PINNACLE 45 SELF-CONTAINED DEPLOYMENT GUIDE

TELEDYNE MARINE
Everywhereyoulook™

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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.

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NOTES

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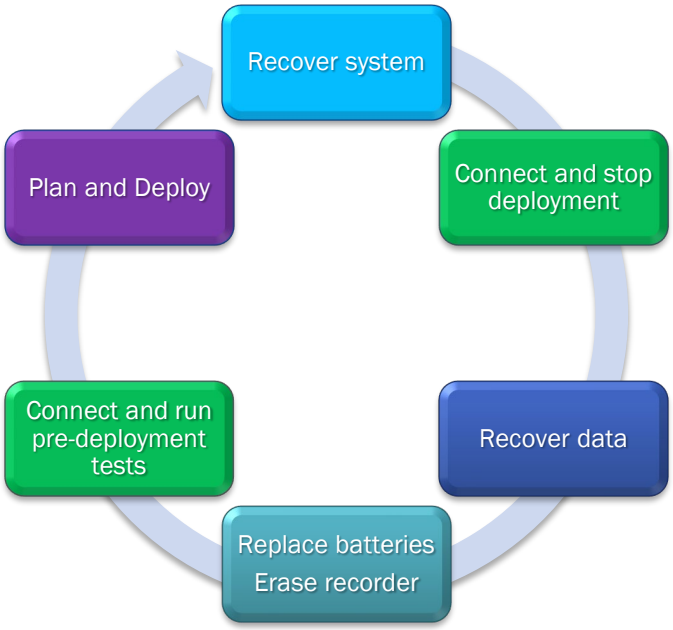
System Turnaround

The Pinnacle 45 kHz Self-Contained ADCP allows for turn-around time of a mooring deployment well under 60-minutes. During a typical turn, the data needs to be transferred, the batteries replaced, and the system prepared to redeploy.

The typical turn-around involves the following tasks:

1. Recover the Pinnacle ADCP to the deck of the support vessel.
2. Connect to the Pinnacle ADCP using *Pinnacle Utilities* to stop the deployment. On connecting, the software will provide the status of the fixed and removable recorders.
3. Remove the end-cap and manually dismount the removable recorder (SD memory card) from the Replaceable Memory Housing and transfer the data to the laptop (see Downloading Data Files).
    - Use a card reader to download all the data directly to a computer for maximum download speeds.
4. Replace the batteries and the removable recorder (with either a new SD card or the existing one).
    - It is recommended that all data is downloaded and verified before both the removable recorder and the fixed recorder are erased.
5. Close the self-contained module and reconnect to the Pinnacle ADCP using *Pinnacle Utilities* to run the pre-deployment tests.
6. Plan the deployment and redeploy the Pinnacle ADCP.



Preparing the Pinnacle ADCP

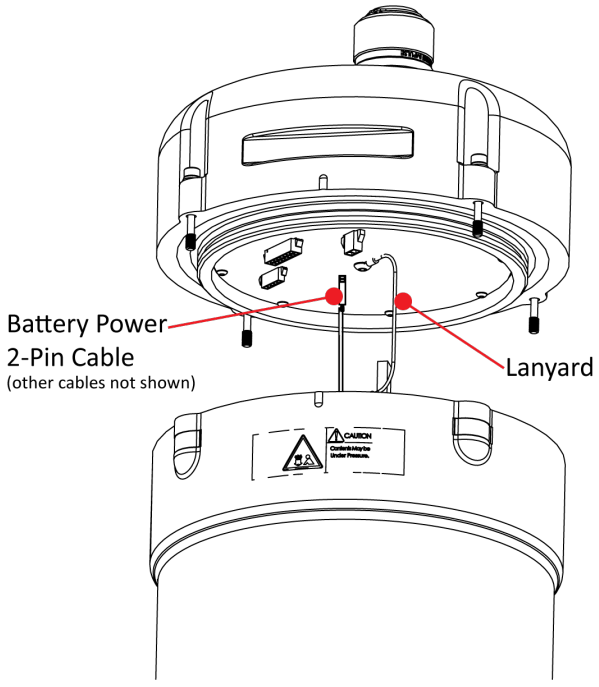
PREPARING THE PINNACLE INCLUDES THE FOLLOWING STEPS:

- Installing the batteries
- Checking the system is closed properly

Connecting the Batteries

Self-Contained system battery packs are shipped inside the Pinnacle but not connected. Connect or install new batteries and seal the system before deployment.

To connect the battery packs:



Remove the end-cap purge plug.

Remove the end-cap by removing the four end-cap captive bolts.

If needed, install fresh battery cores into the battery modules.

Connect the battery pack power cable to the 2-pin PWR connector(s).

For more information about installing the batteries and system close-up, see chapter 4 in the Pinnacle Operation Manual.

