. Order the battery separator replacement kit part number 75DK6003-00.

To replace the battery separators:

1. Remove the batteries.
2. Remove the separator by turning it counter-clockwise.
3. Install the new separator.
4. Replace the batteries.

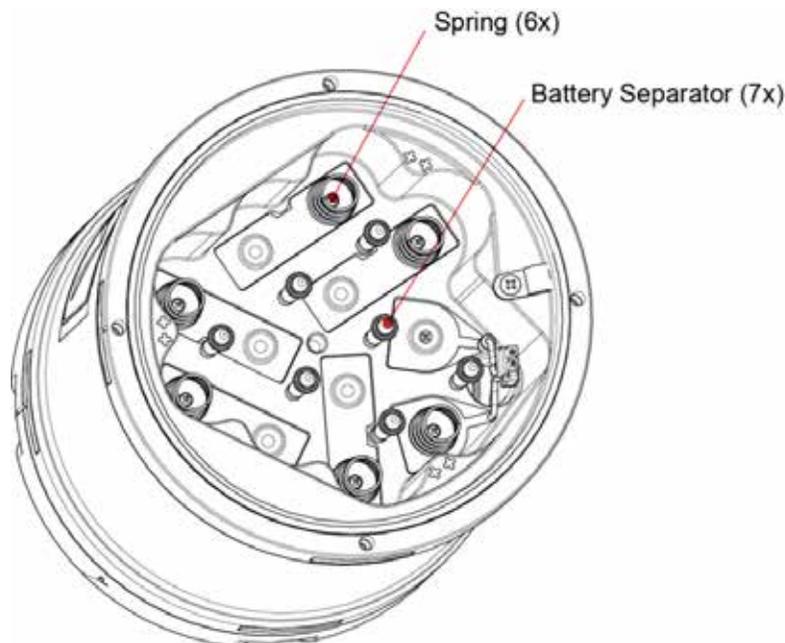


Figure 52. Individual D-cell Battery Compartment

Installing Firmware Upgrades

To install a firmware upgrade:

1. Download the firmware from [TRDI's website](#) customer care page. Save the file to the computer and unzip the file. The file will be *.svxxxx.bin format where xxxx = firmware version.

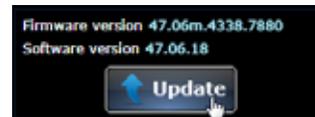


Use a local drive or network drive that is always accessible when exporting and importing *.plan files. ReadyV will "remember" the last drive used and if it is not available, may appear to hang.

2. [Connect](#) to the Sentinel V ADCP.
3. On the [Maintenance](#) panel, select **Update firmware**. The firmware can also be updated by clicking on the **Update** button on the [System](#) panel.



Maintenance Panel



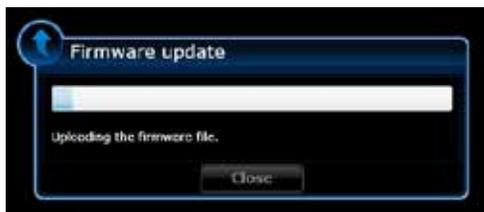
System Panel

Figure 53. Updating the Firmware

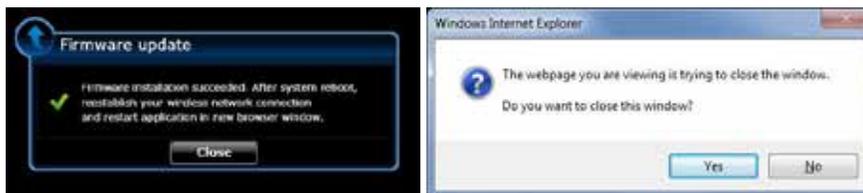
4. Locate the firmware file *.svxxxx.bin file downloaded in step 1. Select the file and click **Open**.



5. The firmware will install.



6. Once the firmware update is complete, the ADCP will reboot. Click **Close** and then close the browser and [reconnect the wireless connection](#) to connect to the ADCP.



7. If the new firmware does not install, [contact Customer Service](#).

Preventing Biofouling

This section explains how to prevent the buildup of organic sea life (biofouling) on the transducer faces. Objects deployed within about 100 meters (»328 feet) of the surface are subject to biofouling, especially in warm, shallow water. Soft-bodied organisms usually cause no problems, but barnacles can cut through the urethane transducer face causing failure to the transducer and leakage into the Sentinel V ADCP.

The best-known way to control biofouling is cleaning the Sentinel V ADCP transducer faces often. However, in many cases this is not possible. In that case, coat the entire Sentinel V ADCP with the recommended antifouling paint. Make sure that the paint is applied in an even coat over the transducer faces.



As originally manufactured, the transducer faces have a smooth surface which makes it inhospitable for most biofouling to develop. Preserving this smooth surface is an effective way to prevent heavy bio-growth on the transducer faces. However, if an antifouling coating is desired on the transducer faces, then the faces must be lightly abraded to allow for the antifouling coating to adhere. **As a rule, the surface must be kept smooth unless an antifouling coating will be applied.**

Most EPA approved anti-fouling paint can be used on the housing and the urethane transducer faces. Contact the antifouling paint manufacturer for preparation and application procedures for this and other antifoulant paints. Interlux is one source of antifouling paint. Contacting this company is done with the knowledge that Teledyne RD Instruments is not recommending them, but only offering this as a source for the anti-fouling paint.

Manufacturer	Contact
Courtalds Finishes	Telephone: +1 (800) 468-7589
Interlux brand paints	Web Page : http://www.yachtpaint.com/usa/

The following tips are only general recommendations. Always follow the anti-fouling paint manufacturer's instructions on how to apply the anti-fouling paint.

1. Transducer Face Surface Preparation - Lightly abrade the surface using Scotch Brite® to remove gloss. Thoroughly clean the areas to be painted with soapy water and dry before applying the anti-fouling paint.
2. Mask as necessary. Do not paint over mounting hardware, thermistor, and pressure sensor.
3. If applying a second coat, allow the first coat to dry. One coat usually lasts one season (3-4 months); two coats might last one year.
4. Be extra careful to apply a smooth, thin coat of paint to the urethane faces.
5. Apply one or two coats of anti-fouling paint at 4-mil per coat.



Do not block the pressure sensor port. The sensor port has several small holes in the center of the copper disk. During anti-fouling paint application, tape-off the copper disk. Once the anti-fouling paint has cured, remove the tape.

This means that the sensor port is not fully protected and fouling may build up on the copper disk and eventually clog the sensor port. However, the sensor port is surrounded by the antifouling paint and most organisms do not seem to find the copper surface attractive. If it is logistically possible to periodically inspect/clean the pressure sensor, it is highly recommended. This tradeoff situation must be analyzed for individual deployments. Unfortunately, the location of the deployment site usually dictates action in this regard.

Removing Biofouling

To remove foreign matter and biofouling:

1. Remove soft-bodied marine growth or foreign matter with soapy water. Waterless hand cleaners remove most petroleum-based fouling.



Do not use power scrubbers, abrasive cleansers, scouring pads, high-pressure marine cleaning systems or brushes stiffer than hand cleaning brushes on the transducer faces. The urethane coating on the transducer faces could be damaged.

If there is heavy fouling or marine growth, the transducer faces may need a thorough cleaning to restore acoustic performance. Barnacles do not usually affect Sentinel V ADCP operation, but TRDI does recommend removal of the barnacles to prevent water leakage through the transducer face. Lime dissolving liquids such as Lime-Away® break down the shell-like parts. Scrubbing with a medium stiffness brush usually removes the soft-bodied parts. Do NOT use a brush stiffer than a hand cleaning brush. Scrubbing, alternated with soaking in Lime-Away®, effectively removes large barnacles.



If barnacles have entered more than 1.0 to 1.5 mm (0.06 in.) into the transducer face urethane, the Sentinel V ADCP should be sent to TRDI for repair. If barnacles cannot be removed without damaging the transducer faces, contact TRDI.

2. Thoroughly clean out any biofouling from the Touch sensor.
3. Rinse with fresh water to remove soap or Lime-Away® residue.
4. Dry the transducer faces with low-pressure compressed air or soft lint-free towels.



Always dry the Sentinel V ADCP before placing it in the storage case to avoid fungus or mold growth. Do not store the ADCP in wet or damp locations.

Notice how most organisms did not seem to find the copper surface of the Pressure Sensor attractive.



Figure 54. Biofouling on a Sentinel V ADCP

NOTE

Chapter 6

TROUBLESHOOTING



In this chapter, you will learn:

- How to troubleshoot communications problems
- How to troubleshoot a built-in test failure
- How to troubleshoot a data problem
- How to troubleshoot ReadyV problems

Troubleshooting Communication Issues

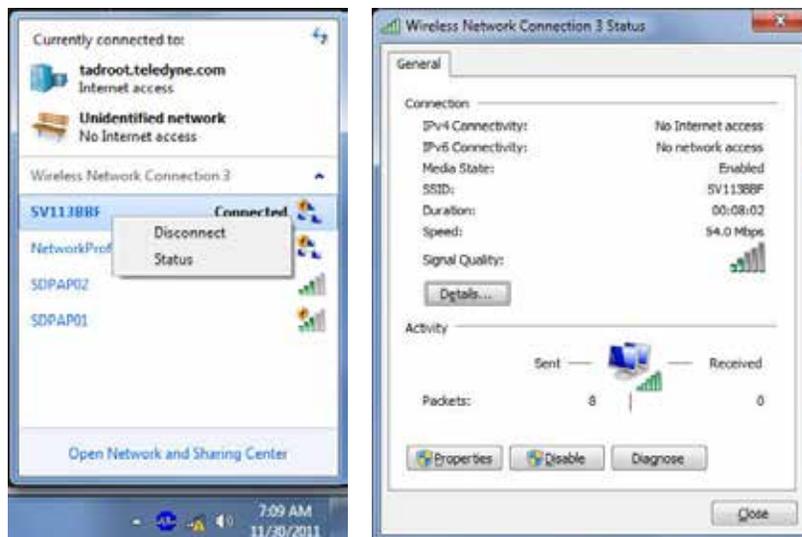
If there is a communications issue or no beeps are heard when power is applied:

- Open the ADCP to check that the internal end-cap cable(s) and battery connector are connected correctly.
- While the end-cap is opened and cables connected, place a finger over the wireless sensor. The LED on the touch sensor board should light.
- Check the Sentinel V battery pack voltage is above 11 VDC.
- Ensure that the Sentinel V battery housing is clean and dry.
- Replace the Sentinel V D-cell [battery springs](#) if their integrity is suspect.
- For systems using the optional External Battery Case, check the I/O cable female connector and the ADCP male connector for bent pins, dirt, or foreign objects. Verify power is reaching the ADCP on the cable connector (see [Cable Wiring Diagrams](#)).

