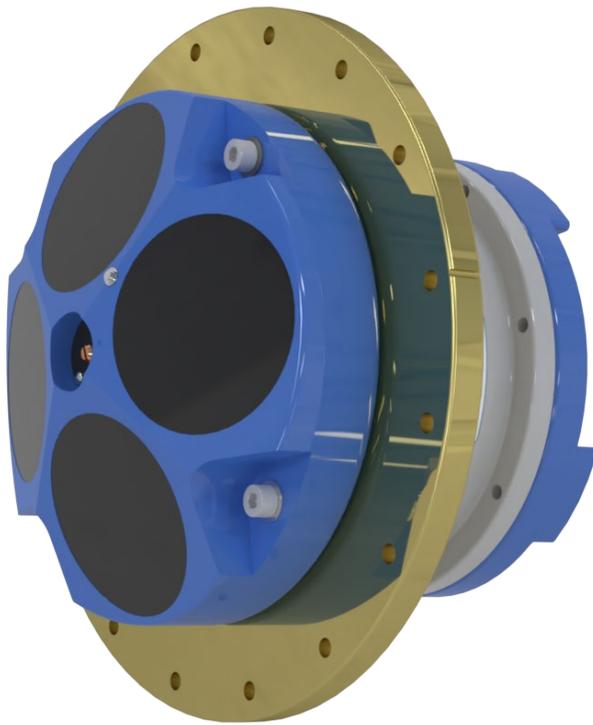


WORKHORSE

MARINER

DEPLOYMENT GUIDE



P/N 957-6286-00 (July 2023)

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HOW TO CONTACT TELEDYNE RD INSTRUMENTS

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

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Client Services Administration – rdicsadmin@teledyne.com

Web: <https://www.teledynemarine.com>

For all your customer service needs including our emergency 24/7 technical support, call +1 (858) 842-2700

Self-Service Customer Portal

Use our online customer portal at <https://www.teledynemarine.com/support/RDI/technical-manuals> to download manuals or other Teledyne RDI documentation.

Teledyne Marine Software Portal

Teledyne RD Instruments Firmware, software, and Field Service Bulletins can be accessed only via our Teledyne Marine software portal.

To register, please go to <https://tm-portal.force.com/TMsoftwareportal> 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).

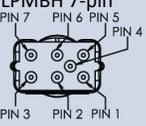
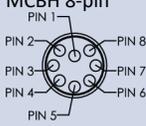
Once you have secured an account, use the Teledyne Marine software portal to access this data with your unique username and password.

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

Workhorse and Workhorse II

This guide covers the original Workhorse (WH) system and repaired systems that require a PC board replacement shipped after November 2022 which ship with the WHII electronics and the WH LPMBH 7-pin end-cap connector.

Table 1. Comparison of Workhorse II to the original Workhorse

	WorkHorse	WorkHorse II	Notes
Connector Type	LPMBH 7-pin 	MCBH 8-pin  or LPMBH 7-pin	MCBH 8-pin improved strain relief and protection of the connector and cable. LPMBH 7-pin maintains compatibility to user's underwater cables.
Memory	PCMCIA, 4 GB max	Compact Flash, with the maximum memory capacity not to exceed 4GB.	Use the RE ErAsE command to erase and format the WHII CompactFlash memory card.
LADCP WM15 Surface Tracking WM15 High-res WM11 High-speed sampling WM12	Purchased options	Standard	See the WorkHorse Operation Manual, Chapter 4 for help on installing feature upgrades.
Compass Type Compass Accuracy / Resolution / Max Tilt	Flux Gate Compass $\pm 2^\circ$ @ 60° magnetic dip angle, 0.01°, $\pm 15^\circ$	ISM Compass 1°RMS, 0.1°, $\pm 70^\circ$	The WH uses the Compass Commands to calibrate the Flux Gate compass. Use the <i>ISM Compass Calibration</i> software to calibrate a WHII compass.
Pressure Sensor / Short-term uncertainty Max. drift	Optional $\pm 0.1\%$ $\pm 0.25\%$	Standard $\pm 0.1\%$ $\pm 0.25\%$	Standard 20 Bar pressure sensor included, or 600 BAR (optional).
Raw Field Strength Recorded	NA	Firmware enabled	Use <i>Compass Post Calibration</i> software to correct for heading errors due to hard and soft iron effects in the Workhorse reference frame during the deployment.
Software	PlanADCP, WinADCP	Workhorse II Plan, ISM Compass Calibration, Compass Post Calibration, WinADCP	Use the <i>PlanADCP</i> software to create a deployment command file if the system has the original Workhorse electronics installed Use the <i>Workhorse II Plan</i> software to create a deployment command file for systems with Workhorse II electronics installed.

