Pretest
Connect the sensor to the instrument and spin the paddlewheel. Check for a speed reading and the approximate air temperature. If there is no reading or it is inaccurate, return the product to the place of purchase.

Antifouling Paint
Marine 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 plastics possibly damaging the sensor.

It is easier to apply antifouling paint before installation, 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

Tools & Materials
Water-based antifouling paint (mandatory in salt water)
Safety goggles
Dust mask
Electric drill with 10mm (3/8”) or larger chuck capacity
Drill bit 3mm or 1/8”
Hole saw 51mm or 2” (plastic or bronze housing)
57mm or 2-1/4” (stainless steel housing in a metal hull)
Sandpaper
Mild household detergent or weak solvent (such as alcohol)
File (installation in a metal hull)
Marine sealant
Additional washer [for aluminum hull less than 6mm (1/4”) thick]
Slip-joint pliers (installing a bronze housing)
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

Figure 1. Antifouling paint
Mounting Location

Turbulence-free water must flow over the paddlewheel at all 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 paddlewheel insert.

- **Displacement hull powerboats**—Locate amidships near the centerline.
- **Planing hull powerboats**—Mount well aft to insure the sensor is in contact with the water at high speeds.
- **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**—Locate amidships and away from the keel at the point of minimum deadrise.

**Caution:** Do not mount the sensor in an area of turbulence or bubbles; near water intake or discharge openings; behind strakes, fittings, or hull irregularities; or behind eroding paint (an indication of turbulence).

**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.

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.
2. Using the appropriate size hole saw, cut a hole 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**

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 (see Figure 2). The sealant must extend 6mm (1/4”) higher than the combined thickness of the hull, washer(s), and hull nut. This will ensure there is sealant in the threads to seal the hull and to hold the hull nut securely in place.

**Stainless steel housing in a metal hull**—To prevent electrolytic corrosion, the stainless steel housing must be isolated from the metal hull. Slide the isolation bushing onto the housing. Apply additional sealant to the surfaces of the bushing that will contact the hull.

**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 (see Figure 2). Align the arrow on the lip of the housing to point forward toward the bow. If the sensor is not installed on the centerline, 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.

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

3. Screw the hull nut in place being sure the notch on the upper rim of the housing and the corresponding arrow on the lip are still positioned forward toward the bow.

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

**Plastic housing**—Do not clamp tightly on the wrenching flats, possibly causing the housing to fracture.

**Plastic hull nut**—Hand-tighten only. Do not over tighten.

**Metal hull nut**—Tighten with slip-joint pliers.

4. Remove any excess sealant on the outside of the hull to ensure smooth water flow over the sensor.

**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.

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**Figure 2. Bedding and installing**
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.

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.)
Servicing the Valve Assembly

Should the valve fail, remove it for servicing.

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

1. On the blanking plug, inspect the O-rings (replace if necessary) and lubricate them with silicone lubricant or petroleum jelly (Vaseline®).
2. Remove the snap ring from the valve assembly using a screw-driver to pry the end of the ring free. Lift the ring out (see Figure 2).
3. Slide the valve assembly upward and out of the housing slowly.

**Note:** The flap valve retainer pin is a loose slip-fit and may slide out when the assembly is removed.

4. Insert the blanking plug into the housing with the arrow on the top pointing forward toward the bow. Screw the cap nut several turns until the threads are engaged. Rotate the blanking plug until the key fits into the notch in the housing. Be sure the arrow on the top of the blanking plug is facing forward toward the bow. Continue to tighten the cap nut. **Hand-tighten** only. Do not over tighten. Reattach the safety wire.

5. Clean, repair, or replace the valve assembly so the flap valve moves freely and seats against the valve housing.

6. To reinstall the valve assembly, first reassemble the flap valve in the valve housing with the retainer pin and spring in place (see Figure 5).

7. Remove the blanking plug. Slide the valve assembly into the housing with the flap valve pointing downward. Insert the snap ring being certain that it locks into the groove in the housing wall.

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

8. Slide the blanking plug (or paddlewheel insert) into the housing with the arrow on the top pointing forward toward the bow. Screw the cap nut several turns until there is resistance. Rotate the plug/insert until the key engages the notch in the housing. Be sure the arrow on the top is facing forward toward the bow. Continue to tighten the cap nut. **Hand-tighten** only. Do not over tighten. Reattach the safety wire (see Figure 2).

Replacement Parts

Lost, broken, and worn parts should be replace immediately. If you have purchased a plastic housing and have a wood hull or desire greater profile housing and prefer a flush housing, see below. Obtain the following parts from your marine dealer or instrument manufacturer.

<table>
<thead>
<tr>
<th>Blanking Plug</th>
<th>Hull Nut</th>
<th>Housing, Hull Nut &amp; Washer</th>
<th>Paddlewheel &amp; Valve Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>33-481-01</td>
<td>04-004 plastic</td>
<td>33-340-02 plastic</td>
<td>33-493-01</td>
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<tr>
<td></td>
<td>02-030 bronze</td>
<td>33-340-01 bronze</td>
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<td></td>
<td>02-530-02 stainless steel</td>
<td>33-451-01 stainless steel</td>
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</tr>
<tr>
<td></td>
<td>04-186-1 isolation bushing</td>
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</tr>
</tbody>
</table>

Sensor Replacement

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.