

smartOar[®]

Coaches Tablet

User Guide

Version 4.0

smartOar[®]
Real-Time Force Curve Feedback

Questions?
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smartOar[®] Coaches Tablet

The Coaches Tablet allows you to watch the force curves of up to 9 “devices” (Oars, Accelerometers, and Gate Angle Sensors) in real-time. With the Coaches Tablet, you can find up to 19 devices and configure them into multiple boats. It is easy to switch between boats so you aren’t limited to working with one crew per session. The Tablet is water-resistant and has a special display that doesn't wash out in direct sunlight. Other viewing devices like laptops, tablets, and smartphones can be difficult to read on bright days.



The Coaches Tablet (Tablet) has three connectors on its side:

- A USB port that accepts a thumb drive for updating the Tablet software. You can also transfer recorded stroke data to a Windows-based computer for additional display and analysis using the smartOar® PC Display software.
- A power connector to charge the Tablet with the AC adapter.
- A VGA connector for connection to a large screen display.

The Coaches Tablet can display up to nine curves simultaneously. Eight curves are available for a combination of Oars, Gate Angle Sensors, and seat

Accelerometers. These various products are referred to as “devices”. The ninth (boat) curve is available to display a boat accelerometer or a gate angle sensor. Multiple boats or combinations of devices in the same boat can be configured and the coach can switch between boats/configurations. Considerable effort was spent in providing on-screen instructions to make it easier to use the Tablet on the water.

The Coaches Tablet communicates with the devices via radio. The frequencies used to communicate are shared by many other services including Bluetooth®, ZigBee®, and Wi-Fi™. These interfering signals can reduce the effective range of the Tablet resulting in dropouts in the curves due to lost data packets. Since boats move, the effective range of the system can change as the distance from interfering signals changes. When dropouts begin to increase, moving closer to the shell can help greatly. These variations in performance are not a defect in the system, but are due to external sources of interference which can come and go as boats move down the course. While the Tablet excels at real-time stroke monitoring, the self-record feature of the oars is a useful tool for capturing strokes and analyzing performance without the negative effects of dropouts.

1. Setup

A. Removing the Tablet Cover

The cover of the Tablet is removable, making it easier to hold the Tablet while using it to observe your rowers’ strokes. To detach the cover, lift the front latch and remove the two hitch pins on the rear hinges. To

replace the cover, put it back on the Tablet loosely and insert the hitch pins back into the hinges before latching the front latch. The antenna, which screws into the connector on the back, or in some cases, the side, may be freed from its keeper and rotated up vertically for maximum range.

TIP: *Be sure to put the loose hitch pins on the cover hinges to keep them from getting lost.*

B. Turning the Tablet On

Turn the Coaches Tablet on by pressing and holding the **power** button until the display brightens - a short press may not work. The battery/status light will turn green and the display will show the boot process. Booting takes just over one minute. When booting is complete, the "**Scan For Oars**" display will appear.

TIP: *The title of each screen is in the upper left corner of the display.*

C. Configuring the Tablet

The Tablet has a configuration screen that can be entered from the **Scan for Oars** or **Assign Oars** screens by pressing and holding the **bookmark** button.

The software versions are shown in the upper part of this screen. There are three "computers" in the box and each has its own version of software.

The oar channel box is the radio frequency (rf) channel that the oars use when transmitting data. While the tablet is booting, it is also scanning all the available rf channels for the one with the least noise and interference. After capturing the oars/devices, it moves them to the lowest noise channel and operates from there.

The date boxes and time boxes are self-explanatory. **Play/pause** jumps from box to box. Use **back** and **forward** buttons change the values.

The threshold multiplier field affects the sensitivity of the stroke detector. It is probably best to leave this set to "2", although the curious may certainly play with the setting.

If you press the **record** button to exit, the changes will be saved.

If you press the **mode select** button to exit, the changes **won't** be saved.

D. Turning the Tablet Off

To turn the Tablet off, press the **power** button. A message will appear telling you to press the power button again within three seconds to complete the process. The intent is to avoid inadvertently turning the Tablet off at an inopportune time (repeated personal experience).

