

TASMAN

INTEGRATION GUIDE



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HOW TO CONTACT TELEDYNE RD INSTRUMENTS

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

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Self-Service Customer Portal

Use our online customer portal at <http://www.teledynemarine.com/rdi> and click on the **Support** link to download manuals or other Teledyne RDI documentation.

Teledyne Technologies Secure Extranet

Teledyne RD Instruments Firmware, software, and Field Service Bulletins can be accessed only via our Customer Support Portal.

To register, please go to <https://extranet.teledyne.com/layouts/15/Registration/registration.aspx?company=7> to set up your customer support account. After your account is approved, you will receive an e-mail with a link to set up your log in credentials to access the portal (this can take up to 24 hours).

Once you have secured an account, go to <https://extranet.teledyne.com/sites/Marine/RDI> to access this data with your unique user name and password.

If you have an urgent need, please call our Technical Support hotline at +1-858-842-2700.

Getting Started with the Tasman

Identifying what's in the Box

Tasman Inventory

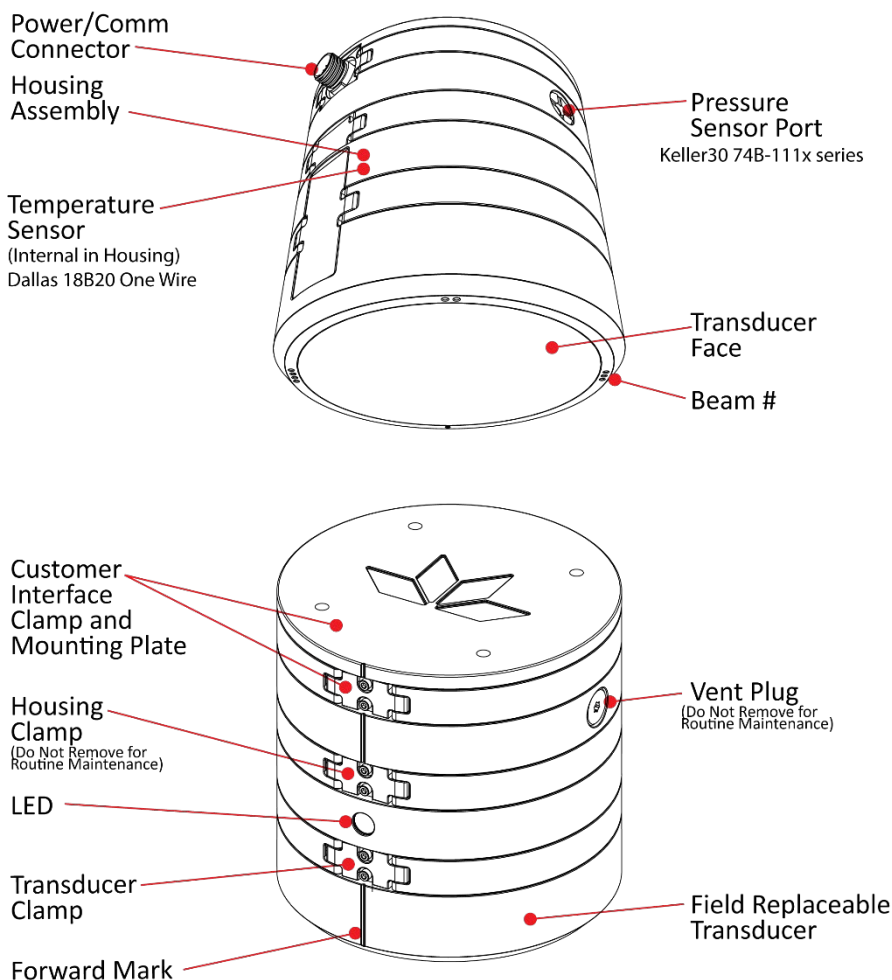
Part Number	Name	Description
TAS300-6K TAS600-6K TAS300-4K TAS600-4K	Tasman 6000-meter DVL Tasman 4000-meter DVL	The Tasman 300 and 600 kHz systems includes the transducer and connector protective cap. When unpacking, use care to prevent physical damage to the transducer face and connectors. Use a soft pad to protect the transducer.
MRDI1174	Shipping Case	Shipping case with foam inserts.
73B-6085-005	Power/Comm Pigtail Cable	The DVL Power/Comm pigtail 5-meter cable allows you to build custom cable to connect the Tasman to your vehicle/platform. It provides all the leads for serial and Ethernet COM, Power and Trigger.
71B-1144-00 71B-1144-01 71B-1143-00 71B-1143-01	Optional Spare Transducer	Optional Field replaceable transducer.
95B-6155-00	Tasman Getting Started Guide	A printed quick start card showing test setup is included. A PDF version is included on the documentation CD.
90Z-8002-00	Navigation Software and Documentation CD	This CD has PDF versions of all the Tasman DVL software and documentation including the Tasman DVL Guide. Please read the manual! The CD also includes the TRDI Toolz Software. TRDI Toolz is a utility and testing software package that can be used to test the DVL.
95B-6156-00	Tasman Integration Guide	A printed quick reference showing how to integrate the Tasman DVL onto a ROV. Refer to Chapter 2 of the Tasman DVL guide for detailed instructions.
Spare Parts	See table below for description	Includes spare closing hardware, spare anodes, and lubricant for connector.



