

OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

Shorty™ Thru-Hull Speed/Temp Sensor with Valve

Low Profile and Flush Models: S300 and ST300

U.S. Patents: 4,898,029; Re 33,982; 5,186,050. Australian Patent 605,281.
Canadian Patent 1,313,775. Japanese Patent 1851014

11/04
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IMPORTANT: Please read the instructions completely before proceeding with the installation. These instructions supersede any other instructions in your instrument manual if they differ.

CAUTION: NEVER USE SOLVENTS!

Cleaners, fuel, paint, sealants, and other products can contain strong solvents, such as acetone, which attack many plastics greatly reducing their strength.

Applications

- Recommended for fiberglass or metal hulls only
- *Never* install a plastic thru-hull housing in a wood hull, since swelling of the wood can possibly fracture the plastic.
- Low profile P371 recommended for cruising sailboats and planing hull powerboats
- Flush P398 recommended for racing sailboats and high-speed powerboats
- Minimum headroom required: 153mm (6")
- Accommodates hull thickness:

Minimum	6mm (1/4")
Maximum	25mm (1")

Tools & Materials

Water based *or* mineral spirits based antifouling paint
(**mandatory in salt water**)

Safety goggles

Dust mask

Electric drill with minimum 10mm (3/8") chuck capacity

Drill bit 3mm *or* 1/8"

Hole saw 51mm *or* 2"

Countersink tool (installing a P398 flush housing)

Sandpaper

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

File (installation in a metal hull)

Marine sealant (suitable for below waterline)

Additional washer [aluminum hull less than 6mm (1/4") thick]

Zip-ties

Installation in a cored fiberglass hull (see page 3):

Hole saw for hull interior 60mm *or* 2-3/8"

Fiberglass cloth and resin

or Cylinder, wax, tape, and casting epoxy

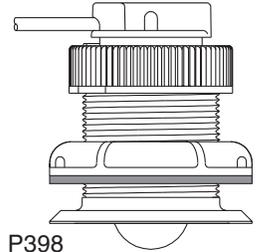
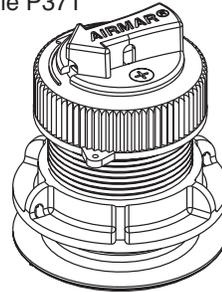
Pretest

Connect the sensor to the instrument and spin the paddlewheel. Check for a speed reading (and the approximate air temperature if applicable). If there is no reading(s), check all the connections and repeat the test. If there is still no reading or it is inaccurate, return the product to the place of purchase.

Record the information found on the cable tag for future reference.

Part No. _____ Date _____

Low Profile P371



Flush P398

Antifouling Paint

Aquatic growth can accumulate rapidly on the sensor's surface reducing performance within weeks. Surfaces exposed to salt water *must* be coated with antifouling paint. Use **water-based *or* mineral spirits based** antifouling paint only. *Never* use ketone-based paint, since ketones can attack many types of plastic possibly damaging the sensor.

It is easier to apply antifouling paint before installing the sensor, but allow sufficient drying time. Reapply paint every 6 months or at the beginning of each boating season. Paint the following surfaces (see Figure 1):

- Outside wall of the paddlewheel insert below the lower O-ring
- Paddlewheel cavity
- Paddlewheel
- Bore of the housing up 30mm (1-1/4")
- Exterior lip of the housing
- Blanking plug below the lower O-ring including the exposed end

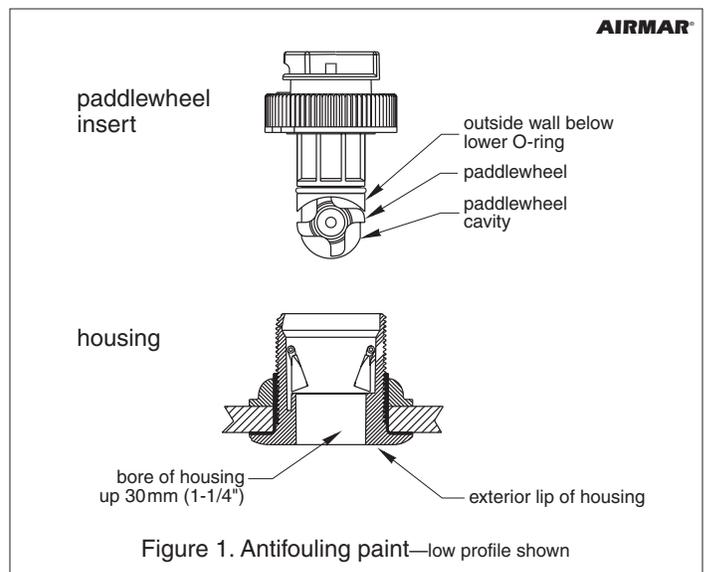


Figure 1. Antifouling paint—low profile shown

Mounting Location

Turbulence-free water *must* flow over the paddlewheel at all boat speeds. Choose an accessible spot inside the vessel. Allow a minimum of 153mm (6") of headroom for the height of the housing, tightening the nuts, and removing the insert.