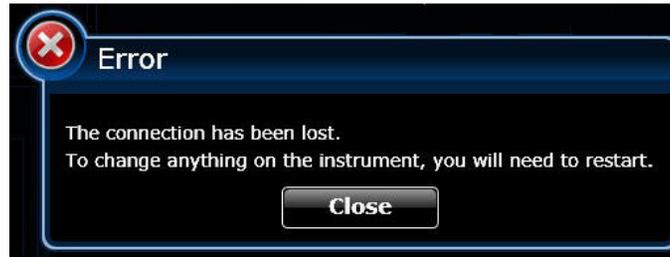
Troubleshooting Wireless Issues

If there is a communications issue and the beeps are heard when power is applied:

- Review the [Wireless Connection Common Issues](#) section.
- Check if a red X or yellow triangle () appears over the wireless network icon in the status bar, the computer reports there is no wireless connection, or a message appears saying there are no wireless networks available. If any of these conditions apply, click the wireless icon and right-click on the connection and select **Connect**.
- Try to disconnect the ADCP by clicking the wireless icon in the status bar and right-clicking on the connection. Select **Disconnect**, and then reconnect.
- Make sure the ADCP is within the wireless range of the computer (typically within 100 feet). Try moving the ADCP closer to the computer. If there is a wall between the ADCP and the computer, try placing the ADCP and computer in the same room. Click the wireless icon in the status bar and check the signal strength by right-clicking on the connection and selecting **Status**.



- Make sure there are no other devices interfering with the ADCP, such as microwave ovens, cordless phones, or other wireless devices.
- If the computer uses an external wireless adapter, make sure the adapter is working correctly and is attached and installed properly.
- If wireless capability is integrated into the computer, make sure the wireless transmitter is turned on. This might also turn the wireless network receiver on and off. Many laptops have an external switch for turning the transmitter on and off. If you aren't sure how to turn it on, check the information that came with the computer or go to the manufacturer's website.
- Try restarting or refreshing the browser if there is a message that the connection has been lost. If no keys have been pressed for five minutes, the ADCP will disconnect.



- If the [firmware](#) was just updated, the browser must be closed and [set up the wireless network](#) again.
- If the ADCP does not appear on the list of wireless networks available to connect to, make sure the ADCP has not timed out. The network is available after power up for two minutes. Placing a finger over the Touch sensor starts the network again for two minutes. Click on the **Refresh** icon (↻) or use the wireless adapter's interface to search for connections. Once connected, the network will remain on.
- Once connected, if no keys are pressed for five minutes, the ADCP will disconnect. After waiting two more minutes, the ADCP will power down. Use the Touch sensor to restart.
- Use the [Maintenance](#) panel and save the system log, fault log, and app log. Send the files to TRDI field service. This may aid in TRDI engineers in troubleshooting the instrument.



Use a local drive or network drive that is always accessible when exporting and importing *.plan files. ReadyV will "remember" the last drive used and if it is not available, may appear to hang.

Troubleshooting a Built-In Test Failure

The built-in tests check the major Sentinel V modules and signal paths. If a built-in test fails, use the following steps to provide the needed information to the Teledyne RDI Field Service group to help reduce the investigation process (see [How to Contact Teledyne RD Instruments](#)).

Repeat the failing test several times rotating the ADCP by 90 degrees each time. By doing so, it may be determined that the failure is directional. If other magnetic, acoustic, or high current systems are in the vicinity of the ADCP, if possible, please power down the equipment and or remove the equipment (at least three meters away) during diagnostic testing; re-run the tests. Use the [Maintenance](#) page and save a copy of the log files.

Troubleshooting Data Problems

This section contains the different tasks that should be performed on the site where experiencing data quality issue(s).

1. Provide a copy of the deployment file (*.plan).
2. Provide a description of the environment where the ADCP is deploying; in particular, details on water description (for instance: highly concentrated in sediment waters). Additionally, provide a description of the intended deployment. Please provide details on environment commands, range expected, standard deviation expected, and goal of the mission.
3. Recover the raw data from the instrument and send the complete deployment data together with a description of the issue, and if possible some screenshots or ensemble numbers to locate region(s) showing the unexpected data behavior. As previously mentioned in Troubleshooting a Built-In Test Failure, if other devices are in the vicinity of the ADCP and are suspected to be the origin of the data quality issue, if possible power the device down or remove it from the area (at least three meters) and re-deploy.

Troubleshooting ReadyV Issues

This section contains tasks that should be performed where experiencing issues with ReadyV.

Screen is Partially Cut Off

If the Zoom level on the browser is set higher than 100%, the right side of the ReadyV screen may be partially cut off.

To change the zoom level in Internet Explorer®, click **Tools, Zoom**. Set the zoom level so that the entire ReadyV screen is visible. Use **Ctrl+** to increase zoom, **Ctrl-** to decrease the zoom level. If the mouse has a scroll wheel, use Ctrl+mouse wheel to adjust the zoom level. Use **Ctrl0** (zero) to return to 100% zoom.

Can Not Download Data

When the **Download** button is clicked on the [Data Recorder](#) Panel, the message box to choose where to save the data file does not display. The Status bar at the bottom of the ReadyV screen may show **Internet** when using Windows XP® and Internet Explorer 8®. It should be **Local intranet** for both Internet Explorer 8® and Internet Explorer 9® with Windows 7®.

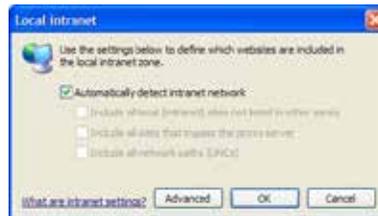


To change to a Local intranet:

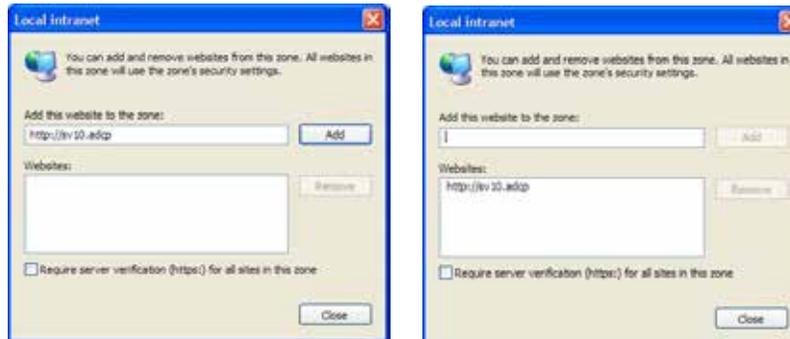
1. On Internet Explorer®, click **Tools, Internet Options**.
2. Select the **Security** tab. Select **Local intranet**.



3. Click on the **Sites** button.



4. Make sure the **Automatically detect intranet network** box is checked. Click the **Advanced** button.



5. The ADCP's address should be in the **Add this website to the zone** box. Click the **Add** button to move it to the **Websites** area. Click **Close**.
6. Close the Internet Options dialog. Data should now download.

Using an Ethernet Connection

This is meant to be a work-around for applications that require a board-level Ethernet connection with a Sentinel V ADCP, or do not allow wireless or touch sensor operation.



Normal maintenance does not require removing the transducer head. Use the following procedures only if directed to do so by TRDI Field Service personnel.

Sentinel V ADCPs contain Electro Static Sensitive Devices. Take accepted ESD prevention measures **before** opening the transducer head.

If the transducer assembly is removed, replace both the desiccant and O-ring.

Never remove the digital recorder SD Card. The digital recorder is located on the top circuit board. To recover data, the SD card should be left in the ADCP and accessed using ReadyV.

Open the Transducer

To open the transducer:

1. Follow the directions in [Removing the Transducer Head Assembly](#). Follow all guidelines and warnings about ESD protection and safety.
2. Lay the transducer on a soft pad in a beams-down orientation.
3. Position the housing in a way so that the internal cable (power and I/O) can reach the cable jack on the top board. Make sure to secure the housing so that it doesn't roll.

Connecting to the ADCP

To connect to the ADCP via Ethernet:

1. Use an Ethernet cable (CAT 5) to connect to the RJ45 jack on the top board (shown in Figure 55 below). Connect the other end of the cable either directly to a computer or to a router network.



Figure 55. Ethernet Connection



Figure 56. Power I/O Cable Connection

2. Connect the internal power I/O cable to the jack on the top board (see Figure 56). After power is applied (long beep), there is a 10 to 15 second delay before the network is available (short beep). The LAN is available after power for two minutes.



Step 3 must be completed in two minutes to connect to the ADCP. After two minutes, the ADCP's LAN will turn off. In the event that the ADCP's LAN turns off before the connection is complete, simply start from step 2 again.

3. Open a browser on the laptop (*Internet Explorer*[®], *Firefox*[®], *Google Chrome*[®], or other browser).
 - If you have a direct Ethernet connection to the ADCP (laptop to ADCP) enter the ADCP's IP address **192.168.0.2** into the address bar or enter **http://SVnnnnn.adcp** (where *nnnnn* is the five or six character Sentinel V serial number shown on the product label).
 - If you are connected to the ADCP through a network, enter **SVnnnnn** only (do not include the ".adcp" portion). Note that the IP address 192.168.0.2 may not work as IP addresses may be assigned by the network.



The address is not case sensitive - enter *SVnnnnn* or *svnnnnn*.

4. The ReadyV Home panel opens. It can take up to 30 seconds for the Home panel to display. Ready V functions and features are the same using this method of connection. See [Chapter 2 – Using ReadyV](#).

Replacing the Transducer Head Assembly

To replace the transducer head:

1. Remove the Ethernet cable.
2. Replace the transducer side O-ring and desiccant.



Ensure that the desiccant will not press on the electronics.

3. Follow the directions in [Replacing the Transducer Head Assembly](#).

NOTES

Chapter 7

RETURNING SYSTEMS TO TRDI FOR SERVICE



In this chapter, you will learn:

- How to pack and ship the ADCP
- How to get a RMA number
- Where to send your ADCP for repair

Shipping the ADCP

This section explains how to ship the Sentinel V ADCP.



Remove all customer-applied coatings or provide certification that the coating is nontoxic if a Sentinel V ADCP is shipped to TRDI for repair or upgrade. This certification must include the name of a contact person who is knowledgeable about the coating, the name, manufacturer of the coating and the appropriate telephone numbers. If the equipment is returned without meeting these conditions, TRDI has instructed our employees not to handle the equipment and to leave it in the original shipping container pending certification. If certification cannot be provided, TRDI will return the equipment or send it to a customer-specified cleaning facility. All costs associated with customer-applied coatings will be at the customer's expense.

When shipping the Sentinel V ADCP through a Customs facility, be sure to place the unit so identifying labels are not covered and can be seen easily by the Customs Inspector. Failure to do so could delay transit time.



TRDI strongly recommends using the original shipping crate whenever transporting the Sentinel V ADCP.

Use the original shipping crate whenever possible. If the original packaging material is unavailable or un-serviceable, additional material is available through TRDI.

For repackaging with commercially available materials:

1. Use a strong shipping container made out of wood or plastic.
2. Install a layer of shock-absorbing static-shielding material, 70-mm to 100-mm thick, around all sides of the instrument to firmly cushion and prevent movement inside the container.
3. Seal the shipping container securely.
4. Mark the container FRAGILE to ensure careful handling.
5. In any correspondence, refer to the Sentinel V ADCP by model and serial number.

