SailTimer Wind Instrument RB™

Owner's Manual

Wireless. Solar-powered. Replaceable Battery.

SailTimer Inc.

www.SailTimerWind.com

Contents

This owner's manual covers the Wind Instrument RB™ with the Removable Battery in the nose cone. Previous models are not included here. Please refer to their earlier Owner's Manuals.

29/9/2022

Quick Start

Your new Wind Instrument RB is the result of precision manufacturing for the axles and bearings, and sophisticated electronics for the power management system and solar charging. It uses Bluetooth LE (Low Energy, also called Bluetooth 4 or 5). It opens up capabilities for sailors that have never been possible before.

Many technical specifications, features and FAQs are provided on the web site www.SailTimerWind.com. The instruction sheet that comes in the box also has a useful summary of key points for getting started. This Owner's Manual provides some additional details and procedures to allow you to use and enjoy this state-of-the-art new technology.

Your Wind Instrument is designed to be self-sufficient and provide its own power outdoors in the wind, ready to transmit for years to come. When you first remove the Wind Instrument from the box and are handling it until it is mounted, it is a good precaution to avoid laying it on a table with all of the weight on the wind cups. Lay the wind cups over the edge of a table to protect the bearing inside.

The Design Thinking Behind Your New Anemometer

Your new Wind Instrument was designed with many innovative new features. Most masthead anemometers have had a horizontal arm. But that attracts large sea birds, which can cause damage. Why not give it a vertical orientation? We did. It is a nuisance to have to run wires down the mast and through the cabin liner to the helm, so why not make the anemometer completely wireless? We did; SailTimer made the first masthead anemometer that could transmit to smartphones and tablets, and this is the newest model. It is also awkward to have circuit boards and wiring running through an anemometer, since the wiring breaks and the circuit boards can get wet. So as another design innovation, we use the circuit board and solar panels as the tail of the wind direction arrow.

Durable, Top-Quality Materials: Maybe you have noticed some parts on your boat that are stainless steel but still need to be polished to keep the rust off them. To avoid that problem with the Wind Instrument, the Mounting Rod is marine-grade stainless steel, which has increased resistance to corrosion. The accessories (L-Bracket, Track Slider and Extension Bar) are also marine-grade stainless steel. For the body of the Wind Instrument, we use a special low-friction, abrasion-resistant thermoplastic called Delrin or acetal (polyoxymethylene - POM) for the vertical cylinders. The pointer arm is carbon fiber to reduce weight from the previous black anodized aluminum.

Lock Nut on the Mounting Rod: This metric M6 nut tightens against the Spindle or base of the Wind Instrument. This helps to protect the threads on the base, so that they can't be turned past the bottom of the threads onto the rod itself. And of course the locking nut stops the base from unscrewing itself off the Mounting Rod with the constant movement of the boat and the wind. Give the nut a gentle tug with a wrench or pliers to make it snug against the plastic, so they won't come unscrewed. You can still unscrew the Wind Instrument from the Mounting Rod by hand or with a pair of pliers quickly and easily, without needing to undo the Mounting Rod from the masthead.

If you want a quick release for the Mounting Rod, you can replace the lock nut with an M6 wing-nut instead, for quick removal with no tools. They are just $5 in the Accessories shopping cart on the web site. We don't supply the Mounting Rod with a wing-nut because most users want it to be streamlined at the masthead. But for quick removal and portability, a wing-nut is very handy. We have them in stainless steel and nylon, since ferrous metals could affect the compass in the tail section.

***To be extra sure that the Wind Instrument won't somehow work itself loose from the lock nut and unscrew off the Mounting Rod, there is an argument for adding thread adhesive or a dab of caulking to the Mounting Rod when the Spindle and lock nut are tightened into place. You should still be able to turn the spindle loose later, but that extra resistance in the threads may ensure that nothing unscrews itself with temperature changes and the constant motion on the boat and in the wind. Mounting is the customer's responsibility, and you don't want to lose your Wind Instrument overboard, if the lock nut worked itself loose.