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

Caution: Do not mount in an area of turbulence or bubbles: near water intake or discharge openings; behind strakes, fittings or hull irregularities.

Caution: Never mount the sensor directly ahead of a depth transducer, since turbulence generated by the paddlewheel's rotation will adversely affect the transducer's performance, especially at high speeds.

Installation

Cored fiberglass hull—Follow separate instructions on page 3.

Hole Drilling

Warning: Always wear safety goggles and a dust mask.

1. Drill a 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 pilot hole is drilled in the wrong location, drill a second hole in a better location. If the hull is fiberglass, apply masking tape to the outside of the hull over the incorrect hole and fill it with epoxy.)
2. Using a 51 mm or 2" hole saw, cut a hole from outside the hull.
P398—This flush model requires countersinking the housing to create a "seat" in the hull.
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

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

Installing

Caution: Never pull, carry, or hold the sensor by the cable as this may sever internal connections.

1. From outside the hull, push the housing into the mounting hole using a twisting motion to squeeze out excess sealant. *Align the arrow on the lip of the housing to point forward toward the bow* (see Figure 2). 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.

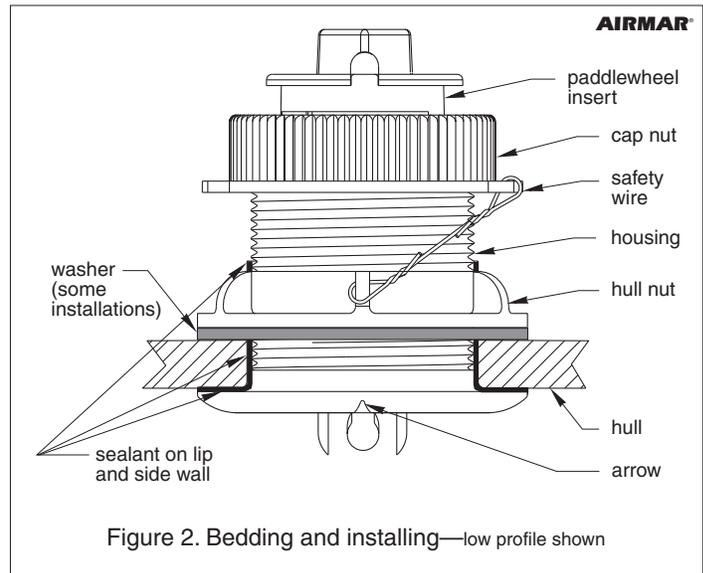


Figure 2. Bedding and installing—low profile shown

2. From inside the hull, slide any washer(s) onto the housing.

Note: Some installations do not have a washer.

Aluminum hull less than 6 mm (1/4") thick—Use an additional rubber, plastic, or fiberglass washer. *Never* use wood, since it will swell, possibly fracturing the plastic housing. *Never* use bronze, since electrolytic corrosion will occur.

Caution: Do not clamp tightly on the wrenching flats, possibly causing the housing to fracture.

3. Screw the hull nut in place, *being sure* the notch on the upper rim of the housing is still positioned forward toward the bow. **Hand-tighten only.** Do not over tighten.
4. Remove any excess sealant on the outside of the hull to ensure smooth water flow over the paddlewheel.

WARNING: The O-rings must be intact and well lubricated to make a watertight seal.

5. After the sealant cures, inspect the O-rings on the paddlewheel insert (replace if necessary) and lubricate them with the silicone lubricant supplied (see Figure 3).
6. Slide the paddlewheel insert into the housing with the *arrow on the top pointing forward toward the bow*. Seat it into place with a pushing twisting motion until the key fits into the notch. The arrow on the top of the insert, the notch, and the arrow on the lip of the housing will all be aligned. *Be careful* not to rotate the housing and disturb the sealant.

