

# OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

## Thru-Hull, Retractable Speed & Temperature Sensor

Models: ST200, ST550

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

Part No. \_\_\_\_\_ Date \_\_\_\_\_

04/12/11

17-034 rev. 06

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 and a dust mask when installing.

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

**WARNING: ST550**—Always attach the safety wire to prevent the insert or blanking plug 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:** Never use a fairing with a plastic housing; the protruding sensor would be vulnerable to damage from impact.

**CAUTION:** Never install a metal housing on a vessel with a positive ground system.

**CAUTION:** The arrow on the top of the insert points:

- ST200—rearward toward the stern
- ST550—forward toward the bow

**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.

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



ST550

### Applications

- **Plastic** housing recommended for fiberglass or metal hull only. *Never install a plastic housing in a wood hull, since swelling of the wood may fracture the plastic.*
- **Bronze** housing recommended for fiberglass or wood hull only. *Never mount a bronze housing in a metal hull because electrolytic corrosion will occur.*

### Tools & Materials

Safety goggles

Dust mask

Water-based anti-fouling paint (**mandatory in salt water**)

Electric drill with a 10mm (3/8") or larger chuck capacity

Drill bit: 3mm or 1/8"

Hole saw: ST200 44mm or 1-3/4"

ST550 51mm or 2"

Countersink tool (installing a P217 flush housing)

Sandpaper

Mild household detergent or weak solvent (alcohol)

File (installation in a metal hull)

Marine sealant (suitable for below waterline)

Washer or backing block (optional)

Mandatory for aluminum hull less than 6mm (1/4") thick

Slip-joint pliers (installing a metal housing)

Grommet(s) (some installations)

Silicone grease or petroleum jelly (Vaseline®)

Cable ties

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

Hole saw for hull interior: ST200 51mm or 2"

ST550 60mm or 2-3/8"

Fiberglass cloth and resin

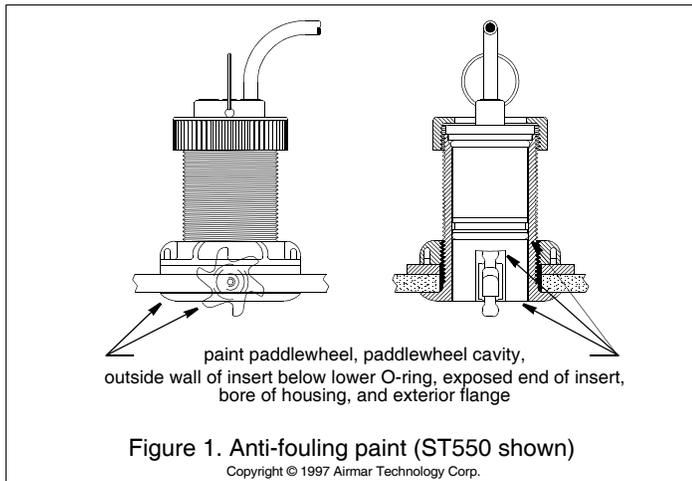
or cylinder, wax, tape, and casting epoxy

### Identify Your Model

The model name is printed on the cable tag.

### Pretest

Connect the sensor to the instrument and spin the paddlewheel. Check for a speed reading and the approximate air temperature (in appropriate). If there is no reading(s) or it is inaccurate, check the connections and try again. If there is still a problem, return the product to the place of purchase.



## Mounting Location

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

**CAUTION:** Never 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 side by side.

**CAUTION:** Do not mount in line with trailer rollers or bunks that may damage the transducer's face.

Turbulence-free water must flow under the paddlewheel at all boat speeds. Choose an accessible spot inside the vessel. Allow headroom for the height of the housing, tightening the nuts, and installing the insert.

ST200	18cm (7")
ST550	28cm (11")

- **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 300–600mm (1–2').
- **Full keel sailboats**—Locate amidships and away from the keel at the point of minimum deadrise.

## Anti-fouling Paint

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

It is easier to apply anti-fouling 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
- Exposed end of the paddlewheel insert
- Paddlewheel cavity
- Paddlewheel
- Bore of housing up 30mm (1-1/4")
- Exterior flange of the housing
- Blanking plug below the lower o-ring and the exposed end

