AIRMAR®
TECHNOLOGY CORPORATION

# *CAST*™ Application

## Mobile App User Guide

Patent http://www.airmar.com/patent.html

## *for* DST810 Multisensor




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## WARNING

**Navigation Aid Only –** The Airmar® CAST ™ app is intended only as a navigational aid and must never be considered a replacement for caution, sound judgement and proper navigational skill. It is used to configure and display navigational data from individual sensors. The user is responsible for the accuracy of the data used to calibrate the connected sensor. Only official government charts and NTMs contain all necessary information for safe navigation. As always, the captain is responsible for their prudent use and safety of passengers and crew.

## INTRODUCTION

The Airmar CAST app is a mobile application that allows you to connect to your Airmar Smart TRIDUCER. You can view data, adjust the outputs, program offsets, and calibrate your device.

CAST app communicates directly with your Airmar DX900+ or DST810 Multisensor; it receives only the data output by the sensor, not all network traffic.

## GETTING STARTED

CAST app is available for iOS and Android devices and can be downloaded from the Apple App Store or Google Play Store.

1. Go to the App Store (iOS) or Play Store (Android)
2. Search “Airmar” and download the free Airmar CAST app.
3. Ensure Bluetooth® is enabled on your device. CAST app uses Bluetooth Low Energy, which does not require pairing. The app will automatically search for devices within range, so there’s no need to open your device’s Bluetooth menu.
4. Open the Airmar CAST app. 

All compatible Airmar devices within range will be displayed on the device list. Select your device from the list to connect.

**Note**: *Make sure you’re as close as possible to the device while trying to connect. The Bluetooth antenna in a DST810 is near the printed cap, but there are many things on a boat that can attenuate a Bluetooth signal. Large objects like fuel tanks or bulkheads can affect the signal strength. Water will also block a Bluetooth signal, so make sure the device isn’t submerged.*

## NAVIGATING AIRMAR CAST APP

### INITIAL CONNECTION TO YOUR AIRMAR SENSOR


Once powered on, the DST810 will broadcast an announcement message without any further input. Simply open the Airmar CAST app on your phone or tablet to see a list of devices within range. There is no need to "pair" with the device.

The device search page in the app will show a list of the available sensors. If you have never connected to a specific sensor before, it will be noted by its model, such as DST810, with an icon to show sensor type. If your phone or tablet has connected to an available sensor before, it will display your customized friendly name and the serial number in the tile. See page 7 for more information on customization.

**Note:** *Trying to make the initial connection to your device in a crowded area, such as a marina, can be difficult. Make sure you're connecting to your device and not a nearby sensor that is also powered on. If multiple sensors are present on the Device Search page, move to a less crowded location to perform the initial connection.*

Tap your sensor on the list to start the connection. The first time you connect, the app will ask you to enter the last three digits of the device's serial number. The serial number can be found on the warranty label affixed to the cable near the sensor. If the label is not readily accessible, the serial number is available on the NMEA 2000 network through a connected MFD or instrument display.



You will only need to verify the serial number on the first connection. If you connect from another device or delete and reinstall the Airmar CAST app on your phone, you'll need your serial number again, so be sure to record and save it if the label isn't readily accessible.

## GENERAL USE NOTES

Many values in the Airmar CAST app can be adjusted by the user. **Any value that is underlined can be adjusted**. Tap the value to open the keypad and make an adjustment or delete the existing value.



When entering table values, tap the cell value to open the keypad and make an adjustment. Tap the heading of the row or column to adjust the value in the cell or delete the row or column altogether.


To enter a negative value using the keypad, enter the value as a positive number first, then tap the "+/-" button in the lower left corner to change the sign.


## DEVICE DATA PAGE—DST810 SMART TRIDUCER

Once connected to your device, the CAST app will display the data available from the device. The DST810 will display Depth (below transducer), Speed (speed through water), and Temperature (water temperature). A single tap anywhere on the screen will change the view from graphic to text.