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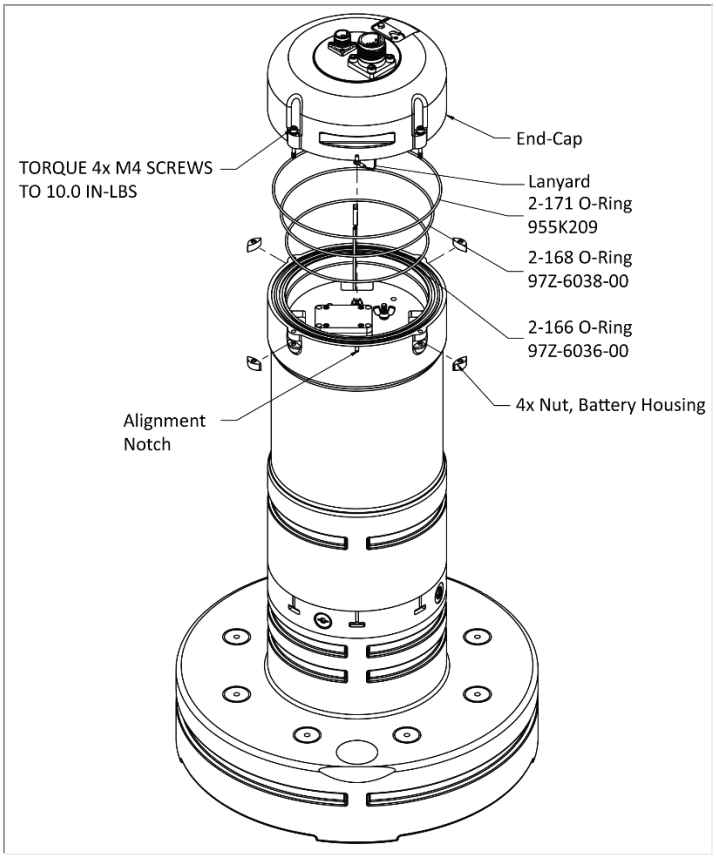


Place the end-cap on the housing, aligning the notches embossed on the end-cap with the notch embossed on the housing.

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

Install all four sets of hardware until “finger-tight.”

Tighten the captured bolts to the recommended torque value of 15 ± 1.0 in-lbs [1.7 ± 0.2 N-m].

Install the purge plug.

For more information about system close-up, see chapter 4 in the Pinnacle Operation Manual.

Quick Review

✔ Check that you have all the Pinnacle parts. ✔ Check that the software and documentation is installed. ✔ Connect to the Pinnacle	Read the **Getting Started with the Pinnacle**
✔ Check that the system is closed properly.	For more information about installing the batteries and system close-up, see chapter 4 in the Pinnacle Operation Manual.

Connecting to the Pinnacle

CONNECTING TO THE PINNACLE INCLUDES THE FOLLOWING STEPS:

- Using Pinnacle Utilities to Connect to the Pinnacle
- Setting the System Type to SC

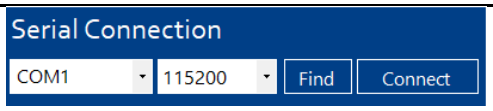
To establish communications with the Pinnacle:

1. Start the *Pinnacle Utilities* software.
2. Connect the Pinnacle deck box and apply power (see the Getting Started guide). Wait five seconds.
3. On power up, the system runs a self-test and the LED will blink.
4. Select **New Serial Connection** or **New Ethernet Connection** depending on the underwater cable type.
5. Enter the ADCP's communication settings.

Serial Communications:

Select the **COM Port** from the drop-down list.

Enter 115200 for the **Baud Rate** from the drop-down list.

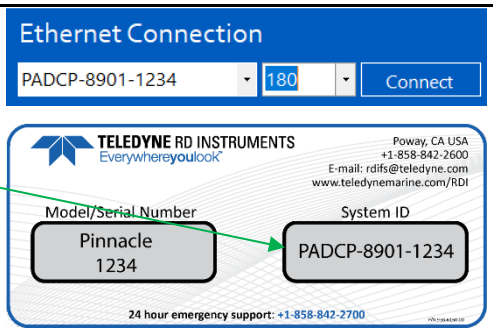


Ethernet TCP Communications when the PC is connected to a network:

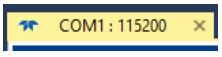
Enter the **System ID** PADCP-xxyy-nnnn as shown on the product label.

Enter the **Port Number** 180

If the PC is NOT connected to a network, see Chapter 1, Configure the PC for a Peer-to-Peer Network Configuration in the Pinnacle Operation manual.



6. Click the **Connect** button. Once connected, the main screen opens, and the session tab will show.



If the Pinnacle is NOT deployed it will go to sleep in five minutes if there is no activity. This is true regardless of Direct-Reading, Self-Contained, Serial COM, or Ethernet communications. The only exception is when Ethernet is connected, and a link is detected. In this case the system will NOT go to sleep.

Read the **Getting Started with the Pinnacle** for information on how to connect the cables.

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

LED Indications

There is one blue LED mounted on the side of the transducer housing. The blink rates indicate the Pinnacle status as defined below. The LED blinks in an 8-bit pattern representing two seconds of time. Each bit represents 0.25 seconds. A 1 indicates the LED is on, a 0 indicates the LED is off.

Serial Not Deployed: The Pinnacle is configured to communicate via serial channels. The pattern is 10001110 and repeats as long as the system is active. Visually (8 seconds shown):

Ethernet Not Deployed: The Pinnacle is configured to communicate via Ethernet channels. The pattern is 10101110 and repeats as long as the system is active. Visually (8 seconds shown):

Deployed to Ping Now: The pattern is 10001000 and repeats for fifteen minutes. Visually (8 seconds shown):

Deployed to ping in the future: The pattern is 1000000 and repeats for fifteen minutes. Visually (8 seconds shown):

On cold-start power up, the Pinnacle runs a self-test. If the self-test passed, the pattern is 10101010 for two seconds, followed by the "not deployed" state. Visually (8 seconds shown):

Self-Test Passed Serial:

Self-Test Passed Ethernet:

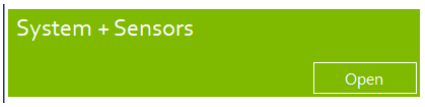
If the self-test does not pass, then the pattern is 10101010 and is repeated until successful user intervention. Visually:

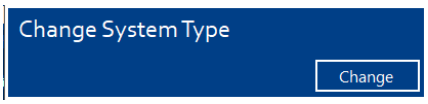
Setting the System Type

The Pinnacle system type can be Direct-Reading (DR) or Self-Contained (SC). Based on the system type, *Pinnacle Utilities* sets important parameters.