2. Configuring Boats

A. *Assigning Oars to Positions*

Turn on all the Oars and other devices you want to monitor with a single press of each device's button. All devices should show a solid green light. As mentioned previously, the Tablet can find up to 19 devices (Oars, Accelerometers, and/or Gate Angle Sensors).

On power-up, the Tablet will be in the **Scan for Oars Mode**. The on-screen instructions tell you to press **play/pause** to search for "oars", which includes other devices.

The Tablet will list all oars/devices it detects by each device's stickered letter/number along with its customizable name. If a stickered letter/number does not agree with the value on the Tablet display, you can change the value that appears on the Tablet with the PC software **Update** program.

The screen will now say "**Assign Oars**" in the upper left corner and "**Assigning devices to boat #1**" over the detected oar/device box. Use the **forward** and **back** buttons to scroll to the device you wish to assign to a position.

Assign the highlighted Oar or other device in the list to an oar position (1-8) by pressing the position number buttons along the bottom of the Tablet. Assign an Accelerometer or Gate Angle Sensor to the 9th position by pressing **bookmark**. On newer tablets, press **bookmark** or the **boat** button just to the right of the rower buttons. Note: Seat Accelerometers and Gate Angle Sensors can also be assigned to positions

1-8. Since Gate Angle Sensors sensors mount on an oarlock, later, we will show you how to relate a Gate Angle Sensor to its Oar.

NOTES: *Like a Gate Angle Sensor, an Accelerometer can also be assigned to any position (it can be attached to a seat to show slide movement).. However, if you want the Accelerometer to indicate the set of the boat at the catch, you must to assign it to the **9th/boat** position. An Accelerometer assigned to positions 1-8 will only show acceleration. Lastly, Oars can only be assigned to positions 1-8.*

When you have assigned all the devices for a given boat, press **mode select** to begin displaying curves, or press **record** to configure another boat/configuration. When configuring another boat, all the devices will reappear as options for the new boat. **If you make a mistake, you can deselect an assignment by pressing the button on the position that is incorrect and then assign the correct Oar or device to that position.** You cannot go back and reconfigure a boat once it has been locked in by pressing the **record** or **mode select** buttons.

TIP: *Place the Oars in the boat so that their labels match the seat positions in the boat. This makes it easy to assign the Oars to the available positions in the boat, without constantly referring to the letter/number labels on the Oars. In starboard-rigged boats, you will need to swap even and odd Oar assignments.*

B. Working with Multiple Boats

The on-screen instructions on the **Assign Oars** screen show how to set up multiple small boats, each with a combination of up to 9 Oars, Gate Angle Sensors, and Accelerometers per boat. Up to 19 Oars/devices can be

captured at one time. This means you can run two eights with boat Accelerometers or four fours with three boat Accelerometers, etc.

As mentioned previously, when you have finished selecting the oars for your first boat, press **record** to configure a new boat. The message over the detected oar box will now say “Assigning devices to boat #2”. Configure your next boat. Press **mode select** when you are done configuring boats to enter the **Display Mode**.

TIP: *Mixing Oars or devices between boats will lead to strange results, since crews rarely row at the same rate with the same timing. Confine all configurations to the same boat. For example, if you have 8 Oars and 8 Gate Angle Sensors, you could configure a boat with 8 Oars and two more “boats” consisting of the bow 4 Oars/Gate Angle Sensors and the stern four Oars and associated Gate Angle Sensors. You can even look at all eight Gate Angle Sensors in one display to see how everyone makes their catches.*

In **Display Mode**, to move between boats, press and hold the **bookmark** button on older tablets for several seconds, or the **boat** button on newer tablets. You cannot switch boats while recording. It is best to make sure you are within range (close) when switching to a new boat. If you are out of range when you switch, it may take ten seconds or so to lock onto a new boat as you come into range.

C. Reassigning Oars

At any time, use the **mode select** button to move between **Assign Oars**, **Display Mode**, and **Playback Select Mode**. By returning to **Assign Oars**, you can reconfigure boats if desired.