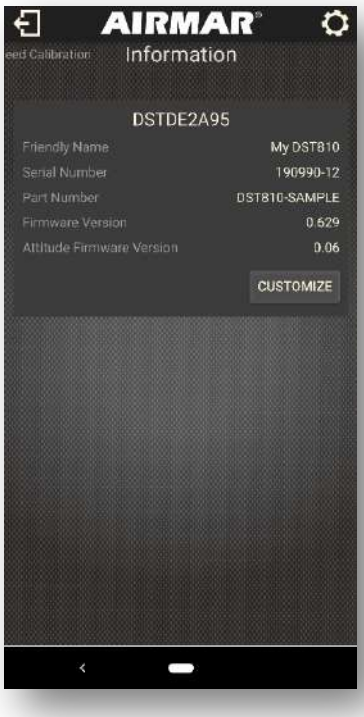

By default, attitude (heel and trim) output is turned off.

A data field that displays "-" is either disabled or is not returning a valid value. If Depth does not display a number, ensure the urethane face of the sensor is in contact with the water. If the water depth is greater than the maximum range of the sensor, no depth will be returned and "-" will be displayed.

The speedometer view will show an initial range of 0 – 15 kn (this range will be adjusted based on the units selected). As the speed increases, the range of the speedometer will automatically adjust to ensure the speed is always easily readable.

**Note**: *If a positive depth offset has been saved to the sensor, the CAST app will display "Depth Below Surface." If the offset saved has a negative value, the CAST app will display "Depth Below Keel." See the Offsets section on page 10 for more information.*

## INFORMATION PAGE




Select the Information tab to display information on the connected device.

The serial number is unique to the connected device.

The part number is the Airmar part number for connected device.

The currently-installed firmware version is displayed next. Take note of all firmware versions for any technical inquiries.

## CUSTOMIZATION

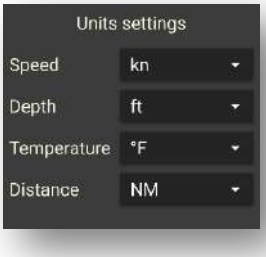
The first time you connect to your DST810, the device will be displayed simply as “DST810” in the search menu. This display name can be adjusted using the “Customize” button.

Select the icon displayed on the heel/trim gauge and enter a “Friendly Name” for the DST810. This name, along with the device’s serial number, will be stored on your device. The next time you connect to the device, the menu will show the device using the Friendly Name and the device’s serial number.


**Note:** *The serial number and Friendly Name are stored locally in the Airmar CAST app, not within the sensor. If you connect to the sensor using a different smartphone, the Friendly Name will not be displayed until you connect and name the device. Entering a Friendly Name will not affect names already saved on other smartphones.*

## UNITS

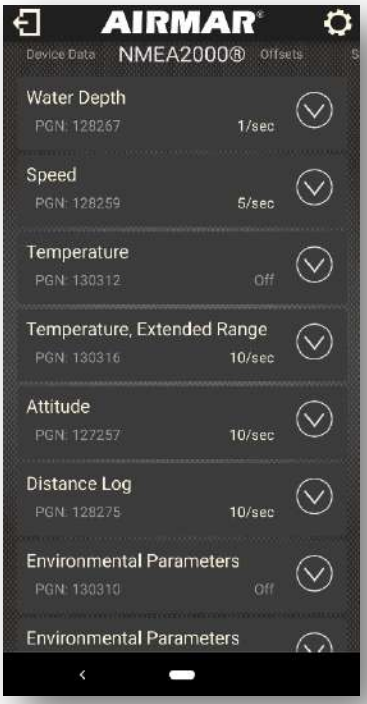
Once connected to a device, you can adjust the display units by tapping the gear icon at the top right corner of the screen. Units for speed, depth, temperature, and distance can be selected individually. For example, speed can be displayed in miles per hour while distance is displayed in nautical miles, or vice versa.



