WORKHORSE II

MONITOR / SENTINEL
DEPLOYMENT GUIDE

TELEDYNE
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https://www.teledynemarine.com

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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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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.

Preparing the ADCP

PREPARING THE ADCP INCLUDES THE FOLLOWING STEPS:

✔ Checking you have all the Monitor/Sentinel parts

✔ Installing the documentation and software

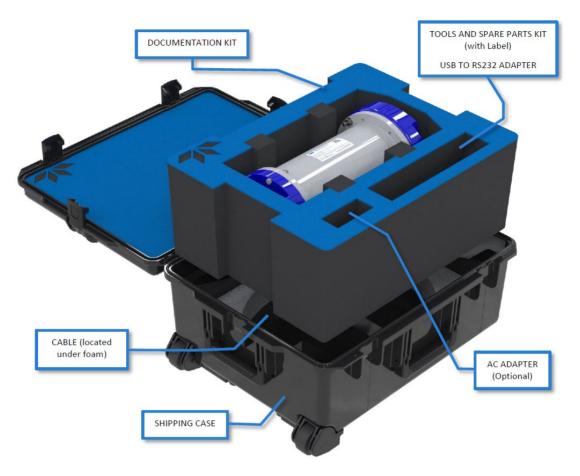✔ Installing the batteries

✔ Checking the system is closed properly

Identifying what's in the Box

Included with the Monitor/Sentinel system:

Part Number	Name	Description
WHSII1200-I, 600, 300 WHMII1200, 600, 300	Sentinel system Monitor system	The Workhorse II Monitor/Sentinel system includes the transducer, CompactFlash Memory card (Sentinel only), 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.

Workhorse II Accessories:

Part Number	Name	Description
977-7016-00 977-7015-00	Shipping case	Shipping case with custom foam cutouts.
737-3172-005 737-3173-005	Test cable Pigtail cable	Optional with Sentinel system. The test cable is used for serial communications. Included with Monitor system. Note the cable is located under the foam in the shipping case.
97Z-6190-00	USB to Serial Adapter	The USB adapter appears as an additional serial COM port.
717-3014-00 optional	AC Power Adapter	The optional AC Adapter converts AC power and supplies +48 VDC to run the Workhorse II.
737-3010-00 optional	RS-422 to RS-232 Converter	Converts RS-422 to RS-232 for serial communications (optional for Monitor systems).
757K6023-00	Alkaline Battery Pack (Sentinel only)	Workhorse II Sentinel batteries are shipped inside the Workhorse II ADCP but **not connected**. Connect the battery and seal the Workhorse II ADCP before deployment.
977-6037-00	Memory (Sentinel only)	Workhorse II Sentinel ADCPs come standard with one CompactFlash memory card with the maximum memory capacity not to exceed 4GB.
957-6300-00 95Z-6007-00 957-6305-00 (part of 757K6189-00)	Getting Started	A printed sheet showing Workhorse II Monitor/Sentinel set up.
	Download instructions	This sheet has instructions for downloading the software and manuals.
	WHII Accessory Kits	This sheet lists the parts included with the accessory kits.
Download from website	TRDI Toolz Workhorse II Plan ISM Compass Calibration Compass Post Calibration WinADCP	Use *TRDI Toolz* to test the ADCP, send deployment commands, and recover data. The *Workhorse II Plan* program creates a deployment configuration file. Use *ISM Compass Calibration* to calibrate the internal compass. Use *Compass Post Calibration* to correct heading/velocity data in a PD0 data file. Use *WinADCP* to review data files.
757K6188-00	Spare Parts Kit	Contains tools, O-Rings, and close-up hardware

DOCUMENTATION KIT

TOOLS AND SPARE PARTS KIT
(with Label)

USB TO RS232 ADAPTER

CABLE (located
under foam)

AC ADAPTER
(Optional)

SHIPPING CASE

Tools and Spare Parts

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

Workhorse II 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)	
97Z-6084-00	O-RING, 2-015 .070DIAX.551 ID, EPDM, DURO 90A, VENT PLUG	
97Z-6084-01	O-RING, 3-904, .072DIAX.351 ID, EPDM, DURO90A, VENT PLUG	
M6WASHSPLTI	Washer, 6MM Split Lock, Titanium	
M6WASHSTDTI	Washer, Flat, Titanium 12.5MM OD	
M6X1.0NUTTI	Nut, Hex, Titanium 10MM	
M6X1.0X50HHTI	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	
GMA-3A	Fuse, 5MM X 20MM 3R 250V	Main Electronics
DES3	Desiccant, Sealed Bag	Inside Housing
817-1067-00	Screw, Pressure Sensor	Pressure Sensor

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Installing Documentation and Software

The Workhorse II software and manuals are available for download.