3. Working With the Curves

A. Changing Oar Curve Colors

When entering **Display Mode**, the highest assigned Oar is automatically the "**Stroke**" Oar. The Tablet uses the "**Stroke**" Oar to determine when the crew has taken a stroke. Since the stroke isn't always rowing, you can change the stroke Oar by pressing and holding the button of the desired new stroke. The new stroke oar is indicated by a pair of asterisks before the impulse number for that oar.

Users can change the appearance of a displayed curve and/or hide it by pressing the button associated with that curve. In this way, users can isolate different combinations in the boat, i.e., watch just stroke and seven, then stroke and six, then stroke and five, etc., or watch all ports only and then all starboards only, etc.

Pressing an oar's button will cause it to cycle repeatedly between its unique color, off, then black.. For the **9th/boat** position, press the **bookmark** or **boat** button (if present) to cycle through the options for an accelerometer or gate angle sensor in that position. Note: You cannot use **bookmark** to change the **9th/boat** position curve while **recording** on older tablets – while **recording** pressing **bookmark** creates a **bookmark**.

B. Associating Gate Angle Sensors With Oars

Gate Angle Sensors are related to specific Oars. To associate a Gate Angle Sensor to a particular Oar, simultaneously press the button of the

Oar along with the Gate Angle Sensor. The Gate Angle Sensor curve will assume the color of the Oar curve and its color will be controlled by the associated Oar button. Accelerometers can also be associated with an Oar because an Accelerometer can be mounted on a rower's seat to give insights regarding seat motion vs. the Oar force curve (shooting the slide). After it is associated, you can turn a curve on or off but its color is determined by the oar to which it is associated. Again, in older tablets, you cannot turn a curve in the **9th/boat** position on or off while **recording** or during **playback**.

C. Changing the Size of the Curves

In **Display Mode** and **Playback Mode**, the height of the force curve on the display can be increased by simultaneously pressing the **forward** and **oar 8** buttons. Simultaneously pressing the **back** and **oar 8** buttons will decrease the size of the curves. Repeat each key press to continue changing the size of the curves. The new size will be in effect for both **Display Mode** and **Playback Mode** until the Tablet is turned off. To change the size of the Accelerometer curves, simultaneously press **bookmark/boat** and **forward** (increase) or **back** (decrease). You cannot change the size of the gate angle sensor curves.

TIP: *The change in size will take effect on the next stroke.*

D. Changing the Display Brightness

The Tablet backlight display is set to maximize visibility in direct sunlight. This can be too bright for early morning rowing. Reduce

brightness by simultaneously pressing **back** and **oar 7**. Increase the display brightness by simultaneously pressing **forward** and **oar 7**.

E. The Force Curves

The Coaches Tablet shows the force curves of up to eight Oars and the timing relationships between them. Of particular interest is the catch timing as the force curve begins to rise on the left side of the screen. Good finish timing, at the end of the force curve, is much harder to achieve because it depends on the physical attributes of the rowers and how the positions are rigged. The shape of the force curve is subject to considerable debate and everyone seems to have an opinion. There is also considerable published research on this issue. The website (smartOar.com) has a video that provides some insights into curve shapes that can help you achieve your goals for the shape of the curves.

F. The Accelerometer Curves

The Accelerometer is usually mounted in the boat itself and shows the acceleration of the boat through the drive and part of the recovery. It also clearly shows how the boat typically slows down (decelerates) coming up to the catch. There are competing theories about whether it is best to have a short or long deceleration interval coming up to the catch. The acceleration curve lets you see and coach to the result you want. Remember, on older tablets without the **boat** button, you cannot use the **bookmark** button to cycle through the curve options in the **9th/boat** position during **record** and **playback**.

G. The Gate Angle Curves

The displayed gate angle curve needs some explanation: The Gate Angle Sensor is meant to be zeroed at the point which the oar is perpendicular from the boat, i.e., sticking straight out from the side. The curve that is displayed is the absolute value of the angle relative to this zeroed position. This means that positive and negative angles corresponding to the catch and release sides of the curve are plotted as positive numbers. The curve looks like a “V” centered on the force curve. This method has the advantage of showing exactly where the gate is perpendicular relative to the force curve (the bottom of the “V”).