## NMEA 2000® PAGE

The NMEA 2000 page displays all the PGNs the connected device is capable of supplying to the network.

By default, each item will display the name of the PGN and the NMEA 2000 PGN number. If the PGN is disabled, “Off” is displayed. If the PGN is enabled, the output rate will be displayed.




Output rates are shown as a number of PGNs per unit time. For example, if the Water Depth (128267) PGN displays “1/sec,” the PGN is enabled and will be output to the network one time each second. If “2/min” is displayed, the PGN will be output to the network two times per minute, or once every 30 seconds.

Use the “arrow” button on the right side of each item to expand it and enable/disable or adjust the output rate.

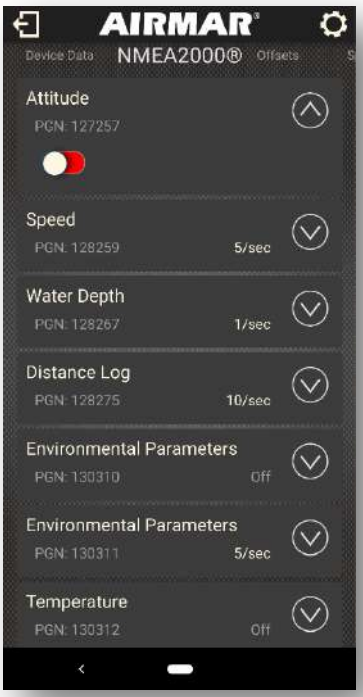
The switch at left will enable or disable the PGN output.

The dropdown menu at right will allow you to adjust the PGN output rate.

**Note**: *Changing the PGN output or output rate will not change the internal data calculation rate.*

Disabling a PGN using the switch will prevent data from being sent to the network, but it will not prevent the sensor from calculating a value internally.

For example, disabling the Depth (128267) PGN will prevent depth information from being provided to the network, but it will not stop the sensor from pinging for depth.



## OFFSETS PAGE

Offsets can be programmed for Depth, Temperature, and Trim, and Heel.

An offset is an additive value. Setting an offset will add to (or subtract from if the offset is negative) the value measured by the sensor. The unadjusted value measured by the sensor is listed as “Raw.” Tap the underlined “Offset” value to adjust the offset. Enter a negative value to subtract from the raw value or a positive number to add.

For example, if the keel extends 1 foot deeper than the face of the transducer, enter a value of -1 as a depth offset to display “Depth Below Keel.” 1 will be subtracted from every depth measurement taken by the sensor before it is sent to the network. Every device on the network will see the adjusted depth below keel.

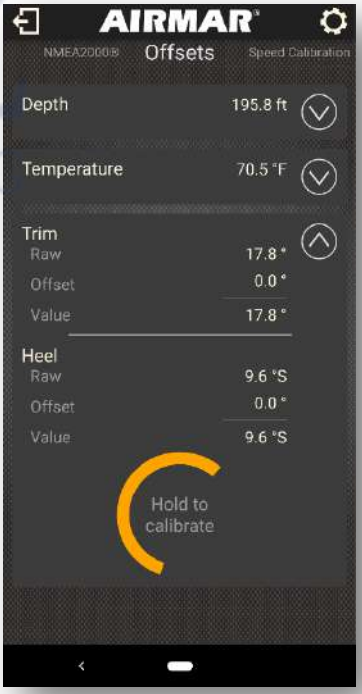
Temperature offsets work similarly to depth offsets.


Heel and trim can be calibrated using an offset as well. The offset in degrees is added to the raw value from the sensor.

If no offsets have been programmed (0 degrees for both heel and trim), the app will prompt you to calibrate the sensor. This can be done in one of two ways.”

To automatically calibrate heel and trim, make sure the boat is relatively stationary. Press and hold the circle marked “Hold to Calibrate.” The app will begin to calculate an average pitch and roll reading over 10 seconds and an orange bar will display the progress. Once the bar flashes green, the average reading for both heel and trim will automatically populate the offset fields and the sensor should read approximately 0 degrees under “Value” for both heel and trim. Remember, the calculation uses an average, so any movement over the measurement period will impact the final number.