Preparing the ADCP

PREPARING THE ADCP INCLUDES THE FOLLOWING STEPS:

- ✔ Checking you have all the Mariner parts
- ✔ Installing the documentation and software

Identifying what's in the Box

Included with the WorkHorse Mariner system:

Part Number	Name	Description
WHMVM1200, 600, 300 WHMVMII1200, 600, 300	Mariner system	The Workhorse Mariner system includes the transducer, Deck Box, dummy plug, and protective cap. When unpacking, use care to prevent physical damage to the transducer face and connector. Use a soft pad to protect the transducer.

Included with the WorkHorse Accessories Kit:

Part Number	Name	Description
977-7002-00 974-7000-00	Shipping case (ADCP) Shipping case (Deckbox)	Shipping case with custom foam cutouts.
757K6060-01	Adapter Plate	Bronze adapter plate kit.
737-3036-025	Underwater cable	The I/O cable is used for serial communications between the ADCP and Deckbox.
97Z-6190-00	USB to Serial Adapter	The USB adapter appears as an additional serial COM port.
95Z-6007-00 957-6284-00 (part of 757K6081-04)	Download instructions Getting Started	This sheet has instructions for downloading the software and manuals. A printed sheet showing Mariner set up.
Download from website	TRDI Toolz	Utility and testing software package that can be used to test both WH and WHII ADCPs.
	PlanADCP WinADCP	Software for Workhorse systems
	Workhorse II Plan ISM Compass Calibration Compass Post Calibration WinADCP	Software for Workhorse II systems
757K6057-00	Spare parts and tools	Contains tools, O-Rings, and close-up hardware. See the WorkHorse Operation Manual, Maintenance chapter for a list of included parts.

Tools and Spare Parts

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

WorkHorse 200 Spare Parts

Part Number	Item Name	Where Used
SPR84-1LB	Rubber Band	Battery pack
5020	Silicone Lubricant	Housing
97Z-6052-00	O-Ring, 2-260 (200-meter housing)	
M6WASHSPLTI	Washer, 6MM Split Lock, Titanium	
M6WASHSTDTI	Washer, Flat, Titanium 12.5MM OD	
M6X1.0NUTTI	Nut, Hex, Titanium 10MM	
M6X1.0X45HHTI	Screw, Hex Head, Titanium	
M8WASHSPLTI	Washer, Split Lock, Titanium	
M8WASHSTDTI	Washer, Flat, Titanium 22.9MM OD	
M8X1.25NUTTI	Nut, Hex, Titanium 13MM	
M8X1.25X65HHTI	Screw, Hex Head, Titanium Full Threads Length	
75ZK6001-00	Kit, Clip, Cable	
75ZK6001-01	Kit, Clip, Dummy Plug	
GMA-3A	Fuse, 5MM X 20MM 3R 250V	
DES3	Desiccant, Sealed Bag	Inside Housing
817-1067-00	Screw, Pressure Sensor	Pressure Sensor

Installing Documentation and Software

The Mariner system documentation and software are downloaded.

- Follow the instruction sheet on downloading TRDI software and manuals.
- Software is available on <https://tm-portal.force.com/TMsoftwareportal>.
 - Install *TRDI Toolz*, *PlanADCP* and *WinADCP* for Workhorse systems.
 - The Workhorse II requires *TRDI Toolz*, *Workhorse II Plan*, *ISM Compass Calibration*, and *Compass Post Calibration*, and *WinADCP* software.
 - Download application software *VmDas* or *WinRiver II* as needed.
- Use our online customer portal at <https://www.teledynemarine.com/support/RDI/technical-manuals> to download manuals or other Teledyne RDI documentation. Download the Workhorse Operation Manual Guide and the Commands and Output Data Format guide. PDF versions of all Workhorse documentation are available for download.





Workhorse Operation Manual



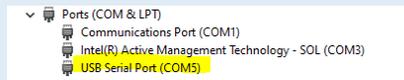
Workhorse Commands and Output Data Format guide

Installing the USB to Serial Adapter Driver



If there is an available internet connection, Windows 10/11 will install the USB driver on first connection. If necessary, install the Virtual COM port (VCP) driver to make the USB adapter appear as an additional COM port. The free FTDI driver download page is available here: <https://ftdichip.com/drivers/>

Use Windows Device Manager® to determine the USB to Serial adapter COM port number. Remove the adapter, wait a moment, note the list of ports, reinsert the adapter and note the new port.