To change the system type to DR:

1. Start *Pinnacle Utilities* and connect to the Pinnacle ADCP.
2. Click **Open** on the System + Sensors box.
3. Click **Change** on the Change System Type box.
4. Select the **SC** system type from the drop-down list to match the Pinnacle configuration.





Quick Review

✔ Connect to the Pinnacle	• For help on using *Pinnacle Utilities*, click the icon. • Always close the TRDI software connection to the system by clicking on the X ( ) in the session tab and then power down the Pinnacle before disconnecting the Ethernet cable. If the Ethernet link drops while an active connection exists with TRDI Software, then you may need to cycle power to the Pinnacle to reconnect.
✔ Set the System Type to SC	• Based on the system type, *Pinnacle Utilities* sets where the data will be recorded, to allow or not allow a deployment if a working recorder is not detected, available Wizards, and to enable or disable data buffering. For more information, see the CD and CG commands in the Pinnacle Operation manual.

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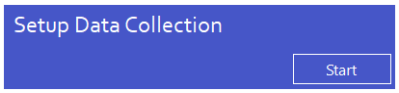
Planning the Deployment

PLANNING THE DEPLOYMENT INCLUDES THE FOLLOWING STEPS:

- Creating a command file using Pinnacle Utilities



Setup the communication parameters between *Pinnacle Utilities* and the ADCP.

Click **Start** on the Setup Data Collection box to start the Plan module.

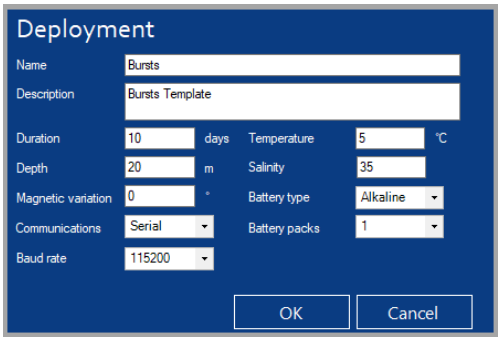
For help on using *Pinnacle Utilities*, click the Help icon.

Set the System Type to SC.

Click the Wizard button (Wizard).

Select the type of Pinnacle ADCP application.

TRDI strongly encourages developing the command files using the *Pinnacle Utilities* **Wizard**. Using *Pinnacle Utilities* allows you to set the command values and see the result of your choices before deploying the ADCP. *Pinnacle Utilities* ensures the Pinnacle ADCP is properly configured.



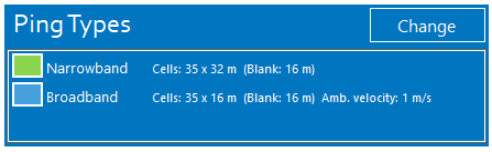
Click the **Change** button on the **Deployment** tab.

Enter a **Name** and **Description** for the deployment.

Set the number and type of batteries used to check if you have sufficient power for the deployment

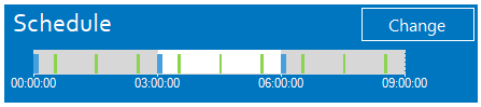
Click **OK** to save the settings.

Example screen shown for the Bursts Wizard.



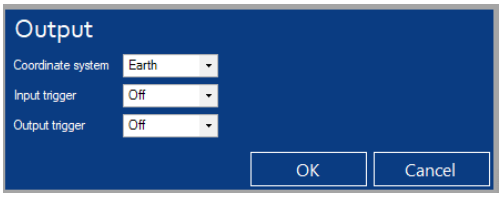
Check the **Ping Type** tab has the necessary pings active.

This is the default setting when the Bursts Wizard is selected.



Set the **Schedule** tab as needed.

This is the default setting when the Bursts Wizard is selected.

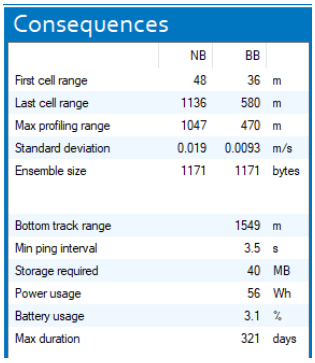


Click the **Change** button on the **Output** tab.

Use this screen to set up the Input and Output triggers if needed.

Click **OK** to save the setting.

Leave the coordinate system at **Earth**.



Review the consequences.

On the toolbar, click the **Save** button to save the command file. Name the command file and click **Save** to save the command file. *Pinnacle Utilities* will automatically add the extension **.txt* to the file. If you make any changes to the input parameters, resave the file. When you exit *Pinnacle Utilities*, you will be prompted to save the file.

Quick Review

Check that the resources for the deployment are acceptable.	Use the Pinnacle Utilities Plan screens to verify all consequences.