Alternatively, the values can be manually programmed. For example, if the raw heel value is 17.8 degrees, entering an offset of -17.8 will result in a reported value of 0 degrees.



## SPEED CALIBRATION


Unlike offsets, which are additive, basic speed compensation values are entered as percentages and are multiplicative. A 10% speed compensation will result in a 10% increase in the reported speed across all values.

For example, a 10% speed compensation will result in an output of 11 kn (+1 kn) when the paddlewheel measures a raw value of 10 kn and an output of 22 kn (+2 kn) when the raw measured value is 20 kn.

The water flow profile under the hull of your boat has a large affect on the reading of the speed sensor. Many variables, including the shape of the hull, the roughness of the surface, the position of strakes, etc. will change the attached flow profile. See the transducer's installation guide for information on where to install the sensor in the hull to ensure accurate speed and depth performance. Even when the sensor is correctly installed, it's important to calibrate your paddlewheel at its installation location and under normal use to make sure it delivers the best possible performance.

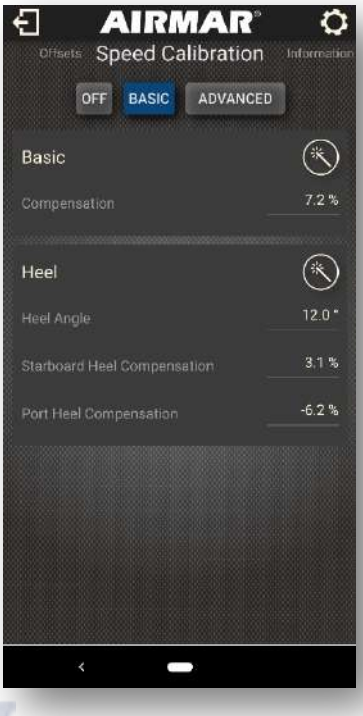
Calibrating speed by traveling a known distance is a common method of calibration, but the start and end points are typically fixed to the ground and a single run does not take into account the movement of the water current.

Calibrating directly to raw GPS speed over ground can also result in an inaccurate calibration. If the boat is traveling in a 3 kn current in the direction of movement, the GPS SOG will be 3 kn faster than the actual speed through water.

The Airmar CAST app allows you to quickly calibrate speed and correct for current. You can also correct the speed calibration for changes in the flow beneath the hull that occur when the boat is heeled over to one side or the other.

There are several methods of speed calibration using the CAST app.

## BASIC SPEED CORRECTION




The simplest way to calibrate speed is a single point percentage offset. This type of calibration applies a fixed percentage correction to every reading from the paddlewheel.

Navigate to the Speed Calibration tab. By default, the speed calibration is set to “OFF.”

Enable the “BASIC” speed calibration.

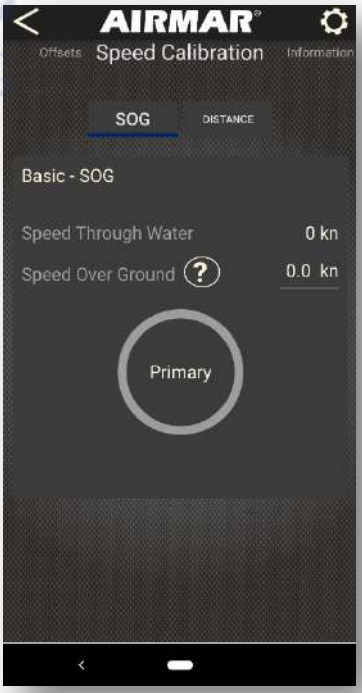
If the desired percentage adjustment is known, you can simply enter it into the Compensation field.

If you would like the app to calculate the correct percentage adjustment for you, tap the wizard icon.

CAST app can calculate the percentage using one of two methods.