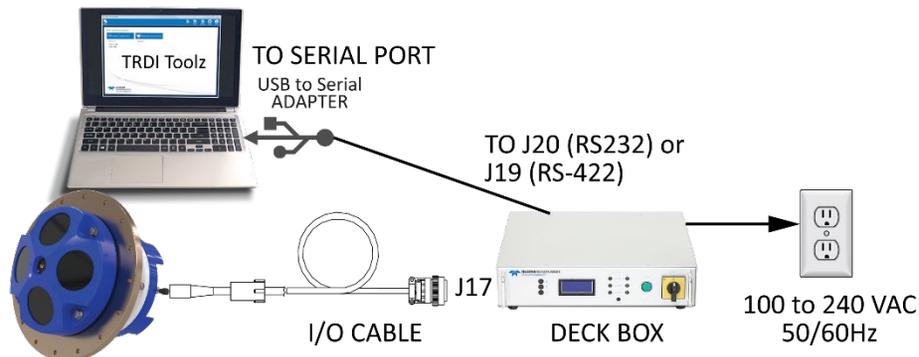
Quick Review

<p>✓ Check that you have all the Mariner parts.</p>	<p>🔗 If you are missing parts, contact TRDI support rdifs@teledyne.com or call +1 (858) 842-2700.</p>
<p>✓ Check that the software and documentation are installed.</p>	<p>🔗 Download and install WH or WHII software.</p>

Connecting to the ADCP

CONNECTING TO THE ADCP INCLUDES THE FOLLOWING STEPS:

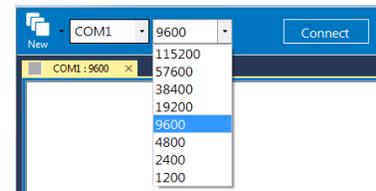
- ✔ Using TRDI Toolz
- ✔ Verify if the system is a WH or WHII



Connecting to the ADCP

To establish communications with the WorkHorse Mariner:

1. Connect the system and apply power.
2. Start the *TRDI Toolz* software.
3. Select **New Serial Connection**.
4. Enter the ADCP's communication settings. Select the **COM Port** the serial cable is connected to and set the **Baud Rate** from the drop-down lists.
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.



How do I know if I have WH or WHII electronics?

```
[BREAK Wakeup A]
Workhorse II Broadband ADCP Version 7x.xx
Teledyne RD Instruments (c) 1996-2022
All Rights Reserved.
>
```

The system has the Workhorse II electronics installed. Use the *Workhorse II Plan* software to create a deployment command file.

```
[BREAK Wakeup A]
WorkHorse Broadband ADCP Version 5x.xx
Teledyne RD Instruments (c) 1996-2010
All Rights Reserved.
>
```

The system has the original Workhorse electronics installed. Use the *PlanADCP* software to create a deployment command file.

If you are unsure of the ADCP's baud rate, use **Tools, Find ADCP**. *TRDI Toolz* will try different baud rates until it connects to the ADCP.



```
>{i7φ²nll²²jñ~ªñδgJ Checking 9600 baud rate
Checking 115200 baud rate
==
WorkHorse II Broadband ADCP Version 7x.xx
Teledyne RD Instruments (c) 1996-2022
All Rights Reserved.

>
```

If you don't know what com port(s) were added when using a USB to serial adapter, use *Windows Device Manager*® to determine the Com port. Remove the adapter, wait a moment, note the list of ports, reinsert the adapter and note the new port.



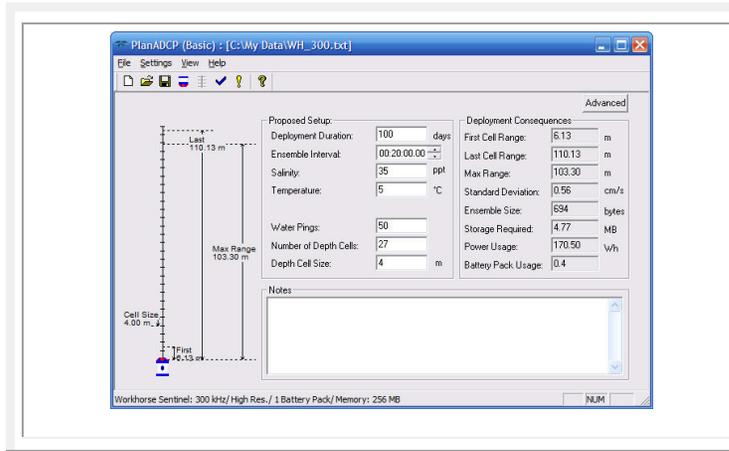
Quick Review

	
<p>✓ Verify the wakeup banner displays</p>	<ul style="list-style-type: none"> • If you are unsure of the ADCP's baud rate, use Tools, Find ADCP. <i>TRDI Toolz</i> will try different baud rates until it connects to the ADCP. • The default factory set communications settings for Mariner systems is RS-422, 9600-baud, no parity, 8 data bits and 1 stop bit. • For help on using <i>TRDI Toolz</i>, click the  icon. • If you have any problems connecting, see the Workhorse Operation manual, Chapter 6.
<p>✓ Install the USB to Serial adapter Virtual COM Port (VCP) driver</p>	<ul style="list-style-type: none"> • The free FTDI driver download page is available here: https://ftdichip.com/drivers/

Planning the Deployment

PLANNING THE DEPLOYMENT INCLUDES THE FOLLOWING STEPS:

- ✔ Creating a command file using PlanADCP or Workhorse II Plan



Use the *PlanADCP* software to create a deployment command file for a system that has the original Workhorse electronics.