1. Follow the instruction sheet on downloading TRDI software and manuals.

2. Software is available on https://tm-portal.force.com/TMsoftwareportal.

    Download *TRDI Toolz*, *Workhorse II Plan*, *ISM Compass Calibration*, *Compass Post Calibration*, and *WinADCP*. These programs are required for set up, testing, and data review.

    Download application software *VmDas* or *WinRiver II* as needed.

3. 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 II Operation manual and Workhorse ADCP Commands and Output Data Format Guide. PDF versions of all Workhorse II documentation are available for download.

Workhorse II Operation Manual   Workhorse ADCP Commands and Output Data Format Guide

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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.

Installing Sentinel Batteries
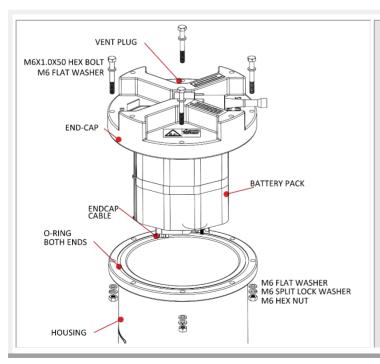
To connect the battery pack:

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

1. Place the Sentinel ADCP with the end-cap facing up. Use a soft pad or the transducer cover to protect the ADCP.

2. Using a 7/8" socket wrench, loosen the Vent plug on the end-cap to vent any pressure inside the housing.

3. Use two 10mm combination wrenches to remove the bolts from the end-cap. Carefully lift the end-cap away from the housing.

4. Connect the battery cable to the top PC board two-pin connector.

5. Check there is a battery pack rubber band around all four wing nuts. This will prevent the wing nuts from backing off the post. Secure the desiccant pack and humidity indicator under the rubber band as shown.

⚠ The Workhorse II Sentinel battery packs are held in place by four sets of washers, lock washers, and wing nuts. If the wing nuts are not tight, the assembly of washers and wing nut can become loose and eventually fall onto the PIO board. This has caused the PIO board to short out.

1. Place the end-cap on the housing, aligning the mating holes and the beam 3 number embossed on the end-cap with the beam 3 number embossed on the transducer head.

2. Examine the titanium end-cap assembly nuts, bolts, and washers (6-mm) for corrosion; replace if necessary.

3. Use two 10mm combination wrenches to tighten the bolts to the recommended torque value of 5.6 Newton-meters (50 pound-inches).

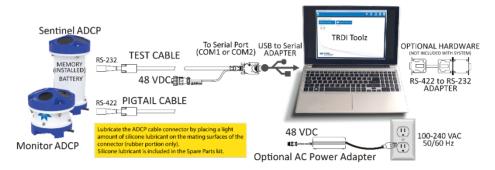4. Tighten the vent plug to 6.78 Newton-meters (60 pound-inches).

Quick Review

✔ Check that you have all the Monitor/Sentinel parts.	⊕ If you are missing parts, contact TRDI support rdifs@teledyne.com or call +1 (858) 842-2700.
✔ Check that the software and documentation is installed. ✔ The software is available for download on https://tm-portal.force.com/TMsoftwareportal	⊕ Install TRDI Toolz, Workhorse II Plan, ISM Compass Calibration. ⊕ Install Compass Post Calibration, and WinADCP. ⊕ Install any application software as needed.
✔ Check that the system is closed properly.	⊕ For more information about installing the battery and system close-up, see chapter 4 in the <u>Workhorse II Operation Manual</u>.

