OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

Thru-Hull Mount: *Retractable with Valve & Sleeve*

Speed & Temperature Sensor

Model **ST850V**

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

09/23/21
17-485-02-rev.4
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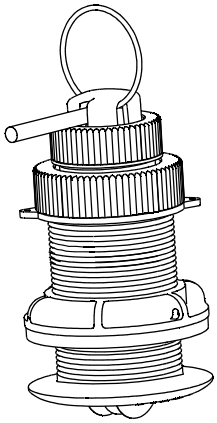
Record the information found on the cable tag for future reference.

Part No._____Date_____



plastic
low-profile
P617V housing

Follow the precautions below for optimal product performance and to reduce the risk of property damage, personal injury, and/or death.

WARNING: Always wear safety goggles, a dust mask, and ear protection when installing.

WARNING: **The valve is not a watertight seal!** Always install the paddlewheel insert or blanking plug **within the sleeve** for a watertight seal. If the insert or plug is installed without the sleeve, water will seep into the boat.

WARNING: All the O-rings must be intact and well lubricated to make a watertight seal. Do not dry fit the insert and/or the sleeve in the housing. Attempting to install the insert and/or sleeve without lubricating all the O-rings may damage them, possibly preventing full insertion and a watertight seal.

WARNING: The **YELLOW** O-ring must be in place near the top of the sleeve to make a watertight seal.

WARNING: Be sure the sleeve with the paddlewheel insert or blanking plug in place is fully inserted into the housing and the *cap* nut is screwed on completely.

WARNING: Always attach the safety wire to prevent the insert, blanking plug, or sleeve from backing out in the unlikely event that the cap nut fails or is screwed on incorrectly.

WARNING: Immediately check for leaks when the boat is placed in the water. Do not leave the boat unchecked for more than three hours. Even a small leak may allow considerable water to accumulate.

CAUTION: Never pull, carry, or hold the sensor by its cable; this may sever internal connections.

CAUTION: The arrow on the top of the insert must point forward toward the bow when installed.

CAUTION: Never use solvents. Cleaners, fuel, sealants, paint, and other products may contain strong solvents, such as acetone, which attack many plastics, greatly reducing their strength.

CAUTION: Never power sand or pressure wash the sensor. It may weaken the structure or damage the internal components.

IMPORTANT*:* Please read the instructions completely before proceeding with the installation. These instructions supersede any other instructions in your instrument manual if they differ.

Applications

Plastic housing recommended for fiberglass or metal hull only. *Never install a plastic housing in a wood hull since swelling of the wood can possibly fracture the plastic.*

Tools & Materials

Safety goggles

Dust mask

Ear protection

Water-based anti-fouling coating (**mandatory in saltwater**)

Electric drill [Ø 10mm (3/8") or larger chuck capacity]

Drill bit: Ø 3mm *or* 1/8"

Hole saw: Ø 51mm *or* 2"

Sandpaper

File (installation in a metal hull)

Mild household detergent *or* weak solvent (such as alcohol)

Marine sealant (suitable for below waterline)

Grommets (some installations)

Cable ties

Installation in a cored fiberglass hull (page 3):

- Hole saw for hull interior: Ø 60mm *or* 2-3/8"
- Fiberglass cloth and resin
- *or* Cylinder, wax, tape, and casting epoxy

Pretest

Connect the sensor to the instrument and spin the paddlewheel. Check for a speed reading and the approximate air temperature. If there are no readings or they are inaccurate, check all the connections and repeat the test. If there are still no readings or they are inaccurate, return the product to the place of purchase.

