

# Contact Info

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Authorised reseller:

# SpeedCoach®

## Wiring Installation Instructions

### Plus Hints & Guides

# NK

**NIELSEN-KELLERMAN**

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Thank you for purchasing this SpeedCoach wiring system. PLEASE take a moment to review these instructions before installing the wiring harness and impeller. Your SpeedCoach system should provide you with years of trouble-free service but we are always here to help if a problem arises. To order parts or accessories or obtain technical support, please call 02 6258 9380. You may also e-mail questions to our support representatives at info@nk.com.au or visit NK online at www.nk.com.au

***If you've never done this before, please read through all of these installation instructions before permanently installing any part of your SpeedCoach System.***

***The VHB ("Very High Bond") mounting tape used in this installation requires 24 hours to cure to its full bond. PLEASE avoid getting it wet (in other words, don't take your boat for a row) until fully cured. Failure to do this risks loss of your brand new impeller, or having to re-install parts of your system.***

***Wherever you will be installing VHB mounting tape, make sure to use the provided alcohol swabs to clean all oil and dust from the mounting surfaces. Avoid touching the VHB with your fingers as the oil on your skin decreases the bond strength.***

***IF you ever need to remove installed VHB, use a hair dryer to warm the VHB thoroughly, then peel very slowly from one edge to avoid damaging the surface.***

### **NK Rowing Electronics Warranty & Service**

NK does not believe in "disposable electronics." We know our products don't lead a pampered life, and we design them for years of performance in tough conditions. We guarantee every NK product to be free of defects in materials and workmanship for a period of TWO YEARS from your date of purchase. We will repair or replace any defective product or part when notified within the warranty period, and will return the product via domestic ground shipping at no charge. The following issues do not result from a manufacturing defect and are not covered under this warranty: damage due to improper use or neglect, including corrosion; impact damage; modifications or attempted repairs by someone other than an authorized NK repair agent; normal wear and tear; failed batteries. NK wants you to be an NK customer for life, so we take care of you even beyond the terms of the normal product warranty with our Customer Care Program. Trade-in any NK display unit, no matter the age or condition, and receive a generous discount on the replacement product.

Visit [www.nk.com.au](http://www.nk.com.au) at any time for detailed product specifications & troubleshooting guides.

## SELECTING AN INSTALLATION LOCATION AND MOUNTING BRACKET

### SpeedCoach for a Rower:

It's a good idea to think about where you want your SpeedCoach while you are sitting in your boat. Your mounting location should allow you to see the unit clearly and reach the top and bottom buttons, but still keep the unit out of the way of your hands, oar handle or paddle throughout the stroke. If you are using a SpeedCoach XL2 or XL4, make sure that you will be able to put the unit with the heart rate plug and/or antenna attached in the docking station without obstruction. There are four common mounting locations:

- On the footstretcher plate between the shoes. This location is by far the most common and will generally require the use of a T-Bracket to raise the SpeedCoach above the end of your shoes. A few rowing shells are now equipped with an extended footplate that provides a mounting location without the T-bracket.
- On top of a wing rigger. A wing rigger usually prevents access to the footstretcher mounting location. The SpeedCoach is mounted in this location with an Angle Bracket attached with Dual-Lock tape to permit the bracket and wires to remain with the boat when the wing rigger is removed.
- On top of the deck. The SpeedCoach is mounted in this location with an Angle Bracket. Note that the Angle Bracket is shipped with Dual-Lock tape pre-installed. If desired, this tape may be peeled off and replaced with VHB mounting tape for a permanent installation on the deck.
- On the cockpit washboard or wall. In some boats, you may wish to mount your unit directly to the stern-most wall of the cockpit. The dock may be attached directly to the cockpit wall with no mounting bracket, or a T-Bracket may be used to raise the unit up.

### SpeedCoach for a Coxswain:

In the coxswain's seat, the SpeedCoach will generally be used with a Cox-Box or Cox-Vox audio system. In most boats, there is sufficient room on the footrest next to the Cox-Box cup bracket. The mounting dock can generally be secured directly to the deck without the use of a mounting bracket. In a bow-coxed shell, be sure to choose a mounting location that will not obscure the coxswain's already limited view. Bow-coxed shells vary widely in their configurations, so you may need to be creative in finding a mounting location. Both the T-Bracket and Angle Bracket are made of aluminum, and will permit some careful bending to accommodate other mounting positions. Be careful not to bend the bracket more than once, or the metal will fatigue and break.

## INSTALLING THE MOUNTING BRACKET (IF USED)

The SpeedCoach wiring is shipped with no mounting bracket attached to allow you the flexibility to choose your mounting option. Make sure you have purchased the correct mounting bracket for the installation option you have chosen. To install the bracket, clean the mounting location thoroughly with an alcohol prep pad, peel the liner from the Dual-Lock or VHB tape, align the bracket on the mounting location, and press firmly.

### Install the T-Bracket:

The pre-drilled holes in the T-Bracket are designed to allow easy installation of the bracket onto the bolts that are used to adjust the height of the footstretcher shoe plate. To mount in this location, simply remove one of the bolts, slide the mounting bracket onto the bolt in front or behind the plate, and replace the bolt.

If there is not a bolt already on the footstretcher that you can use, you may need to drill holes in the footstretcher and secure the docking station with a stainless steel bolt and nut or screw(s). Be sure your footplate is a solid material if you are using screws. It may be necessary to insert a small shim behind the stem of the T-Bracket to support it.

To mount the T-Bracket onto the washbox or cockpit wall, you may use VHB tape to avoid making holes in your boat. Try to maximize the contact area for the VHB as the stem of the mounting bracket takes a good deal of force when clicking the SpeedCoach into the mounting dock.