## Installation

### Hole Drilling

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

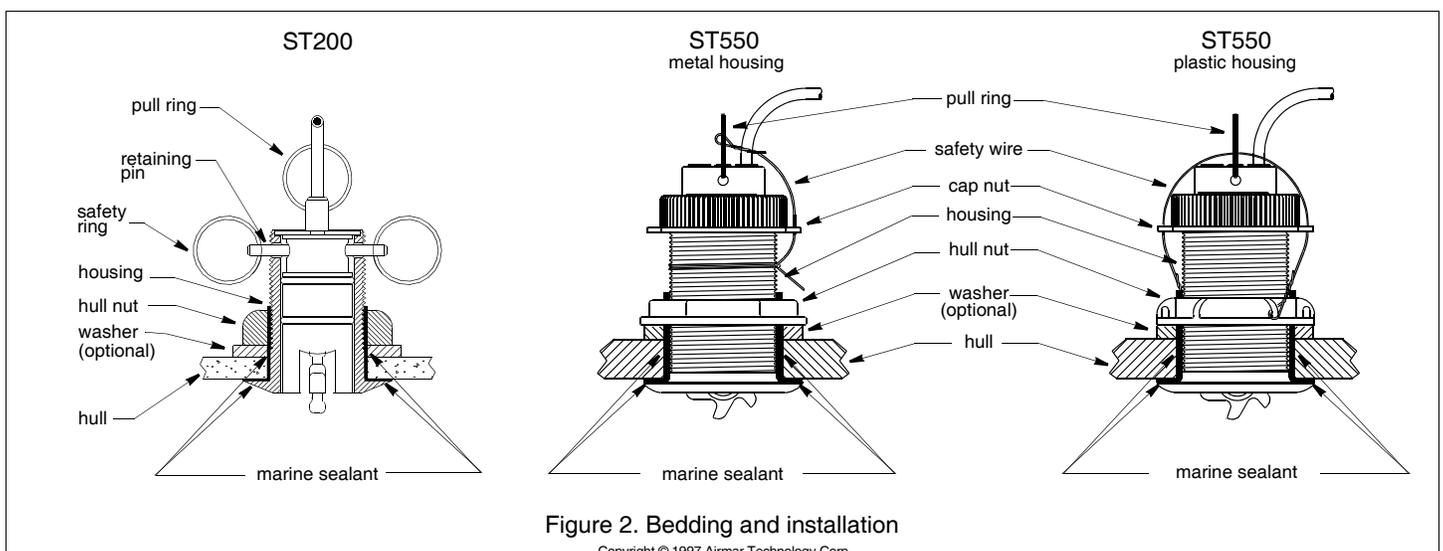
1. Drill a 3mm or 1/8" pilot hole from inside the hull. If there is a rib, strut or other hull irregularity, drill from the outside.
2. Using the appropriate hole saw, cut the hole perpendicular from outside the hull.
3. Sand and clean the area around the hole, inside and outside, to ensure that the 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 (see Figure 2)

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

1. **ST200**—Remove one safety ring, the retaining pin, the paddlewheel insert, the hull nut, and any washer.  
**ST550**—Remove the cap nut, paddlewheel insert, the hull nut, and any washer.
2. Apply a 2mm (1/16") thick layer of marine sealant around the flange of the housing that will contact 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, 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 (see Figure 2). Align the arrow on the flange of the housing pointing forward toward the bow and parallel to the centerline of the boat. If the sensor is not installed on the centerline, angle the housing slightly toward the centerline to align it with the water flow.

2. Airmar recommends a backing block or thick washer inside the hull to distribute the force from the hull nut and provide a flat surface to tighten against. Use a rubbery, fiberglass, or plastic washer.

**Plastic housing**—Never use a wood backing block, since swelling of the wood may fracture the plastic.

**Aluminum hull less than 6mm (1/4") thick**—A washer is mandatory. Never use bronze as electrolytic corrosion will occur.

3. Screw the hull nut in place.

**Plastic housing**—**Hand-tighten** only. Do not over-tighten.

**Metal housing**—Tighten with slip-joint pliers.

**Cored Fiberglass Hull**—Do not over tighten, crushing the hull.

**Wood hull**—Allow the wood to swell before tightening the hull nut.

4. Check that the notch on the *upper rim* of the housing is aligned:  
**ST200**—rearward toward the stern.  
**ST550**—forward toward the bow.

5. Remove any excess sealant on the outside of the hull to ensure smooth water flow under the paddlewheel.

6. After the marine sealant cures, inspect the o-rings on the paddlewheel insert (replace if necessary) and lubricate them with silicone grease or petroleum jelly. The o-rings must be intact and well lubricated to make a watertight seal.

7. With the arrow on the top of the paddlewheel insert facing forward toward the bow, slide it into the housing. *Be sure to engage the key in the notch.* (Use a pushing twisting motion.) Be careful not to rotate the outer housing and disturb the sealant.

8. **ST200**—Align the holes of the housing and the paddlewheel insert. Slide the retaining pin in place and attach the safety ring.  
**ST550**—Screw the cap nut in place. **Hand-tighten** only. Do not over-tighten.

9. **ST550**—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.

**Metal housing**—Wrap one end of the safety wire tightly around the housing and twist it together with the long end. Keeping the wire taut throughout, lead the wire straight up and through an eye in the cap nut. Loop the wire through the pull ring and twist it securely to itself.

**Plastic housing**—Attach the safety wire to one eye in the hull nut. Keeping the wire taut throughout, lead the wire in a counter clockwise direction. Thread it through one eye in the cap nut, the pull ring, the second eye in the cap nut and a second eye in the hull nut. 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's warranty.