Hermetic Seal for Electronics in Tail

The tail of the wind direction arrow contains the electronics and digital compass. That way, the wind direction arrow knows which way it is pointing, with no calibration. This is the first masthead anemometer with a compass right in the wind direction arrow. It can measure wind direction, not just wind angle -- an important feature for crowdsourced wind maps. The shell on the tail is UV-resistant, and clear so that sunlight can pass through to the solar panels inside.

For measuring wind speed, there is a tiny magnet on the bottom flange of the wind cups. Rather than the usual approach of running a wire from an axle sensor on the cups to a circuit board, we use a tiny magnet on the wind cup base. As it comes around, the invisible magnetism reaches through the sealed plastic of the tail, and triggers a sensor inside. That lets your Wind Instrument be waterproof and submersible.

Ceramic Bearings
To provide rotation with virtually no friction, your Wind Instrument RB™ has miniature ceramic ball bearings in the wind cups for wind speed and in the spindle (base) for wind direction. The ceramic performs really well and has the advantage that it is even better than stainless steel for being non-corrosive, which is important for these precision mechanisms.

Battery in Nose Cone
Most wind vanes and anemometers use a brass nose cone as a counterweight for the tail. Brass he heavier than steel. But why put a heavy deadweight on something that you want to turn easily in a light breeze? The new Wind Instrument RB solves this engineering challenge by putting the battery in the nose cone as the counterbalance.

There are details about replacement batteries and wall chargers on the Accessories page on the web site. To open the battery compartment, hold the main part of the nose cone (so that you are not putting a lot of twisting force on the rest of the pointer arm), and unscrew the cap. When putting the battery back in, make sure the white connectors are lying flat; if they are on their side the cap may not close tight against the O-ring for a waterproof seal. Also check the wires coming out of the pointer tube under the battery, to make sure they are sitting in a slot and not getting pinched by the end of the battery so that the wires may wear through. When disconnecting the battery, the small white connectors can be pulled gently apart; there is no latch. Be cautious not to pull on the wires, to avoid pulling the wires out of the connectors.

Secure Transmissions

Only one device can pair with the Wind Instrument at a time, to minimize power consumption. However, some apps can retransmit the wind data on wifi, as can the SailTimer Air Link™ accessory.

There are also security advantages to having only one user connect to the Wind Instrument, ensuring that someone else is not receiving your wind data and using up the battery power in your Wind Instrument.

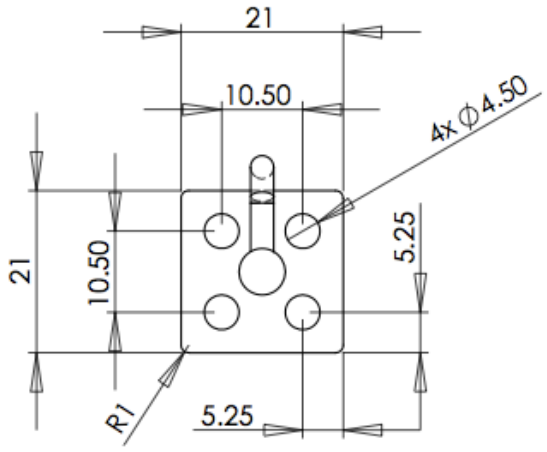
Even if there are multiple Wind Instruments in your marina, there is no chance of receiving data from a different Wind Instrument when you are connected to your own. They each transmit encrypted data.

When you get your Wind Instrument and first connect to it, you can rename your Wind Instrument, to make it easy to identify in future use. That way, you don't have any concern that you have connected to a different boat's Wind Instrument. (Which would not last long anyways, once they sailed out of range.) Bottom line: only you can connect to your Wind Instrument, with an encrypted, secure connection, and you cannot accidentally receive wind data from a neighboring boat.