Connecting to the ADCP

C O N N E C T I N G   T O   T H E   A D C P   I N C L U D E S   T H E   F O L L O W I N G   S T E P S :

✔ Using TRDI Toolz to communicate with the Workhorse II

Connecting to the ADCP

To establish communications with the Workhorse II:

1. Lubricate the cable connector and connect to the ADCP. Attach the cable to the computer's serial communication port or connect the USB adapter to a spare USB port. Use a RS-422 to RS-232 converter if the ADCP is configured as RS-422. Apply +48VDC 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. From the **Break** button drop down menu, select **Hard Break** (shortcut **Alt+H**). Click the **Break** (⚡) button. The wakeup banner will display in the terminal window.

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.

```
>{¡¬φ²∩ᴵᴵᴵᴵᴵ²²jñ~ªñδgJ Checking 9600 baud rate
Checking 115200 baud rate
==
Workhorse II Broadband ADCP Version 77.xx
Teledyne RD Instruments (c) 1996-2021
All Rights Reserved.
>
```

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.
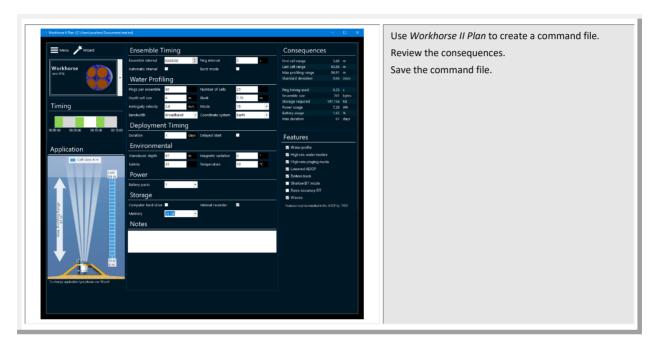
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Quick Review

✔ Verify the wakeup banner displays	🔁 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. 🔁 The default factory set communications settings for Sentinel is RS-232, 9600-baud, no parity, 8 data bits and 1 stop bit. Monitor systems use RS-422, 9600-baud, no parity, 8 data bits and 1 stop bit. 🔁 For help on using *TRDI Toolz*, click the ❓Help icon. 🔁 If you have any problems connecting, see the <u>Workhorse II Operation manual</u>, Chapter 6.
✔ Install the USB to Serial adapter Virtual COM Port (VCP) driver	🔁 The free FTDI driver download page is available here: <u>https://ftdichip.com/drivers/</u>

Planning the Deployment

PLANNING THE DEPLOYMENT INCLUDES THE FOLLOWING STEPS:

✔ Creating a command file using Workhorse II Plan

Use *Workhorse II Plan* to create a command file.

Review the consequences.

Save the command file.

 See the Workhorse II Plan help file for details.

Quick Review

✔ Check that the resources for the deployment are acceptable.

Use Workhorse II Plan wizard screens and verify all consequences.

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Deploying the ADCP

D E P L O Y I N G   T H E   A D C P   I N C L U D E S   T H E   F O L L O W I N G   S T E P S :

✔ Setting the ADCP clock

✔ Formatting the CompactFlash card recorder

✔ Testing the ADCP

✔ Calibrating the Compass

✔ Sending the commands to the ADCP

Pre-Deployment Checks

Use *TRDI Toolz* 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 Monitor/Sentinel maintains the correct time while system power is removed. The clock is powered by a lithium battery on the WHP board.

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.

```
[BREAK Wakeup A]
Workhorse II Broadband ADCP Version 77.xx
Teledyne RD Instruments (c) 1996-2021
All Rights Reserved.

>TS 21/06/17 09:50:34
>
```

Format the CompactFlash Card Recorder

Use the **RE ErAsE** command to erase and format the CompactFlash memory card to the FAT32 format.

To format the CompactFlash memory card:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.

2. Wake up the ADCP by pressing the ⚡ button.

3. Enter the **RE ErAsE** command and then press the **Enter** key or click on **Send**. This command *is* case sensitive.

```
>RE ErAsE erasing...
Recorder erased.
>
```

> ⚠️ Use *TRDI Toolz* to download data from the CompactFlash card (see Downloading Data Files). Once erased, data is not recoverable. Do not format or delete files from the CompactFlash card using Windows®. This may leave hidden files on the card. Always use the ADCP's RE ErAsE command to format and delete data from the CompactFlash card recorder.
>
> A recorder card with a file count more than 50 files will cause a noticeable delay between the first ensemble and the Start Pinging (CS) command. If this delay is a concern, ensure that unwanted files are cleared before starting the deployment.
>
> The maximum data file size is 4GB.