### Install the Angle Bracket:

The Angle Bracket is designed to be mounted to the top of a wing rigger or the deck. The Dual-Lock tape allows you to remove the docking station from the wing rigger when you derig your boat. It's easiest to leave both pieces of Dual-Lock attached to the bracket when making the installation.



## Stroke & SpeedCoach Accessories

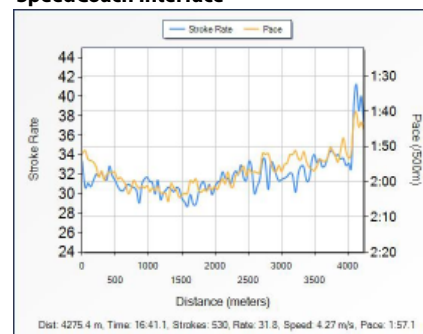
### Bumpers & Lanyards

Rubber Bumpers come in an assortment of colours to personalise and protect your StrokeCoach, SpeedCoach, SpeedCoach Gold and SpeedCoach XL display units. Nine bumper colours to choose from: red, orange, yellow, green, blue, purple, pink, grey and white. Complete your color scheme with a replacement lanyard available in black and: red, orange, yellow, green, blue, purple, grey and white.

All new units come with one bumper & a lanyard included. Bumpers **Part# 0159 + colour**



### SpeedCoach Interface



The SpeedCoach Interface allows you to upload your stored data to a computer. Chart the results, review the data closely, or just keep it in an electronic log. Comes complete with downloading software. Compatible with SpeedCoach Gold and SpeedCoach XL. Interface USB port version **Part# 0162**

### Seat Racing with your SpeedCoach System

Everyone's pulled their test pieces and rowers have established themselves at the head of the pack. But wait, ergs don't float! Right? How do you know your top dog on the erg isn't dead weight in the boat? And what about the one who rows with the best of them, but struggles on the erg? Who's going to make the boat? There are many philosophies on how to seat race, and what ever works for you is great. Here's another option.

Most people believe the SpeedCoach system is designed for smaller boats, like singles and doubles. But in fact, it can also be very effective in larger team boats. Let's say you have an eight to fill. You start with your top eight erg scores. Here's a ninth that is a very steady rower and shows some real improvement. They deserve a shot at the boat. Instead of breaking into fours to seat race, send your normal eight out with a SpeedCoach system and switch one rower during practice. For example, run a series of minute pieces, building the rate up each minute to race pace. Note the average boat speed for each piece. Now switch rowers. Repeat this series and again note the boat speed. Immediately, you will have numerical feedback as to their effectiveness in the boat. Simply put: if the split isn't lower - the boat isn't going faster.

You can even perform long-term seat racing by comparing lineups over several days. Just have your coxswains record the average speed during either steady state or pieces. Then run a similar workout with a different lineup to see if the boat speed increases or decreases. This allows the rowers enough time to get comfortable in their lineup, as opposed to switching boats every 1000 meters. It also won't take long before your coxswains start to get a feeling for typical boat speed for a given workout.

This type of racing is ideal for smaller programs with barely enough rowers to fill an eight. These programs don't have the luxury of racing a fleet of fours to find boat movers. Instead, just switch one rower at a time and check the boat speed. Mixing the lineup with the same eight rowers may also uncover a faster lineup. However, without knowing their boat speed, it's difficult to quickly find the best lineup.

Keep in mind that changes in current will NOT affect the measured speed, but wind and fatigue should be taken into account. In a future article, we'll discuss why water current will not affect your speed measurements.

# Why we recommend placing the impeller between five to six metres from the bow.

**Laminar vs. Turbulent Flow:** On a rowing shell, two different kinds of flow are apparent. The smooth laminar flow at the bow (depending on the boat and speed, this can extend up to three metres from bow ball) and turbulent flow, all the little vortices along the hull that ultimately create the lovely sound of a fast moving boat. The laminar flow is very important to boat speed – laminar flow creates significantly less resistance. Therefore, everything has to be done to maintain laminar flow. Even the smallest disruption on the hull will create turbulent flow right away and create an undesired effect on the boat. Hence it's particularly important to keep the bow clean at all times and free of dents, scratches and tape. For this reason we avoid placing the impeller in the laminar flow.

**Accessibility:** A wireless pick-up of impeller measurement is a must to avoid drilling holes through the hull. Hence, a sensor needs to be placed as closely as possible to the spinning impeller. In most rowing shells, there is an easy placement for both around five to six metres from the bow (typically around the two-seat). Since the sensor should be somewhat protected from outside influence, we recommend to place it under the foot stretcher. Under no circumstances should it ever be necessary to drill holes into bulkheads or have wires dangling on bow decks.

**Boat pitch:** The vertical movement of the boat during each stroke needs to be accounted for, too. The impeller needs to be ideally placed where the flow conditions are consistent. Through the pitch, boundary layer thickness changes close to the bow. With our impeller position we have more stability and therefore more accuracy.

**Thickness of Turbulent Layer:** The layer of turbulent flow increases along the hull and also with increasing speed. Additional minor inaccuracies and differences in hull designs affect the boundary layer. To maintain consistent conditions that allow precise calibration, placement of the impeller between five and six metres from the bow works best for most accurate distance and speed measurement.

**Effect on steering:** Five to six metres from the bow, the impeller is relatively close to the turning point of a rowing shell, even an eight. If mounted in the bow, however, an impeller will act as a fin in front of the turning point and could have an adverse effect on steering of a shell.

**How much drag does the impeller create, and will it slow me down?** The hydrodynamic design of the NK impeller mount actually creates a fraction of the drag of a standard skeg. Laboratory tests were performed on the hull mount impeller to determine the drag effects on a rowing shell. For single sculls, the drag from the hull mount impeller is approximately 0.1% of the TOTAL boat drag, and proportionately smaller for larger boats. A larger size impeller does not equal more drag since it is placed in the turbulent flow, however, even the smallest object in or near the laminar flow will have a significant negative effect on boat speed (with no gains).