See the packing slip for additional options. If you are missing parts, contact TRDI support rdifs@teledyne.com or call +1 (858) 842-2700.

Tasman Spare Parts

Description	Quantity	Part number	Where used
Anode, housing	2	81B-42116-00	Anodes for Housing Exterior
Anode Screw	2	M5X0.8X10FH	
SCREW, 6-32X.3125L SKT HD CAP SCR 316 SST	2	92185A145	Screws for clamp
#6 Lock Washer SS Split Ring	2	FAS 211	
Silicone Lubricant, 4-pack	1	5020	Power/Comm Connector
Tool Bag, Canvas	1	84Z-6000-00	Spare parts are located inside bag



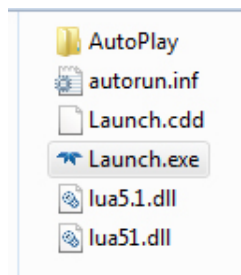
Tasman systems rated for 4000 meters depth have a red transducer face. Systems rated to 6000 meters have a black transducer face.

Installing Documentation and Software

The Tasman system includes a Navigation Software and Documentation CD with the documentation and all software needed for the Tasman system.

To install the Tasman Documentation and Software:

1. Insert the CD into the drive.
2. Use Windows Explorer® to open the CD drive folder.
3. Double-click on the *launch.exe* file. Use the browser to view or copy the Tasman documentation to your computer.
4. Recommended software to install:
 - Install *TRDI Toolz*



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

Connecting to the Tasman

Power Overview

The Tasman requires a DC supply between 10.7 to 36 VDC (24 VDC typical). Either an external DC power supply or battery can provide this power. The power supply should be able to source at least two Amps for a bench test setup (no pinging).

Power on Cycle – The power supply 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 Tasman. The capacitors provide a store of energy for use during transmit. The inrush current is as much as four amps if plugged in after the DVL Transmit Cap is fully discharged. The Tasman will draw this amperage until its capacitors are fully charged (less than 200ms).



If the power supply limits the current or the power drop on the cable is significant, then the power on cycle will fail or the system will reset during pinging. Therefore, TRDI recommends a 1.5 to 2 Amp power supply to cover all performance cases. For more information, see [Electrical Specifications](#).