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Deploying the Pinnacle

DEPLOYING THE PINNACLE INCLUDES THE FOLLOWING STEPS:

- Setting the Pinnacle clock
- Testing the Pinnacle
- Calibrating the Compass
- Sending the commands to the Pinnacle

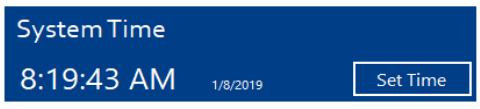
Pre-Deployment Checks

Pinnacle Utilities has a user-friendly interface for running the pre-deployment tests.

Setting the Pinnacle Clock

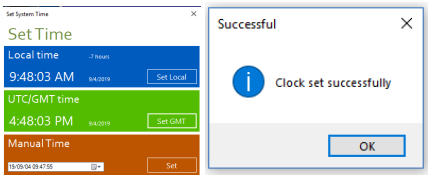
The real-time clock (date and time) within the Pinnacle maintains the correct time while system power is removed. The clock is powered by a lithium battery on the CPU board.

To set the ADCP's real-time clock:



Setup the communication parameters between *Pinnacle Utilities* and the ADCP.

Click **Set Time**.



Choose **Set Local**, **Set UTC/GMT** or **Manual Time**. *Pinnacle Utilities* will set the clock to match the PC's time or UTC/GMT.

Click **OK** at the **Clock set successfully** screen.

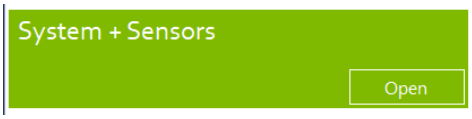
Testing the Pinnacle

To run the Built-in tests:

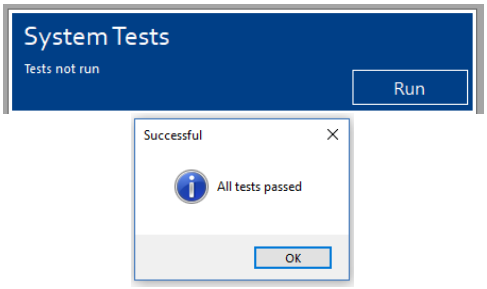
Direct Reading Pinnacle Shown

Setup the communication parameters between *Pinnacle Utilities* and the Pinnacle.

Place the Pinnacle system in enough water to cover the transducer face. Use wood strips or a hoist to lift the transducer to protect the face.



Click **Open** on the System + Sensors box.

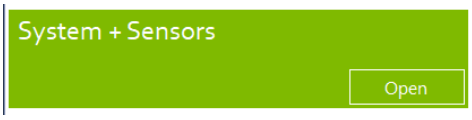


Click on the System Tests **Run** button.

Click **OK** at the **All tests passed** screen.

Testing the Sensors

To view the sensor data:



Start *Pinnacle Utilities* and connect to the Pinnacle ADCP.

Click **Open** on the System + Sensors box.

Click **Start** on the Sensor Data button.

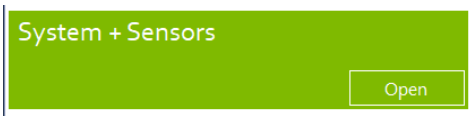
To verify the sensors are functional rotate and tilt the system and verify the Pitch and Roll sensor data is reasonable. Rotate the system clockwise and verify the heading increases. Validate the accuracy of beam 3 at 0, 90, and 180 degrees. If the heading is off by more than 2 degrees, calibrate the compass. If the pressure is not zero, zero the pressure sensor.

Click the **X** on the **Sensors** screen to exit the sensor test.

Zero the Pressure Sensor

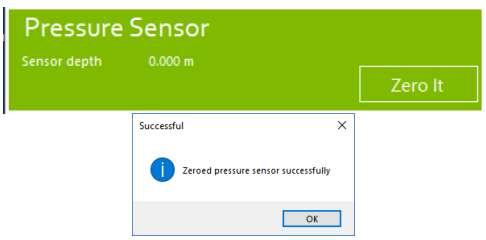
Zero the pressure sensor at the deployment site, prior to deploying the Pinnacle in the water.

To zero the pressure sensor:



Setup the communication parameters between *Pinnacle Utilities* and the ADCP.

Click **Open** on the System + Sensors box.



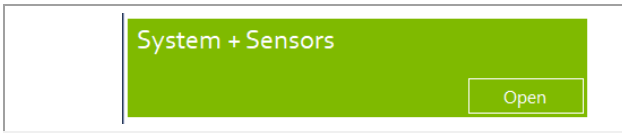
Click **Zero It** on the Pressure Sensor box. This will zero the pressure sensor.

Click **OK** at the **Zeroed pressure sensor successfully** screen.

Testing for Acoustic Interference

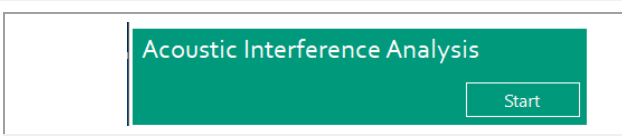
Observation of the acoustic interference plots will provide information about interference to the Pinnacle ADCP. The *Pinnacle Utilities* software provides the user with a frequency domain plot (~100% bandwidth) of the Pinnacle's four receiver channels during a sampling interval.