## INSTALLING THE SPEEDCOACH DOCK

Next you will mount the plastic dock on the end of the SpeedCoach wiring to the front of the installed mounting bracket or directly to the mounting location chosen. If installing the docking station on a T-Bracket, you may use a cable tie to secure the harness wires so they will stay out of the way when you are strapping your feet into your shoes.

- 1) Clean the mounting location thoroughly with an alcohol prep pad.
- 2) Peel the liner from the VHB tape on the wiring dock;
- 3) Align the dock on the mounting bracket or location and press firmly. Be sure to support the mounting bracket from behind while pressing the dock into place.



## MOUNTING THE SPEEDCOACH

Slide the SpeedCoach display unit onto the docking station until it clicks. Be sure that the lanyard is out of the way.

**NOTE:** To prevent the loss of your SpeedCoach in the event that it is bumped while you are rowing, loop the lanyard around the top of the T-bracket or some part of your shell and slip the SpeedCoach through the loop. (The lanyard is designed specifically for this purpose.)



## INSTALLING THE SEAT MAGNET & RATE SENSOR

The seat magnet and rate sensor work together to measure your rating while rowing. The magnet must pass within  $\frac{3}{4}$ " of the sensor in order to register a rating, so it is important to make sure that the seat magnet and sensor are installed correctly.

The SpeedCoach can measure stroke rate without using the rate sensor by measuring the changes in boat speed throughout the stroke. To enable this feature, place the unit in 0-Stroke Mode, and make sure that you have an impeller on the boat. The stroke rate will not be as consistent or stable as with a seat sensor, but this method can be used as an alternative to the seat magnet and rate sensor (or as a troubleshooting test when your rate is not working properly.)

### Install the Rate Sensor (Black Sensor):

Refer to Figures 1a and 1b. Note the position of the sensor - it should be close to the center of the seat travel and it MUST be perpendicular to the long axis of the shell.

It is not necessary for the sensor and magnets to be centered between the rails as shown in Figure 1a. They may be positioned off center as shown in Fig 1b. However, the holes in the magnet assembly MUST pass directly over the holes in the sensor. The dashed horizontal line in each figure indicates the correct alignment.

PLEASE NOTE: The sensor needs to be installed at the center of the seat travel. If the sensor is too close to either end of the seat travel, the SpeedCoach may indicate ONE-HALF the correct stroke rate.



The vertical spacing between the stroke sensor and the magnet assembly is critical. If the magnet passes too far from the sensor the sensor may fail to register every stroke, resulting in low readings. If the magnet is too close to the sensor, it may strike the sensor and knock one or both out of place.

Because the distance between the seat plate and the deck varies considerably from shell to shell, you should start by measuring this distance. Refer to Figure 2.

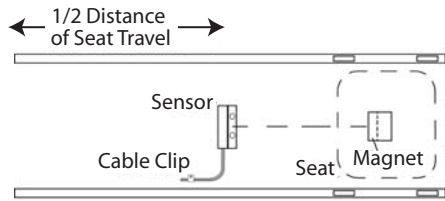


FIGURE 1a: SENSOR & MAGNET INSTALLATION (Sensor Installed on Centerline of Seat)

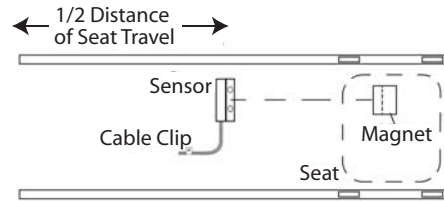


FIGURE 1b: SENSOR & MAGNET INSTALLATION (Sensor Offset Centerline of Seat)

- If the distance measured as in Figure 2 is between 22mm and 28 mm, you may mount the sensor and magnet with no further adjustment.
- If the distance measured as in Figure 2 is GREATER than 28 mm, you will need to make a spacer of appropriate thickness. You may choose to shim the sensor or the magnet; whichever is easier. DO NOT use any magnetic material for your shim. Many boat builders have shims designed to fit their particular seats.
- If the distance measured in Figure 2 is LESS than 22 mm, the magnet and the sensor will interfere. Try mounting the magnet on the upper side of the seat plate or the sensor on the underside of the deck. As a last resort, you will have to remove material from either the seat or the deck (this almost never needs to be done).

Check that the sensor cable is routed conveniently before mounting the sensor. You can install the sensor and magnets semi-permanently by using the 3M VHB (Very High Bond) tape supplied. Should you wish to make a temporary installation, use electrical tape to affix the sensor. Use the alcohol prep pad provided to clean the area of the deck to where you will attach the sensor. Peel away the protective layers of the VHB double-sided tapes, and firmly press the sensor onto the cleaned area of the deck. Wait 24 hours before rowing to allow the VHB tape to fully cure.

Using the provided cable tie mounts, secure the sensor wire. If in the future you need to remove the wire, simply cut the cable tie and later use a new one to secure the wire.

**Install the Magnet:**

- 1) Remove and inspect the seat plate to find an appropriate place to mount the magnet.
- 2) Clean the mounting location thoroughly with an alcohol prep pad.
- 3) Peel the liner from the VHB tape on the magnet.
- 4) Align the magnet on the mounting location and press firmly.
- 5) Return the stroke seat to its slide and check that the clearance between the magnet and sensor is no more than 10 mm (refer to Fig 2). Check also that the magnets pass directly over the sensor (refer to Figures 1a, 1b).

NOTE: On seats without a sliding carriage (such as shown in the photo), there may be no seat plate for attaching the magnet. One option in this instance is to place the flange of the magnet assembly on top of the axle tube and secure the magnet with a few wraps of electrical tape.