Installation

Your Wind Instrument RB is designed to send the strongest signal downward, since it is usually mounted up on a masthead or pole. You may also find that a tablet like an iPad can receive the signal more strongly when on the periphery of transmissions in certain orientations, like with the glass screen facing the Wind Instrument. When mounting the Wind Instrument RB, it helps to try to place it on the masthead in an optimal position. If it is in view of the helm, the cockpit or the cabin, the signal will be stronger than if it is trying to transmit through a metal mast. Metal seems to be the strongest obstruction, but with other materials like glass, fiberglass, wood or drywall, the Bluetooth signal (and wifi) can typically pass through one or more walls. For optimal placement on the masthead, the goal is to keep the Wind Instrument in view with direct line of sight as much as possible.

Mounting Pattern for Drilling Holes
The drill pattern for the holes in the foot of the Mounting Rod are shown below. For example, the four holes are 4.5 mm in diameter to fit the fasteners that come with the foot plate (which is just 21 mm square).



Units in millimeters.

The fasteners provided are size #8-32 stainless steel; nuts & bolts are provided in this size, and also screws in case you can't access the underside of the masthead to put a nut on.

For the #8 screws, drilling holes in the soft metal of the masthead with a 9/64-inch drill bit will provide a very snug fit, so the screws won't come loose. The screws have a wide head on them, so no washers are needed.

A threaded machine bolt and nut may hold better than a screw (assuming your masthead is aluminum). So the strongest attachment may be the bolt and nuts that come with the product -- although sometimes it is hard to get at the under side for the nut.

It is also possible to tap 4 threads in this pattern into the masthead, and add lock washers. Tapping is a way to get the same holding power, without needing the nut underneath.

L-Bracket
If you don't have space on top of the masthead, the optional L-Bracket allows you to mount on a vertical surface like a wall or the side of the mast. It has the 4-hole pattern on the horizontal part of the L, for the foot of the anemometer to bolt on to. For side-mounting, there are 3 holes, also for a #8 screw (4.5 mm in diameter). The outer two are 1.25" (31.75 mm) from center to center, with the center hole in the middle between these.

If mounting onto the side of masthead, it is better to put screws into the vertical side of the solid aluminum masthead itself, not into the thin aluminum of the hollow mast. Trying to hold screws in the side of the hollow mast itself doesn't give much purchase because the aluminum is so thin. You may also be able to put long stainless steel bolts right through, to have a more secure attachment. Or if you have a space free at the top of a small boat mast, you may be able to use hose clamps to securely hold the L-bracket, rather than trying to use screws in the side of a hollow mast.

Stanchion Mount with Wing-Nut Hose Clamps
In the photo below, rather than being mounted on top of a masthead, it is mounted on a stanchion using a handy L-bracket accessory.

Use the L-bracket with the L upside down, which ensures that it can't slide out the bottom of the hose clamps. The L-bracket comes with special wing-nut hose clamps that can be tightened by hand without any tools.

Off-Season Removal
You can leave the Mounting Rod or the L-bracket in place all winter if you want. That may less wear on the screw holes, than taking the screws out every year. It is fast and easy to unscrew the lock nut below the black base (the Spindle) of the anemometer, and turn the black base (the spindle) off of the stainless steel Mounting Rod.

Your Wind Instrument RB can be turned off if you are putting it in storage for the winter, by unplugging the battery. This is recommended if there are freezing temperatures in your location. When off-season temperatures are below freezing, the battery functions less effectively the colder it gets. This battery does work in an exceptionally wide range of outdoor temperatures. But if it stops charging for a month or two of extreme cold during the winter, that could affect the battery chemistry. Also, in rare cases if the battery goes flat while the electronics are in mid-operation, a crash could result (the same as unplugging a desktop computer without the normal shut-down could cause a crash). Issues resulting from flat batteries in the winter are avoidable so are not covered by warranty. Battery care is out of our control as the manufacturer, and is the user's responsibility.

The LED on the tail (below the CE logo) blinks every 4 seconds when Bluetooth is not connected. You'll see that you can make the blinking stop/start by unplugging the battery in the nose. If off-season storage is an option, that does reduce wear and tear, especially during winter storms.

How to Install Without Lowering or Climbing the Mast

If you don't want to wait until the off-season when the mast is down, or get cranked up in the bosun's chair, ladders like the Mast Mate may be another option. But there are also two procedures for raising your SailTimer Wind Instrument™ from deck level (summarized on the web site here). Since this is really the beginning of wireless marine electronics, there has been little need to develop a system like this until now. But we get a lot of requests from customers who want to use our wireless anemometer on a boat that is already in the water, with the mast already up. So this gives you two convenient options for being able to use wind data right away.

