Transducers for Fishfinders

Owner's Handbook

Document number: 81196_2
Date: August 2002

Transducers for Fishfinders Owners Handbook

August 2002

Intended Use

The transducer units detailed in this handbook are used in conjunction with Raymarine fishfinders and are intended for recreational marine depth, speed, and/or temperature measurement purposes.

Safety Notice

This equipment must be installed and operated in accordance with the instructions contained in this manual. Failure to do so can result in personal injury and/or navigational inaccuracies.

Raymarine products are supported by a network of Authorized Service Representatives. For information on Raymarine products and services, contact either of the following:

United StatesRaymarine, Inc.
22 Cotton Road, Unit D
Nashua, NH 03063-4219
USA
Telephone 603-881-5200
Fax 603-864-4756
www.raymarine.com

EuropeRaymarine Ltd
Anchorage Park
Portsmouth
Hampshire PO3 5TD
England
Telephone +44 (0)23 9269 3611
Fax +44 (0)23 9269 4642
www.raymarine.com

Preface

This handbook describes the transducers that are required for use with Raymarine fishfinders. A list of currently available fishfinder transducers appears on *page 4*.

The handbook contains very important information on the installation and operation of your new equipment. In order to obtain the best results in operation and performance, please read this handbook thoroughly.

Raymarine's Product Support representatives or your local dealer will be available to answer any questions you may have.

The technical and graphical information contained in this handbook, to the best of our knowledge, was correct as it went to press. However, the Raymarine policy of continuous improvement and updating may change product specifications without prior notice. As a result, unavoidable differences between the product and handbook may occur from time to time, for which liability cannot be accepted by Raymarine.

Warranty

Your transducer ownership warranty is registered when you fill out the warranty registration card included with your Raymarine Fishfinder Owner's Handbook. It is very important that you complete the owner information and return the card to the factory in order to receive full warranty benefits.

EMC Conformance

All Raymarine equipment and accessories are designed to the best industry standards for use in the leisure marine environment.

The design and manufacture of Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised.

Contents

Chapter 1: Overview

1.1 Introduction

This handbook provides instructions to assist you in the installation and set up of the various transducers for Raymarine fishfinders. See *Table 1-1* on *page 4* for a list of the different sensor, material and mounting types available.

General

Raymarine fishfinders require a transducer, either thru-hull, in-hull, or transom-mount.

Transducers can measure water depth, temperature, distance traveled, and/or speed. It is important to position your transducer correctly, as described in *Section 1.4, Selecting the Equipment Location*.

Note: *If speed and temperature are being input via SeaTalk, these values are displayed instead of the speed and temperature inputs from the transducer.*

This handbook is divided into three chapters as follows:

Chapter One provides an overview of the transducer installation. It includes sections on Unpacking and Inspecting the Components, Selecting the Transducer Site and a description of the Cable Runs.

Chapter Two provides detailed instructions on how to mount and connect each type of transducer.

Chapter Three provides information on maintenance and what to do if you have problems.

EMC Installation Guidelines

All Raymarine equipment and accessories are designed to the best industry standards for use in the leisure marine environment.

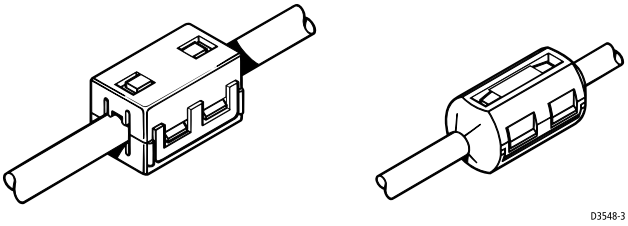
Their design and manufacture conforms to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised. Although every effort has been taken to ensure that they will perform under all conditions, it is important to understand what factors could affect the operation of the product.

The guidelines given here describe the conditions for optimum EMC performance, but it is recognized that it may not be possible to meet all of these conditions in all situations. To ensure the best possible conditions for EMC performance within the constraints imposed by any location, always ensure the maximum separation possible between different items of electrical equipment.

For **optimum** EMC performance, it is recommended that **wherever possible**:

- Raymarine equipment and cables connected to it are:
  - At least 1 m (3 ft) from any equipment transmitting or cables carrying radio signals, e.g., VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (7 ft).
  - More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The equipment is supplied from a separate battery from that used for engine start. Voltage drops below 10 V (20 V for 10 kW open array scanners) in the power supply to our products, and starter motor transients, can cause the equipment to reset. This will not damage the equipment, but may cause the loss of some information and may change the operating mode.
- Raymarine specified cables are used at all times. Cutting and rejoining these cables can compromise EMC performance and so must be avoided unless doing so is detailed in the documentation.
- If a suppression ferrite is attached to a cable, this ferrite should not be removed. If the ferrite needs to be removed during installation it must be reassembled in the same position.

The following illustration shows a typical range of suppression ferrites fitted to Raymarine equipment.



Connections to Other Equipment

If your Raymarine equipment is to be connected to other equipment using a cable not supplied by Raymarine, a suppression ferrite MUST always be attached to the cable near to the Raymarine unit.

1.2 The Fishfinder System

Transducers enable fishfinders to display depth, water temperature and/or speed, depending on the type of transducer(s) installed.

Before you start the installation, check that you have the correct transducer for your application, as described below in *Selecting the Correct Type of Transducer*.