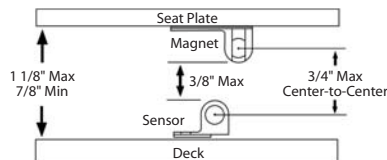
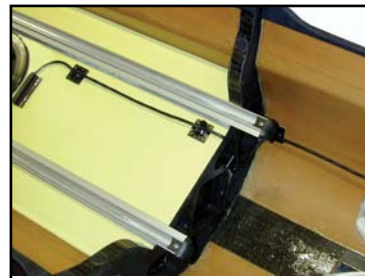


FIGURE 2: SENSOR & MAGNET SPACING



	Impeller		GPS	
	Without current	With current	Without current	With current
Actual total distance rowed	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2%  <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2%  <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good for large distances -Accurate by 1-15m  <b>Negatives:</b> -Possibly inaccurate for small distances	<b>Positives:</b> -Measurement is over around  <b>Negatives:</b> -Extremely inaccurate
Speed per stroke	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2%  <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2%  <b>Negatives:</b> -Calibration necessary	<b>Positives:</b>     <b>Negatives:</b> -Measurements vary widely from stroke to stroke	<b>Positives:</b>     <b>Negatives:</b> -Extremely inaccurate
Average pace	<b>Positives:</b> -Very good, if properly calibrated  -Accurate by 1-2%  <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, if properly calibrated  -Accurate by 1-2%  <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, through increased accuracy of traveled distance -Improvement through smoothing programs  <b>Negatives:</b>   -Extremely inaccurate	<b>Positives:</b>     <b>Negatives:</b> -Extremely inaccurate

**In conclusion:**

Despite its very simple usage, GPS systems have to be operated with care. The information generated by GPS is potentially extremely inaccurate, especially when used on a body of water with current. Used without consideration of this fact, the training feedback could harm an athlete's development or even health.

The impeller system, however, clearly shows advantages when calibrated properly. When not calibrated, the impeller system will still show accurate, corresponding changes in speed.

**About the Author:**

Volker Nolte is men's head rowing coach and assistant professor at the University of Western Ontario, where he teaches coaching and biomechanics and coaches the highly successful men's rowing team. He was the lightweight men's national team coach with Rowing Canada from 1992 to 2000. His national team crews won an Olympic silver medal at the 1996 Atlanta Games, two World Championship titles in 1993 and 2000, and several medals at World Championships in recent years.

Nolte received a PhD in biomechanics from the German Sport University in Cologne, and is an internationally acknowledged expert in biomechanics. With his expertise in the coaching field, he presents frequently at scientific and coaching education conferences worldwide. This year, Volker published his latest book, "Rowing Faster".

\* Information regarding GPS systems relates to commercially available instrumentation at comparable costs of impeller systems

# GPS vs. IMPELLER

With emerging technology and affordability of GPS, coaches and rowers often ask why NK's speed measurements still rely on an impeller. Below is a recent article written by Dr. Volker Nolte, an expert on biomechanics as well as internationally accomplished coach and rower, comparing GPS and Impeller based speed measurements:

Thanks to the improvements in technology, it is now possible to give rowers invaluable feedback about their performance in the boat. Electronics developed at a pace that was unthinkable a few years ago measures time and distance with minuscule sensors and computer chips. The computer then calculates related quantities like stroke rate and speed, displays it on monitors and still is small and light enough to be used in a racing shell without any measurable influence on the performance of the rower. Therefore, it is understandable that more and more rowers utilise such equipment.

Rowers use electronic feedback equipment to direct their training towards very specific, but different goals. High performance athletes want to control their training intensity to gain the desired fitness improvements in the most effective way and look for feedback during their races. Recreational rowers need information to direct their power output for health reasons. Researchers use training and race data to analyse performances for physiological, biomechanical and strategy studies.

For each of these tasks, it is critically important that the feedback one receives from the equipment is correct. The electronics provide indicators that potentially have very serious and important consequences for the rower. In case of incorrect data feedback, athletes may choose inappropriate intensities that do not lead to improvements, or even put the athletes' health at risk. Obviously, researchers need proper data to interpret their findings correctly.

Therefore, it is very important for any user to know exactly which data the respective equipment provides. In general, two different methods are currently utilised to measure the quantities mentioned above: Impeller and GPS.

Impeller measurement is based on the principle that the water sets it in a motion that corresponds with the speed of the boat that it is attached to. The motion of the impeller is directly dependent from the flow of the water relative to the boat. This means that the movement of the boat relative to the water is measured. Sensors in the boat record the spinning of the impeller to calculate the required data.

Global Position Systems (GPS) measure the position of the receiver as a place on the earth's surface. If the receiver is connected with the boat, GPS is able to track its movement and can calculate various data from that. This means that the movement of the boat relative to the ground is measured. Below, you find a comparison of the two measurement systems.

GENERAL INFORMATION		
System	Impeller	GPS*
Necessary equipment	Monitor, impeller, wires, (magnet on sliding seat possible, but not necessary)	Monitor, receiver
Necessary preparation	Impeller and wire installation, calibration	None
Measurement method	Impeller spins with moving boat relative to water; computer counts turns of impeller; calculates distance traveled relative to water, boat velocity relative to water, stoke rate	Computer receives signals from satellites to determine position on earth every 1-3 sec; calculates distance traveled over ground and boat velocity over ground
Calibration	Through rowing of a known distance, the calibration factor is found and set on monitor	Automatically done by computer
Accuracy	Distance traveled and velocity always relative water: Less than 2% for any measurement with or without current	Distance traveled and velocity always over ground: ~ 1- 15m for position or any distance;  This means that without current the distance or velocity measurement for one single stroke could be off by more than 10%, but accuracy improves dramatically with overall distance and the calculation of average velocity over longer time; Measurements of actually traveled distance and boat velocity on water with current are off depending on the relation of the current speed to average speed of the boat relative to the water
Energy consumption	Low	Relatively high

## INSTALLING THE HEART RATE SENSOR

SpeedCoach XL2 and XL4 display units can measure heart rate when the heart rate sensor is installed and a chest strap is worn. The ideal location to mount the sensor is on the side of the boat, in line with the stroke rate sensor and oriented perpendicular to the stroke rate sensor. Try to mount the sensor so that the chest strap always remains within 1 m of the sensor.

