Speed Sensor Calibration – EVOLUTION N2k Version

The procedure below calibrates the boat speed sensor when EVOLUTION functions as a race processor. It finetunes the raw data from the boat speed sensor. Then EVOLUTION sends the adjusted data to the instruments.

If you have advanced racing instruments with boat speed calibrations, such as B&G H3000, H5000, or Hercules, follow the specific procedure to determine an adjustment value for your equipment. Refer to the detailed technical notes for instructions.

Method

This method determines the adjustment factor at a boat speed of 6 kt. Use the engine; sails are unnecessary. To access the boat speed calibration form, go to "*Evolution > Yachts > Setup Active [Yacht Data]*", click "*Speed Through Water*", then select "*Edit Settings & Calibrations*".

Description ARG-4134 Utopia Boat Length 34 ft Data Channels Yacht Data Data Export External Clock UTC Fix (Position @ UTC) Fix Quality (HDOP) Magnetic Variation Magnetic Heading True Heading Channel Argie Heel Angle Heel Angle Heel Angle Leeway Angle Leeway Motion Motion through Water Motion water St & Rate Edit Settings & Calibrations Use DPS □ 	Yacht Setup - ARG-4134 Utopia		×
Data Channels Yacht Data Data Export External Clock UTC Fix (Position @ UTC) NMEA Fix Quality (HDOP) Magnetic Variation NMEA 0183 Input Setup Magnetic Heading Channel A True Heading Device III Speed through Water Device III Rate of Turn (°/sec) Sentence VHW Heel Angle Eeway Angle Edit Settings & Calibrations Use DPS Leeway Motion over Ground v Edit Settings & Calibrations Use DPS	Description ARG-4134 Utopi	a	Boat Length 34 ft
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The system displays the "Boat Speed Calibration and Corrections" form, specific to adjusting boat speed data.

Boat Speed Calibration & Corrections									
Calibratio	n Sensor	Correct	tion						
Run	STW	SOGh	HDG	Time	Distance	Adjust			
Start Run 1: READY - Set proper heading and speed to run for at least 2 minutes. Calibration Value: Actual 1.00 Factor Adjusted									

The procedure is straightforward. A run is conducted at a constant speed and on a fixed heading for 2 minutes or more. Then, a similar run is performed without changing the speed and heading in the opposite direction (+180°). The system will average the adjustment factors in both directions, canceling the current effect.

Getting Ready

In the Instruments

- 1. Verify that the instrument system has EVOLUTION (gateway/interface) as the NMEA 2000 source for boat speed. If necessary, consult the equipment manual.
- In the instrument system, enter a neutral boat speed correction factor of 100% (or 1.00, as the case may be). This must always remain loaded in the instruments, as EVOLUTION will provide the corrected speed data.

In EVOLUTION

- 1. Access the "Yacht Setup" form, "Yacht Data" tab, and "Speed through Water" data:
- 2. Verify that the "*Source*" for the "*Speed through Water*" data is "*NMEA2K*" and the "*Device*" is the sensor, typically a device from the AIRMAR firm models ST-8xx or DST-8xx.



Then, click the "Edit Settings and Calibrations" button. In the "Boat Speed Calibration & Corrections" form, on the "Sensor" and "Corrections" tabs, make sure that the "Apply..." options are turned off and unchecked in their respective boxes.

"Calibration" tab, use the button below	10 kt -7 % - 04
Calibration Factor 1.00 Copy	15 kt -10 %5
Apply Calibration to Input	Apply Correction to Input

Acceptable Conditions for Calibration

- 1. Ensure the speed sensor is free of organic growth and in excellent physical condition.
- 2. Clean the hull, particularly in the area around the sensor.
- 3. Select a day with stable sea conditions, low wind speed, and calm waves.

Calculation of the Boat Speed Adjustment Factor

This method compares the boat's speed over the ground (measured by GPS) with the speed through the water (measured by the STW sensor). To eliminate the effect of the current, two runs are performed in opposite directions to average the recorded adjustment values for each run. To ensure smooth runs, take the boat to a calm water area where you can run for at least 0.5 nautical miles and 2 minutes while maintaining a steady speed and heading. It's best to avoid zones with swirling currents and other vessel traffic.

Step 1 – Open the Speed Calibration Tool.

- In EVOLUTION, use the "Evolution > Yacht > Setup Active" menu option that opens the "Yacht Setup" form. In it, select the [Yacht Data] tab, and from the list of items, select "Speed through Water".
- 2. Finally, use the "*Edit Settings & Calibrations*" button to open the "*Boat Speed Calibration & Corrections*" form.

Boat Speed	Boat Speed Calibration & Corrections X										
Calibration Sensor Correction											
Run	STW	SOGh	HDG	Time	Distance	Adjust					
Start St											
Calibratio	Calibration Value: Actual 1.00 Factor Adjusted need 2+ runs										

Run 1: READY - Set proper heading and speed to
run for at least 2 minutes.

The information area always shows the expected action by the system. In this case, it indicates that you are ready to start the first run and should find a location to perform it within at least 2 minutes at the calibration speed, which is typically 6 knots.

Step 2 – Perform the Runs.

Boat Speed Calibration & Corrections

Calibration Sensor Correction

SOGh

5.90 kt

Run time OK!

STW

6.30 kt

Done 🔿

Calibration Value: Actual

Run

1

Each run should last at least 2 minutes; extending it to 3 or 4 minutes improves the final result. To eliminate any effects of the current, you need to do at least two runs in the opposite direction. A third run is optional and only recommended if the current flow changes.

×

Adjust

0.937

- With the boat sailing at the desired speed and heading, use the "*Start*" button to initiate the run. During the run, this button changes its name to "*Cancel*," allowing you to stop it.
- 2. After running for more than 2 minutes, this button is renamed "*Done*" and is used to conclude the run.