1. 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 to prevent chafing. To reduce electrical interference, separate the sensor cable from other

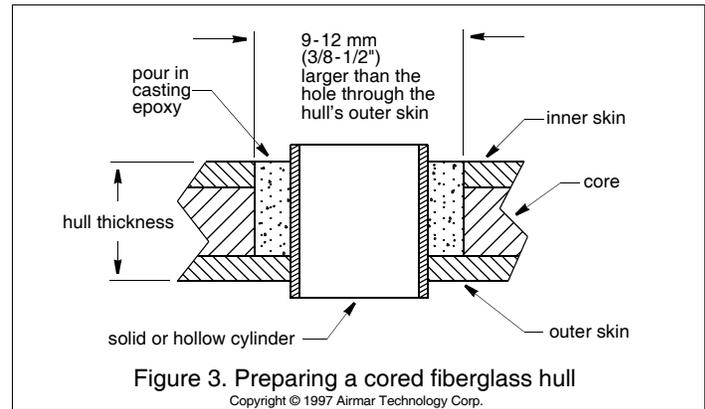


Figure 3. Preparing a cored fiberglass hull

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electrical wiring and the engine. Coil any excess cable and secure it in place with cable ties to prevent damage.

2. 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 thru-hull sensor for leaks. Note that very small leaks may not be readily observed. *Do not 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 page 3).

## 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 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 the appropriate hole saw, cut the hole from outside the hull through the *outer* skin only (see Figure 3).

3. From inside the hull, use the appropriate interior 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 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" on page 2.

## Operation, Maintenance, Repair & Parts

### Using the Blanking Plug

To protect the insert, use the blanking plug:

- When the boat will be kept in salt water for more than a week.
  - When the boat will be removed from the water.
  - When aquatic growth buildup is suspected due to inaccurate readings from the instrument.
1. On the blanking plug, inspect the o-rings (replace if necessary) and lubricate them with silicone grease or petroleum jelly (see Figure 4). The o-rings must be intact and well lubricated to make a watertight seal.
  2. **ST200**—Remove the paddlewheel insert from the housing by removing one safety ring and the retaining pin.  
**ST550**—Remove the safety wire and unscrew the cap nut.
  3. With the blanking plug ready in one hand, pull the paddlewheel insert most of the way out using the pull ring. Remove the insert and rapidly replace it with the plug. With practice, only 250ml (10oz.) of water will enter the boat. Align the arrow on the top of the plug facing forward toward the bow. *Be sure to engage the key in the notch.* (Use a pushing twisting motion.)
  4. Secure the blanking plug:  
**ST200**—with the retaining pin and safety rings.  
**ST550**—with the cap nut and safety wire.

### Servicing the Paddlewheel Insert

**ST550** converts to low-speed or high-speed operation simply by changing the paddlewheel. The low-speed paddlewheel is optimized for speeds up to 40kn (46MPH) and the high-speed paddlewheel is designed for speeds up to 50kn (57MPH).

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 10 kn (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.

1. Using the new paddlewheel shaft, push the old shaft out about 6mm (1/4"). With pliers, remove the old shaft (see Figure 4).
2. Place the new paddlewheel in the cavity with the flat side of the exposed 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.
4. Install two o-rings.
5. The remaining o-rings are placed in a similar position on the blanking plug.

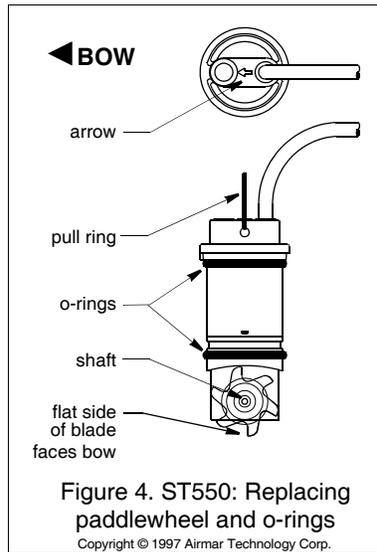


Figure 4. ST550: Replacing paddlewheel and o-rings  
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Figure 5. ST200: Paddlewheel Kit 33-114  
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### Replacement Transducer & Parts

The information needed to order a replacement Airmar transducer 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.

If you have purchased a plastic housing and have a wood hull or desire greater strength, purchase a metal housing. Lost, broken, or worn parts should be replaced immediately.

Model	Blanking Plug	Cap Nut	Hull Nut	Housing & Hull Nut	Paddle-wheel Kit
ST200	33-412	—	04-002	—	33-114 (see Fig. 5)
ST550	33-414	04-234-1 (plastic) 02-131-01 (bronze)	04-004 (plastic) 02-030 (bronze)	33-100 (bronze B17)	

Obtain parts from your instrument manufacturer or marine dealer.

Gemeco  
(USA)

Tel: 803-693-0777  
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