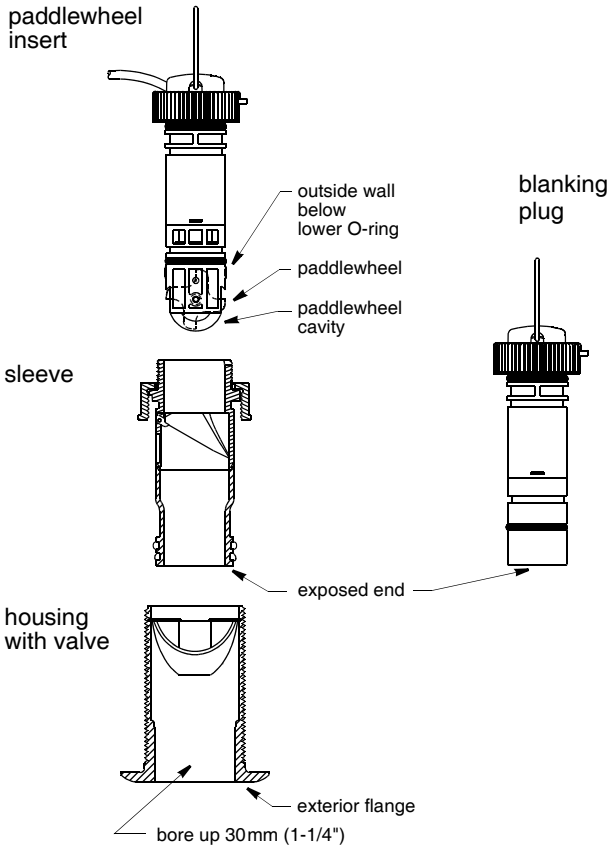


Figure 1. Anti-fouling coating

Mounting Location

CAUTION: Do not mount the sensor in line with or near water intake or discharge openings; behind strakes, fittings, or hull irregularities that will disturb the water flow.

CAUTION: Do not mount the sensor directly ahead of a depth transducer, since turbulence generated by the paddlewheel's rotation will adversely affect the depth transducer's performance, especially at high speeds. Mount sensors side-by-side.

Turbulence-free water must flow under the paddlewheel at all boat speeds. Choose an accessible spot inside the vessel. Allow a minimum of 280mm (11") of headroom for the height of the housing, tightening the nuts, and removing the insert.

- **Displacement hull powerboats**—Locate amidships near the centerline.
- **Planing hull powerboats**—Mount well aft to ensure the sensor is in contact with the water at high speeds.
- **Fin keel sailboats**—Mount on or near the centerline and forward of the fin keel 300 to 600mm (1–2').
- **Full keel sailboats**—Locate amidships and away from the keel at the point of minimum deadrise.

Anti-fouling Coating

Marine growth can accumulate rapidly on the sensor's surface reducing performance within weeks. Surfaces exposed to saltwater must be covered with an anti-fouling coating. *Use a water-based anti-fouling coating only*. Never use ketone-based paint, since ketones can attack many plastics possibly damaging the sensor.

It is easier to brush on anti-fouling coating before installation, but allow sufficient drying time. Re-coat every 6 months or at the beginning of each boating season.

Coat the following surfaces (Figure 1):

- Outside wall of the paddlewheel insert below the lower O-ring
- Paddlewheel cavity
- Paddlewheel
- Exposed lip of sleeve and blanking plug
- Exterior flange of the housing
- Bore of housing up 30mm (1-1/4")

Installation

Hole Drilling

***Cored fiberglass hull**—Follow separate instructions on page 3.*

1. Drill a Ø 3mm or 1/8" pilot hole from inside the hull. If there is a rib, strut or other hull irregularity near the selected mounting location, drill from the outside.
2. Using the appropriate size hole saw, cut a hole perpendicular to the hull from outside the boat.
3. Sand and clean the area around the hole, inside and outside, to ensure that the sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol) before sanding. **Metal hull**—Remove all burrs with a file and sandpaper.

Bedding

CAUTION: Be sure the surfaces to be bedded are clean and dry.

Apply a 2mm (1/16") thick layer of marine sealant around the flange of the housing that contacts the hull and up the sidewall of the housing (Figure 2). The sealant must extend 6mm (1/4") higher than the combined thickness of the hull, the washer(s), and the hull nut. This will ensure there is sealant in the threads to seal the hull and to hold the hull nut securely in place.

Installing

1. From outside the hull, push the housing into the mounting hole using a twisting motion to squeeze out excess sealant (Figure 2). *Align the arrow on the flange of the housing to point forward toward the bow.* If the sensor is not installed on the centerline of the boat, angle the housing slightly toward the centerline to align it with the water flow.
2. From inside the hull, slide the washer onto the housing.
3. Screw the hull nut in place being sure the arrow on the flange of the housing is still positioned forward toward the bow.