**NOTE:** At present, NK can only guarantee interference-free readings for XL heart rate monitors when there is only ONE chest-belt transmitter within a 2 m range of the heart rate sensor at any time. As a result, it is possible to use two monitors in most pairs or doubles by placing the stroke seat sensor close to the stern end of the seat deck, and the bow-seat sensor close to the bow end of the deck. In larger shells, the monitors and sensors will need to be at least two seats apart (i.e. at 2 and 4 seats, not at 2 and 3 seats). In larger team boats, it is likely that heart rate systems in adjacent seats will interfere with each other. (This includes having a rower wear a personal heart rate monitor in a seat adjacent to a rower using an XL2.)

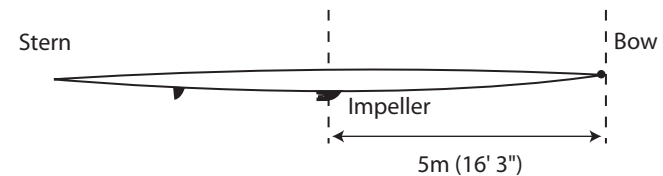
### Install the Heart Rate Sensor:

- 1) Clean the mounting location thoroughly with an alcohol pad.
- 2) Peel the backing off the pieces of velcro on the heart rate sensor;
- 3) Press the sensor firmly onto the deck.
- 4) Secure the wire with the cable tie mounts. If in the future you need to remove the wire, simply cut the cable tie and later use a new one to secure the wire.



## INSTALLING THE SPEED SENSOR & IMPELLER

All boats produce a boundary layer of turbulent water from the bow to the stern. The closer you get to the stern, the more turbulent the water. The SpeedCoach unit is factory calibrated for correct readings with the impeller installed at 5 meters from the bow of the boat. This location will typically fall under the footstretchers of a single, or around two seat of a larger boat. Installing the impeller in this location should yield accurate performance even if you don't calibrate your unit. You should avoid placing the impeller farther than 6 meters from the bow because the water will be too turbulent for the impeller to spin consistently, so accuracy will be compromised - even if calibrated. (See "CALIBRATION" section for instructions on how to calibrate.)



### Select the Impeller and Sensor Location:

- You DO NOT need to drill holes through the hull of the boat to install the impeller and sensor. The sensor mounts to the inside of the boat, above the impeller, and communicates wirelessly through the hull.
- Measure 5 meters from the bow of your boat, and inspect your boat to select a mounting location for the impeller. Make sure to select a location where you will be able to mount the speed sensor directly above the impeller. Avoid sealed bulkheads, ribs and footstretchers. The impeller does not need to be on the exact midline of the boat, but must stay submerged. Keep the impeller parallel with the keel to minimize drag and steering effects.
- The impeller can be mounted permanently with the included VHB tape, or temporarily with electrical or packing tape. If you are planning on removing the impeller, you may wish to mark the location with permanent marker so you do not have to measure when you re-install.

### Install the Impeller (Semi-Permanent):

- 1) Set the impeller on top of the hull in your selected location. Sight down the length of the hull to ensure the impeller is straight. Mark your mounting location with a permanent pen.

- 2) Clean the mounting location thoroughly with an alcohol prep pad (being careful not to remove your marks).
- 3) Peel the liner from one side of the VHB tape and align the VHB tape with your marks and smooth in place.
- 4) Peel the remaining liner from the VHB tape.
- 5) DOUBLE CHECK (it's easy to make a mistake here) that you have the curve of the impeller pointing toward the bow ball, and the impeller pointing toward the fin.

6) Align the impeller on the VHB tape and press firmly.

7) WAIT 24 HOURS BEFORE ROWING. The tape requires 24 hours to fully cure!



### Install the Impeller (Temporary):

For borrowed boats, or if you plan to remove your impeller for racing, you may install your impeller temporarily with electrical tape. When installed properly with electrical tape, the impeller should not easily fall off your boat. However, check the tape regularly to make sure that it is still secured to the boat and is not beginning to peel off.

1) Set the impeller on top of the hull in your selected location. Sight down the length of the hull to ensure the impeller is straight. Mark your mounting location with a permanent pen.

2) Clean the mounting location thoroughly with an alcohol prep pad (being careful not to remove your marks).

3) CUT (do not tear - this stretches the adhesive and makes it less effective) two pieces of electrical tape approximately 180 mm long.

4) Place the impeller in its mounting location. DOUBLE CHECK (it's easy to make a mistake here) that you have the curve of the impeller pointing toward the bow ball, and the impeller pointing toward the fin.

5) Lay one long piece of electrical tape on either side of the impeller, with approximately half of the width of the tape on the impeller mount flange and half on the hull. You should have approximately an inch of extra tape on each end that will affix solely to the boat.

6) Cut two 65 mm pieces of tape for the two ends of the impeller. Lay them on top of the ends of the mount flange, and across the two long pieces of tape.

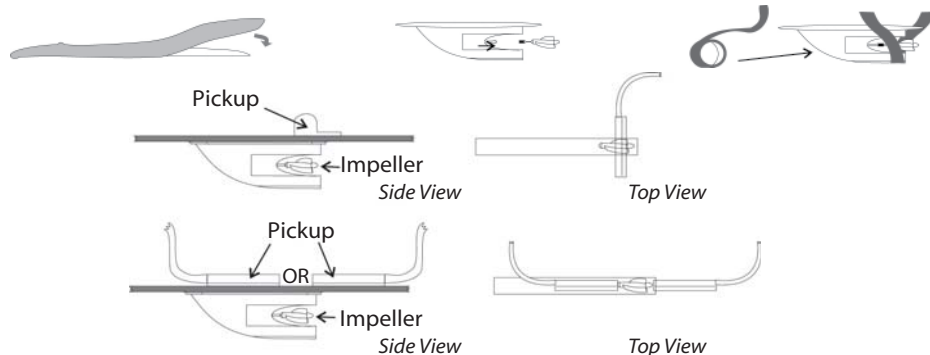
7) Smooth all the tape thoroughly, ensuring there are no bubbles and full contact with the hull.