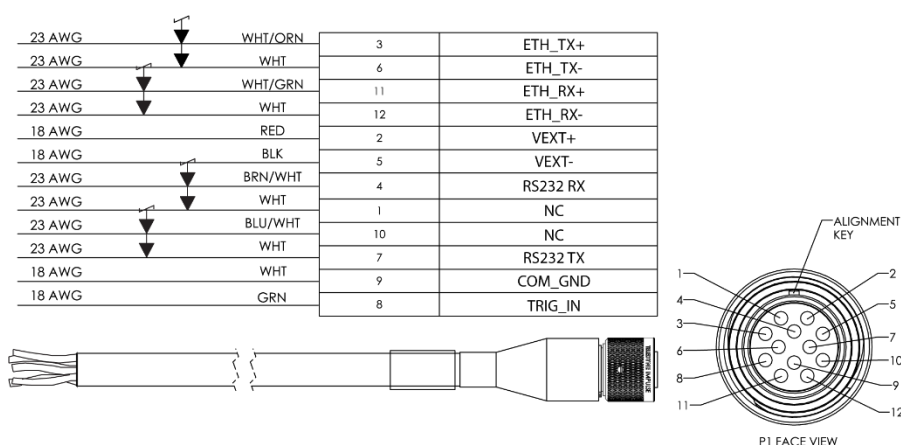


If the Power is put in then removed within a very short time (few secs) and then applied again, then the Inrush limiter will not be able to limit the current pulled from the DVL which would result in a higher than 4Amps Inrush current spike.



Wait approximately 30-seconds between back to back power cycles. This will ensure the electronics residual charges have been dissipated and for the Wake Logic to properly detect the next Cold Start.

Wiring Diagrams



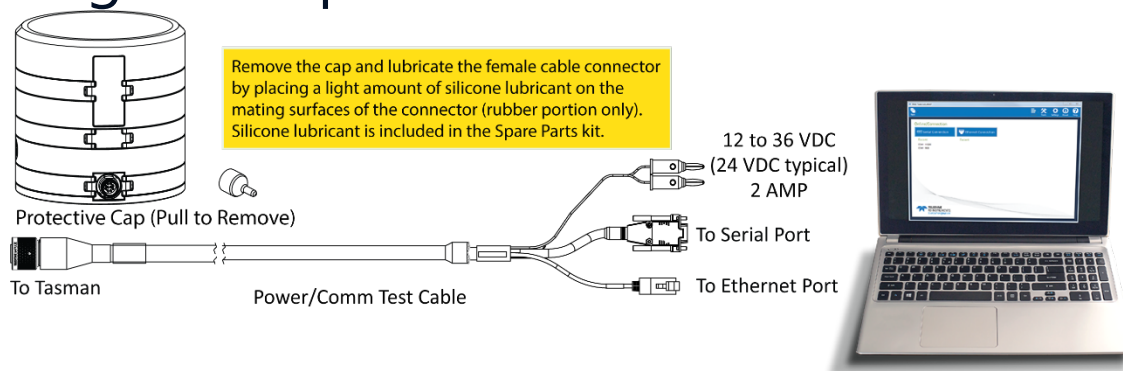
Tasman Power/Comm Cable 73B-6085 Pigtail Cable



Where shown, RX is the incoming signal; TX is the outgoing signal. RS-422 is a future option. Cable bend radius is 11.4 cm (4.5 inches).

The 12-pin connector part number is MKS(W)-3XL12-CCP from Teledyne Impulse.

Using the Optional Test Cable



Tasman Connections for Bench Test [Optional Test Cable 73B-6094-00]

Using TRDI Toolz

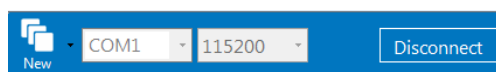
The command and control port can be Serial or Ethernet, but NOT both. The last port used to send a break is the command and control port.

To establish communications with the Tasman:

1. Connect the system and apply power.
2. Start the *TRDI Toolz* software.
3. Select **New Serial Connection** or **New Ethernet Connection**.
4. Enter the Tasman's communication settings.

Serial Communications:

Select the **COM Port** the serial cable is connected to and set the **Baud Rate** from the drop-down list to 115200



Ethernet Communications:

Enter the Static DHCP server **IP or host name** 192.168.1.100

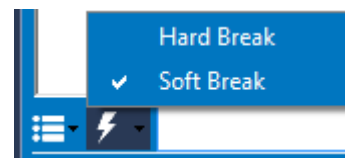
Enter the **Port Number** 1033

Select **TCP**



If the network assigns a Dynamic IP address, the Static IP address **192.168.1.100** will not work; Connect using the serial port and use the CE command to verify the IP address. You must have the RJ45 connector plugged into the network switch for the CE command to return the Ethernet setting info.