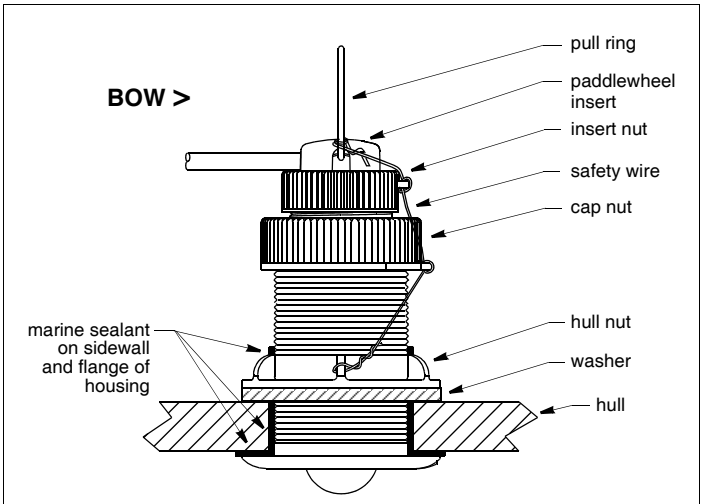


Figure 2. Bedding and installing

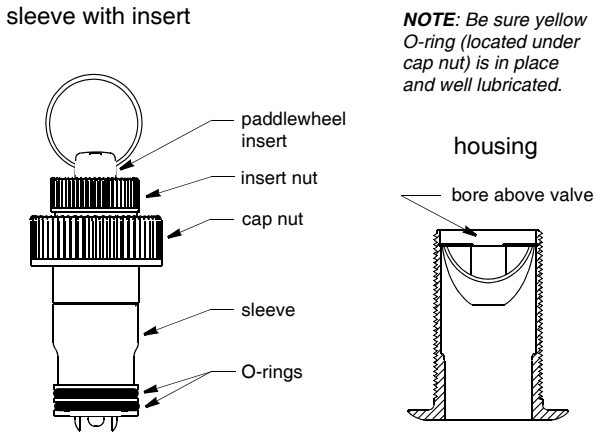


Figure 3. Lubricating the sleeve and housing

Plastic hull nut—**Hand tighten** only. Do not over tighten.
Cored Fiberglass Hull—Do not over tighten, crushing the hull.

4. Remove any excess marine sealant on the outside of the hull to ensure smooth water flow under the sensor.
5. All the O-rings must be intact and well lubricated to make a watertight seal. After the marine sealant cures, inspect the O-rings on the sleeve (replace them if necessary) and lubricate them with the silicone lubricant supplied (Figure 3). Be sure the **YELLOW** O-ring is in place near the top. Also lubricate the bore of the housing above the valve using the silicone lubricant supplied.
6. Slide the sleeve with the factory installed paddlewheel insert into the housing. *The arrow on the top of the insert points forward toward the bow* (Figure 2). (The cable exits toward the stern.) *Be sure the sleeve is fully inserted into the housing.* Screw the *cap* nut several turns until the threads are engaged. Continue to tighten the *cap* nut. Be sure it is tightened completely. Be careful not to rotate the housing and disturb the sealant. **Hand tighten only**. Do not over tighten.
7. Always attach the safety wire to prevent the paddlewheel insert and/or the sleeve from backing out in the unlikely event that the insert/cap nut fails or is screwed on incorrectly. Attach the safety wire to one eye in the hull nut. Keeping the wire taut throughout, lead the wire in a counterclockwise direction and thread it through one eye in the *cap* nut. Thread the wire through the eye a second time. Then lead the wire through the eye in the *insert* nut. Thread the wire through the eye a second time. Loop the wire through the pull ring and twist the wire securely to itself.

Cable Routing & Connecting

CAUTION: If your sensor came with a connector, do not remove it to ease cable routing. If the cable must be cut and spliced, use Airmar's splash-proof Junction Box No. 33-035 and follow the instructions provided. Removing the waterproof connector or cutting the cable, except when using a watertight junction box, will void the sensor warranty.

- Route the cable to the instrument being careful not to tear the cable jacket when passing it through the bulkhead(s) and other parts of the boat. Use grommets and deck glands where appropriate.
- To reduce electrical interference, separate the sensor cable from other electrical wiring and the engine.
- Coil any excess cable and secure it in place with cable ties to prevent damage.
- Refer to the instrument owner's manual to connect the sensor to the instrument.