- SOG: Speed through water is calculated using a GPS reference speed over ground.
- Distance: Speed through water is calculated using travel time over a known distance such as a measured mile.

## SOG METHOD

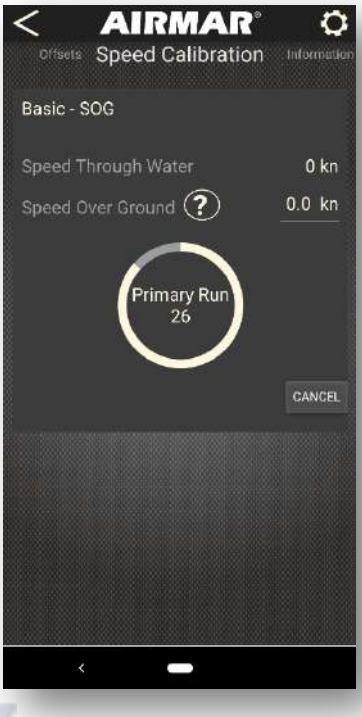



The SOG method allows the app to calculate your average speed over ground using the internal GPS in your smart device. You can also manually enter an average value from an external source.

Bring the boat up to calibration speed. This is the speed where you want the greatest accuracy in your speed reading and will be different for each boat.

Once traveling at a relatively constant speed and direction, tap the “Primary” button. The app will count down as it calculates an average indicated speed from the paddlewheel and an average GPS SOG.

Once complete, the average for each value will be shown and the "Primary" button will change to "Reverse."




Turn the boat 180 degrees and bring it back to approximately the same speed used in the primary direction. You don't need to hold exactly the same speed from the primary run, but the closer, the better. Maintain a consistent speed and direction.

Tap "Reverse" and wait for the app to count down while the average speeds are calculated. The second run in the opposite direction allows the app to calculate the speed of the current in the water and remove it from the calibration.

Once complete, the app will display the calculated percentage adjustment. Tap "Apply" to save the value.

The speed correction value has now been calculated and saved to memory in the DST810. It will be applied to all speed values sent to the network and transmitted wirelessly to the app. All devices connected to the NMEA 2000 network will display the adjusted value.

The value can be manually adjusted by tapping the value on the Speed Calibration screen.

## DISTANCE METHOD

The distance method of speed calibration will not make use of GPS. Instead, you'll travel a known distance at a relatively constant speed. The app will calculate the average speed traveled using the time required to cover the known distance. It will also calculate the average indicated speed from the paddlewheel and compare the two.


**Note:** *Calibration using a known distance requires both an accurate measurement between two reference points and an accurate time to travel between them. The shorter the distance between points, the more potential there is for error in the measurement. A minimum distance of one statute mile is recommended for a distance-based speed calibration.*

Select the "Distance" button.

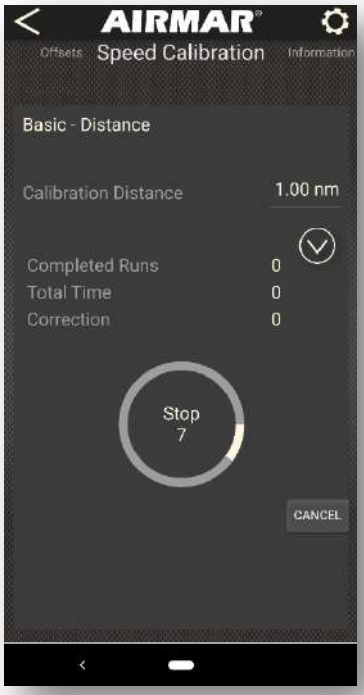
Enter the known distance between two points in the units indicated.

Bring the boat up to calibration speed. This is the speed where you want the greatest accuracy in your speed reading and will be different for each boat.

When you pass the start point, tap “Start.” The app will begin counting in seconds.

When you pass the end point, tap “Stop.” The number of runs will increase by one and the calculated speeds will be shown.