To view the Acoustic Interference Analysis data:

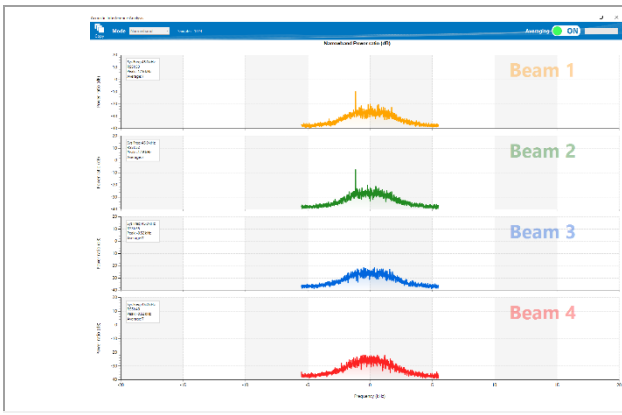


Start *Pinnacle Utilities* and connect to the Pinnacle ADCP.

Click **Open** on the System + Sensors box.



Click **Start** on the Acoustic Interference Analysis box.



Use the **On/Off** switch to turn on or off Averaging.

Move devices that may cause interference closer to the Pinnacle transducer. Observe changes in the plots. Interference will show as spikes.

As needed, click **Copy** to create a screen capture of the Acoustic Interference screen.

It takes a few seconds for the Acoustic Interference data to display.

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.

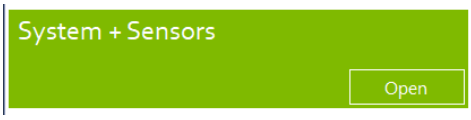
To achieve the best possible field calibration of the compass, the compass calibration should be performed:

- 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 Pinnacle 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.

The Pinnacle saves "raw magnetometer" compass readings as a way to avoid this problem without performing a field calibration, and then allows the user to post-correct for magnetic influences when the data file is opened (see Viewing Data). This technique relies upon the instrument moving sufficiently during deployment, and it only allows for hard-iron corrections.

To calibrate the compass:

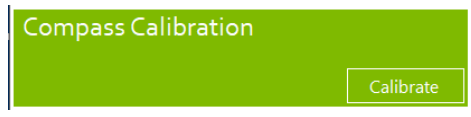


Go outside, away from magnetic materials.

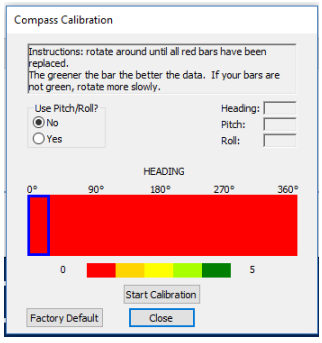
Start *Pinnacle Utilities* and connect to the Pinnacle ADCP.

Click **Open** on the System + Sensors box.

Use the shipping case to rotate the Pinnacle during calibration—this way you will not scratch or drop the Pinnacle.



Click Compass Calibration, **Calibrate** button.



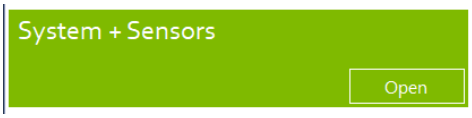
Click **No** for **Use Pitch/Roll**. This calibration requires two rotations (one for calibration and one for verification).

Press the **Start Calibration** button to start.

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

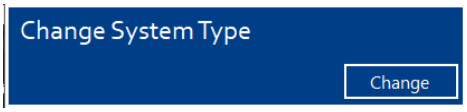
Deploying the Pinnacle

To start a Self-Contained deployment:

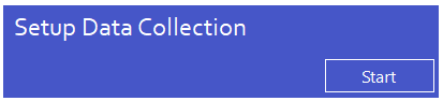


Start *Pinnacle Utilities* and connect to the Pinnacle ADCP.

Run the pre-deployment checks.



On the System + Sensors screen, change the System Type to SC.



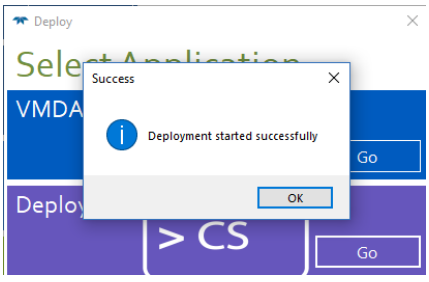
Click **Start** on the Setup Data Collection box.

Use the *Pinnacle Utilities* Wizard to plan or open a self-contained deployment (see Planning a Deployment and the *Pinnacle Utilities* help file).

Click the **Deploy** button.

If an error message "*Deployment start/stop failed*" appears, press the **Deploy** button again.

Click the **Go** button on the Self-Contained **(>CS)** box.



Click **OK**. *Pinnacle Utilities* will disconnect from the ADCP.

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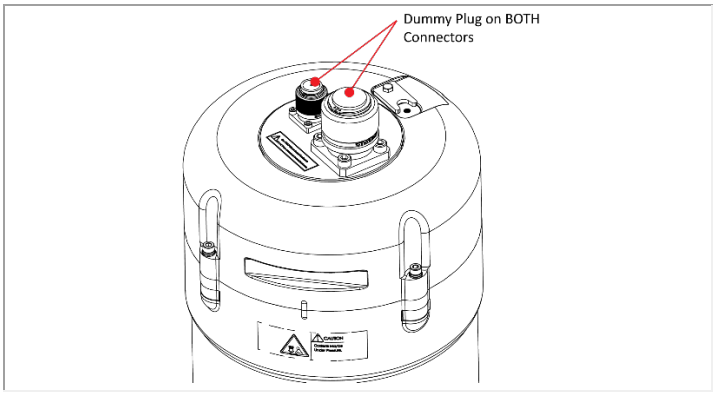


Remove the cable and install dummy plugs on both connectors.

Thread the coupling ring onto the receptacle to complete the connection.