Returning Systems to the TRDI Factory

When shipping the system to TRDI from either inside or outside the United States, the following instructions will help ensure the Sentinel V ADCP arrives with the minimum possible delay. Any deviation from these instructions increases the potential for delay.

Step 1 - Request a Return Material Authorization

To obtain a Return Material Authorization (RMA) number and shipping instructions for the return of the instrument, do one of the following:

- Open the RMA using the web link: <http://adcp.com/support/sendADCP.aspx>
- Contact Customer Service Administration at rdicsadmin@teledyne.com
- Call +1 (858) 842-2600

When requesting a RMA number, please give us the following information:

- What is being shipped (include the serial number)
- When you plan to send the shipment
- What issue(s) need to be corrected
- Name of the Field Service Engineer that knows about the issue
- When you need the instrument returned

TRDI's Customer Service will then respond with the RMA number for the shipment. Please include this number on all packages and correspondence.

Step 2 – Provide a MSDS as necessary

Please provide a Material Safety Data Sheet (MSDS) if the system/transducer is painted with antifouling paint.

Step 3 - Ship via air freight, prepaid

Urgent Shipments should be shipped direct to TRDI via overnight or priority air services. Do not send urgent airfreight as part of a consolidated shipment. If the system is shipped consolidated, it will cost less, but may lose up to three days in transit time.

Non-urgent shipments may be shipped as part of a consolidated cargo shipment to save money. In addition, some truck lines may offer equivalent delivery service at a lower cost, depending on the distance to San Diego.

Mark the Package(s)

To: Teledyne RD Instruments, Inc. (RMA Number)
14020 Stowe Drive
Poway, California 92064

Airport of Destination = San Diego
Notify Paxton, Shreve and Hayes

Phone: +1 (619) 232-8941
Fax: +1 (619) 232-8976

Step 4 - Urgent shipments

Send the following information by fax or telephone to TRDI.

Attention: Customer Service Administration

Fax: +1 (858) 842-2822

Phone: +1 (858) 842-2600

- Detailed descriptions of what is shipping (number of packages, sizes, weights and contents).
- The name of the freight carrier
- Master Air bill number
- Carrier route and flight numbers for all flights the package will take

Returning Systems to TRDI Europe Factory

When shipping the system to TRDI Europe, the following instructions will help ensure the Sentinel V ADCP arrives with the minimum possible delay. Any deviation from these instructions increases the potential for delay.

Step 1 - Request a Return Material Authorization

To obtain a Return Material Authorization (RMA) number and shipping instructions for the return of the instrument, do one of the following:

- Open the RMA using the web link: <http://adcp.com/support/sendADCP.aspx>
- Contact Customer Service Administration at rdiefs@teledyne.com
- Call +33(0) 492-110-930

When requesting a RMA number, please give us the following information:

- What is being shipped (include the serial number)
- When you plan to send the shipment
- What issue(s) need to be corrected
- Name of the Field Service Engineer that knows about the issue
- When you need the instrument returned

TRDI's Customer Service will then respond with the RMA number for the shipment. Please include this number on all packages and correspondence.

Step 2 – Provide a MSDS as necessary

Please provide a Material Safety Data Sheet (MSDS) if the system/transducer is painted with antifouling paint.

Step 3 - Ship Via Air Freight, Prepaid

Urgent Shipments should be shipped direct to TRDI via overnight or priority air services. Do not send urgent airfreight as part of a consolidated shipment. If the system is shipped consolidated, it will cost less, but may lose up to three days in transit time.

Non-urgent shipments may be shipped as part of a consolidated cargo shipment to save money.

Mark the package(s) as follows:

To: Teledyne RD Instruments, Inc. (RMA Number)
2A Les Nertieres
5 Avenue Hector Pintus
06610 La Gaude, France

Step 4 - Include Proper Customs Documentation

The Customs statement must be completed. It should be accurate and truthfully contain the following information.

- Contents of the shipment
- Value
- Purpose of shipment (example: "American made goods returned for repair")
- Any discrepancy or inaccuracy in the Customs statement could cause the shipment to be delayed in Customs.

Step 5 - Send the Following Information by Fax or Telephone to TRDI

Attention: Sales Administration

Phone: +33(0) 492-110-930

Fax: +33(0) 492-110-931

- Detailed descriptions of what is shipping (number of packages, sizes, weights and contents).
- The name of the freight carrier
- Master Air bill number
- Carrier route and flight numbers for all flights the package will take

NOTES

Chapter 8

SPECIFICATIONS



In this chapter, you will learn:

- What are the Sentinel V specifications
- Sentinel V dimensions and weights

Table 6: High Bandwidth Water Profiling

Depth Cell Size ¹	Sentinel V20		Sentinel V50		Sentinel V 100	
	Range ² (m)	Std. dev. ³ (cm/s)	Range ² (m)	Std. dev. ³ (cm/s)	Range ² (m)	Std. dev. ³ (cm/s)
0.25m	18.3	11.5				
0.50m	20.6	4.3	45.0	11.5		
1.0m	22.4	2.1	51.5	4.3	96.3	6.5
2.0m	24.8	1.0	57.0	2.1	105.3	3.3
4.0m			64.2	1.0	116.5	1.6
8.0m					130.1	0.8



1. User's choice of depth cell size is not limited to the typical values specified.
2. Range, which depends on cell size, is specified here for High bandwidth mode at 5° C, typical ocean backscatter and nominal 14 VDC battery power. Using 18 VDC will increase the range by 5 to 10% depending on conditions.
3. High bandwidth mode single water ping per ensemble standard deviation.
5. Table applies to Sentinel V Series ADCPs.

Table 7: Low Bandwidth Water Profiling

Depth Cell Size ¹	Sentinel V20		Sentinel V50		Sentinel V 100	
	Range ² (m)	Std. dev. ³ (cm/s)	Range ² (m)	Std. dev. ³ (cm/s)	Range ² (m)	Std. dev. ³ (cm/s)
0.25m	22.9	21.8				
0.50m	25.3	8.0	58.6	21.8		
1.0m	27.3	4.0	65.6	8.0	122.6	12.3
2.0m	29.8	1.9	71.6	4.0	132.4	6.2
4.0m			79.3	1.9	144.3	3.1
8.0m					158.9	1.5



1. User's choice of depth cell size is not limited to the typical values specified.
2. Range, which depends on cell size, is specified here for Low bandwidth mode at 5° C, typical ocean backscatter and nominal 14 VDC battery power. Using 18 VDC will increase the range by 5 to 10% depending on conditions.
3. Low bandwidth mode single water ping per ensemble standard deviation.
4. Table applies to Sentinel V systems.

Table 8: Sentinel V Range

Model	Frequency	Range (m) @ 14VDC	Range (m) @ 18 VDC	Depth Cell Size (m)
Sentinel V20	1000kHz	27.6	28.5	2
Sentinel V50	500kHz	74.9	78.9	4
Sentinel V100	300kHz	148.8	156.7	8



Range, which depends on cell size, is specified here for narrow bandwidth mode at 5° C, typical ocean backscatter and nominal 14 VDC battery power.

Table 9: Sentinel V Bandwidth

Model	Maximum profiling range - 25% BW	Maximum profiling range - 6% BW
Sentinel V20	25.0m	30.0m
Sentinel V50	64.7m	79.9m
Sentinel V100	127.3m	155.9m



Range, which depends on cell size, is specified here at 5° C, 35ppt, 0m depth, and maximum bin size.

Table 10: Profile Parameters

Item	Specification
Velocity accuracy	
Sentinel V20 and V50	$\pm 0.3\%$ of the water velocity relative to the ADCP ± 0.3 cm/s
Sentinel V100	$\pm 0.5\%$ of the water velocity relative to the ADCP ± 0.5 cm/s
Velocity resolution	0.1 cm/s
Velocity range	± 5 m/s (default), ± 20 m/s (maximum)
Number of depth cells	1 to 255
Ping rate	up to 10 Hz

Table 11: Echo Intensity Profile

Item	Specification
Vertical resolution	Depth cell size
Dynamic range	80 dB
Precision	± 1.5 dB

Table 12: Transducer and Hardware

Item	Specification
Beam angle	25°
Configuration	4 beam, convex, 5 th beam vertical
Depth Rating	200 meters
Materials	Transducer, housing, and end-cap: plastic Connector: Metal shell
Internal memory	One 16GB microSD card included
Communications	IEEE 802.11b/g/n
FCC Certification	FCC ID: S5WV2648273001
Industry Canada Certification	IC: 10915A-V2648273001



The user's body must remain 20 cm (7.8 inches) away from the ADCP during normal operation.



FCC-IC Statements:

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept harmful interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Table 13: Standard Sensors

Temperature (mounted on transducer)	
Range	-5° to 45° C
Precision	±0.4° C
Resolution	0.1°
Tilt (MEMS accelerometers)	
Range	±90° pitch, ±180° roll
Accuracy	2° RMS
Precision	0.05° RMS
Resolution	0.1°
Compass (magneto-inductive sensor)	
Accuracy	2° RMS ⁽¹⁾
Resolution	0.1°
Max Dip Angle	85°
Pressure Sensor (mounted on transducer)	
Range	300m
Accuracy	0.1% FS



1. ±2.0° is commonly achieved after field calibration.

Table 14: Environmental Specifications

Item	Specification
Operating temperature with or without batteries	-5° to 45°C
Short Term Storage/Shipping (<45days) temperature (Batteries Installed)	-5° to 45°C
Long Term Storage (>45days) temperature (Batteries Installed)	0° C to 21° C
Long Term Storage (>45days) temperature (Batteries Removed)	-30° to 60°C
Long Term (>45days) Battery Storage	Batteries should be stored in cool dry air with a temperature range of 0° C to 21° C
Battery Shelf Life	Use batteries within 24 months of the manufacture date



Do not deploy the system with batteries that are older than the **Deploy By** date. It should be noted, that while a battery pack will not be dead after the **Deploy By** date, the actual performance of the battery is in doubt, and may not have sufficient capacity for the deployment.



Sentinel V battery packs have three dates on them:

Manufacture Date is the date the battery was built and final tested.

TRDI Ship by Date provides the maximum duration that the battery will remain on TRDI's shelves before shipping and is 12 months after the manufacture date.

Deploy By Date provides the last date when the battery should be used to start a deployment and is 24 months from the manufacture date.

Table 15: Sentinel V Battery Power Specifications

Item	Specification
DC input	12 to 20 VDC external power supply
Battery Voltage	18 VDC (new), 11 VDC (depleted)
Battery Capacity (Pack)	510 watt hours @ 5° C
Battery Capacity (12 D-cell Commercial Batteries) ¹	100 watt hours @ 0°C
External Battery Case	18 VDC (new), 11 VDC (depleted). Holds two battery packs.



1. For reference only; actual capacity varies by battery manufacturer.

Outline Installation Drawings

The following drawings show the standard Sentinel V dimensions and weights.

Table 16: Outline Installation Drawings

Description	Drawing Number
Self-Contained, Loose Battery, with end-cap connector	96D-6001
Self-Contained, Loose Battery, SC end-cap	96D-6002
Self-Contained, Battery Pack, with end-cap connector	96D-6003
Self-Contained, Battery Pack, SC end-cap	96D-6004
External Battery Case	96D-6005



Outline Installation Drawings are subject to change without notice. Contact TRDI before building mounts or other hardware.