The number of runs already completed will be shown as “Completed Runs.” “Total Time” is a count of the total number of seconds for all runs. “Run Speed” shows the average recorded paddlewheel speed on the last run, while “Speed” shows the overall average. “Run Correction” is the correction factor calculated on the previous run, and “Correction” is the overall average correction factor calculated.




Follow the same process for additional runs. If you would like to throw a run out, tap “Discard Run” once complete and try again.

**Note:** *If you’re performing the calibration in a location where a significant current may be present, make sure to perform an even number of runs with half in one direction and half returning in the opposite direction, as close to 180 degrees as possible. This will ensure the calculated average accurately accounts for the current.*

Once complete, tap “Apply” to save the value.

The speed correction value has now been calculated and saved to memory in the DST810. It will be applied to all speed values sent to the network and transmitted wirelessly to the app. All devices connected to the NMEA 2000 network will display the adjusted value.

The value can be manually adjusted by tapping the value on the Speed Calibration screen.

## HEEL-CORRECTED SPEED CALIBRATION

**Note**: *Make sure the attitude PGN is enabled on the NMEA 2000 page. Once enabled, make sure the sensor has been calibrated with the boat stationary. Refer to the Offsets Page section for more information about calibration of the attitude sensor. Heel-corrected Speed Calibration and the Advanced Calibration Table cannot be used without attitude enabled.*

Changes in heel angle of the boat while underway can affect the speed calculated by the paddlewheel. The DST810 can store calibrations at up to two different angles on each side in addition to the standard calibration. In order to apply a speed calibration at more than one angle, the advanced table must be used.

As the heel angle of the boat changes, the sensor will shift from one curve to the next, interpolating between them.

For example, if a 15% compensation is applied at 10 degrees of heel and a 5% compensation is applied at 0 degrees, the sensor will apply a 10% compensation at 5 degrees of heel.

Heel-corrected Speed Calibrations are applied using a similar process as the Standard Calibration. However, the nature of the process prevents making runs in opposite directions. For this reason, it's important to perform the calibration in slack water.

Begin the calibration by selecting the wizard icon on the Heel-corrected Speed Calibration window. Like the Standard Calibration, the Heel-corrected Speed Calibration can be performed using two methods.

- SOG: Speed through water is calculated using a GPS reference speed over ground.
- Distance: Speed through water is calculated using travel time over a known distance such as a measured mile.


## SOG METHOD

The SOG method allows the Airmar CAST app to calculate your average speed over ground using the internal GPS in your smart device or manually enter an average value from an external source.

Bring the boat up to calibration speed. This is the speed where you want the greatest accuracy in your speed reading and will be different for each boat.

Choose the angle at which you would like to perform the calibration. Make sure you can maintain the angle of heel entered in both directions; the same angle is used for both port and starboard. The app will automatically recognize a port or starboard tack; there's no need to specify the run, only to maintain as close to the selected angle as possible.

Once traveling at a relatively constant speed, direction, and heel angle, tap the "Primary" button. The app will count down as it calculates an average indicated speed from the paddlewheel and an average GPS SOG.

The app will not prompt for a second run as this is often not possible. It's important this calibration be run in slack water.

Once complete, the app will display the calculated percentage adjustment for the side to which the boat was heeled. Perform the same process again to add a calibration for the opposite side, and keep in mind the two will frequently be different. Tap "Apply" to save the value.

The speed correction value has now been calculated and saved to memory in the DST810. It will be applied to all speed values sent to the network and transmitted wirelessly to the app. All devices connected to the NMEA 2000 network will display the adjusted value.

The value can be manually adjusted by tapping the value on the Speed Calibration screen.

## DISTANCE METHOD

The distance method of speed calibration will not make use of GPS. Instead, you'll travel a known distance at a relatively constant speed. The app will calculate the average speed traveled using the time to cover the known distance. It will also calculate the average indicated speed from the paddlewheel and compare the two.