The Pinnacle ADCP is now ready to deploy.

Quick Review

Check the System Type is set to SC	Pinnacle Utilities sets where the data will be recorded, to allow or not allow a deployment if a working recorder is not detected, and to enable or disable data buffering. For more information, see the CD and CG commands in the Pinnacle Operation manual.
All maintenance items (as needed) were done including set clock, zero pressure sensor, install fresh batteries, and compass calibration.	TRDI recommends that if you are having trouble calibrating the Pinnacle compass that you move the system and/or ensure the area around the system is clear of electrical equipment and ferrous materials.
Deploy the Pinnacle	Use Pinnacle Utilities to create the deployment. Install dummy plugs on both connectors before deploying. Read Chapter 2 in the Pinnacle Operation Manual for information on how to install/mount the Pinnacle for a deployment.

Recovering Data

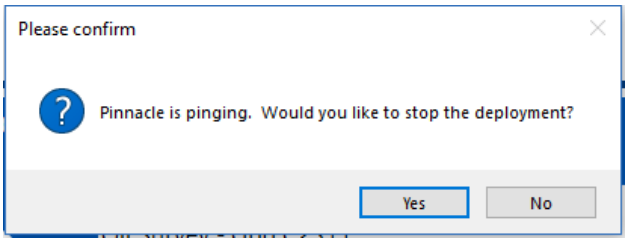
RECOVERING DATA INCLUDES THE FOLLOWING STEPS:

- Stopping the deployment
- Downloading data files
- Erasing the recorders
- Viewing data using the Pinnacle Utilities software

Stopping a Deployment

The deployment must be stopped before downloading data or before opening the self-contained module and dismounting the removable recorder (SD memory card). This is necessary, and standard best practice to ensure that the recorder is not being accessed at the time of dismount.

To stop the deployment:

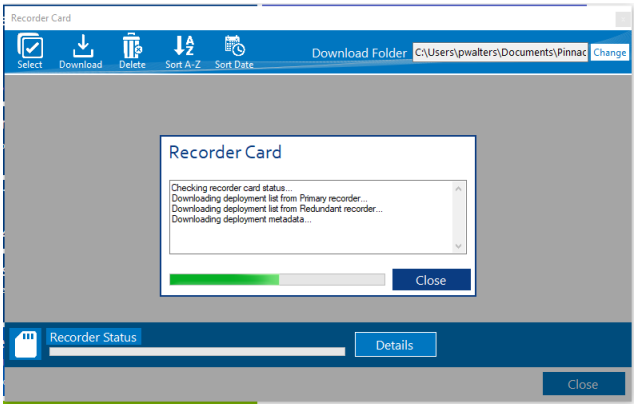


Start *Pinnacle Utilities* and connect to the Pinnacle ADCP.

Click **Yes** to stop the deployment.

Note that if you select **No**, Pinnacle Utilities will disconnect from the ADCP and continue the deployment.

If you can not connect to the system, go to the Downloading Data section and remove the end-cap and eject the removable recorder (SD card).



Upon connecting to the Pinnacle and stopping the deployment, the Pinnacle will ensure that all data is written and finalized. For example, if data still exists in the Doppler output buffer, that buffer will be flushed, processed, and written to the recorders.

Pinnacle Utilities software will then compare the files on the fixed recorder and the removable recorder (SD memory cards) to provide immediate feedback to the user. Verify both recorder cards match.

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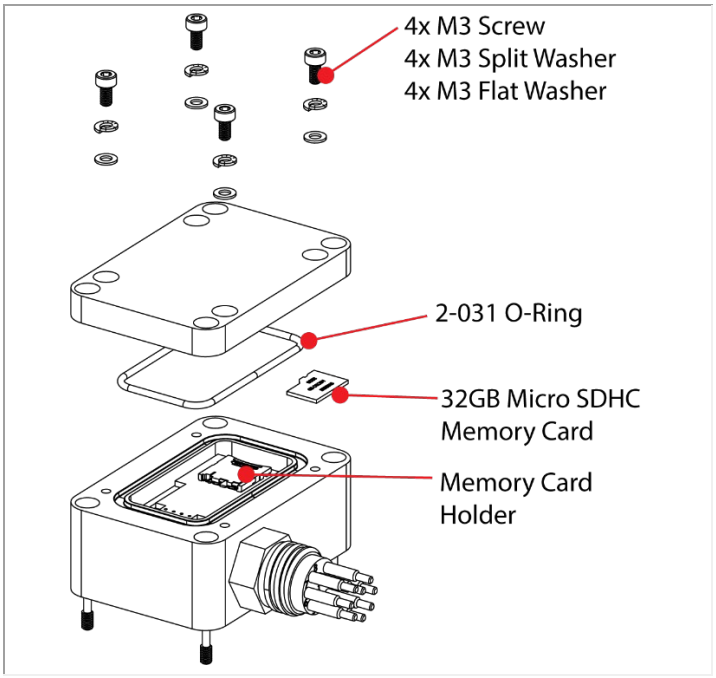
Downloading Data Files

Upon completion of stopping the deployment and verifying that the removable recorder and fixed recorder match, data can be transferred or downloaded to a computer.

To transfer data:



Remove the purge plug.

Remove the end-cap.

Remove the compression plate/memory module from the housing.

Remove the four socket head screws holding the cover in place. Lift the cover off.

Remove the O-ring and keep in a safe place until ready to install the cover.

Eject the removable recorder (SD card).

Use a card reader to transfer the data directly to a computer.