Cantilever Method
You may have noticed the loop on the side of the Mounting Rod that came with your Wind Instrument. That is used with the Cantilever Method we have developed. This is the lowest-cost procedure.

Attach an extra pennant or foresail halyard to that metal loop on the Mounting Rod. Then add a thin line (e.g. 4-mm diameter) through 1 or 2 holes in the foot, as shown in the photo at right. It is amazingly simple: just raise the Wind Instrument with the halyard, then pull down on the thin line to swing the Wind Instrument upright like a cantilever.

Depending on the shackle or rope on the end of your halyard, you can usually make the Wind Instrument more vertical by tying around the Mounting Rod itself and through the loop. If you tie only to the loop (as with the shackle shown in the photo on the bottom of the previous page), the Wind Instrument tends to tilt out a bit. It is better to connect around the Mounting Rod shaft and through the loop, if possible.

When lowering the Wind Instrument, its structure is designed to withstand strong wind forces. But it is a sensitive scientific instrument. So be cautious not to force it, if it gets hooked on something on the way down.
Pennant halyards are often found on a side deck, going up to a spreader. We don't recommend using the pennant halyard on a spreader, because the Wind Instrument would be blocked by the sails on some tacks. If you don't have a spare halyard going up to the masthead or want to try a different method, then it is best to use the Track Slider below.

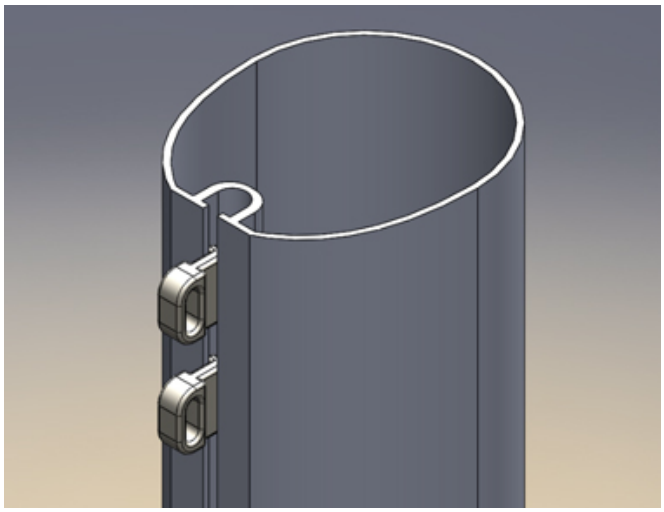
SailTimer Track Slider™
Use this method if you don't have a spare halyard from a spinnaker or pennant, or if you need a more secure attachment. We hope that this procedure looks simple, but it actually took a lot of designing, prototyping, testing and refinement, since most mast tracks are unique.

The general approach is to raise the Track Slider up the mainsail mast track. Most mainsails have a rigid headboard on the top corner (as in photo at right), and possibly also a few extra inches on the track above the mainsail. The Track Slider is designed to sit flat against the mast, inside the mainsail halyard and the headboard on the top corner of the mainsail. The Track Slider base plate (above right) only takes up 1 inch vertically at the top of the mast track. It has been tested with lots of different mast and sail types, although there may be rare examples where it won't fit (and can be returned for a refund).

The Track Slider is held in position by 2 slider cars in the mast track (which you provide, since there are different varieties on each different boat). A cable tie is provided that holds the slider cars in notches on the base plate. This holds the base plate in-between the two slider cars, straight and tight to the mast track.

Next, attach two shackles through the two larger holes in the base plate (as shown in photo below right). Use shackles that fit whatever clip or knot you have on the end of your halyard. Connect both shackles to

the mainsail halyard, as shown in the photo below. If you tie the halyard rope directly to the two shackles, be sure the rope cannot rub on the edge of the base plate. If you use a shackle as shown in the photo below, use a shackle as short as possible, to let the base plate get closer to the masthead.