**Note:** *Calibration using a known distance requires both an accurate measurement between two reference points and an accurate time to travel between them. The shorter the distance between points, the more potential there is for error in the measurement. A minimum distance of one statute mile is recommended for a distance-based speed calibration.*

Select the "Distance" button.

Enter the angle at which you would like to calibrate and the known distance between two points in the units indicated.

Bring the boat up to calibration speed and the selected heel angle. This is the speed where you want the greatest accuracy in your speed reading and will be different for each boat.

When you pass the start point, tap “Start.” The app will begin counting in seconds.

The number of runs already completed will be shown as “Completed Runs.” “Total Time” is a count of the total number of seconds for all runs. “Run Speed” shows the average recorded paddlewheel speed on the last run, while “Speed” shows the overall average. “Run Correction” is the correction factor calculated on the previous run, and “Correction” is the overall average correction factor calculated.

Follow the same process for additional runs. If you would like to throw a run out, tap “Discard Run” once complete and try again.

**Note:** *If you’re performing the calibration in a location where a significant current may be present, make sure to perform an even number of runs with half in one direction and half returning in the opposite direction, as close to 180 degrees as possible. This will ensure the calculated average accurately accounts for the current.*

Once complete, tap “Apply” to save the value. The app automatically detects the direction of heel and populates the correct field.

The speed correction value has now been calculated and saved to memory in the DST810. It will be applied to all speed values sent to the network and transmitted wirelessly to the app. All devices connected to the NMEA 2000 network will display the adjusted value.

The value can be manually adjusted by tapping the value on the Speed Calibration screen.

## ADVANCED SPEED CALIBRATION TABLE


**Note:** *The advanced speed calibration table will override any other programmed speed corrections. It will not be added on top of the existing speed calibration. Before switching to the advanced calibration table, make sure to carefully quantify the performance of the sensor without any corrections in place.*

The Advanced Speed Calibration Table allows fine adjustment of speed correction over multiple speeds and angles.

Up to two angles per side can be selected.

Up to 10 non-zero speeds can be added to the table.

**Note:** *When using the advanced calibration table, make sure the highest speed in the table is the fastest speed the vessel will typically achieve. If the speed exceeds the largest value in the table, the sensor will apply a linear correction of the same slope. This can lose accuracy quickly if the last speed is very low. It's important the table include the entire range of achievable speeds regardless of the number of individual points.*

To use the advanced speed calibration table, first switch speed calibration to "Off."


Either manually or using 3rd party software, collect the difference between indicated speed and actual speed through water at each calibration point.

The table is organized with speeds shown as columns and heel angles shown as rows. Each cell is the speed correction (in units of speed, such as knots, mph, etc.) applied to that specific heel angle and speed combination.

Enable the Advanced Speed Calibration Table on the Speed Calibration Tab. Expand the table to the desired number of rows and columns. Input the differences measured previously. For example, if at 0 degrees of heel and 8 kn indicated speed the actual speed through water was measured at 8.5 kn, enter 0.5 in that cell. If the actual speed through water was measured at 7.5 kn, enter -0.5 in that cell.

Make sure to fill out the table completely. Remove any unused rows and columns by selecting the heading and tapping the X. The advanced table does not adjust the basic speed calibrations; it is a standalone method of speed calibration that overrides the others. Inaccurate indicated STW will result if the table is not completely filled in.

Make sure to save a record of the table as entered. Because the advanced speed settings override all others, the table will be deleted if you return to the Basic Calibration settings. The table will need to be reentered if you return to the Advanced Calibration Table.

The speed calibration tabs will not appear when the device is in landscape mode—turn back to portrait aspect to display the tabs and exit the advanced calibration.

**Note:** *Make sure to keep a record of the data in the advanced table. As long as the table is active, the data are saved to memory in the DST810. If the Advanced Speed table is disabled by switching back to Basic or Off, the data in the table will be permanently deleted.*

AIRMAR TECHNOLOGY CORPORATION
35 Meadowbrook Dr., Milford, New Hampshire 03055
www.airmar.com