Use the *PlanADCP* wizard to create a command file. Review the consequences.

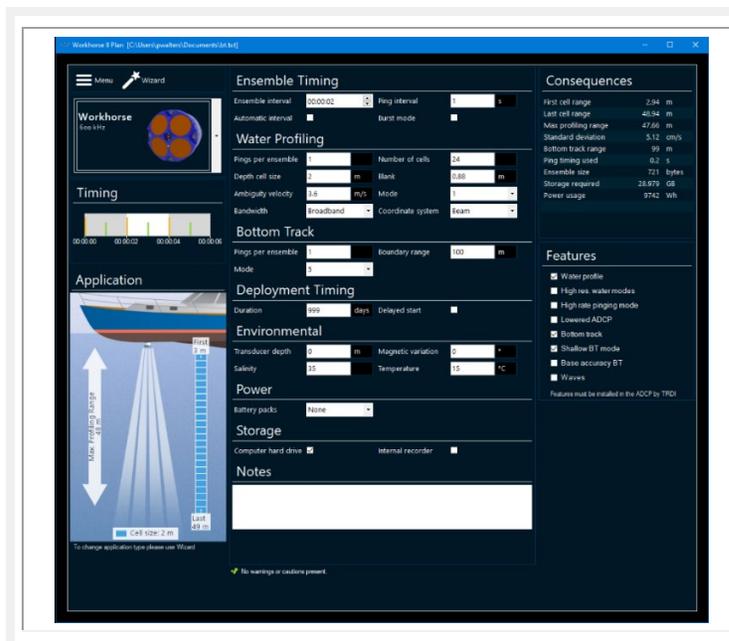
Save the command file.

See [How do I know if I have WH or WHII electronics?](#) to determine what electronics are installed in the system.

If you are collecting data with *VmDas* or *WinRiver II*, use *VmDas* or *WinRiver II* to create the commands to deploy the system.



see the PlanADCP User's Guide for details



Use the *Workhorse II Plan* software to create a deployment command file for a system with WHII electronics.

Use *Workhorse II Plan* to create a command file. Review the consequences.

Save the command file.

See [How do I know if I have WH or WHII electronics?](#) to determine what electronics are installed in the system.

If you are collecting data with *VmDas* or *WinRiver II*, use *VmDas* or *WinRiver II* to create the commands to deploy the system.



See the Workhorse II Plan help file for details.

Quick Review

	
<ul style="list-style-type: none"> ✓ Check that the resources for the deployment are acceptable. 	<ul style="list-style-type: none"> 🔗 Use the <i>PlanADCP</i> or <i>Workhorse II Plan</i> software to verify all consequences.
<ul style="list-style-type: none"> ✓ Use the correct planning software 	<ul style="list-style-type: none"> 🔗 Use the <i>Workhorse II Plan</i> software to create a deployment command file for a system with WHII electronics. 🔗 Use the <i>PlanADCP</i> software to create a deployment command file for a system with the original Workhorse electronics. 🔗 See How do I know if I have WH or WHII electronics? to determine what electronics are installed in the system.
<ul style="list-style-type: none"> ✓ If you are collecting data with VmDas or WinRiver II 	<ul style="list-style-type: none"> 🔗 Use VmDas or WinRiver II to create the commands to deploy the system.

Deploying the ADCP

DEPLOYING THE ADCP INCLUDES THE FOLLOWING STEPS:

- ✓ Setting the ADCP clock
- ✓ Testing the ADCP
- ✓ Calibrating the Compass

Pre-Deployment Checks

TRDI Toolz has a user-friendly interface for running the pre-deployment tests and setting the Monitor/Sentinel real-time clock.



Refer to the Workhorse and Workhorse II Command Guide for a listing of all direct commands and their format.

Setting the ADCP Clock

The real-time clock (date and time) within the Mariner maintains the correct time while system power is removed. The clock is powered by a lithium battery.

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

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.
2. Wake up the ADCP by pressing the  button.
3. Click **Tools, PC Time to ADCP**.
4. *TRDI Toolz* will send the TS command to set the clock.

```
>TS 22/06/17 09:50:34
>
```

Testing the ADCP

To run the Built-in tests:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.
2. Wake up the ADCP by pressing the  button.
3. Enter the PA direct command to send to the ADCP and then press the **Enter** key or click on **Send**.



If any of the tests fail, read Chapter 6 in the Monitor/Sentinel Operation Manual.

Testing the Sensors

To test the sensors:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.
2. Wake up the ADCP by pressing the  button.
3. Enter the PC2 direct command to send to the ADCP and then press the **Enter** key or click on **Send**.

Press any key to quit sensor display ...