5. Click the **Connect** button. Once connected, the button will change to **Disconnect**.
6. Click the **Break** (⚡) button. From the **Break** button drop down menu, select **Soft Break** (= = =). The wakeup banner will display in the terminal window.



```

Tasman
Teledyne RD Instruments (c) 2019
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Firmware Version: 74.xx
Current time is: 19/08/01,21:01:38.47
Break received, serial
>

```



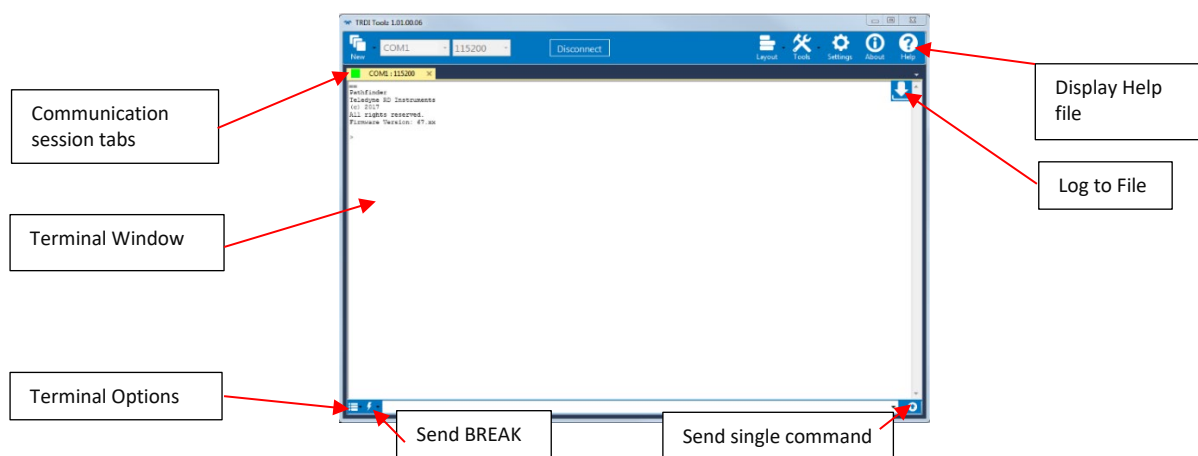
It may be necessary to click inside the terminal window and then click the **Break** button to wake up the system.



You must have the RJ45 connector plugged into the network switch for the CE command to return the Ethernet setting info.



The command and control port can be Serial or Ethernet, but NOT both. The last port used to send a break is the command and control port.



For more information on *TRDI Toolz*, click the Help icon (?) to open the TRDI Toolz Software help file.

Using the Network Configuration Page



The system must be connected to the Ethernet port to use the Network Configuration page.

To establish communications with the Network Configuration page:

1. Connect the system and apply power.
2. Open a browser on the laptop (*Internet Explorer®*, *FireFox®*, *Google Chrome®*, etc.).
3. Enter the Tasman's DHCP server IP address **10.20.230.17** into the address bar.
4. On **Network Configuration**, choose **STATIC** or **DHCP**. Use Dynamic Host Configuration Protocol (DHCP) server protocol when the network automatically provides an Internet Protocol (IP) host with its IP address and other related configuration information such as the subnet mask and default gateway.

If you are using a STATIC network, then configure the **Base IP Address**, **Network Mask**, **Gateway Address**, **Name Server Address**, and **Command/Control Port** as needed. The default configuration is shown in Figure 6.

- On the Output Formats section, enable or disable the output data formats (PD0, PD4, PD5, PD6, PD11, PD13, and PD26), **Protocol (TCP or UDP)**, **Address**, and **Ports**.
- Once done, click **Submit**.



If all outputs are enabled, it can affect the ping rate.

Tasman 600 Network Configuration Update
Software Version v1.03

Network Settings

Network Configuration DHCP **Link Status**
Not Active

Base IP Address: 10.20.230.17

Network Mask: 255.255.255.0

Gateway Address: 10.20.230.1

Name Server Address: 10.20.230.1

Command/Control Port: 1033

Output Formats

FORMAT	ENABLE	PROTOCOL	ADDRESS	PORT
PD0	ON	UDP	10.20.230.28	1034
PD4	OFF	TCP	10.20.230.1	1035
PD5	OFF	TCP	10.20.230.1	1036
PD6	OFF	TCP	10.20.230.1	1037
PD11	OFF	TCP	10.20.230.1	1038
PD13	OFF	TCP	10.20.230.1	1039
PD26	OFF	TCP	10.20.230.1	1040

Submit Reset

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RD INSTRUMENTS
Everywhere you look

Tasman Network Configuration Page

Testing the Tasman DVL

You should test the Tasman DVL:

- When you first receive the system.
- Before each deployment or every six months.
- When you suspect instrument problems.
- After each deployment.