At the catch, you can see how the angle changes with time. Many catch defects are clearly visible from the shape of this portion of the curve. If the angle decreases substantially before the force curve begins to increase, “rowing it in” may be a problem. If the gate angle curve is flat for a length of time, the rower may be coming early to the catch and waiting. If the curve changes rapidly coming up to the peak value before the catch, the rower may be “rushing up to the catch” or “reaching”.

HINT: *The Gate Angle Sensor is easily moved between gates. If assigned to the **9th/boat** position, you can look at an individual rower by attaching it to the bracket on their pin and see the eight force curves and one gate angle curve. The same restriction for accelerometers on older tablets in the in the **9th/boat** position during **record** and **playback** here as well.*

4. The Numbers

A. The Oar Impulse

At the bottom of the display, above each **oar** button, are two values for each active Oar. The lower value is the Oar identifier that matches the letter/number placed on the Oar shaft and programmed into the Oarpod (black box on shaft of Oar) at the time of installation. The **Update** program allows this value to be changed.

The number above the oar identifier is the area under the rowing curve and is technically called the "impulse". The impulse is the integration of the *force* of the stroke over the *time* it is occurring. This is not the same as power. To know the power, one needs to know how far the oar is moving while the force is applied. smartOar® doesn't measure a rower's power, i.e., it doesn't replace the erg. smartOar® does indicate how hard the rowers are pulling and how long they are pulling as well as how they match up to each other throughout the stroke. When an Oarpod battery is low, the impulse number is surrounded by a red box, indicating that the oar needs to be charged

If a gap in the curve (dropout due to a lost packet of data) occurs, the impulse value may be less accurate due to the dropout. Move the launch closer to the shell to reduce the incidence of dropouts.

B. Accelerometer Numbers

When an Accelerometer is present in the **boat** position, an extra set of boxes appears at the top of the display. The **Acc** box shows the maximum deceleration (check) of the boat for that stroke. The **Set** box shows the set of the boat at the catch in degrees with **S** and **P** indicating

whether the boat was down to port or starboard. For these readings to be accurate, the Accelerometer must be zeroed when first put in the boat (see the Oar User Guide Appendix). When the Accelerometer is assigned to an oar position (1-8), the box above its button will only show the maximum deceleration for each stroke *and not the set*.

C. Gate Angle Sensors

When a Gate Angle Sensor is present in the **boat** position, an extra set of boxes also appears at the top of the display. The box on the right shows the maximum catch and finish angles for each stroke. When a Gate Angle Sensor is assigned to an oar position (1-8), the box above its button shows the maximum catch and finish angles for each stroke. When a Gate Angle Sensor is associated with an oar, by pressing both buttons simultaneously, the color of the Gate Angle Sensor Curve matches that of the Oar to which it is associated.

5. Recording and Playback

A. General

Press **record** to start recording strokes. The message "**recording**" will appear in the upper left of the screen. Press **record** again to stop recording. If something memorable happens while recording, you can press the **bookmark** button. During playback, and in the PC software, you can jump to the bookmarked strokes to show a rower something you spotted. The stroke count for the boat is displayed on the screen. During

recording, the stroke count in parentheses shows the number of strokes since the recording was started.

While in **Display Mode**, the onscreen instructions tell users they can press and hold **play** (for about two seconds) to move into **Playback Mode**. Here you can select any recorded file for viewing by using the **back** and **forward** arrow buttons to scroll to the desired stroke file. The files are named by the time and date that they were recorded. Each time you press **record** a separate stroke file will be created.

While in **Playback Mode**, you can **pause** the display, and then use **forward** or **back** to move to the next or previous stroke. You can also turn each device's curves **on/off/black** just as in the **Display Mode**.

In **Playback Mode**, you can stepwise increase the rate the strokes are displayed by pressing the **forward** button repeatedly. Pressing the **back** button will reduce the rate one step. Repeating will get you back to the base stroke rate. The playback rate is shown in the upper left corner of the screen.