8) WAIT 24 HOURS BEFORE ROWING.



### IMPORTANT!

While transporting your boat, it is important to secure or remove the impeller. The constant spinning will wear the magnet. You can either keep a cover on your boat while transporting, tape the impeller so it cannot spin, or unscrew the impeller from the hull mount.



NK developed the first SpeedCoach more than 10 years ago, and thousands of rowers and coaches have relied on it to help them train more effectively. We're continually making changes and improvements to the SpeedCoach line to make them easier to use, and better performing. Here are some of the common questions we get about the SpeedCoach line of products.

### How does the SpeedCoach Help Me to train more effectively?

The SpeedCoach can be such an influential training tool by giving you immediate, quantitative feedback on the way the boat is moving. Did a rigging change help? How about concentrating on quicker catches? If the boat is going faster, then yes, it did. This immediate information is especially valuable for rowers who don't have a coach with them all the time, for coxswains who are making critical race plan decisions, and for coaches who are determining the fastest combinations through seat racing. Strokes of coxed boats can also benefit from the information the SpeedCoach provides - and giving them their own display unit lets them see the stroke rating and boat speed without having to be told by the coxswain. They will know immediately when the stroke rate starts to vary, and they will be able to confirm stroke rate changes on the second stroke.

For maximum benefit, give every rower in the boat their own display unit. NK provides specific wiring for each individual seat in the boat. Multiple wiring harnesses' speed sensors can use the same impeller, allowing every rower to see the same information at the same time. The motivational power of seeing the speed jump when the crew makes a move is tremendous. Elite crews are training with multiple SpeedCoach setups and seeing the benefits of the results.

### How does the current affect the speed readings?

The SpeedCoach accurately measures speed and distance through the water so current does not affect your workout distances or times over those distances. By using the distance shown on the SpeedCoach instead of a land-measured distance, you will always be rowing the same length piece regardless of current. This is because the impeller on the boat doesn't 'see' the current in the water. To the impeller, you are always sitting on still water.

If this is a little confusing, imagine sitting in a current without rowing. One minute later, your boat will have traveled some distance down river, even though you haven't rowed a single stroke. The SpeedCoach will read a distance of 0 metres. Conversely, if you row upstream at the exact speed of the current, the SpeedCoach will display this speed and track the distance traveled even though you will appear to be making no forward progress on land.

The benefit of this is that you can compare times for upstream and downstream pieces of equal length measured by the SpeedCoach. For example, if you row a land-measured 2000 metre course both upstream and downstream, this is how far you might have actually rowed through the water and the corresponding time to finish the piece:

	Upstream	Downstream
Actual Distance Rowed (m)	2200	1800
Time (min:sec)	7:30	7:00

You would not be able to compare these times because the pieces on-land measurements were affected by the current, and so were actually different distances.

Next workout, ignore the land course and use the SpeedCoach to measure the 2000 meters rowed. Now look at the distance and time for the piece:

	Upstream	Downstream
Actual Distance Rowed (m)	2000	2000
Time (min:sec)	7:15	7:17

(This crew showed some fatigue on the second piece)

The SpeedCoach eliminates the effect of the current on the time of the piece. Now you can compare pieces from day to day and in any current.

### How much drag does the impeller create, and will it slow me down?

The hydrodynamic design of the NK impeller mount actually creates a fraction of the drag of a standard skeg. Laboratory tests were performed on the hull mount impeller to determine the drag effects on a rowing shell. For single sculls, the drag from the hull mount impeller is approximately 0.1% of the TOTAL boat drag, and proportionately smaller for larger boats.

### What about other performance measurements?

Force, acceleration, check, drag... these are all pieces of information that coaches ask us about. But it all boils down to one critical measurement - and that's boat speed. The boat with the least amount of check isn't necessarily the boat that crosses the finish line first. That's why NK has focused on developing the best measurement electronics for boat speed - it's what wins races, and we believe if you train with that focus, you will go faster.

The following is an explanation of the benefits and uses of the NK SpeedCoach™ Rowing Computer written by Michael Naughton. Michael is an applications engineer at NK and rows at Philadelphia's Undine Barge Club. He was a varsity sweep oarsman at LaSalle High School in Philadelphia and the University of Miami in Florida. Michael recently placed third in the lightweight double sculls at the U.S. Elite Championships.

## THE NK SPEEDCOACH™ ROWING COMPUTER TRAINING EFFECTIVELY

### A Personal On-Board Coach

I use the SpeedCoach as my technical rowing coach. Speed and rate changes are instantly reflected. I find that when my catches are quick or my finishes are accelerated, the speed comes up. I also find that rowing at 34 strokes per minute is sometimes actually slower than rowing at 32 strokes per minute.

When it comes to practicing my sprint, the SpeedCoach shows me if the boat is getting faster with every shift up in the stroke ratings. I check the splits before I sprint, then come up a few beats and try to drop those splits! If the splits don't come down, it's time to work on the sprint some more. At least I found out during practice rather than in the last 200 meters of a race.

After using the SpeedCoach in practice, I learn how fast I'm capable of racing. In the grueling middle part of a 2000 meter race, I know if I'm falling off pace or even picking up speed. And when it comes time for the sprint, I see if all that work in practice is paying off. The SpeedCoach is even more helpful in a head race. For the stretches without boats to pass, it acts as the incentive to push harder and faster.