To test the Tasman:

- Interconnect the system as described in Setting Up the Tasman System.

2. Place the Tasman transducer in water (at least 2 to 4 cm to cover the transducer face).
3. Apply power to the system.
4. Start the *TRDI Toolz* program (for help on using *TRDI Toolz*, see the TRDI Toolz Help file).
5. Click the **Break** button. The wakeup banner appears on the log file window.

```
Tasman
Teledyne RD Instruments (c) 2019
All rights reserved.
Firmware Version: 74.xx
Current time is: 19/08/01,21:01:38.47
Break received, serial
>
```

6. At the ">" prompt in the communication window, enter the command **CR1** then press the **Enter** key. This will set the Tasman to the factory default settings.
7. At the ">" prompt in the communication window, enter the command **CK** then press the **Enter** key. This will save the factory default setting.
8. At the ">" prompt in the communication window, enter the command **PS0** then press the **Enter** key. This will display the Tasman system configuration data.

```
>ps0
Serial Number: 0
Frequency: 614400 Hz
Configuration: DVL : 4-beam velocity.
Transducer Type: PHASEDARRAY
Beam Angle: 30 Degrees
Beam Pattern: CONVEX
Sensors: TEMP PRESS 600BAR
CPU Firmware: 74.xx
FPGA Version: 1.00.011 [0x100b]
```

```
Board Serial Number Data:
E3 00 00 0A 8D 30 7A 28 DS18B20 TMP SNS
B6 00 00 03 02 D9 CA 23 ETH72B-2306-01A
15 00 00 02 D5 6F 6A 23 XDC72B-2356-00A
CA 00 00 02 96 27 11 23 PTX72B-2304-10A
F4 00 00 01 F1 91 75 23 DSP72B-2303-01B
EF 00 00 02 A7 21 8B 23 RCV72B-2302-13A
```

9. At the ">" prompt in the communication window, enter the command **PA** then press the **Enter** key. This will run the Tasman Pre-Deployment test.



Submerge the transducer face in 2 to 4cm of water. The PA test may fail in air. Only a failure with the transducer in water is a relevant test.

```
>PA
ROM Test...PASS [ 3aad ]
RAM test...PASS
FRAM test...PASS
Receive Buffer Test...PASSED
XMIT RAM Test....PASSED
Receive Path Test (Hard Limited)...PASSED
Transmit/Receive Continuity Check...PASSED
```

```
Composite Result:
GO for Deployment
```

10. If the wakeup displays, PSo displays, and PA message displays with a result of "GO for Deployment", the Tasman is functioning normally.
11. If the result shows "NO-GO for deployment" then run a PT200 test to obtain a more detailed log of the failure. See Troubleshooting EMI for more information.

Mechanical Integration

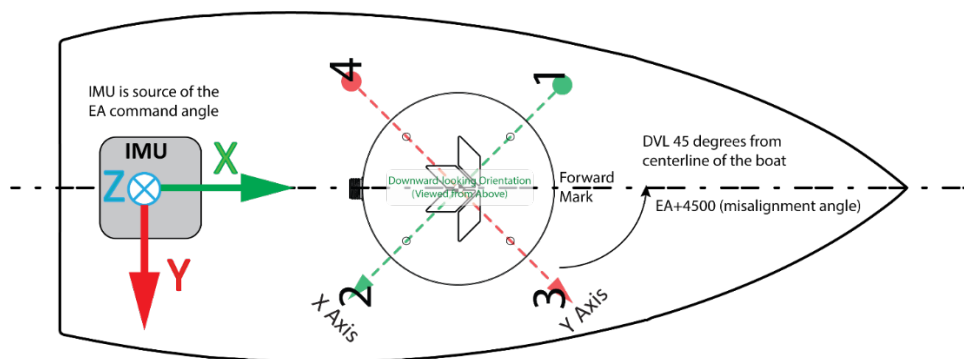
Alignment

The mechanical alignment of the transducer head is important to DVL data accuracy. Mechanically mount the head as close as possible to your reference point. You also must mount the transducer head as level as possible using the ship's roll and pitch references.