Testing the ADCP

To run the Built-in tests:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.

2. Place the system in a plastic container with at least 2 to 4cm of water to cover the transducer faces. The system can rest on the bottom of the container.

3. Wake up the ADCP by pressing the ⚡ button.

4. Enter the **PA** command and then press the **Enter** key or click on **Send**.

> 📌 This test may fail if the transducer is not in water. If any of the tests fail, read Chapter 6 in the Workhorse II 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** command 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. 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 II 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** command and then press the **Enter** key or click on **Send**.

Calibrating the Compass

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).
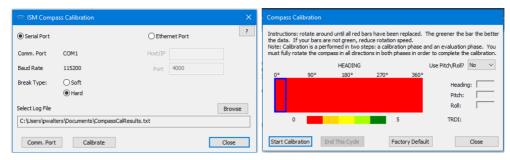
To calibrate the internal compass:

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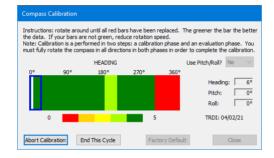
> Communication errors may occur during calibration when using a slow communication Baud rate. If you receive a *Failed to get calibration data…* message, try increasing the Baud rate (115200 Baud is recommended). The Workhorse II uses a Hard break.
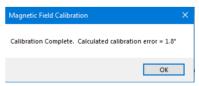
3. Click the **Calibrate** button.

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.

Removing the Transducer Cover

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

> ⚠️ You MUST remove the cover to collect good data.

Deploying the ADCP

Use TRDI's software *Workhorse II Plan* to create and save a command file (see Planning the Deployment).

To send multiple commands to configure the ADCP and start it pinging:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.

2. Wake up the ADCP by pressing the ⚡ button.

3. On the **Tools** menu, select **Script Editor**.

4. Click the **Open** icon and select the command file to run from the list. If no extension is given for the script file, an extension of *.txt is assumed.

5. Click the **Send** icon. Clicking the drop-down menu will show the options to **Send to current** or **Send to all**. Use the **Send to all** feature to send the same script file to all connected ADCPs.

Once the system receives the CS command (last command in the command file) and it is setup to deploy immediately, the unit will start pinging per the timing commands schedule. It will beep audibly while pinging and output data for each ensemble per the schedule based on the WD command.
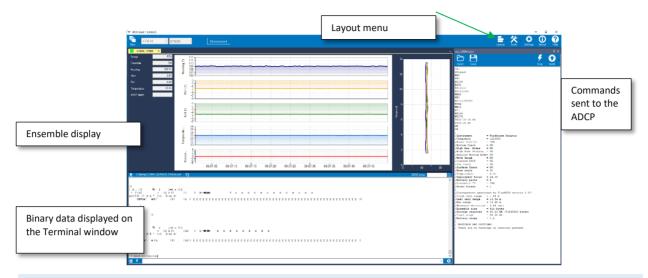
If the system is setup for a delayed deployment, the ADCP sets its alarm clock to the TF command setting, goes to sleep, and waits until time TF before beginning the data collection process. Once pinging, these audible beep and data output indicators will be observable.
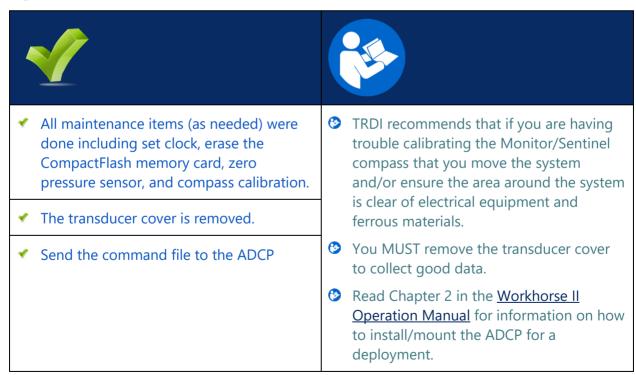
> 📖 For more information on the commands, see the WorkHorse Commands and Output Data Format guide, available for download on
> https://www.teledynemarine.com/support/RDI/technical-manuals.