TIP: Use the *mode select* button to move between **Oar Select**, **Display**, and **Playback Modes** in the Tablet.

B. Stopwatch Feature

A stopwatch feature is activated when **record** is pressed. **Elapsed Time** and **Stroke Count** are displayed on the top right of the display. When **record** is pressed again to stop recording, the total elapsed time to 1/100th of a second is displayed along with the number of strokes during the interval. The stopwatch is reset at the start of the next

recording. During recording, the 100th of a second is not displayed because the display cannot update that quickly.

C. Transferring and Deleting Data

The Tablet saves up to 50 files in memory. If there are already 50 files saved, and you record another, the Tablet *deletes* the oldest file.

To transfer files using a thumb drive, just insert it into the Tablet. Regardless of the screen you are in, after about ten seconds, the Tablet detects the thumb drive and the display switches to the **Transfer/Delete** screen. Use the **back** and **forward** buttons to highlight the desired file in the list. The Tablet has instructions on the left side of the display. Press **play** to copy to USB thumb drive. Remove USB thumb drive and press **mode select** to exit.

NOTE: *The thumb drive must be removed to use the Tablet in other modes. If you don't, pressing **mode select** will cause it to leave, then jump right back to the transfer/save screen.*

6. The VGA Output Connector

The VGA Output Connector is a standard DB15 female connector for connecting to an external monitor. Many large screen TVs can accept VGA signals. This makes the Tablet useful for larger audiences to view after a row. There are VGA to HDMI converters available for TVs that lack a VGA input.

If you have an indoor tank that works with standard oars, there are many possibilities for displaying strokes on a large monitor so that the rowers can see

each other's force curves. They can work to match up their strokes including curve shape, catch and release timing, or to just "go after" each other—seeing who can outperform the others while still rowing well. Specialized tank oars can be instrumented as easily as on-water oars.

7. Charging and Care of the Tablet

The Tablet is not truly waterproof. There is an air pressure equalizer on the front of the Tablet that can let water in if submerged. The connectors and front panel are watertight so rain shouldn't interfere with tablet operation.

The display screen has special coatings that reduce glare from sunlight. It should be cleaned carefully with a lens cleaner for plastic lenses or LCD TV screens, and it is very important that the cleaning cloth is guaranteed not to scratch plastic. **Some paper products can have bits of wood residue in them, and can scratch the display screen.**

The batteries in the Tablet are good for several hours of usage. When the Battery Level indicator in the top right of the screen no longer says "OK", immediately wrap up the session and recharge the Tablet using the supplied charger.

8. The Special Button Presses

There are several special combinations of button presses designed to engage special features or reduce the risk of inadvertently deleting files.

Coaches Tablet - Guide to Special Button Presses

Change the Stroke Oar – If the current stroke is not rowing, press and hold the button of the new stroke until their curve turns red to resume seeing strokes.

Increase Size of Curves – Simultaneously press **forward** and **oar 8**.

Decrease Size of Curves – Simultaneously press **back** and **oar 8**.

Increase Size of Accelerometer Curves – Simultaneously press **forward** and **bookmark**.

Decrease Size of Accelerometer Curves – Simultaneously press **back** and **bookmark 6**.

Increase Display Brightness – Simultaneously press **forward** and **oar 7**.

Decrease Display Brightness – Simultaneously press **back** and **oar 7**.

Change Curve of Gate Angle Sensor or Accelerometer in 9th/boat Position - Press **forward** or **boat** (if present) to cycle through options.

Associate Gate Angle Sensors and Accelerometers with Oars in Display Mode - Press button for each simultaneously. Curve colors will match Oar color.

Speedup Playback – Press **forward** repeatedly to increase playback rate.

Slow Playback – Press **back** repeatedly to decrease playback rate.

Force Tablet Reset – If the tablet becomes unresponsive, simultaneously press **back** and **oar 2** on tablets without the **boat** button or press **oar1**, **oar2**, and **oar3** on tablets with the **boat** button.

Hint: *Print this page and use it as a reference while coaching*

Any questions? We're here to help. Call us at 303.570.6749 or email us at sales@smartoar.com.