TRDI recommends mounting the transducer head with Beam 3 (instrument Y-axis) rotated 45° relative to the ship forward axis. The Forward Mark on the transducer will face forward.

Mounting the transducer head with Beam 3 (instrument Y-axis) rotated 45° relative to the ship forward axis causes the magnitude of the signal in each beam to be about the same. This improves error rejection, reduces the effect of ringing, and increases the Tasman's effective velocity range by a factor of 1.4. If Beam 3 is aligned at an angle other than zero, use the EA command to describe the rotation between instrument Y-axis (beam 3) and ship forward axis.



Transducer Alignment Reference Points

Installing the DVL on the ROV

There are many options for mounting the Tasman systems and they depend on the application. Use the four mounting holes on the customer interface plate. The customer interface plate, 81B-6104-00 can be machined to accommodate your needs. See the [Outline Installation Drawings](#) for dimensions and weights.



Electrical Integration

Grounding Recommendations

The DVL has three isolated grounds to achieve the desired performance levels of the instrument. The grounding systems are as follows:

- Communication ground
- Power ground
- Chassis ground

Multiple grounds connected to a vehicle hull or to a vehicle chassis can have undesirable consequences. Grounding problems can be avoided by implementing prudent grounding schemes.

Bypassing or shorting the DVL isolation / ground noise filter circuit will increase the sensitivity of the DVL to vehicle noise, which will increase noise floor in the instrument and in the data, thereby resulting in a reduced operational range and data contamination from interference. Additionally, bypassing of the DVL isolation/ground filter can lead to accelerated corrosion.

Avoiding Electro-Magnetic Interference (EMI)

The main sources of EMI are induced voltages from signal and power lines that are in proximity to the affected component or signal. These problems are avoided or minimized by the proper routing of wires, proper shielding of wires and proper location of individual systems components. EMI is also caused by unwanted differences in potential on signal or ground electronic lines.



For more information, see the Tasman Guide, Chapter 2 – System Integration, Identifying EMI.

Acoustic Integration

The following items must be taken into consideration when using the Tasman DVL.

Flow Noise – Water flowing over the transducer faces increases the acoustic noise level, which in turn decreases the operational range of the DVL. Flow noise can be reduced across the transducer faces by mounting the DVL behind a sea chest, fairing, or acoustic window. Flow noise can also be reduced by optimizing the transducer head type and design to conform to the platform hull form being used.

Cavitation – Cavitation is the formation of air bubbles due to the reduction of ambient pressure because of hydrodynamic flow conditions. Cavitation at the edges of the transducer or surrounding area near the transducer often results in increased acoustic noise, and a corresponding reduction in operating range. As with flow noise, cavitation can also be reduced by optimizing the transducer head type and design to the platform hull form being used.

Ringling – Ringing occurs in DVLs when the energy from the side lobes of the transmitted signal excites the metal portion of the DVL transducer such that a resonant condition occurs. This causes the transducer and anything attached to it to resonate at the system's transmit frequency. While some ringing is normal in DVLs, its magnitude must be minimized.

Windows Use Considerations – Windows can be used to produce overall performance improvements in vessel-mounted DVLs. There are several advantages and disadvantages to consider before using an acoustic window.

Advantages

- Well will not fill with air bubbles caused by the ship moving through the surface water.
- Flow noise is reduced.
- The well can be filled with fresh water to limit corrosion.
- Barnacles cannot grow on the transducer faces. Barnacle growth is the number one cause of failure of the transducer beams.
- The transducer is protected from debris floating in the water.

Disadvantages

- The range of the DVL may be reduced because the window can and will absorb some of the transmit and receive energy.
- The transmit signal could be reflected into the well, causing the well to “ring”. This will cause the data being collected during the ringing to be biased. Some vessels have reported a loss in range as great as 50 meters. As noted, the ringing may be damped by applying sound absorbing material on the well walls (Precision Acoustics F48 anechoic tile).
- The transmit signal could be reflected off the window and back into the other beams.