6. Use the **Layout** menu to show or hide the Ensemble Display and Terminal windows. The Ensemble Display shows limited situational data (Format, Ensemble, Heading, Pitch, Roll, Temperature, ADCP depth) in tabular form from the ADCP data stream, when present.

Note that the Ensemble Display is off when *TRDI Toolz* is first started.

Quick Review

✔ All maintenance items (as needed) were done including set clock, erase the CompactFlash memory card, zero pressure sensor, and compass calibration.	⊗ TRDI recommends that if you are having trouble calibrating the Monitor/Sentinel compass that you move the system and/or ensure the area around the system is clear of electrical equipment and ferrous materials.
✔ The transducer cover is removed.	⊗ You MUST remove the transducer cover to collect good data.
✔ Send the command file to the ADCP	⊗ Read Chapter 2 in the Workhorse II Operation Manual for information on how to install/mount the ADCP for a deployment.

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Recovering Data

RECOVERING DATA INCLUDES THE FOLLOWING STEPS:

✔ Downloading data files

✔ Post-calibrate the compass data

✔ Viewing data using the WinADCP software

Downloading Data Files

To download a data file:

1. Setup the communication parameters between *TRDI Toolz* and the ADCP.

2. Wake up the ADCP by pressing the ⚡▾ button.

3. Click **Tools**, **Download Data**.

4. *TRDI Toolz* sends the **RY** command to recover the data. The **RY** command uploads the entire contents of the CompactFlash memory card via the serial interface to a host computer using the standard YMODEM protocol for binary file transfer. The data is transferred to the host and stored as binary files.

5. Once the data has been recovered, the CompactFlash memory card can be erased by sending the command **RE ErAsE**. This command *is* case sensitive. *Once erased, the data is not recoverable.*

Compass Post Calibration

Compass Post Calibration corrects for heading errors due to hard and soft iron effects in the Workhorse reference frame during the deployment. Often, post calibration will provide results more reliable than when only a pre-deployment calibration is performed.

Some example scenarios where the post calibration is useful:

• The Workhorse is installed on a mooring and rotates freely sampling the magnetic environment throughout the deployment.

• The magnetic properties of the installation changed after the pre-deployment calibration. For example, a battery pack was added, or the Workhorse was installed in a mounting frame constructed of a ferrous material.

• The Workhorse was subject to magnetic interference during the pre-deployment calibration.
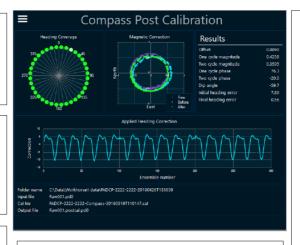
Post calibration will not be effective if:

• The magnetic interference is not in the Workhorse reference frame. The Workhorse is deployed adjacent to a large metal structure like a bridge or ship for example.

• The magnetic properties change over the deployment.

Heading Coverage: Green indicates heading data was collected. Light green indicates some heading data was collected. Missing circles indicates the ADCP did not collect heading data for that direction.

Magnetic Correction: The Before series (shown in cyan) is the Raw data (shown in purple) with the existing magnetic correction applied, the After series (shown in green) is the Raw data with the post-calibration correction applied.

Example Postcal.txt file:

```
Date: 10/20/2021 3:05 PM
Offset: 9.02e-003
One cycle: 4.26e-001
Two Cycle: 3.60e-001
One cycle phase: -76.3
Two cycle phase: -20.0
Dip angle: -59.7
Initial heading error: 7.9°
New heading error: 0.56°
Use Post-cal: true
```


The *filename.pd0* data file and the *filename.cal* calibration file must be in the same folder.

Post Calibration will create the *filename.postcal.txt* and *filename.postcal.pd0* files.

The original raw data is not changed. Use the *filename.postcal.pd0* file to view the data with the post compass calibration correction applied.

The **Offset** is the amount by which the calibrated circle must be moved to be centered on zero.

The **One-Cycle Magnitude** and **Phase** are the RMS hard iron correction. That is, how big is the circle and at what angle is its origin.

The **Two-Cycle Magnitude** and **Phase** are the RMS soft iron correction. That is, how round (non-elliptical) is the circle and at what angle is its origin.
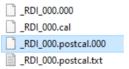
Dip angle is the angle made with the horizontal by the Earth's magnetic field lines.

Initial Heading Error is the compass error before the post calibration is applied.