While data is transferred, replace the Pinnacle's batteries.

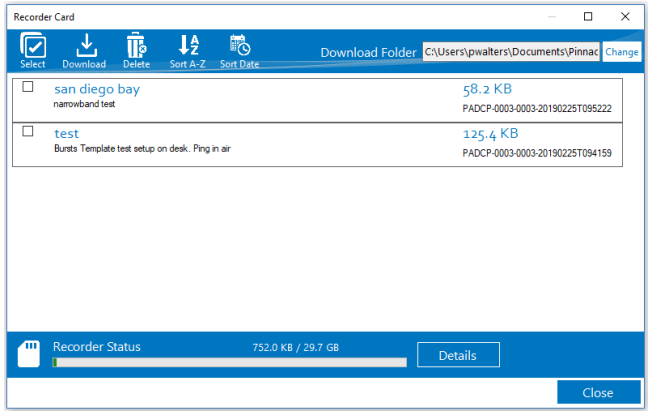
The auxiliary memory module should be opened on a bench. Dropping any hardware down the side of the 4X battery housing would likely require disassembly of the SC battery modules to retrieve.

To download data via Ethernet:

Start *Pinnacle Utilities* and connect to the Pinnacle ADCP via Ethernet.

Click the Recorder Card **Show** button to Manage/Download the recorder.

The recorder card screen will open.



Pinnacle Utilities will display a list of deployments on the instrument.

Use the **Select** Button to select all (click again to select none) or select the checkbox to select deployment(s) for download.

Click the **Change** button to set the Working folder location.

Click the **Download** button to start to download all checked/selected deployments. The progress bar shows the progress in percent, time remaining, and bytes downloaded/total bytes.

Click the **Delete** button to delete all checked/selected deployments. Click **Yes** at the confirmation dialog. There is no cancel once confirmed.

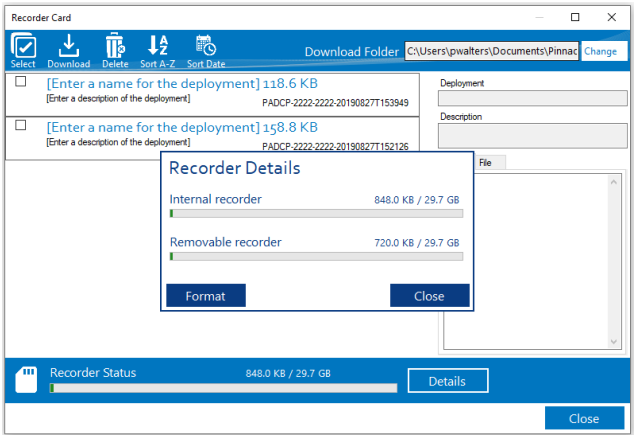
Erasing the Recorder

Once all data has been transferred or downloaded, the recorders can be erased and formatted for the next deployment.

To format the recorders:

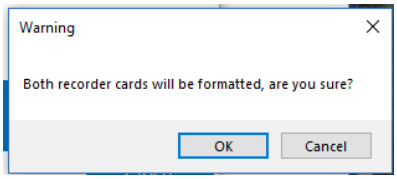
Start *Pinnacle Utilities* and connect to the Pinnacle ADCP via Ethernet.

Click the Recorder Card **Show** button to Manage/Download the recorder.

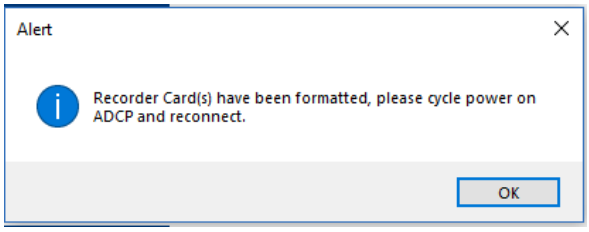


Click the **Details** button to check that the Internal and Removable recorders match.

Click the **Format** button. This will format both recorder cards and erase all data on them.



Click on **Yes** at the warning and confirm dialog. There is no cancel of this action once confirmed.



Cycle power to the Pinnacle and reconnect with *Pinnacle Utilities*.

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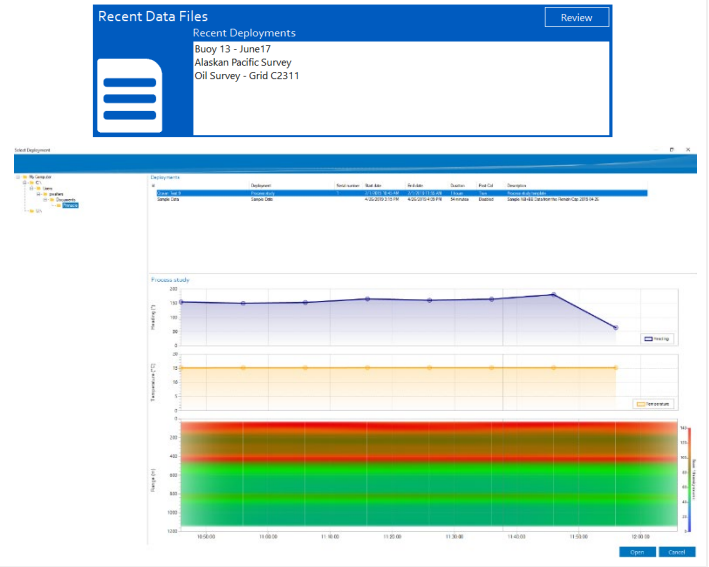
Viewing Data

Pinnacle Utilities can open and display Pinnacle data files.