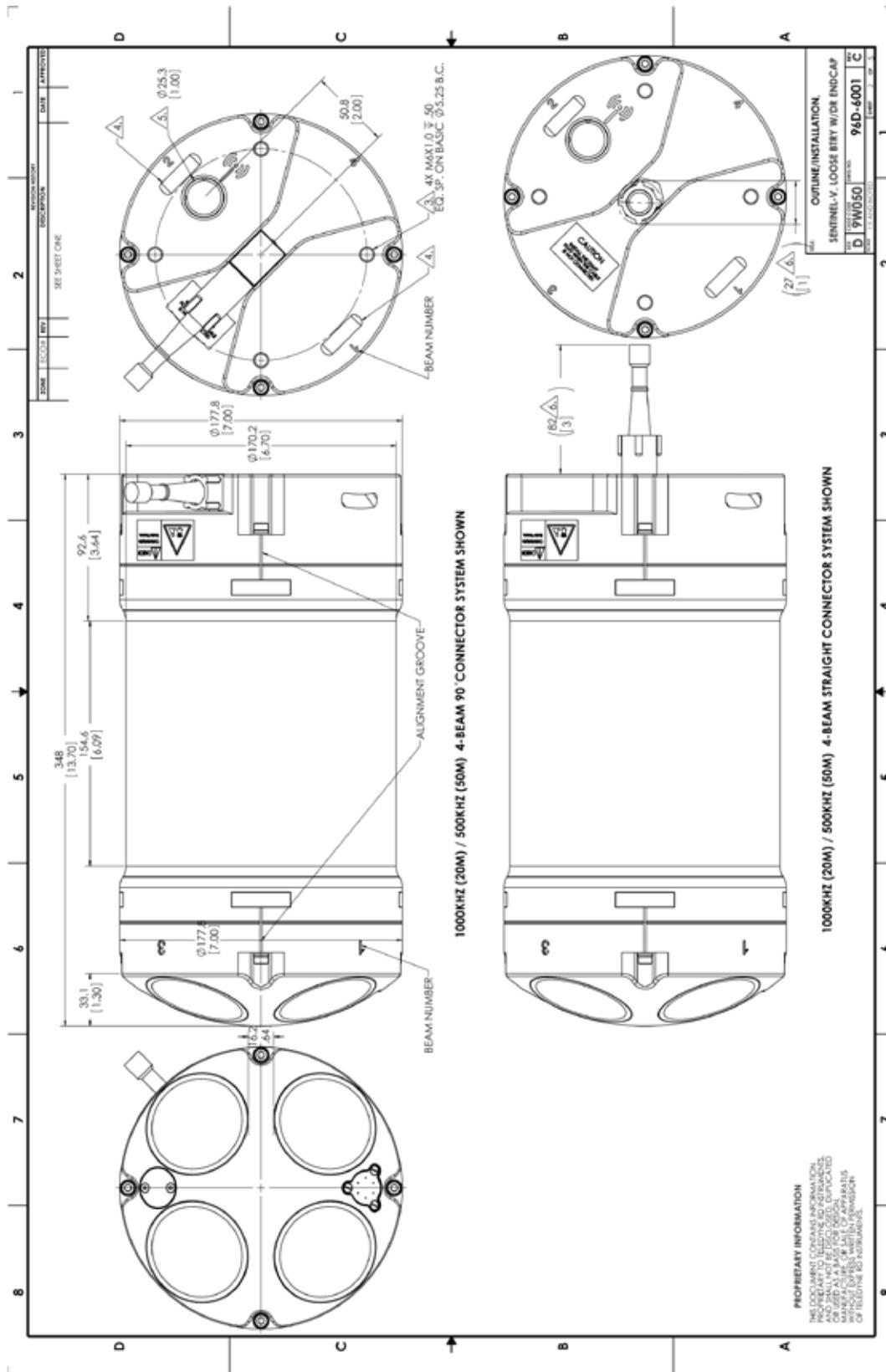


Figure 58. 96D-6001 Sheet 2

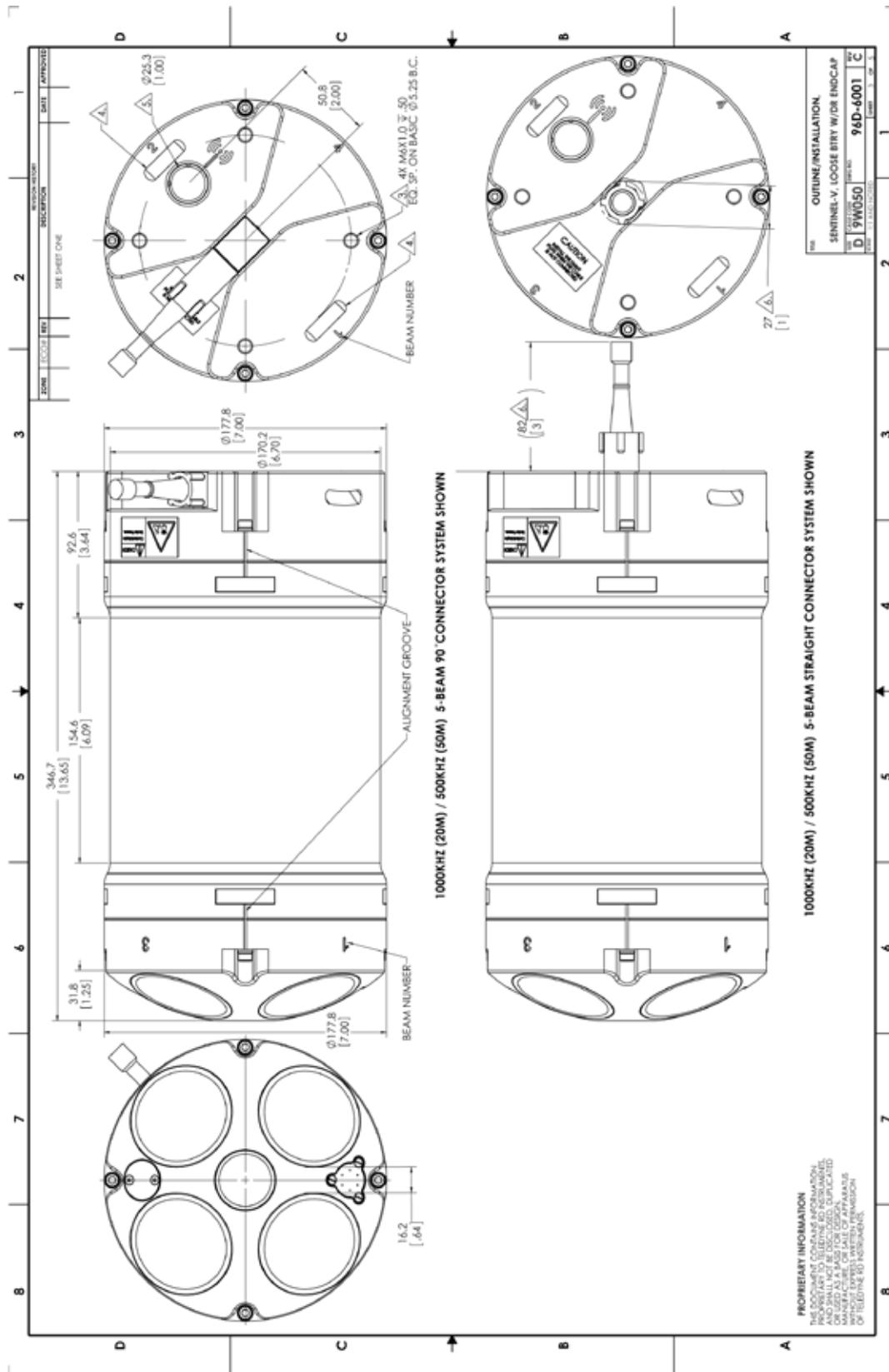


Figure 59. 96D-6001 Sheet 3

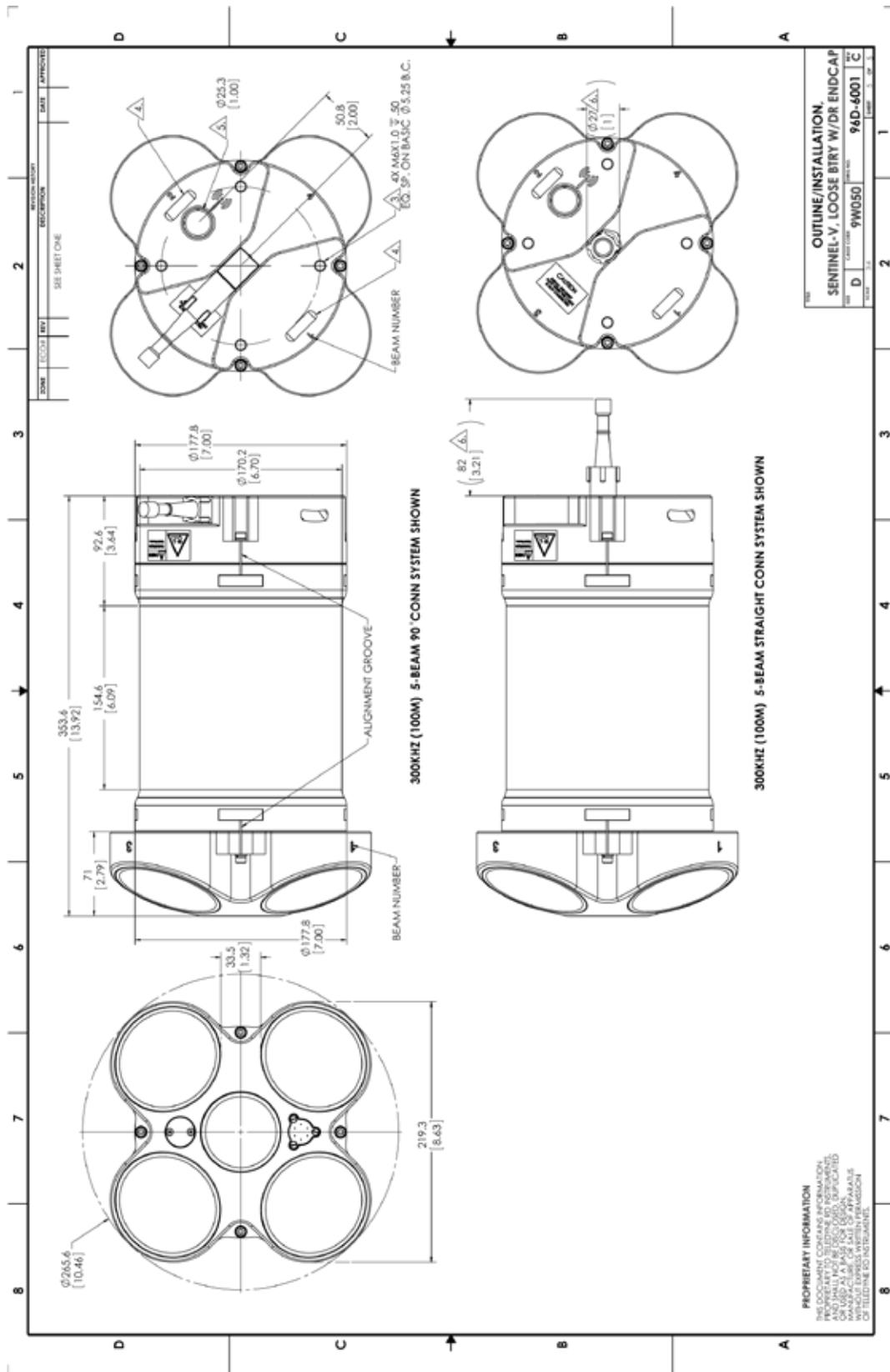


Figure 61. 96D-6001 Sheet 5

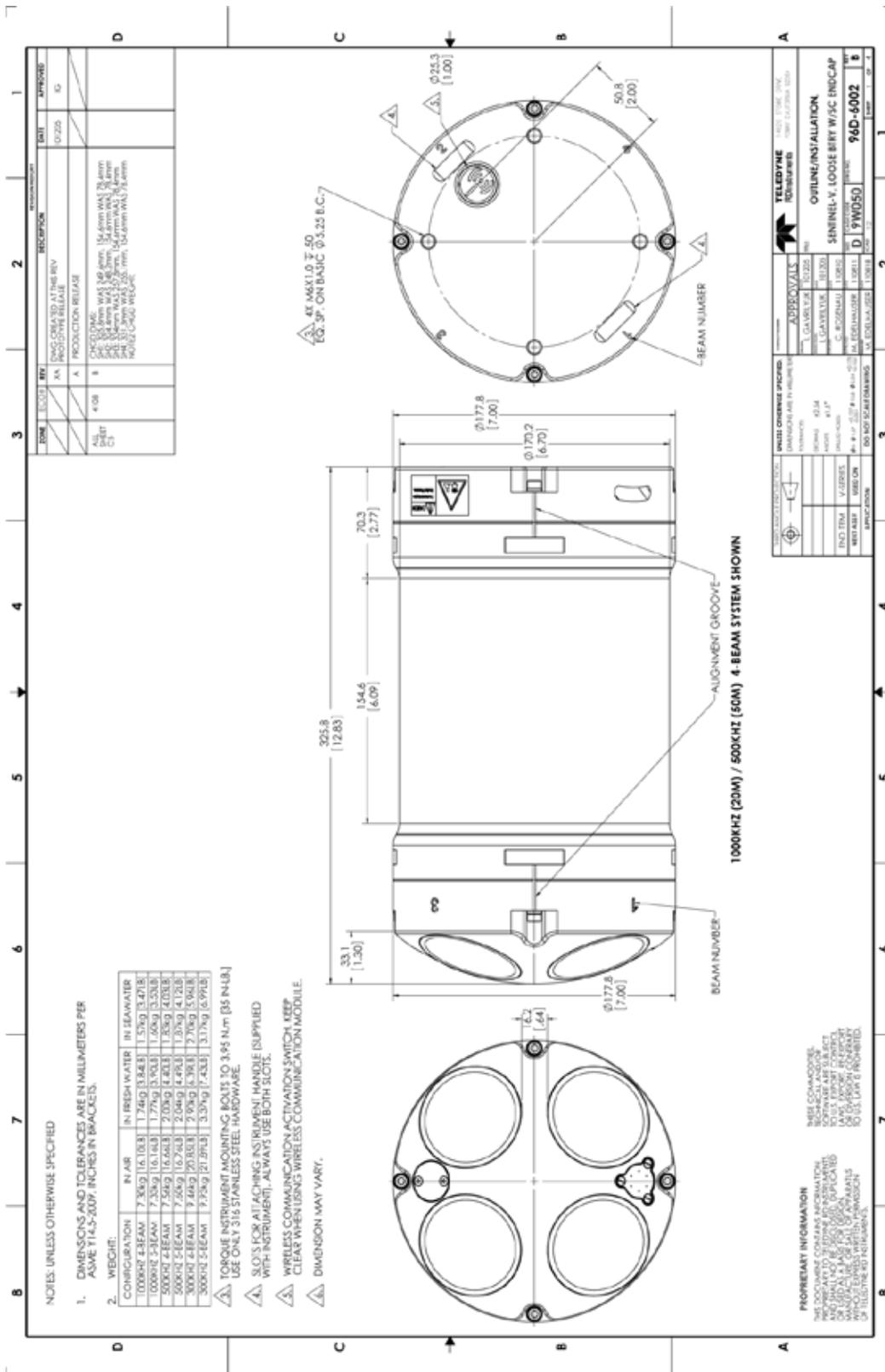


Figure 62. 96D-6002 Sheet 1

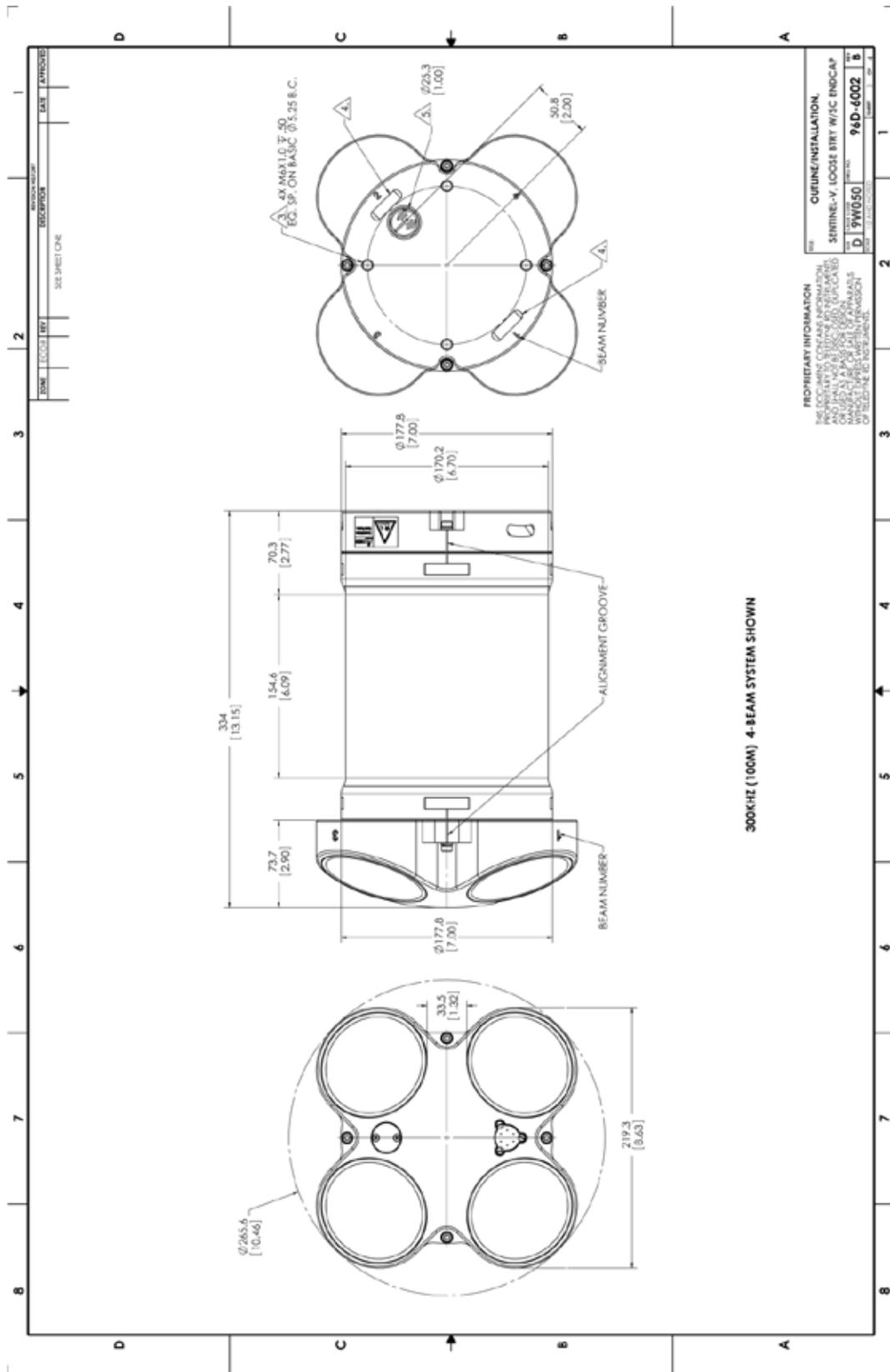


Figure 64. 96D-6002 Sheet 3

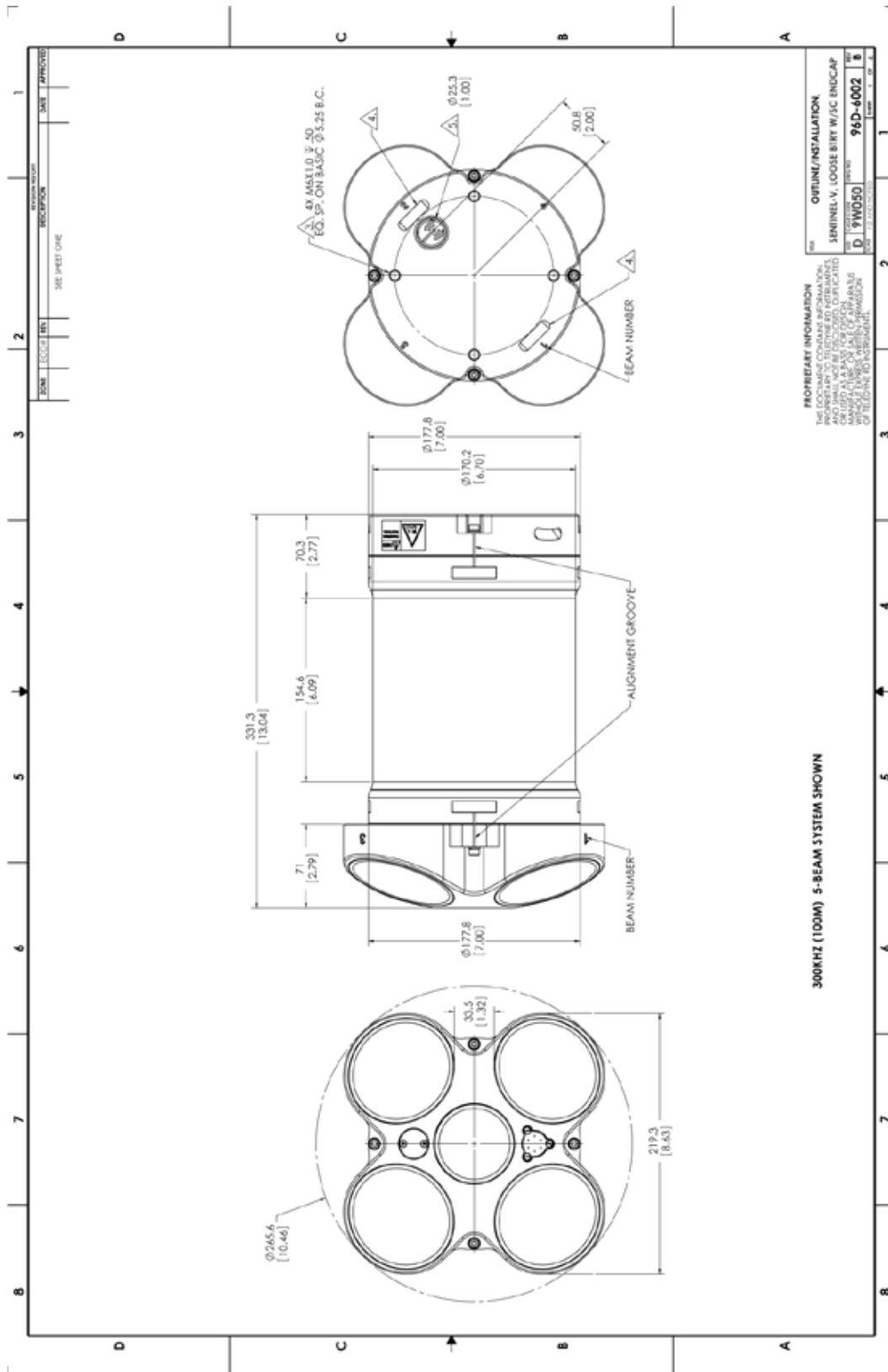


Figure 65. 96D-6002 Sheet 4

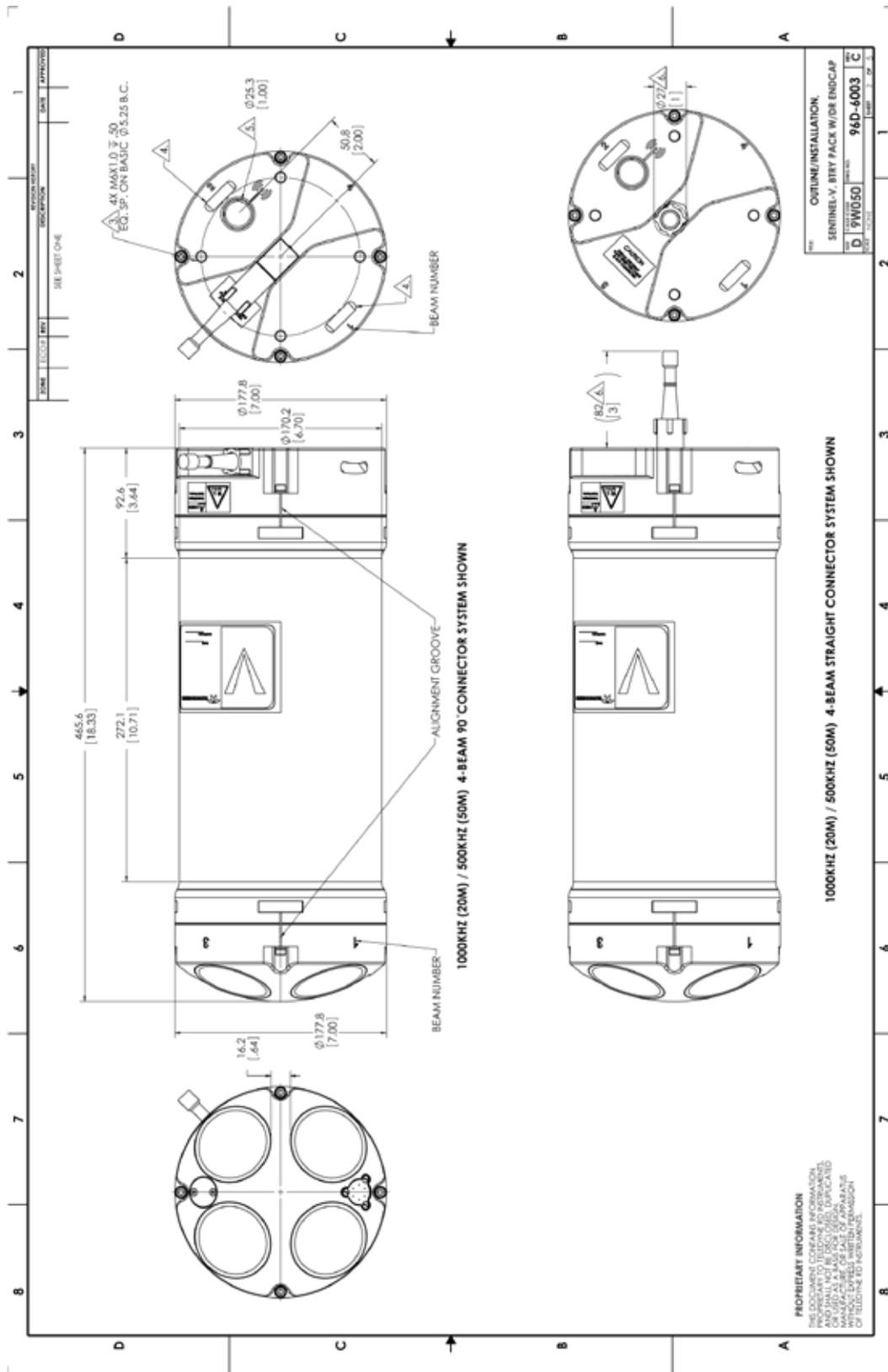


Figure 67. 96D-6003 Sheet 2

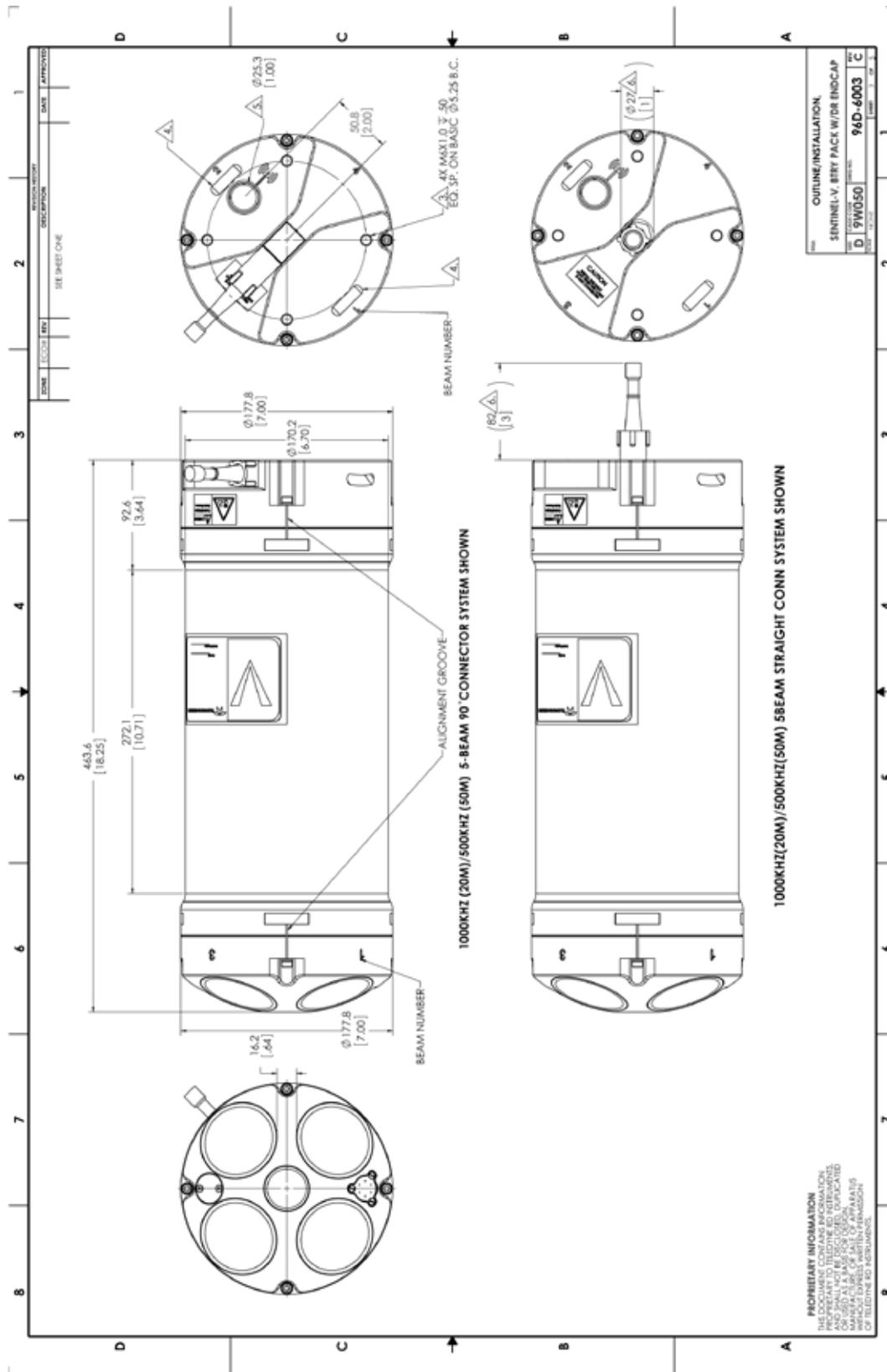


Figure 68. 96D-6003 Sheet 3

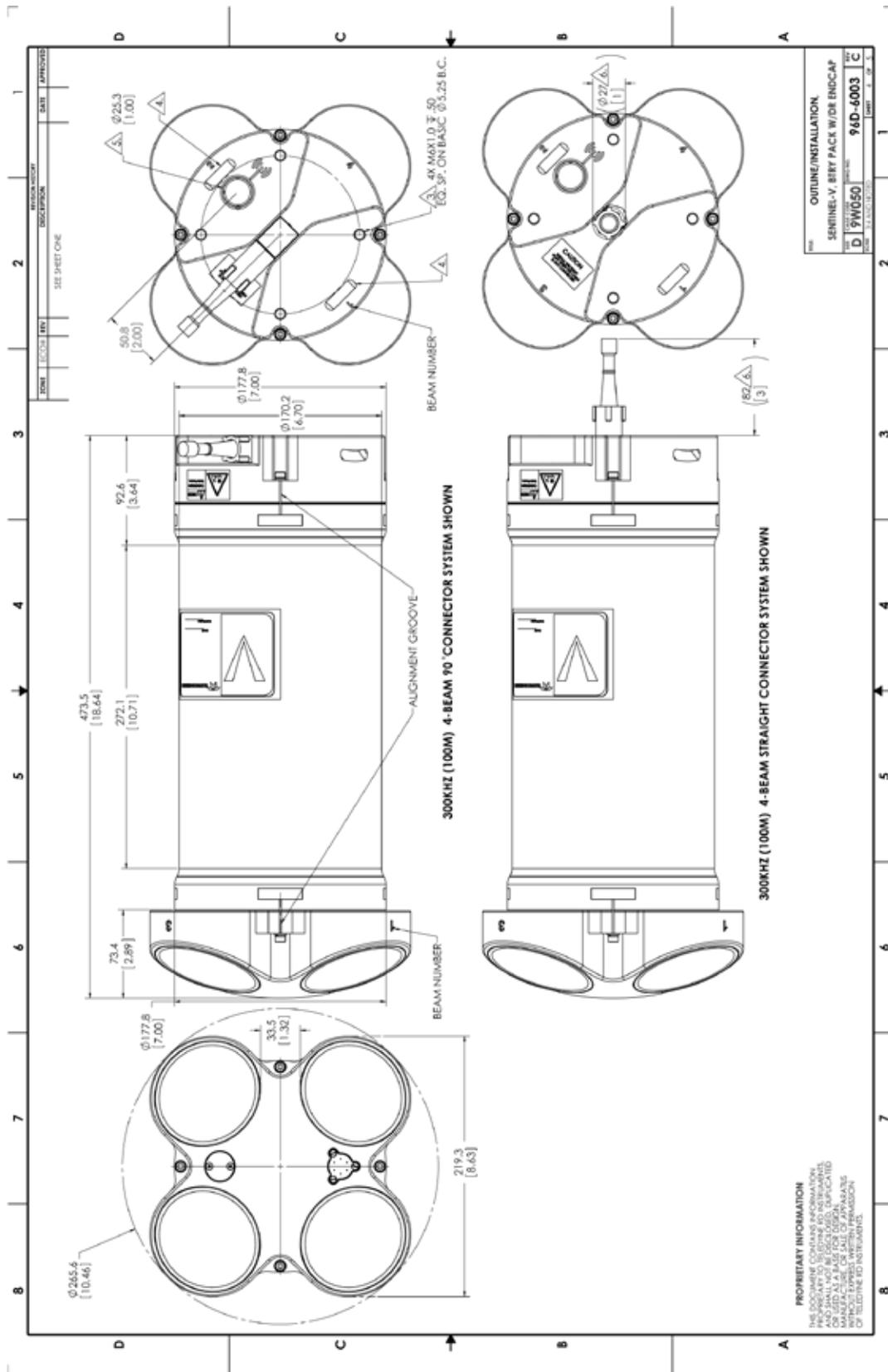


Figure 69. 96D-6003 Sheet 4

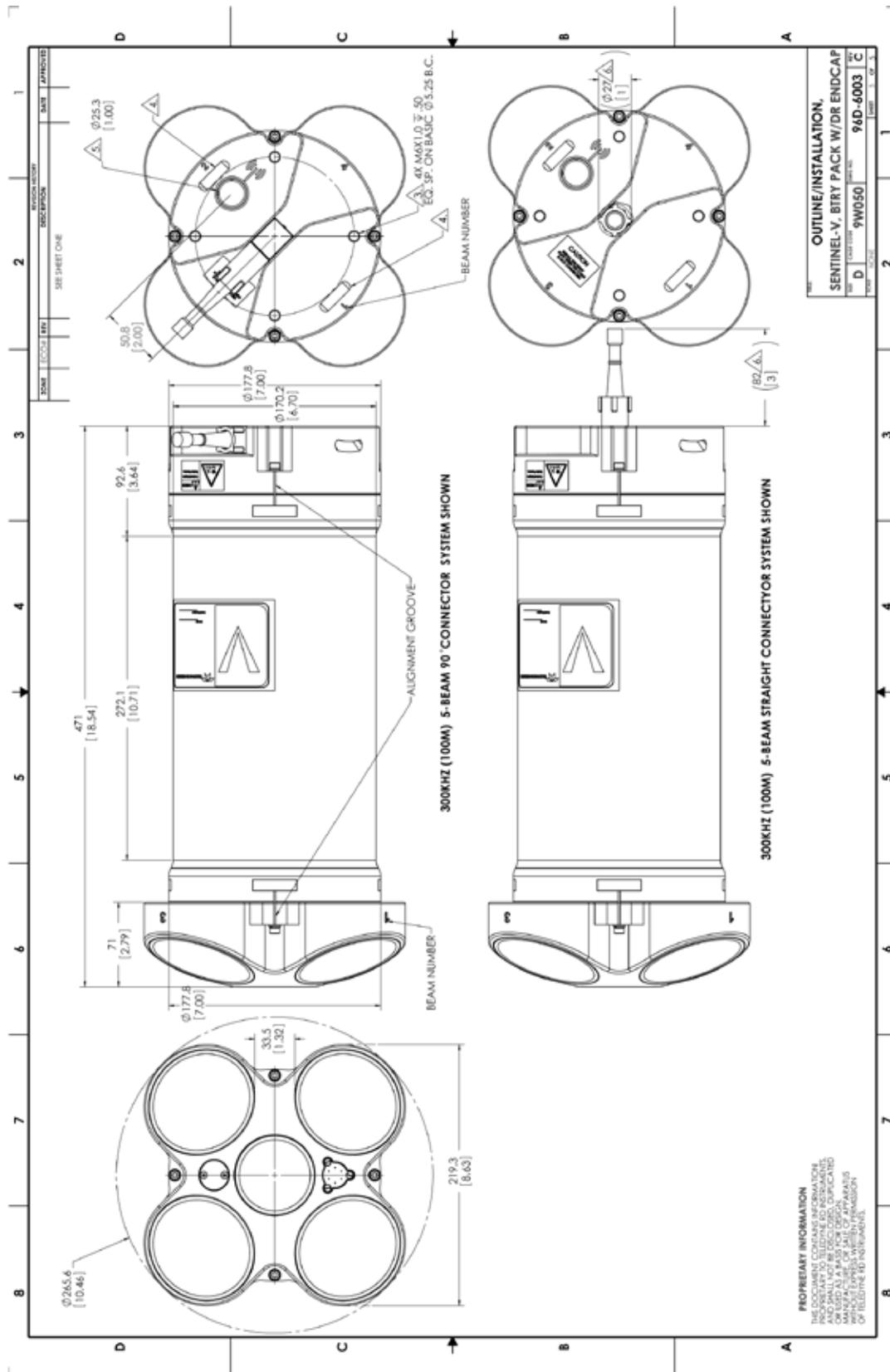


Figure 70. 96D-6003 Sheet 5

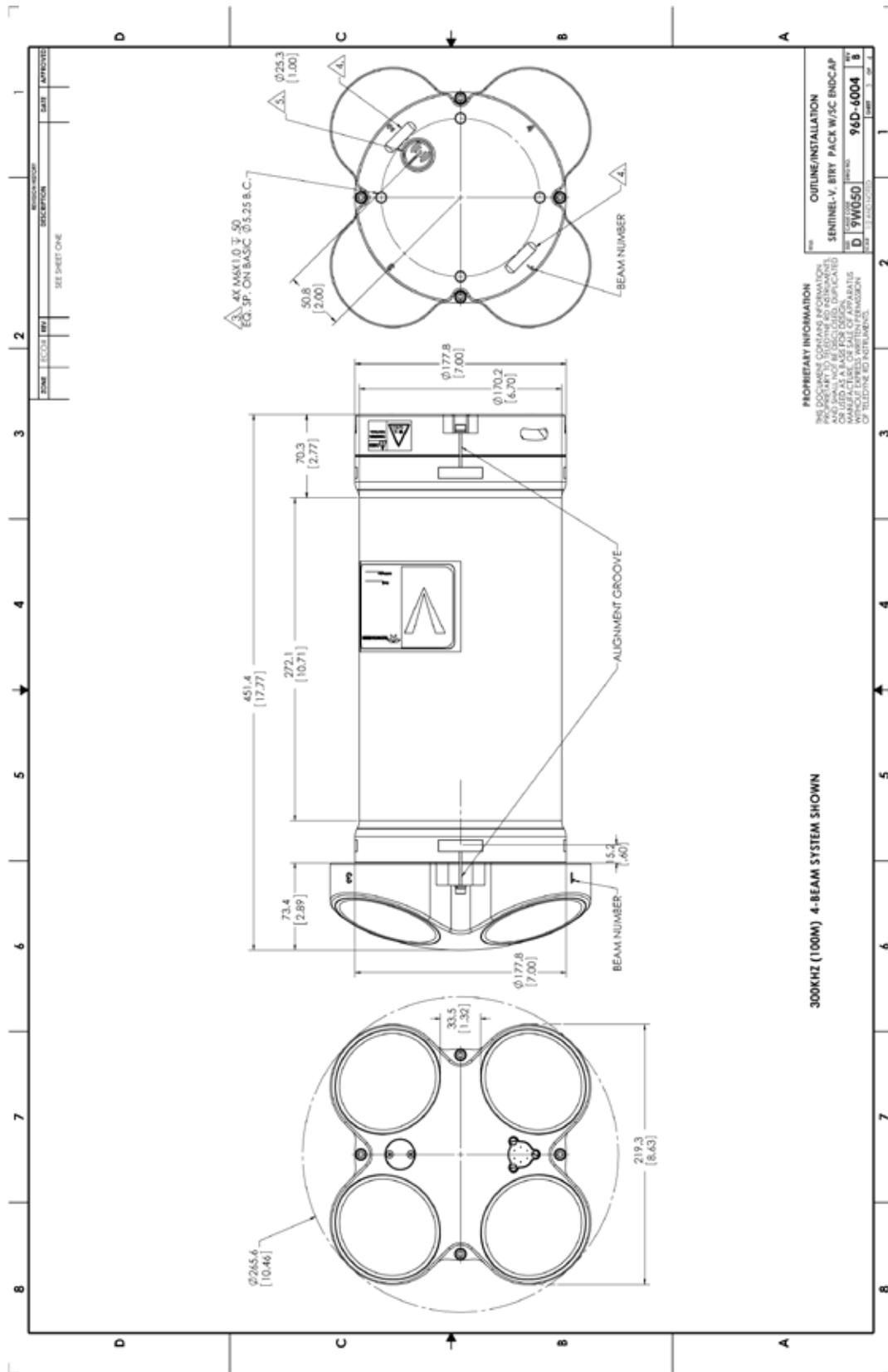


Figure 73. 96D-6004 Sheet 3

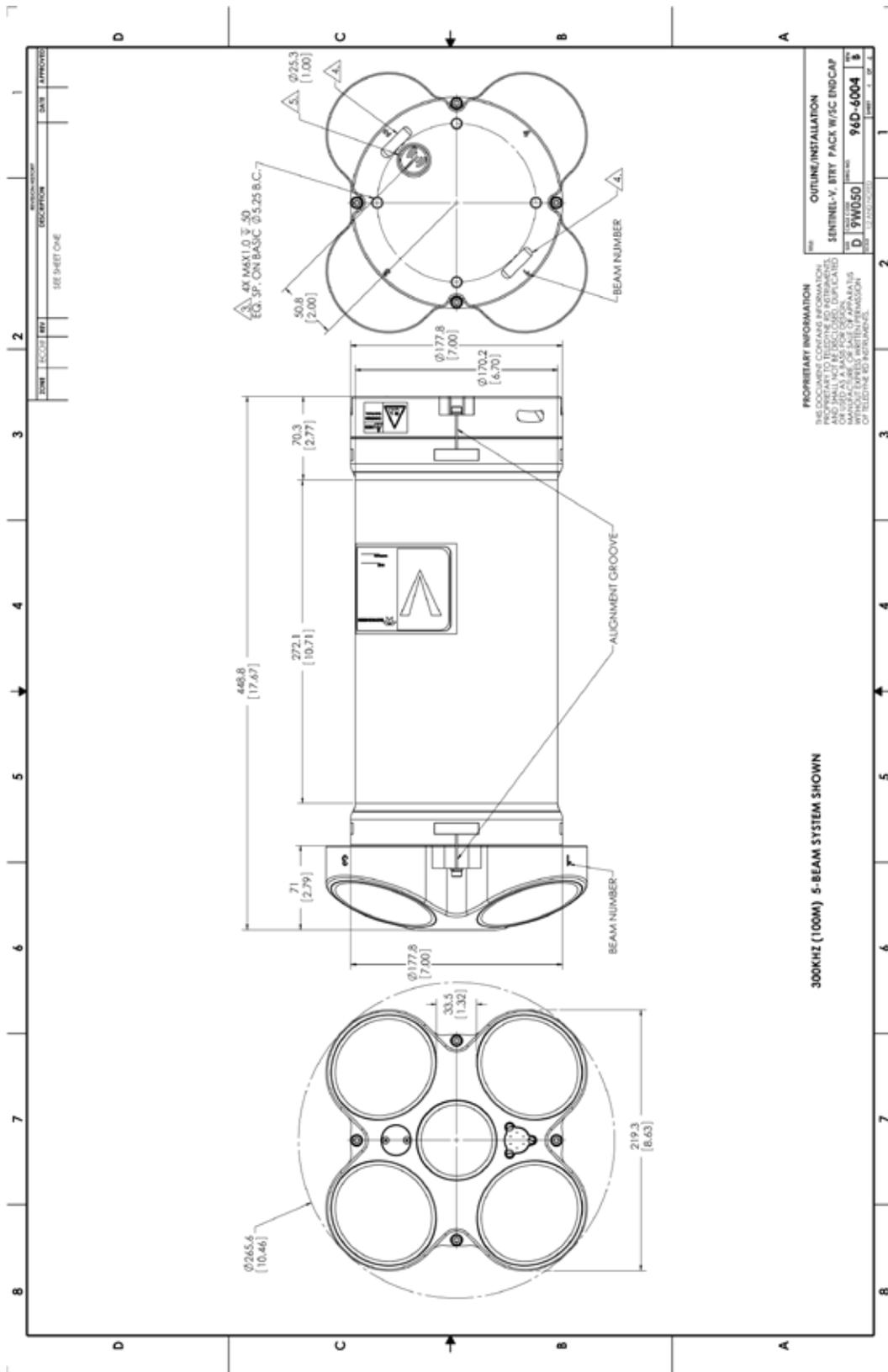


Figure 74. 96D-6004 Sheet 4

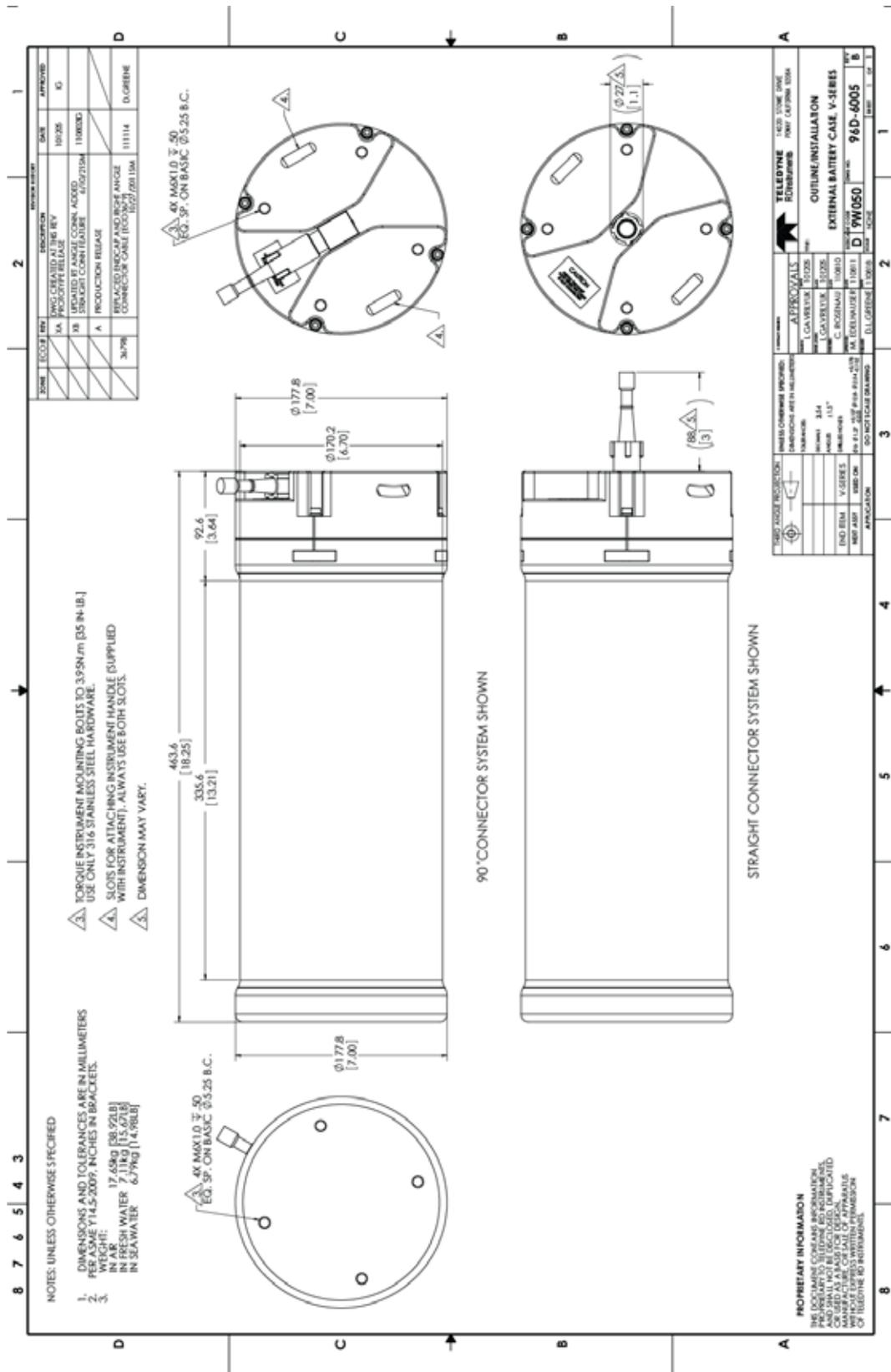


Figure 75. 96D-6005 Sheet 1

Appendix **A**

NOTICE OF COMPLIANCE



In this chapter, you will learn:

- China RoHS requirements
- Material disclosure table