### Using the Memory to Get Boat Speed

Once the race or workout is over, I still use the SpeedCoach to help get faster. I use the memory to review the race in depth. For example: In a sprint race, I review every 100 meters of the race and analyze which part of my race needs the most work. It's quick and easy to scroll through the memory to see exactly which 100 meter segments were the slowest. Then I also review the last 300 meters to find out just how efficiently the stroke rate came up.

### Seat Racing

The SpeedCoach can be used as an effective seat racing tool. For example: A coach can send a boat out to row a 1000 meter piece and return with memory of the practice. The coach can review every 100 meters of the entire piece and also get an overall time. Later, send out a different lineup to row a 1000 meter piece. Because the SpeedCoach measures speed and distance independent of current, both boats can row their piece in any conditions they like (aside from large wind fluctuations). The coach can still compare the times for both pieces.

### Multiple SpeedCoach Units in One Boat

The SpeedCoach system can easily be used with multiple units in the same boat. Many team boats are now installing a SpeedCoach display in every seat. This shows each rower the exact speed at which the boat is moving. Depending on the level at which your boat is competing, this can be a powerful, motivating incentive to get your boat to the finish line first. The U.S. Olympic Men's Quad and Women's Eight are two of the elite level boats which trained with units in every seat. There is still only one impeller which is mounted to the hull of the boat. Special length wires connecting the sensor to the individual display unit are used for reaching distant seats in the shell.

### Hull Mount Impeller Drag

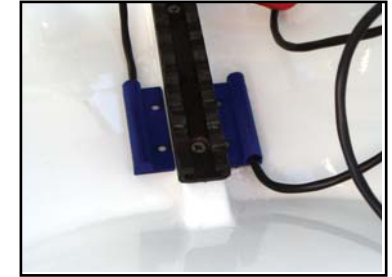
Laboratory tests were performed on the hull mount impeller to determine the drag effects on a rowing shell. For single sculls, the drag from the hull mount impeller is 0.1% of the TOTAL drag of the boat, and proportionately smaller for larger boats.

It is important to balance the small drag penalty of the hull mount impeller against the benefits of knowing the speed of the boat in the middle of a race. At NK, we're certain that the *SpeedCoach* is an invaluable training tool. It's up to you to decide if the information during a race is outweighed by the added time from the drag. With the hull mount impeller removed for racing, the *SpeedCoach* will still display a stroke rating and give elapsed time (for mounts with a seat switch sensor).

### Install the Speed Sensor (Blue Sensor)

The sensor can be mounted parallel or perpendicular to the impeller. Either way is suitable; the impeller just must be within 2 inches of the impeller.

- 1) Clean the mounting location thoroughly with an alcohol prep pad.
- 2) Peel the liner from the VHB tape on the blue sensor.
- 3) Align the sensor directly above the impeller and press firmly.
- 4) If desired, secure the wires using cable ties and mounts. If you have extra wire, coil the wire and secure with a cable tie.



**NOTE:** Multiple sensors can be mounted around one impeller, simply mount them next to each other, or stack them on top of each other. (i.e. if you have a mounting harness in both seats of a double.)

## CALIBRATION

Calibration is an optional step that allows the display unit to compensate for different impeller locations and variations in hull shapes. If you need very accurate distance and speed measurements (to compare your performance with published results, for instance), calibration is a good idea. However, even if your unit is not properly calibrated, your SpeedCoach will provide you with valuable feedback on changes in boat speed, and you will be able to compare upstream and downstream pieces.

Your SpeedCoach has a factory calibration value of 1.000. To calibrate your system, you will be determining a new calibration value by comparing your SpeedCoach's distance reading with a known distance reading. On still water, row or paddle over your measured distance and record the distance displayed on your SpeedCoach. On flowing water, row or paddle over your measured distance both up and down stream and average the results shown on your display. Then, use the following formula to obtain your new calibration value.

$$\frac{\text{(CURRENT CAL VALUE)(TRUE DISTANCE)}}{\text{DISPLAYED DISTANCE}} = \text{NEW CAL VALUE}$$

For example, if you know you covered 1 mile, but your display shows 0.92, your calibration value will be:

$$\frac{(1.000)(1.00)}{0.92} = 1.086$$

PLEASE NOTE: Calibration is boat and impeller location-specific: if you move your unit to a new boat, or modify the location of your impeller, it is recommended that you recalibrate the unit.

## TROUBLESHOOTING

### General Troubleshooting:

Always try to borrow a fellow rower's SpeedCoach or SpeedCoach Gold so that you can narrow down the variables. By testing your boat's wiring harness with a functional unit, and having your unit tested in a functional wiring harness, you can help determine where the problem lies. Make sure that both SpeedCoach units you are using have a calibration of 1.000 and are set to 2-Stroke Mode.

*Are the ratings very high and intermittent?*

Your unit may have been affected by an ESD (electro-static discharge). Perform a hard reset on your unit to clear the charge. To do so, open the battery door, remove the batteries, and hold down both buttons for 10 seconds. Replace the batteries, make sure the o-ring is in place, and close the battery door. This is like rebooting your computer.



**My Unit Works in My Friend's Boat, but Neither Mine nor Hers Works in My Boat:**

The problem most likely lies with your wiring harness or impeller -

- 1) Check to make sure there are no cuts, nicks or pinched areas along the wire (a flashlight will be helpful here)
- 2) Be sure that both sensors are aligned correctly.
- 3) Be sure that there is no debris or corrosion on the impeller and that it spins freely.
- 4) Check that the metal contacts on the mounting dock are flush with the surface of the dock.
- 5) Clean the metal contacts on the mounting dock with a non-abrasive cleanser, like Bon-Ami. DO NOT use solvents on the docking station as it may cause damage and voids the warranty.