With the mainsail halyard being used to raise the Track Slider, you'll need another pulley block for the mainsail. Attach this pulley block for the mainsail to a shackle that is either on the mainsail halyard shackle or above it on the halyard itself (e.g., on a knot in the rope above - or on the loop attaching the shackle to the mainsail halyard), being careful to avoid any chafing areas on the rope. Then put a new rope through this new block to serve as the new mainsail halyard, so that the headboard on the mainsail will come up and over the base plate.

We provide cable ties, and three pairs of lock nuts and bolts in the Track Slider package. However, we thought you would prefer to provide your own block (pulley), because we didn't know which size you would want. Mainsail blocks/pulleys tend to be expensive, so this gives you some control over what size and price you prefer. The same is true with the additional mainsail halyard rope that you'll need to provide.

With the rig set up, you can then pull your original mainsail halyard to raise the SailTimer Track Slider™ to the masthead. It can stay there until you get access to the masthead for more permanent attachment of the Mounting Rod to the masthead with nuts & bolts. You can then also raise/lower the mainsail, using the additional block and halyard that you added. The photo above shows how most mainsails have a header plate at the top that will pass right over the Track Slider at the top of the mast track.

Finally, once the Track Slider rig is raised to the top of the mast, you can use a thin rope to pull the Mounting Rod vertical once the masthead is cleared. Attach this thin line to the loop on the Mounting Rod as shown at right, or to the base of Mounting Rod. It should be diagonal across above Track Slider base plate, so that when you pull on the thin line, it will straighten the Mounting Rod and Wind Instrument to vertical. The thin line can also be used to pull down the SailTimer Track Slider™ later.

Preventive Maintenance

For proactive maintenance, resealing the seams around the 2 horizontal bars coming out of the tail section is recommended in the off-season, or annually when convenient to get the Wind Instrument close at hand. Your Wind Instrument has constant movement in a range of temperatures, and occasionally may be subject to strong wind forces. The clear shell on the tail is hermetically sealed to be waterproof, by melting the seam with ultrasonic welding. But sealant is required around the black horizontal bars. where they exit the tail section. These are structural stress points, so it is wise to do proactive maintenance by applying extra UV-resistant sealant as shown in the photo at left, to keep the seams sealed.

It is easy to get at these seams. Remove the dome nut (8 mm) and loosen the set screw on the carbon fiber tube with an allan key (2 mm - 5/56"). Then you can slide the axle column out toward the nose cone. No need to undo anything else.

Then apply a dab of sealant around the 2 seams, and put the axle column back in place.

Power Management

The Wind Instrument RB and earlier models is one of the first devices in the world of any kind that can transmit to smartphones and tablets powered only by solar panels. At SailTimer our engineers have done extensive R&D to make the power consumption in the Wind Instrument extremely frugal.

When using the SailTimer API™ or a mobile app, there are a few things that you may want to be aware of regarding battery levels. First, in the API on both iOS and Android there is a Disconnect button. If you are not using the Wind Instrument while on board (e.g., at night), or are leaving the boat, this allows you to disconnect until next time. Shutting off the Bluetooth connection reduces power consumption and puts your Wind Instrument into **Sleep Mode**. So if you are not at the boat, it is using almost no power (and is still solar charging).

One of the interesting features of the Wind Instrument RB is that functions like this can be enabled via the API or Air Link, through Over-The-Air Updates.

It is never a good idea to run your Wind Instrument until the battery goes flat. When outside in temperatures above freezing, it can generate its own renewable power. Or our LCD wall charger can be used to top up the battery level if it gets a bit low e.g. after winter storage. Those are easy. But it is difficult to fill up a battery with the trickle charge from a small solar panel, if you flatten the battery. Filling up the battery requires hundreds of times more power than normal operation. So the recommended procedure is to monitor your battery level periodically in the API, until you are sure that the battery level is staying full given the sun and temperatures in your location. There are further details about solar charging and battery care in the FAQ at SailTimerWind.com.