Date of Manufacture

China RoHS requires that all Electrical and Electronic Products are marked with a Date of Manufacture. This is the starting point for the Environmental Friendly Use Period, described below.

Environmental Friendly Use Period (EFUP)

Per SJ/T 11364-2006 – Product Marking, the EFUP is defined as the time in years in which hazardous/toxic substances within Electrical and Electronic Products (EIP) will not, under normal operating conditions, leak out of the Product, or the Product will not change in such a way as to cause severe environmental pollution, injury to health, or great damage to property. TRDI has determined the Environmental Friendly Use Period shall be Ten (10) years.

The purpose of the marking is to assist in determining the restricted substance content, recyclability, and environmental protection use period of our covered products, as required in Chinese law, and does not reflect in any way the safety, quality, or warranty associated with these TRDI products.



Some homogenous substance within the EIP contains toxic or hazardous substances or elements above the requirements listed in SJ/T 11363-2006. These substances are identified in Table 17.

WEEE



The mark shown to the left is in compliance with the Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE).

This symbol indicates the requirement NOT to dispose the equipment as unsorted municipal waste, but use the return and collection systems according to local law or return the unit to one of the TRDI facilities below.

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Poway, California 92064

Teledyne RD Instruments Europe
2A Les Nertieres
5 Avenue Hector Pintus
06610 La Gaude, France

Teledyne RD Technologies
1206 Holiday Inn Business Building
899 Dongfang Road, Pu Dong
Shanghai 20122 China

CE

This product complies with the European Community Directives:

Electromagnetic Compatibility Directive 2004/108/EC

The following Standards were used to verify compliance with the directives:

EN 61326-1:2006 – EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Emissions:

EN55011:2009 – Class “A” Radiated Emissions

Immunity:

EN61000-4-2,

EN61000-4-3

EN61000-4-4

EN61000-4-5

EN61000-4-6

EN61000-4-8

EN61000-4-11

R&TTE Directive 1999/5/EC:

EN 300 328 V1.8.1 (2012-06) Wideband transmission systems 2.4GHz



Material Disclosure Table

In accordance with SJ/T 11364-2006, the following table disclosing toxic or hazardous substances contained in the product is provided.

Table 17. Toxic or Hazardous Substances and Elements Contained in Product

零件□目(名称) Component Name	有毒有害物□或元素 Toxic or Hazardous Substances and Elements					
	□ Lead (Pb)	汞 Mercury (Hg)	□ Cadmium (Cd)	六价□ Hexavalent Chromium (Cr ⁶⁺)	多溴□苯 Polybrominated Biphenyls (PBB)	多溴二苯□ Polybrominated Diphenyl Ethers (PBDE)
□能器配件 Transducer Assy.	X	X	O	X	O	O
接收机□路板/数据□理器□路板 Receiver PCB/ DSP PCB	O	O	O	O	O	O
微□理器□路板/□入□出□路板 CPU PCB/PIO PCB	O	O	O	O	O	O
机体装配 Housing Assy.	O	O	O	O	O	O
底座装配 End-Cap Assy.	O	O	O	O	O	O
□池□ Battery Pack	O	O	O	O	O	O
交流□□□器 AC Voltage Adapter	O	O	O	O	O	O
水下专用电缆 Underwater Cable	O	O	O	O	O	O
□用装箱和泡沫塑料□ Shipping Case w/Foam	O	O	O	O	O	O

O: 表示□有毒或有害物□在□部件所有均□材料中的含量均在 SJ/T 11363-2006 □准□定的限量要求以下。

O: Indicates that the toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit required in SJ/T 11363-2006.

X: 表示□有毒或有害物□至少在□部件的某一均□材料中的含量超出 SJ/T 11363-2006 □准□定的限量要求。

X: Indicates that the toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T 11363-2006.

Appendix **B**

GPL COMPLIANCE NOTICE



In this chapter, you will learn:

- GPL Compliance
- GNU General Public License
- GNU Lesser General Public License

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Customer Service
Teledyne RD Instruments
14020 Stowe Drive
Poway, CA 92064

Please include the phrase "Source for Sentinel-V firmware" and the version number in your request.

This offer is valid to anyone in receipt of this information.

Note that the complete source for the firmware version that shipped with your instrument can be found on the V Series Documentation CD.

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<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice

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