Checking for Leaks

When the boat is placed in the water, **immediately** check around the sensor for leaks. Note that very small leaks may not be readily observed. Do not to leave the boat in the water for more than 3 hours before checking it again. If there is a small leak, there may be considerable bilge water accumulation after 24 hours. If a leak is observed, repeat "Bedding" and "Installing" **immediately** (page 2).

Installation in a Cored Fiberglass Hull

The core (wood or foam) must be cut and sealed carefully. The core must be protected from water seepage, and the hull must be reinforced to prevent it from crushing under the hull nut allowing the housing to become loose.

CAUTION: Completely seal the hull to prevent water seepage into the core.

1. Drill a Ø 3mm or 1/8" pilot hole from inside the hull. If there is a rib, strut, or other hull irregularity near the selected mounting location, drill from the outside. (If the hole is drilled in the wrong location, drill a second hole in a better location. Apply masking tape to the outside of the hull over the incorrect hole and fill it with epoxy.)
2. Using a Ø 51mm or 2" hole saw, cut the hole from outside the hull through the *outer* skin only (Figure 4).
3. From inside the hull, use a Ø 60mm or 2-3/8" hole saw to cut through the *inner* skin and most of the core. The core material can be very soft. Apply only light pressure to the hole saw after cutting through the inner skin to avoid accidentally cutting the *outer* skin.
4. Remove the plug of core material so the *inside* of the outer skin and the inner core of the hull are fully exposed. Sand and clean the inner skin, core, and the outer skin around the hole.
5. If you are skilled with fiberglass, saturate a layer of fiberglass cloth with a suitable resin and lay it inside the hole to seal and strengthen the core. Add layers until the hole is the correct diameter.

   Alternatively, a hollow or solid cylinder of the correct diameter can be coated with wax and taped in place. Fill the gap between the cylinder and hull with casting epoxy. After the epoxy has set, remove the cylinder.
6. Sand and clean the area around the hole, inside and outside, to ensure that the marine sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol) before sanding.
7. Proceed with "Bedding" and "Installing" (page 2).

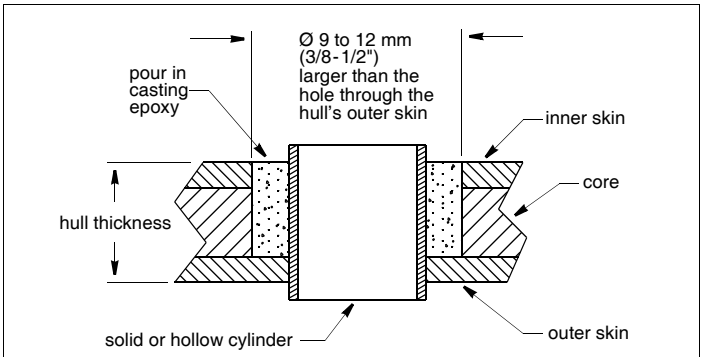


Figure 4. Preparing a cored fiberglass hull

Operation & Maintenance

How the Valve Works

The valve is not a watertight seal! The sensor incorporates a self-closing valve which minimizes the flow of water into the boat when the paddlewheel insert is removed (Figure 5). The curved flap valve is activated by both a spring and water pressure. Water pushes the flap valve upward to block the opening, so there is no gush of water into the boat.

Always use the paddlewheel insert or the blanking plug within the sleeve for a watertight seal. In the unlikely event that the paddlewheel insert/blanking plug cannot be removed or the sleeve valve breaks, replace either the sleeve or the housing the next time the boat is hauled from the water.

Using the Blanking Plug

To protect the paddlewheel, use the blanking plug:

- When the boat will be kept in saltwater for more than a week.
- When the boat will be removed from the water.
- When aquatic growth buildup on the paddlewheel is suspected due to inaccurate readings from the instrument.

1. *All the O-rings must be intact and well lubricated to make a watertight seal.* On the blanking plug, inspect the O-rings (replace if necessary) and lubricate them with the silicone lubricant supplied or petroleum jelly (Figure 5).
2. Remove the paddlewheel insert from the sleeve by removing the safety wire from the pull ring and the *insert* nut. Unscrew the *insert* nut (Figure 2). Grasp the pull ring and remove the insert with a slow pulling motion.