SONAR Interference Considerations – Interference from other acoustic and electromagnetic devices can cause velocity and direction bias. In extreme cases, interference may prevent the DVL from operating.



For more information, see the Tasman Guide, Chapter 2 – System Integration.

Operational & Setup Integration

The following items must be taken into consideration when using the Tasman DVL.

Unfavorable Environments – There are certain environmental conditions where the DVL's errors may be large or where the instrument does not function at all.

- In the surf zone where waves are actively breaking, the acoustic beams may not be able to penetrate the bubble clouds, and even if they do, the sound speed may be significantly affected by the high concentration of bubbles. This changes the Doppler scale factor.
- The dense growth of weeds or kelp on the bottom may prevent the DVL from detecting the true bottom. If the DVL locks onto the top of the weeds by mistake, they may have motion relative to the bottom due to wave action, which would give inaccurate velocity measurements.
- In areas of high salinity (>35ppt), the absorption of the sound by the water column will reduce the altitude capability of the DVL. Absorption (maximum range) can also be affected by water temperature.
- In areas where the salinity varies as a function of location and/or time, the Doppler scale factor will be varying, and it may be necessary to integrate a speed-of-sound sensor into the navigation system to keep the velocity measurement errors to an acceptable value. Temperature gradients can cause similar issues. This is only for the Z-axis velocity, as Speed of Sound does not impact 2D velocities on a Phased Array Transducer.

Triggering – There are two methods for triggering the DVL:

- **Sending ASCII Character through Serial Port.** When the system is interfaced to a serial port (e.g. a navigation computer), the system can be setup to wait for an input before each ping. To setup the DVL in this fashion, clear the Auto Ping Cycle bit in the CF command by sending CFx0xxx, where the x's represent the settings of the other parameters. Start the DVL pinging with the CS command. The DVL will output a '<' before each ping and wait for input. Send any valid ASCII character to trigger the ping. The instrument will not enter sleep mode while it is waiting for the trigger.
- **Using Low-Latency Triggering.** The trigger methods shown above all have latencies ranging from a few milliseconds to a few hundred milliseconds, which may be excessive for high-precision applications. Consequently, TRDI has developed a low-latency trigger method (see CX command). To configure the DVL for low-latency triggering, set the CX command to enable trigger input. Start the DVL pinging with the CS command. The DVL will then wait for a trigger before each ping. Setting the trigger lines to a break state for no less than 10 microseconds sends the trigger. The DVL will then ping within 1 millisecond of the leading edge of the break pulse. Note that it is possible through the CX command settings to set a timeout for the DVL to wait for a Trigger and then if no Trigger occurs during that time it will either Self Deploy and never look for Trigger again or Ping once and then go back to waiting for Trigger. The input trigger voltage is 3.3VDC to 5VDC.



For more information, see the Tasman Guide, Chapter 2 – System Integration and Chapter 7 - Commands.

INS Integration

The Tasman is integrated into the vehicle and connected to its network. The user accesses the Tasman's configuration HTML page and navigates to the network configuration page. The network configuration page provides a selection of PD outputs and a network configuration for each. The web page automatically refreshes and displays the current setting.

Network Settings

Network Configuration STATIC

Base IP Address: 192.168.1.100

Network Mask: 255.255.255.0

Gateway Address: 192.168.1.1

Name Server Address: 192.168.1.1

Command/Control Port: 1033

Link Status
Active

Output Formats

FORMAT	ENABLE	PROTOCOL	ADDRESS	PORT
PD0	ON	UDP	192.168.1.255	1001
PD4	OFF	UDP	192.168.1.255	1035
PD5	OFF	TCP	192.168.1.255	1036
PD6	OFF	TCP	192.168.1.255	1037
PD11	OFF	TCP	192.168.1.255	1038
PD13	OFF	TCP	192.168.1.255	1039
PD26	OFF	TCP	192.168.1.255	1040