Final Heading Error is the compass error after the post calibration is applied.

To post calibrate the data:

1. Use *TRDI Toolz* to download the data from the CompactFlash recorder. For example, the pd0 data file is named *_RDI_000.000* and the *_RDI_000.cal* is the post calibration file and both files are downloaded to the same folder.

2. Start the *Compass Post Calibration* software and click the **Menu** button to select the PD0 data file (*.000).

3. *Compass Post Calibration* will create the *filename.postcal.txt* and *filename.postcal.000* files. The original raw data is not changed. Use the *filename.postcal.000* file to view the data with the post compass calibration correction applied.

> The *.cal* file is created during data collection and is recorded to the CompactFlash recorder with the *.000 pd0 data file.
>
> Post calibration relies upon the instrument moving sufficiently the during the deployment to collect "raw magnetometer" data for the heading coverage. If the *.cal* file did not have sufficient heading coverage, then the post calibration will fail to converge.

Viewing Data
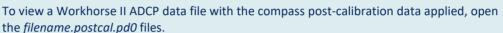
WinADCP is used to view data.

To open a data file:

1. Start *WinADCP*.

2. Click **Open** and select a data file.

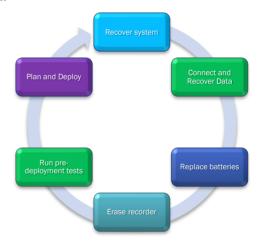> The original *.pd0 file is never changed, moved, or overwritten.

> 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.

Redeployment

The Self-Contained deployment typical turn-around involves the following tasks:

1. Recover the ADCP to the deck of the support vessel.

2. Connect to the ADCP using *TRDI Toolz*. Transfer the data to the laptop.

   - It is recommended that all data is down-loaded and verified before the recorder is erased.

3. Replace the batteries.

4. Erase the CompactFlash memory card recorder.

5. Close the self-contained housing and run the pre-deployment tests.

6. Plan the deployment with *Workhorse II Plan* and redeploy the ADCP.

Recover system
Connect and Recover Data
Replace batteries
Erase recorder
Run pre-deployment tests
Plan and Deploy

PDDecoder Library in C language

The Teledyne Marine PDDecoder library is an open-source library written in C language to decode the PD0 data formats that are commonly output by Teledyne Marine/Teledyne RD Instruments ADCPs. The definition and details of the PD0 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

✔ Download the data.	⊙ Use TRDI Toolz to download data.
✔ Post-calibrate the compass data	⊙ Use Compass Post Calibration software.
✔ Check and process the data	⊙ Read the *WinADCP* help file for information on how to check and process data.

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Conclusion

Congratulations! You have completed the Monitor/Sentinel Self-Contained Deployment Guide. Read the following chapters in the Workhorse II Operation Manual for more detailed information.

Workhorse II Operation Manual

⊕ Chapter 1 – Overview

   This chapter includes an overview of the Workhorse II features, options, computer, power requirements, and connecting to the Monitor/Sentinel 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.

⊕ Chapter 4 – Maintenance

   This chapter covers Workhorse II maintenance. Use this section to make sure the Monitor/Sentinel is ready for a deployment.

⊕ Chapter 5 – Testing the Workhorse II

   Use this chapter to test the Workhorse II is functioning correctly.

⊕ Chapter 6 – Troubleshooting

   This chapter covers how to troubleshoot the Workhorse II. If the Monitor/Sentinel 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 Monitor/Sentinel ADCP needs to be returned to TRDI.

⊕ Chapter 8 – Specifications

   This chapter includes specifications and dimensions for the Workhorse II (including outline installation drawings).

Workhorse Commands and Output Format Guide

⊕ Chapter 1 – Introduction to Commands

   This chapter explains how commands are used by the Workhorse II.

⊕ Chapter 2 – Command Descriptions

   This chapter defines the commands used by the Workhorse II ADCPs.

⊕ Chapter 3 – Advanced Commands

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

⊕ Chapter 4 – PD0 Output Data Format

   This chapter explains the PD0 output data format used by the Workhorse II.

⊕ Chapter 5 – Special Output Data Formats

   This chapter explains the PD3 through PD18 output data formats used by the Workhorse II.

NOTES

EAR99 Technology Subject to Restrictions Contained on the Cover Page.