   ***NOTE**: Do not remove the CAP nut.*
3. Slide the blanking plug into the sleeve with a twisting motion until the key fits into the notch (Figure 5). Be sure the blanking plug is fully inserted. Screw the *insert* nut in place (Figure 2). It must be screwed on completely. **Hand tighten** only. Do not over tighten.
4. Reattach the safety wire to the *insert* nut and the pull ring. This will prevent the blanking plug from backing out in the unlikely event that the *insert* nut fails or is screwed on incorrectly.

Servicing the Paddlewheel Insert

Aquatic growth can impede or freeze the paddlewheel's rotation and must be removed. Clean the sensor with mild household detergent and a Scotch-Brite® scour pad. If fouling is severe, push out the paddlewheel shaft using a spare shaft or a 4D finish nail with a flattened point. Then, lightly wet sand the paddlewheel with fine grade wet/dry paper.

The water lubricated paddlewheel bearings have a life of up to 5 years on low-speed boats [less than 10kn (11MPH)] and 1 year on high-speed vessels. Paddlewheels can fracture and shafts can bend due to impact with water borne objects and mishandling in boat yards. O-rings must be free of abrasions and cuts to ensure a watertight seal.

1. Using the new paddlewheel shaft, push the old shaft out about 6mm (1/4"). With pliers, remove the old shaft (Figure 5).
2. Place the new paddlewheel in the cavity with the flat side of the blade facing the same direction as the arrow on the top of the insert.
3. Tap the new shaft into place until the ends are flush with the insert.

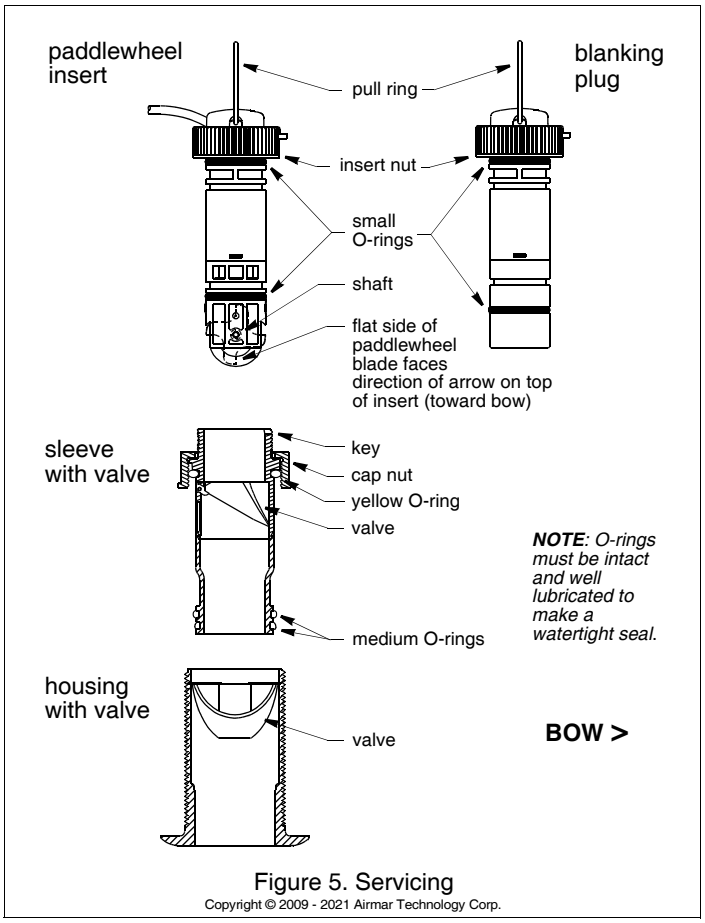


Figure 5. Servicing

4. *All the O-rings must be intact and well lubricated to make a watertight seal.* Install two of the small O-rings and lubricate them with the silicone lubricant supplied or petroleum jelly.
5. Being sure the O-rings are intact and well lubricated to make a watertight seal, the remaining two small O-rings are used on the blanking plug.

Winterizing

After the boat has been hauled for winter storage, remove the blanking plug to let the water drain away before reinserting it. This will prevent any water from freezing around the blanking plug and possibly cracking it.

Replacement Sensor & Parts

The information needed to order a replacement sensor is printed on the cable tag. Do not remove this tag. When ordering, specify the part number and date. For convenient reference, record this information on the top of page one.

Lost, broken, and worn parts should be replaced immediately. Obtain parts from your instrument manufacturer or marine dealer.

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