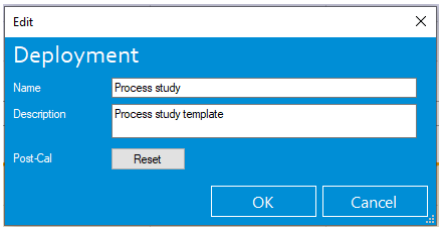
To open a data file:



Start Pinnacle Utilities.

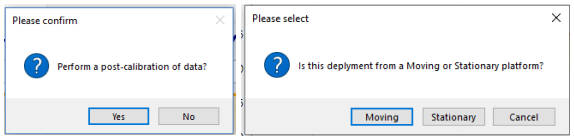
On the start screen, recently opened deployments are shown in the box and can be clicked to reopen the file.

Click the **Review** button to see a list of data files and a preview of the data.



Double-clicking on a data file will open a dialog box that allows editing the deployment **Name** and **Description** and resetting the **Post-Cal** flag. Click **Reset** to change the flag from True to False. Click **OK** to exit the dialog.

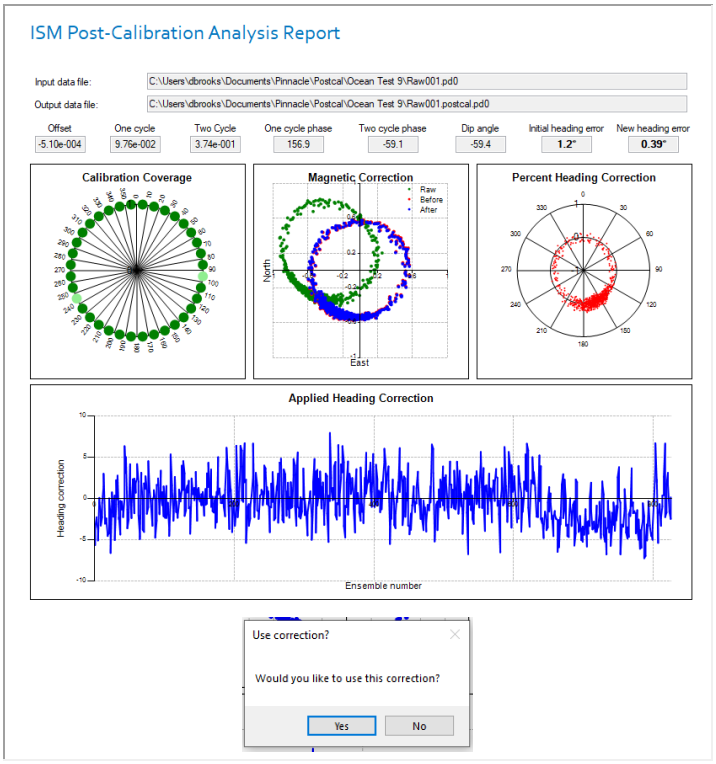
- If the Post-Cal flag is **True**, then the data file will open with the post-calibration applied when the **Open** button is clicked.
- If the flag is **False**, then you can perform a post-calibration of the data when the **Open** button is clicked.



Click the **Open** button on the Select Deployment screen. All data associated with a deployment, including the post-calibration data will be in the Deployment Folder:

To open the deployment and use the post-calibration applied data file, click the **Yes** button on the Use Correction box. This will create the *filename.postcal.txt* and *filename.postcal.pd0* files. If the file is reopened, it will automatically use the post-calibration data files.

Select if the deployment was from a **Moving** or **Stationary** platform.



Checking the **No** button on the Use Correction box allows the user to operate on their original raw data.

When done viewing the post-calibration data, click **Close** and then the data file will open.

The Before series (shown in red) is the Raw data (shown in green) with the existing magnetic correction applied, the After series (shown in blue) is the Raw data with the post-calibration correction applied.

For information on the chart and panels, and processing data, see the Pinnacle Utility help file.

Quick Review

Download the data.	Use Pinnacle Utilities or transfer the data.
Check and process the data	Read the Pinnacle Utilities Software help file for more information.

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Conclusion

Congratulations! You have completed the Pinnacle Self-Contained Deployment Guide. Read the following chapters in the Pinnacle Operation Manual for more detailed information.

PINNACLE OPERATION MANUAL

- **Chapter 1 – Overview**
  This chapter includes an overview of the Pinnacle features, options, computer and power requirements, and connecting to the Pinnacle.
- **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 Pinnacle Utilities.
- **Chapter 4 – Maintenance**
  This chapter covers Pinnacle maintenance. Use this section to make sure the Pinnacle is ready for a deployment.
- **Chapter 5 – Troubleshooting**
  Use this chapter if the Pinnacle fails the pre-deployment test.
- **Chapter 6 – Returning Systems to TRDI for Service**
  Use this information to obtain a Return Material Authorization (RMA) number if the Pinnacle needs to be returned to TRDI.
- **Chapter 7 – Specifications**
  This chapter includes specifications and dimensions for the Pinnacle (including outline installation drawings).
- **Chapter 8 – Commands**
  This chapter explains how commands used by the Pinnacles.
- **Chapter 9 – Output Data Format**
  This chapter explains the PD0 output data format used by the Pinnacles.
- **Appendix – LongRanger to Pinnacle Transition**
  Use this appendix if you are a LongRanger user and now using a Pinnacle system

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.

Available for download from the portal at https://tm-portal.force.com/TMsoftwareportal/s/

NOTES