**My Unit Doesn't Work in my Boat or My Friend's Boat, but Hers Works in My Boat:**

The problem most likely lies with your SpeedCoach --

- 1) Inspect the metal contacts on the back of you SpeedCoach. Are all four above the level of the case? Do they spring back out when you press them in gently? Is their metal surface smooth and shiny?
- 2) Clean the metal contacts on your unit with a non-abrasive cleanser, like Bon-Ami. DO NOT use solvents on the unit as it may cause damage and voids the warranty.
- 3) Is the battery door secure and well-sealed?
- 4) Is the unit window secure and undamaged?
- 5) Your unit may have been affected by an ESD (electro-static discharge). Perform a hard reset on your unit to clear the charge. To do so, open the battery door, remove the battery or batteries, and hold down both buttons for 10 seconds. Replace the batteries, make sure the o-ring is in place, and close the battery door. This is like rebooting your computer, and often fixes strange or erratic behavior of the display unit.

**Specific Problems:**

**Speed or Pace Readings are Inaccurate**

*Is the Calibration Value Set Correctly?*

The calibration value should be set at 1.000 unless you have completed the necessary steps to recalibrate your unit.

*Is the Impeller Properly Installed?*

The impeller should be 5 meters from the bow of the boat. If the impeller is installed in a different location, the unit will provide incorrect information unless calibrated. The impeller should not be more than 6 meters from the bow, or turbulence may cause inconsistent performance.

*Does the Impeller Spin Freely?*

If the impeller begins to accumulate any debris or corrosion, it may not spin freely which will lead to inaccuracy. If you are unable to clear the debris, a new impeller can be purchased. The impeller may be unscrewed and replaced without removing the hull mount. Note: Any slight humming noise created by the impeller should fade within a week or so.

**No Stroke Rate or Rate Seems Incorrect**

*Is Unit Making Contact with the Bracket?*

The unit must have clear contact with contact pins on mounting bracket. Push the unit into the mounting bracket until a clear "click" is heard. Be sure the lanyard is not pinched in the bracket and interfering with the connection.

*Are the Magnet and Sensor Aligned?*

Double-check the set-up and orientation of the seat magnet and black sensor, reviewing the illustrations.

*Is the Stroke Mode Correct?*

If your stroke rate consistently seems very high, almost double what it should be, the unit may be in single stroke mode (1-Str). Make sure unit is set in 2 stroke mode (2-Str).

*Is the Unit in Memory Recall Mode?*

If there is no rate, time or distance displaying, make sure the unit has not been left in memory recall mode.

*Is the seat sensor operating properly?*

In order to rule out a seat sensor failure, place the display unit in 0-Stroke Mode. This allows the stroke rate to be calculated based on the changes in boat speed, not the seat sensor. If the ratings return to normal, your wiring harness seat sensor may be failing. Contact NK for a replacement wiring harness.

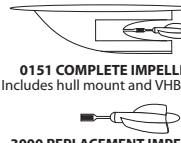



**SpeedCoach® Configuration Guide**

**Wiring Harness Includes:**

Mounting Dock with VHB Tape, Seat Sensor, Seat Magnet, Speed Sensor & Complete Impeller

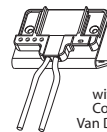
**Optional at extra cost:**

Mounting Bracket #0280 or #0282

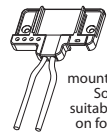
					Wiring Harness	Typical Bracket	Speed Cable Length	Rate Cable Length
1x	Bow Cox	2x 2+ 2-	Bow Cox	4x 4+ 4-	3166	0282	3.66m	2.13m
1x	Bow		Bow	Bow	3155	0280	0.91m	1.68m
	Stroke		2 Seat	2 Seat	3165	0280	2.13m	1.68m
	Stern Cox		3 Seat	3 Seat	3166	0280	3.66m	2.13m
			Stroke	4 Seat	3168	0280	5.79m	2.13m
			Stern Cox	5 Seat	3172	0280	10.06m	2.13m
			6 Seat	6 Seat				
			7 Seat	7 Seat				
			Stroke	Stroke				
			Stern Cox	Stern Cox				
 <p><b>0151 COMPLETE IMPELLER</b> Includes hull mount and VHB Tape</p> <p><b>3000 REPLACEMENT IMPELLER UNIT</b> Screws into existing hull mount</p>					<p>NOTE 6 &amp; 7 Seats will have extra length. May coil extra length or order custom harness (extra cost). Sectioned harness also available for #3172 (extra cost)</p>			
<b>KAYAKS</b>		Stroke rate from paddle tilt switch			3160	0282	1.83m	1.07m
<b>CANOES (HIGH-KNEEL OR OC-1)</b>		Stroke rate from impeller's speed			3161	0280, 0282 or None	1.07m	no rate sensor
<b>KAYAKS</b>		No stroke rate, speed only			3161	0280 or None	1.07m	no rate sensor
<b>DRAGON BOAT</b>		Stroke rate from impeller's speed			3166	0282 or None	3.66m	no rate sensor
<b>SURF BOAT</b>		Stroke rate from impeller's speed			3161	0282 or None	1.07m	no rate sensor



**0280 optional T-Bracket**  
Installs on footstretcher or wall of cockpit. Most commonly used.



**0282 optional Angle Bracket**  
Installs on deck or wing rigger with dual-lock tape. Commonly used for Van Dusen, Maas Aero and Kayaks. May be helpful for bow cox (can be rotated 90° and mounted on hull interior).



**No Bracket standard**  
Harness dock comes with VHB mounting tape applied. Some boats have a suitable mounting area on footstretcher plate, washbox or cockpit and do not require bracket.

**Mounting Hardware**  
All required mounting hardware is shipped WITH the mounting bracket - screws and nuts, bolts with T-Bracket. Dual-Lock tape with Angle-Bracket.