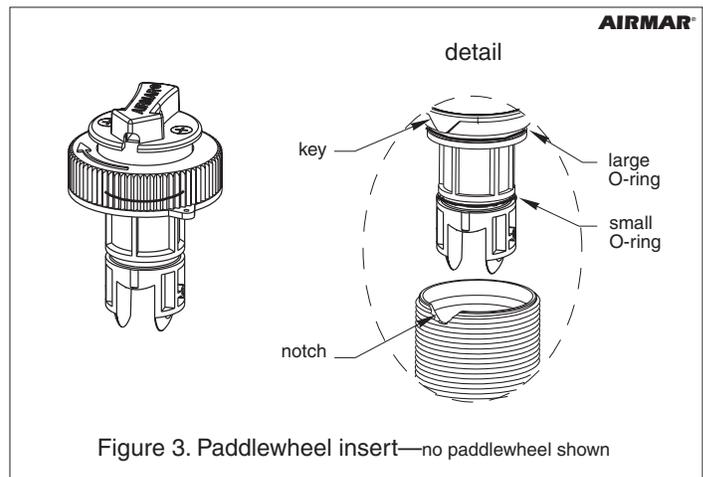


Figure 3. Paddlewheel insert—no paddlewheel shown

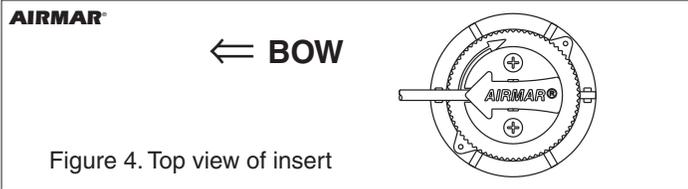


Figure 4. Top view of insert

Screw the cap nut several turns, then check that the insert's arrow is still facing forward toward the bow (see Figure 4). Continue to tighten the cap nut. **Hand-tighten only. Do not over-tighten.**

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

- Attach the safety wire to one eye in the hull nut. Lead the wire in a counterclockwise direction and thread it through one eye in the cap nut. Twist the end securely to the wire (see Figure 2).

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 33-035 and follow the instructions provided. Cutting the cable or removing the connector, except when using Airmar's 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. 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 zip-ties to prevent damage.
- Refer to the instrument owner's manual to connect the sensor to the instrument.

Checking for Leaks

Warning: Never install a thru-hull sensor and leave the boat in the water unchecked for several days.

When the boat is placed in the water, **immediately** check around the thru-hull sensor for leaks. Note that very small leaks may not be readily observed. It is best 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 (see Figure 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.

Warning: Always wear safety goggles and a dust mask.

- Drill a 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.)
- Using a 51 mm or 2" hole saw, cut the hole from outside the hull through the *outerskin* only (see Figure 5).

- From inside the hull, use a 60mm or 2-3/8" hole saw to cut through the *innerskin* 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 *outerskin*.

- Remove the plug of core material so the *inside* of the outer skin and the inner core of the hull is fully exposed. Sand and clean the inner skin, core, and the outer skin around the hole.

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

- 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 (see Figure 5).

- 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.

- Proceed with "Bedding" and "Installing" on page 2.

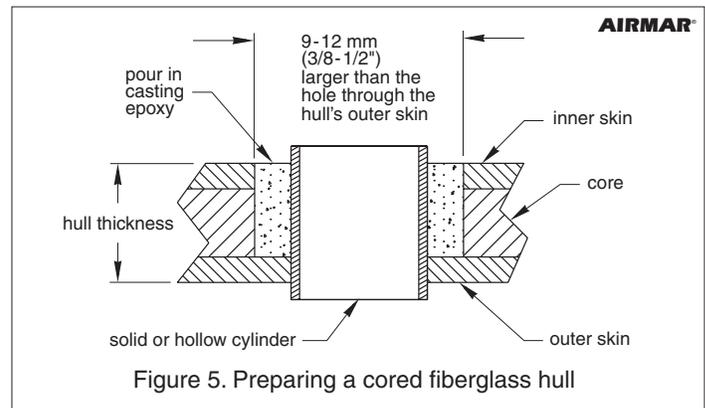


Figure 5. Preparing a cored fiberglass hull

Operation & Maintenance

CAUTION: Do not remove the screws on the top of the sensor. To remove the insert, unscrew the cap nut. This will jack the insert up. Then remove the cap nut and insert as a single unit.

How the Valve Works

The sensor incorporates a self-closing valve which minimizes the flow of water into the boat when the paddlewheel insert is removed. The curved flap valves are activated by water pressure. Water pushes the flap valves upward to block the opening, so there is no gush of water into the boat (see Figure 6).

WARNING: THE VALVE IS NOT A WATERTIGHT SEAL! Always install the paddlewheel insert or blanking plug secured with the safety wire for a watertight seal.

Using the Blanking Plug

To protect the paddlewheel insert, use the blanking plug when:

- The boat will be kept in salt water for more than a week.
- The boat will be removed from the water.
- Aquatic growth build-up on the paddlewheel is suspected due to inaccurate readings from the instrument.

Caution: DO NOT remove the screws on the top of the transducer. To remove the insert, unscrew the cap nut. This will jack the insert up. Then remove the cap nut and insert as a single unit.

WARNING: The O-rings must be intact and well lubricated for a watertight seal.