HDG

094º M

Time

1.00 Factor V Adjusted need 2+ runs

2m 04s

Run 1: RUNNING - Data Quality Excellent

Distance

0.21 nm

Boat Spee	oat Speed Calibration & Corrections X									
Calibration Sensor Correction										
Run STW SOGh HDG Time Distance Adjust										
😇 1 6.30 kt 5.90 kt 094° M 57s 0.09 nm 0.937										
×	Cancel Run 1: RUNNING - Data Quality Excellent Keep running for at least 1m 03s.									
Calibra	tion Value:	Actual	1.00 Fac	tor 🗸 Adj	justed need	d 2+ runs				

As the r	un progres	sses, t	he syst	em s	how	s th	e cal	culated
values,	including	boat	speed	(ST\	N) a	and	GPS	speed
(SOGh),	heading,	and	time.	The	righ	it-ha	and o	column
displays	the adjust	ment	value.					

After 2 minutes, the system reports "*Run time OK*", as shown by the figure on the left. You only need to complete the first run by clicking the "*Done*" button.

Now that the system is ready, you can begin the second run. The instructions for heading and speed are in the information area. The button is labeled "*Start*" again. Set the heading and speed as shown, then repeat 1 and 2.

Run	STW	SOGh	HDG	Time	Distance	Adjust					
1	6.30 kt	5.90 kt	094º M	2m 10s	0.22 nm	0.937					
Start Run 2: READY - Set heading to 274° M, speed to 6 kt and run for at least 2 minutes											

After completing the second run, the form will display as follows. On one hand, the second run is recorded. Additionally, the lower area is unlocked. There, you can see that, for this example, the system computes a calibration factor of 0.91. This value is calculated by averaging the two adjustments made in the opposite runs.

Boat Spee	Boat Speed Calibration & Corrections X									
Calibrat	ion Senso	r Correct	tion							
Run	STW	SOGh	HDG	Time	Distance	Adjust				
1	6.30 kt	5.90 kt	094º M	2m 10s	0.22 nm	0.937				
2	2 6.70 kt 5.89 kt 272° M 2m 24s 0.24 nm 0.880									
Calibrat	Image: Start									

Step 3 – Add the Adjustment Factor to EVOLUTION.

- 1. Using the same form, go to the "Sensor" tab, where you need to load the adjustment factor. For convenience, you can use the "Copy from Calibration Tab" button to input the "Calibration Factor" obtained.
- 2. Also, **check the "***Apply***..." box** to indicate that EVOLUTION must apply this factor to the raw data from the sensor.

Boat Speed Calibration & Corrections								
Calibration Sensor Correction								
If EVOLUTION receives the speed data directly from a sensor that cannot be calibrated, you can apply a calibration factor to correct the speed values. This is a simple multiplier adjustment.								
Manually enter a value or, after a successful calibration using the "Calibration" tab, use the button below to copy the "Adjust" value.								
"Calibration" tab, use the button below to copy the "Adjust" value. Calibration Factor 1.00 Copy from Callibration Tab Apply Calibration to Input								

In short, the bottom of this tab will appear as follows.



Step 4 – Enable Linearization Correction

After adjusting the speed, navigate to the "*Correction*" tab. This tab includes the necessary correction following the speed adjustment. The correction is required because the paddle wheel sensor rotates at a slower speed when the boat is moving slowly and at a faster speed when the boat is moving faster. To address this discrepancy in the data, EVOLUTION can add or subtract a percentage from the resulting base adjustment. At the calibration speed of 6 knots, the correction will be 0%. The table provided in the initial EVOLUTION configuration is appropriate for most situations.

Boat Speed Calibration & Corrections								×
Calibration	Sensor	Correction						
STW C	Correct %	—	20%	_	_	_	_	_
0 kt	18 %	- 1	15% 🚬					_
3 kt	12 %	- 1	10%		_	_		_
6 kt	0 %	-	5%	-		_		_
10 kt	-7 %	-	0%		\mathbf{X}	_		_
15 kt	-10 %		-5%					
Apply C	Correction	to Input	10% 0 kt	Зkt	6 kt	9 kt	12 kt	15 kt

1. Check the "*Apply Correction to Input*" box in the figure above.

Step 5 – Perform a Final Check

Close the speed calibration tool form and repeat the entire process (Steps 1 and 2) to validate the calibration performed. Now, the adjustment factor calculated after both runs must be between 0.98 and 1.02, that is, within a range of +/-2 %.

Data Quality

EVOLUTION will monitor the quality of the data during the runs. If the heading or speed is not constant, the data quality will drop from "*Excellent*" to "*Good*", "*Poor*", or "*Failed*". The first column (Run) displays the corresponding icons: \bigcirc , \bigcirc , and \bigcirc .



When a run fails, the system shows a message indicating the problem. This button allows you to delete the run immediately. The system will not permit you to continue if the failed run is not discarded.

Both runs must achieve the highest possible quality. If conditions are suboptimal, it is advisable to postpone calibration until conditions improve.

Practical Tips

- To ensure consistency between the two runs, adjust the engine RPM to the appropriate speed and run the boats perpendicular to the wind and waves.
- Conduct the opposite runs in the same area immediately after the previous run(s), while avoiding the turbulent path created by the last run.
- Select an area with consistent currents, steering clear of eddies and regions with heavy boat traffic.
- The "Adjust" column will indicate the difference between the GPS (ground speed) and the boat speed sensor (speed through the water). A value of 1 means no difference, while a value of 1.1, for instance, indicates a 10% difference.
- Remember to do a final review; please check Step 5.
- Remember to maintain a neutral calibration factor (100%) in the instruments and use the EVOLUTION gateway as the source for boat speed.