Heading	Pitch	Roll	Up/Down	Attitude Temp	Ambient Temp	Pressure
301.01°	-7.42°	-0.73°	Up	24.35°C	22.97°C	0.0 kPa
300.87°	-7.60°	-0.95°	Up	24.36°C	22.97°C	0.0 kPa

4. Use the PC2 test to display the sensor values. Rotate and tilt the system and verify the Pitch and Roll sensor data is reasonable. Rotate the system clockwise and verify the heading increases. Validate the accuracy at 0, 90, and 180 degrees. If the heading is off by more than 2 degrees, calibrate the compass. If the Depth sensor is not zero, zero the pressure sensor.
5. If a sensor fails, contact TRDI Field Service.



See the WorkHorse Operation Manual, Chapter 5 for details on testing the sensors.

Zero the Pressure Sensor

Zero the pressure sensor at the deployment site, prior to deploying the Monitor/Sentinel ADCP in the water.

To zero the pressure sensor:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.
2. Wake up the ADCP by pressing the  button.
3. Enter the AZ direct command to send to the ADCP and then press the **Enter** key or click on **Send**.

Calibrating the ISM Compass



This section applies to the WHII electronics only. See [How do I know if I have WH or WHII electronics?](#) to determine what electronics are installed in the system.

The main reason for compass calibration is battery replacement. Each new battery carries a different magnetic signature. The compass calibration algorithm corrects for the distortions caused by the battery to give you an accurate measurement.

To achieve the best possible field calibration of the compass, the compass calibration should be performed:

- In a “magnetically clean” environment, i.e., in an area free from stray magnetic fields (electronics, power lines, etc.) and magnetic materials such as iron.
- As close as possible to the actual deployment site (so that during calibration the instrument is measuring a magnetic field intensity and dip angle that are as close as possible to the as-deployed environment)
- With a large variety of instrument orientations (ideally tilting the instrument by 30 degrees or more during orientation).
- TRDI recommends that if you are having trouble calibrating the Workhorse II ADCP compass that you move the system and/or ensure the area around the system is clear of electrical equipment and ferrous materials.



In an oil & gas environment, it is typically impossible to meet the first two requirements above. Oil fields are full of metal structures that preclude a “magnetically clean” environment. Even in standard oceanography, for example a deep-water deployment in the open ocean, it is not possible to meet both requirements because any location reasonably near the deployment site is aboard a ship, which will be a decidedly magnetically dirty environment. Therefore, the customer typically must choose between calibrating a long way away from the deployment site or use the factory default calibration and then post-calibrate the data (see [Compass Post Calibration](#)).

To calibrate the internal ISM compass:

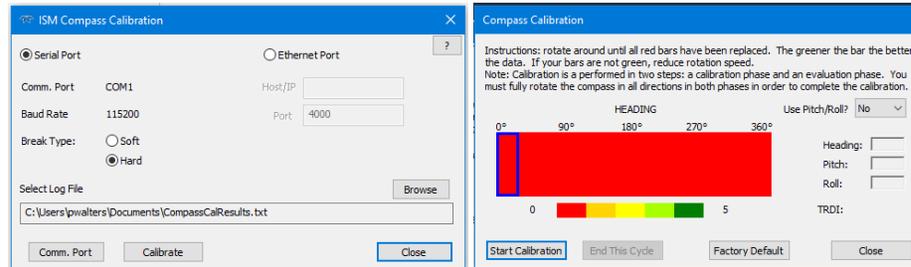
1. Go outside, away from magnetic materials.
2. Start the *ISM Compass Calibration* software and set up the communication parameters between the software and the ADCP.





Communication errors may occur during calibration when using a slow communication Baud rate. If you receive a *Failed to get calibration data...* message, try increasing the Baud rate (115200 Baud is recommended). The Workhorse II uses a Hard break.

3. Click the **Calibrate** button.



4. Select **Use Pitch/Roll?**

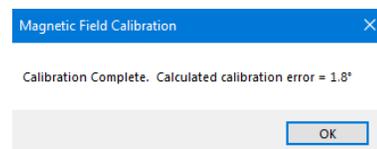
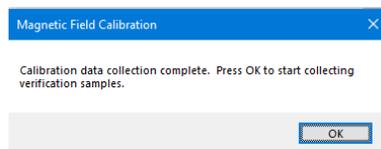
- Select **No**. This calibration requires two rotations (one for calibration and one for verification).
- Select **Yes**. This calibration requires eight rotations (four for calibration and four for verification).

5. Click the **Start Calibration** button.

6. As you rotate the system, the bars will change color. The Blue bar indicates where you are in the rotations.



- Green – Good
 - Light Green – Acceptable
 - Yellow – Within parameters (one or two yellow bars for the entire rotation is OK)
 - Orange – Unacceptable - Rotate slower!
 - Red – Not measured
7. When the first rotation(s) are complete, click **OK** on the message box to continue with the verification samples.
8. When the second rotation(s) are complete, click **OK** on the message box. The calibration error should be less than 2 degrees.