The firmware on your Wind Instrument has a sophisticated battery charging system that monitors solar charging and power consumption. It allows you to check battery levels in the API at any time for an accurate reading. The battery gauge circuitry is not getting power when turned off, so it resets to the factory level of 2 bars as if only partially full. Your Wind Instrument will need to be turned on and get a bit of charging out in the sun again, to start to display when it is full (4.2 volts).

Recharging

If the blue LED is not blinking (on the tail below the CE symbol), the battery is flat. Don't leave the battery flat for a long time or it could affect the battery chemistry. In normal operation, the unit is always on, because it needs to listen for your connection. But it is designed to generate far more power than it consumes, for continuous ongoing operation night and day.

Recharging the battery takes far more power than normal operation of the device. This is a big advantage of the Wind Instrument RB, with Removable Batteries that can be charged fast in a wall charger (see details and warnings about wall chargers and replacement batteries in Accessories).

For solar charging, you'll need to lay the tail section horizontal, with the solar panel tilted up at the sun (like in this photo). If convenient, turn it to follow the sun in morning and afternoon. Just lay it in a lawn chair for example, facing south east in the morning and south west in the afternoon. Even in tropical latitudes this tilting works best, because the sun is overhead through mid-day and does not hit the solar panels directly if the unit is mounted vertically. The more directly the solar panels face the sun, the faster your charging will be. One or two sunny days like this will usually get it charged enough to turn on, and a third day to fully top up the battery. It will still charge on cloudy days, but not as fast. The charging is faster outside rather than through a window.

NMEA 0183 Sentences

NMEA 0183 is an open industry-standard format for data sent between marine electronics. Your Wind Instrument sends the wind speed and wind direction in NMEA 0183 format, as shown below. The SailTimer™ chartplotter app (and Charts Edition) can receive that data, and we also encourage third-party apps to receive the wind data too. It is also possible to send this data into the wiring for marine electronics, using the SailTimer Air Link™. You do not need to understand this raw data, but we provide the specification in case the details are needed.

MWD Sentence
The format of the NMEA sentence that we use is: $WIMWD,148,T,166,M,1.2,N,0.6,M*--

The initial 2 letters after the $ are the talker-ID, with WI specifying that it is Weather Information. Then the MWD indicates that it is wind speed and direction.

All of the wind data in MWD is True wind (not Apparent or Relative). 148,T is the wind direction in True (non-magnetic) degrees. 166,M in the above example is the Magnetic wind direction.

1.2,N is the wind speed in knots, which is represented by N in the sentence. 0.6,M is the wind speed in meters per second. Finally, the 2 digits after the '*' is a checksum.

Proprietary STW Sentence
There is no NMEA 0183 sentence for Apparent wind speed and direction. Apparently it was not expected that there would ever be a digital compass in a wind sensor, when the NMEA 0183 protocol was established. So NMEA 0183 only includes sentences for apparent wind *angle*, not direction. But we don't want to convert from Apparent to True for the MWD sentence, send that data to an app, and then re-convert it back to Apparent. Doing the math twice makes the data less precise. Therefore, we added a proprietary sentence. It is acceptable within the NMEA 0183 specification to use a proprietary sentence, if it begins with $P to indicate that it is proprietary, and then some characters to identify what it is. So when you see green text streaming in the API, this is what it means:
$PSTW,116,T,133,M,0,N,0.0,M*03

$P - Proprietary sentence
STW - SailTimer Wind Instrument
116,T - Apparent Wind Direction (AWD) in True-North reference
133,M - Apparent Wind Direction (AWD) in Magnetic-North reference
0,N - Apparent Wind Speed in knots
0.0,M - Apparent Wind Speed in meters per second
*03 - Checksum

MWV Sentence
The third line in the set is for True or Apparent wind angle.

$WI - The initial 2 letters after the $ are the talker-ID, with WI specifying that it is Weather Information.
MWV - The V refers to wind *angle*.
157.8,R - Wind angle in degrees from 0-360. R = Relative (apparent), T = True.
9.3,N - Wind speed also in Relative or True.
A*28 - A = valid data. The final number is a checksum verification.

Bon voyage.