1. Inspect the O-rings on the blanking plug (replace if necessary) and lubricate them with the silicone lubricant supplied or petroleum jelly (Vaseline®) (see Figure 6).
2. Remove the safety wire from the cap nut (see Figure 2).

WARNING: Never leave the boat unattended without either the paddlewheel insert or blanking plug installed.

3. To remove the paddlewheel insert from the housing, unscrew the cap nut. This will jack the insert out of the housing. Do not unscrew the screws. Replace the paddlewheel insert with the blanking plug. Seat it into place with a pushing twisting motion until the key fits into the notch in the housing. Screw the cap nut in place and **hand-tighten only**. Do not over tighten (see Figure 6).

Note: If the flap valves do not move freely and block the blanking plug from being inserted, clean the valve assembly so the flap valves move freely and rest against the valve housing. In the unlikely event that the flap valves cannot be freed, you may need to push the flap valves down or break them off.

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

4. Reattach the safety wire to the cap nut (see Figure 2).

Winterizing

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

Servicing the Paddlewheel Insert

Aquatic growth can impede or freeze the paddlewheel's rotation and *must* be removed. Clean the surface using a Scotch-Brite® scour pad and mild household detergent. 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 surface 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 (11 MPH)] 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. A replacement Paddlewheel Kit 33-350-01 is available.

1. Using the new paddlewheel shaft, push the old shaft out about 6mm (1/4"). With pliers, remove the old shaft (see Figure 6).
2. Place the new paddlewheel in the cavity with the flat side of the blade facing the same direction as the arrow on the insert top.
3. Tap in the new shaft until the ends are flush with the insert.
4. Install one large and one small O-ring (see Figure 6 detail).
5. Place the remaining two O-rings in similar positions on the blanking plug.

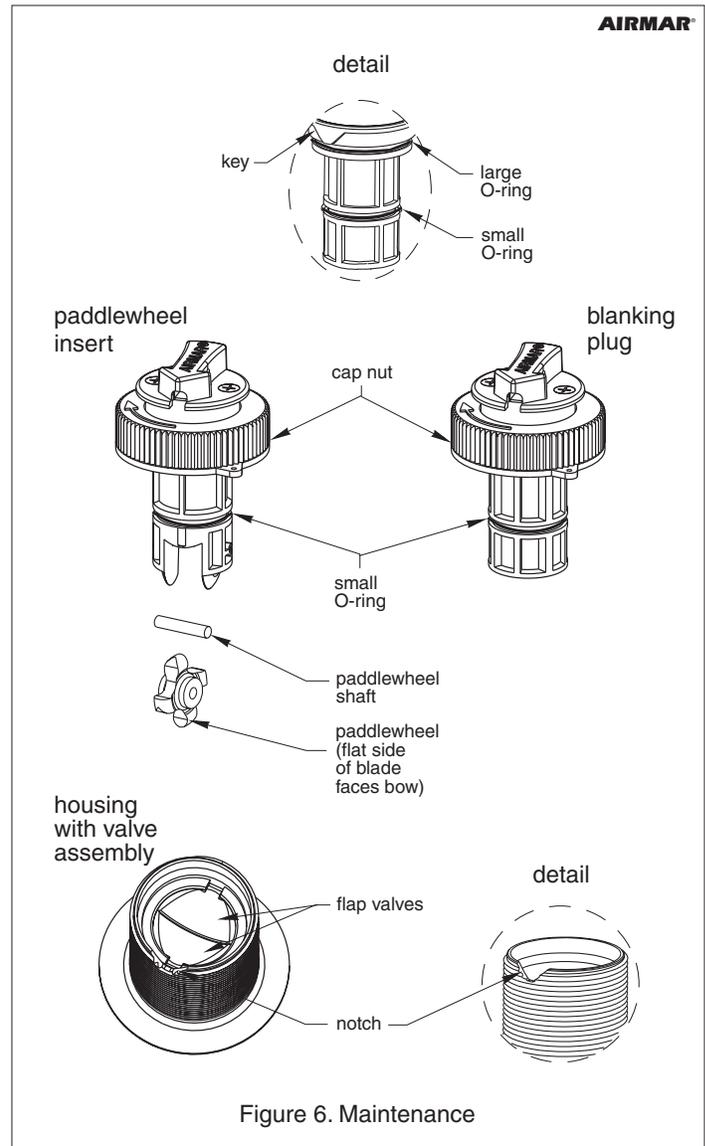


Figure 6. Maintenance

Replacement Parts

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

Part	Airmar Part Number
Blanking Plug	20-288-01
Paddlewheel Kit	33-350-01
Cap Nut	04-011
Hull Nut	04-004
Housing (P371), Valve, and Hull Nut Kit	33-361-01

Sensor Replacement

The information needed to order a replacement Airmar 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.