Stability of the instrument during the calibration process, as well as a non-magnetic calibration site is essential to getting the lowest overall error value.

Calibrating the Flux Gate Compass



This section applies to the original WH electronics only. See [How do I know if I have WH or WHII electronics?](#) to determine what electronics are installed in the system.

To calibrate the Flux Gate compass:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.
2. Wake up the ADCP by pressing the  button.
3. At the > prompt, type **AR** and press the **Return** key. This will return the compass to the factory calibration matrix.
4. At the > prompt, type **AF** and press the **Return** key. Choose option “a” or “b” to start the calibration procedure.

Field Calibration Procedure

Choose calibration method:

- a. Remove hard iron error (single cycle) only.
 - b. Remove hard and soft iron error (single + double cycle).
 - c. Calibration for a single tilt orientation (single + double cycle).
 - d. Help.
 - e. Quit.
5. Tilt the ADCP. Tilt an upward-looking WorkHorse with a block under one side of the end-cap. A 35-mm block will give you an 11-degree tilt. Check the on-screen instructions to see if the orientation is OK. Adjust as necessary.



The tilts must remain constant during the rotations. The transducer beam is the center point of the rotation.

6. When prompted, rotate the ADCP slowly 360 degrees (approximately 5 degrees per second).
7. The second rotation requires the ADCP to be tilted 15 degrees in another direction than from the first rotation. Follow the on-screen instructions to orient the ADCP correctly. When prompted, rotate the ADCP slowly 360 degrees (approximately 5 degrees per second).
8. The third rotation requires the ADCP to be tilted 15 degrees in another direction than from the first and second rotations. Follow the on-screen instructions to orient the ADCP correctly.
9. If the calibration procedure is successful, it records the new calibration matrix to nonvolatile memory. The ADCP will not change its matrix unless the calibration is properly carried out.
10. If the calibration procedure is not successful, return your ADCP to the original factory calibration, by using the AR command. Try using the AR command if you have trouble calibrating your compass. In some circumstances, a defective compass calibration matrix can prevent proper calibration.



For a detailed explanation of the calibration procedure, see the WorkHorse Operation Manual, Chapter 4.



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

Removing the Transducer Cover

The Mariner ADCP is shipped with a transducer cover to protect the transducer faces. Remove the cover when deploying the ADCP.



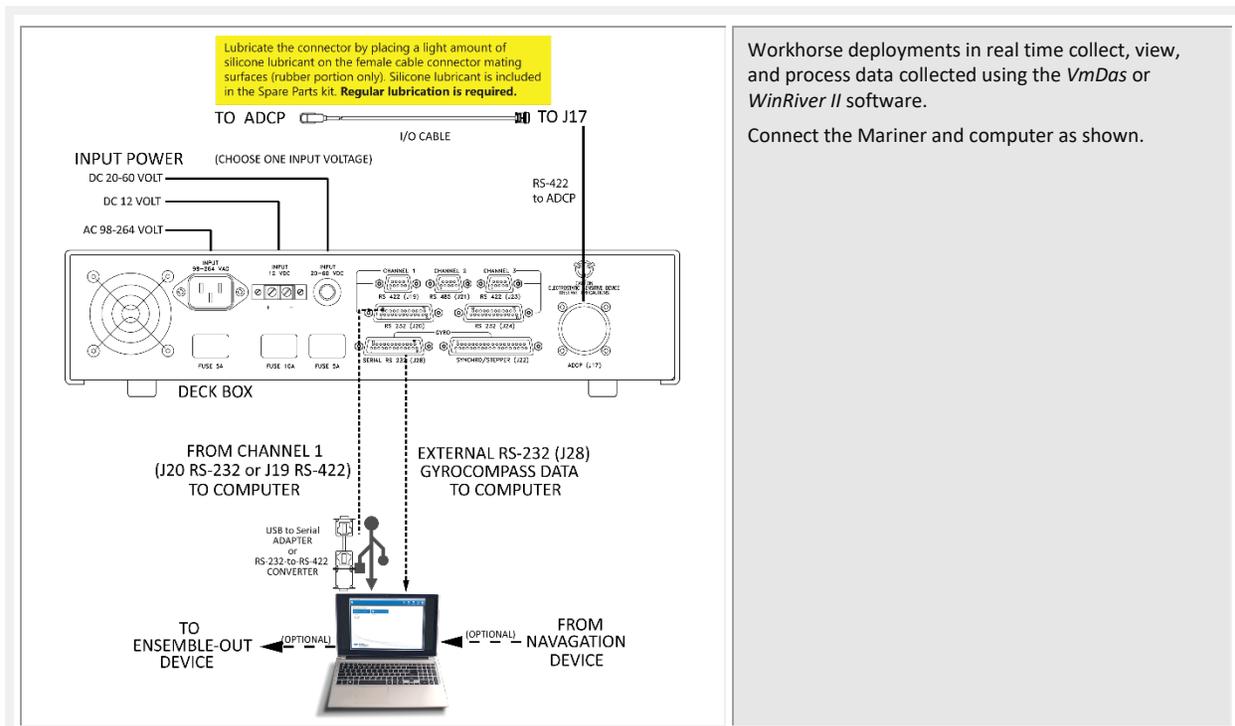
You **MUST** remove the cover to collect good data.