Submit Reset

1. Configure the Tasman to output PD0 via UDP broadcast socket 255:255:255:255, port 1001.
2. The command file used by the Tasman enables Ethernet turnkey mode, and sets the delay start time to 30 seconds (CT command set to CT 2 30) (see Chapter 3, Creating or Modifying Command Files in the Tasman **DVL** Guide).
3. Cycle power to the Tasman (wait 30 seconds between power off and power on) and monitor the output via Wireshark. The user can also command the DVL to start (as an alternative to waiting for Turn Key timeout) by sending a CS command to the DVL TCP Command and Control Port (192.168.1.100, port 1033).
4. 30 seconds after application of power the UDP broadcast packets from the Tasman are observed. Use *TRDI Toolz* to see that the DVL is outputting the Broadcast UDP data (255.255.255.255: port 1001).
5. The Bottom-Track High Resolution Velocity (output data format ID 5803h) and Navigation Parameters Data (output data format ID 2013h) blocks provide aid in the velocity measurement resolution and quality information for use in an Extended Kalman Filter (EKF) Inertial Navigation System (INS) solution. Time Of Validity output for highly accurate coupling with an INS further improves your resulting DVL aided INS position accuracy. See the Navigation Parameters Data Format, bytes 54-69.
 - The Figure of Merit (FOM) is calculated for every velocity estimate and each beam
 - Estimates the standard velocity error
 - Confidence that when FOM is low, error is low
 - FOM can provide warning for individual beams, not entire velocity solution
 - May be used to filter data to reduce standard deviation and bias

Choosing a Data Format

Deciding on which output data format to use depends on the needs of the deployment. The following describes the basics of the formats available.

- **PD0** – PD0 is Teledyne RD Instrument's standard format. PD0 is a binary output format. It provides the most information possible including a header, fixed and variable leader, bottom track, and water profile information. The fixed and variable leader is a recording of time, DVL setup, orientation, heading, pitch, roll, temperature, pressure, and self-test diagnostic results. Data fields to be output are user selectable. PD0 has distance made good in the output if the Bottom Track High Resolution Velocity Output Format is selected. This format is selected via the #BJ command.



The Bottom-Track High Resolution Velocity (5803h) and Navigation Parameters Data (2013h) blocks provide aid in the velocity measurement resolution and quality information for use in an Extended Kalman Filter (EKF) Inertial Navigation System (INS) solution.

- **PD4** – PD4 is a binary output format of bottom track speed over the bottom, speed through the water, and range to bottom information.
- **PD5** – PD5 is a superset of PD4 and includes information on salinity, depth, pitch, roll, heading, and distance made good.
- **PD6** – PD6 is a text output format. Data is grouped into separate sentences containing system attitude data, timing and scaling, and speed through the water relative to the instrument, vehicle, and earth. Each sentence contains a unique starting delimiter and comma delimited fields. If PD6 is selected, there is no data written to the recorder.
- **PD11** is a text output format. It complies with the NMEA 0183 version 2.30 standard.
- **PD13** – PD13 outputs like PD6, except it adds Pressure and Range-to-bottom for all four beams and omits the System Health Monitor Data line.
- **PD26** – The PD26 format includes the \$VMVBW, \$VMDBT, and \$VMVLW NMEA Speed Log Formats.



For more information, see the Tasman DVL Guide, Chapter 8 – Output Data Formats.

Want to know more?

Congratulations! You have completed the Tasman Integration Guide. Read the following chapters in the Tasman Guide for more detailed information.

-  **Chapter 1 – Tasman Overview**
This chapter includes an overview of the Tasman features, options, computer and power requirements, and connecting to the Tasman DVL.
-  **Chapter 2 – System Integration**
This chapter covers system integration in detail.
-  **Chapter 3 – Collecting Data**
Use this chapter to create a command file that will be used to collect data.
-  **Chapter 4 – Maintenance**
This chapter covers Tasman DVL maintenance. Use this section to make sure the Tasman is ready for a deployment.
-  **Chapter 5 – Returning Systems to TRDI for Service**
Use this information to obtain a Return Material Authorization (RMA) number if the Tasman DVL needs to be returned to TRDI.
-  **Chapter 6 – Specifications**
This chapter includes specifications and dimensions for the Tasman DVL (including outline installation drawings).
-  **Chapter 7 – Commands**
This chapter defines the commands used by the Tasman.
-  **Chapter 8 – Output Data Formats**
This chapter defines the output data formats used by the Tasman.