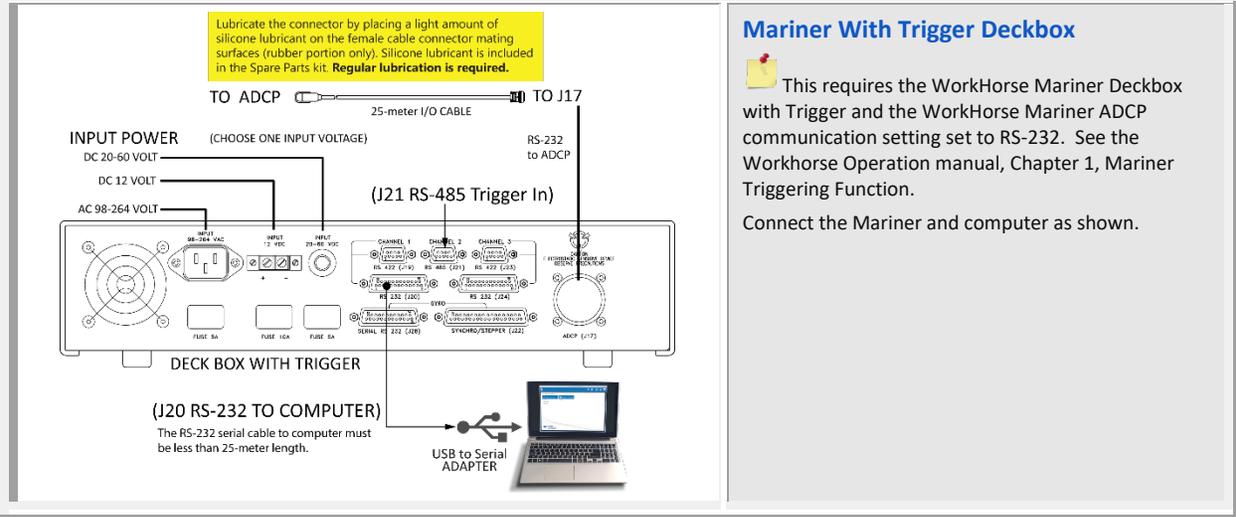


Real-Time Deployments

DEPLOYING THE ADCP INCLUDES THE FOLLOWING STEPS:

- ✔ Connecting the cables
- ✔ Configuring VmDas or WinRiver II



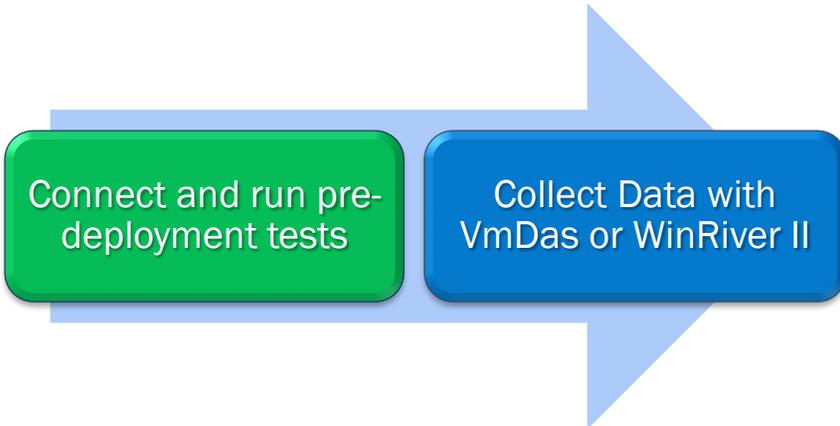


Mariner With Trigger Deckbox

This requires the WorkHorse Mariner Deckbox with Trigger and the WorkHorse Mariner ADCP communication setting set to RS-232. See the Workhorse Operation manual, Chapter 1, Mariner Triggering Function. Connect the Mariner and computer as shown.

The typical Direct-Reading deployment involves the following tasks:

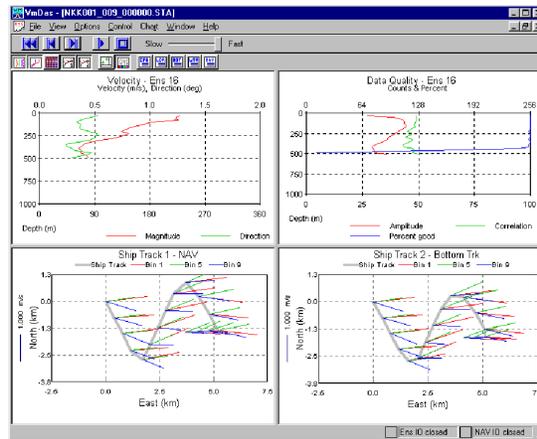
1. Connect to the ADCP using *TRDI Toolz*. Use *TRDI Toolz* to run the pre-deployment tests.
2. Use *VmDas* or *WinRiver II* to collect data.



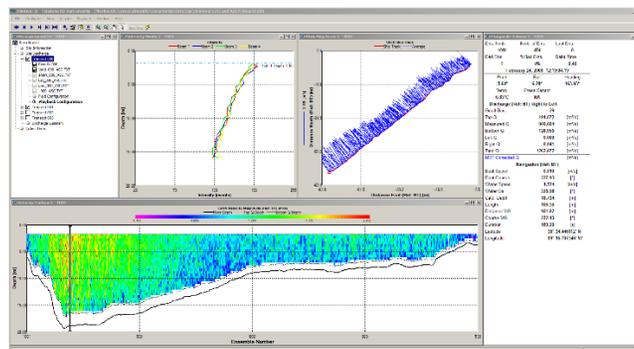
All real-time data is collected, viewed, processed, and played back using *VmDas* or *WinRiver II*. No data is recorded to the Workhorse II internal recorder. Data is recorded to the computer folder selected in *VmDas* or *WinRiver II*.



For information on *VmDas* or *WinRiver II*, clicking Help in the software will open the software user's guide.



VmDas Display



WinRiver II Display

Quick Review

	
<ul style="list-style-type: none"> ✓ All maintenance items (as needed) were done including zero pressure sensor, and compass calibration. 	<ul style="list-style-type: none"> ⓘ TRDI recommends that if you are having trouble calibrating the Mariner compass that you move the system and/or ensure the area around the system is clear of electrical equipment and ferrous materials. ⓘ You MUST remove the transducer cover to collect good data. ⓘ Read Chapter 2 in the WorkHorse Operation Manual for information on how to install/mount the ADCP for a deployment.
<ul style="list-style-type: none"> ✓ The transducer cover is removed. 	
<ul style="list-style-type: none"> ✓ Use VmDas or WinRiver II to configure and send commands to the ADCP 	

Post-processing Data

POST-PROCESSING DATA INCLUDES THE FOLLOWING STEPS:

- ✔ Viewing data using the WinADCP software

Viewing Data

WinADCP is used to view data.

To open a data file:

1. Start WinADCP.
2. Click **Open** and select a data file.



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



For information on using WinADCP, click the **Help** icon.

To view a Workhorse II ADCP data file with the compass post-calibration data applied, open the *filename.postcal.pd0* files.

PDDecoder Library in C language

The Teledyne Marine PDDecoder library is an open-source library written in C language to decode the PDO data formats that are commonly output by Teledyne Marine/Teledyne RD Instruments ADCPs. The definition and details of the PDO format can be found in the Workhorse II Commands and Output Data Format guide. Available for download from the Teledyne Marine software portal:

<https://tm-portal.force.com/TMsoftwareportal>.

Quick Review

	
<p>✔ Check and process the data</p>	<p>📖 Read the WinADCP help file for information on how to check and process data.</p>

Conclusion

Congratulations! You have completed the Mariner Deployment Guide. Read the following chapters in the WorkHorse Operation Manual for more detailed information.

WORKHORSE OPERATION MANUAL

Chapter 1 – At a Glance

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

Chapter 2 – Installation

Use this chapter to plan your installation requirements.

Chapter 3 – Data Collection

Use this chapter for an overview of collecting data using WinSC and PlanADCP.

Chapter 4 – Maintenance

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

Chapter 5 – Testing the WorkHorse

Use this chapter to test the ADCP is functioning correctly.

Chapter 6 – Troubleshooting

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

Chapter 7 – Returning Systems to TRDI for Service

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

Chapter 8 – Specifications

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



WORKHORSE COMMANDS AND OUTPUT FORMAT GUIDE

Chapter 1 – Introduction to Commands

This chapter explains how commands used by the Mariner ADCPs.

Chapter 2 – Command Descriptions

This chapter defines the commands used by the Mariner ADCPs.

Chapter 3 – Advanced Commands

This chapter defines the Sound Velocity Smart Sensor, Waves, Lowered ADCP, and Ping Synchronization commands used by the Mariner ADCPs.

Chapter 4 - Output Data Format

This chapter explains the PDO output data format used by the Mariner ADCPs.

Chapter 5 – Special Output Data Formats

This chapter explains the PD3 through PD18 output data formats used by the Mariner ADCPs.

Chapter 6– How to Decode an ADCP Ensemble

This chapter explains how to decode PDO data.