Selecting the Correct Type of Transducer

Raymarine Fishfinders can be used with any of the following transducers:

Table 1-1: Transducer Types

Part No.	Sensor Type	Material	Mounting Method	Max. Power
E66008	Depth	Plastic	In-Hull	600 W
E66013	Depth	Plastic	Thru-Hull	600 W
E66014	Depth	Bronze	Thru-Hull	600 W
E66015	Depth	Stainless steel	Thru-Hull	600 W
E66018	Speed, Temp	Bronze	Thru-Hull	600 W
E66019	Speed, Temp	Plastic	Transom	600 W
E66020 [1]	Depth, Speed, Temp	Bronze	Thru-Hull	600 W
E66024	Depth, Temp	Bronze	Thru-Hull (high performance)	600 W or 1000 W
E66029 [1]	Depth, Speed, Temp	Bronze	Thru-Hull (long stem)	600 W
E66030	Speed, Temp	Plastic	Thru-Hull	600 W
E66033	Depth, Temp	Bronze	Thru-Hull	600 W or 1000 W
E66035	Depth, Temp	Bronze	Thru-Hull	600W
E66038	Depth, Speed, Temp	Plastic	Transom	600W
E66043 [1]	Depth, Speed, Temp	Stainless steel	Thru-Hull	600W

[1] E66020, E66029 and E66043 thru-hull transducers must be installed with a high-speed fairing.

Note: *This information was current as of the date this handbook was printed. New transducer models are constantly becoming available. Check with your dealer for the most current list.*

WARNING:

If the E66020, E66029 and E66043 thru-hull transducers are not carefully installed and fitted to the shape of the hull, the vessel may take on water. To ensure proper alignment and a secure fit, these transducer models MUST be installed with a fairing. In addition to improving fishfinder performance at all speeds, the fairing allows better fitting to the hull and dramatically increases the sealing surface.

Applications

Plastic housings are recommended for fiberglass or metal hulls.

Bronze housings are recommended for wood or fiberglass hulls.

- Installation of a bronze housing in a metal hull requires using of a fairing, available from your Raymarine dealer.
- *Never* install a metal housing in a vessel with a positive ground system.

Transom Mount Transducers are recommended for personal watercraft and powerboats with outboard, inboard-outboard and jet drives. They are NOT recommended for large or twin screw inboard boats.

- Adjusts to transom angles from 3° – 16°. For angles greater than 16°, a tapered plastic, wood or metal shim will be needed.
- Designed for operation from 5 –58 m.p.h. (4 – 50 knots).

Thru-Hull Transducers are recommended for boats with straight-shaft inboard engines.

In-Hull transducers are recommended for fiberglass hulls, especially in high speed power boats and racing sailboats.

Planning the Installation

Before you install your system, plan the installation, considering:

- Location of the transducer and fishfinder, as described in *Section 1.4*
- Cable Runs, including cables for an integrated system (to provide heading and position data, etc.), as described in *Section 1.5*.

1.3 Unpacking and Inspecting the Components

Unpack your system carefully, to prevent damage to the equipment. Save the carton and packing, in case you need to return a unit for service.

Check that you have all the correct system components. These depend on your system package, as follows:

Table 1-2: Parts and Accessories

Item	Part No.	Supplied with:	Option for:
Transducer (*see Table 1-1 on page 4)*	—	—	All
Transducer cable, 10 ft (3 m) extension	E66009	—	All
Transducer cable, 18 ft (5 m) extension	E66010	—	All
Transducer Y Cable	E66022	Speed/Temp Transducers	All others
High Speed Fairing	E66023[1]	—	E66020, E66029
	E66045[2]	—	E66043
	E66025	—	E66024
	E66034	—	E66033
	E26017	—	E66035

[1] E66023 fairings are required for installing E66020 and E66029 bronze thru-hull transducers.

[2] E66045 fairings are required for installing E66043 stainless steel thru-hull transducers.

Note: *This information was current as of the date this handbook was printed. Check with your dealer for the most current list of parts and accessories.*

1.4 Selecting the Equipment Location

Transducer Mounting Location

It is very important that you mount the transducer correctly. The transducer provides the most reliable readings if it looks into water that is smooth and undisturbed.

Acoustic noise is always present and these sound waves can interfere with the operation of the transducer. Ambient (background) noise from sources such as waves, fish, rain and other vessels cannot be controlled. Carefully selecting the transducer's mounting location can minimize noise generated by the vessel's propeller(s), shaft(s), machinery, and other echo sounders. The lower the noise level, the higher the echo sounder gain that can be used, and the better the Fishfinder's performance.

CAUTION:
To ensure accurate readings, DO NOT mount the transducer in an area of turbulence or bubbles:

- **near water intake or discharge openings**
- **behind strakes, fittings or hull irregularities**
- **behind eroding paint (an indication of turbulence)**

Choose a location where:

- The water flowing across the hull is smoothest with a minimum of turbulence and bubbles (especially at high speeds).
- The transducer will be continuously covered by water when the boat is moving. If the transducer is mounted near the side of the boat, it may be exposed when the boat is turning.
- The transducer beam is unobstructed by the keel or propeller shaft.
- There is a minimum deadrise angle.
- There is adequate headroom inside the vessel for the height of the thru-hull housing, tightening the nuts, and removing the valve assembly insert.

Transom Mount Transducer

- **Single drive boat** - Refer to *Figure 1-1* . If your boat has one propeller (outboard or inboard), mount the transducer about 18" (455 mm) to the side of the boat's centerline. To reduce any interference caused by air bubbles, choose the side on the downstroke of the propeller (usually the starboard side).
- **Twin drive boat** - If your boat has twin propellers (outboard or inboard-outboard), mount the transducer between the drives near the centerline of the boat. If the boat will be operated at high speeds, the transducer may be mounted closer to the centerline of the hull.

- If the propeller can be turned to steer the boat, allow at least 2" (50 mm) beyond the swing radius of the propeller. This will prevent the propeller from damaging the transducer when it is turned.

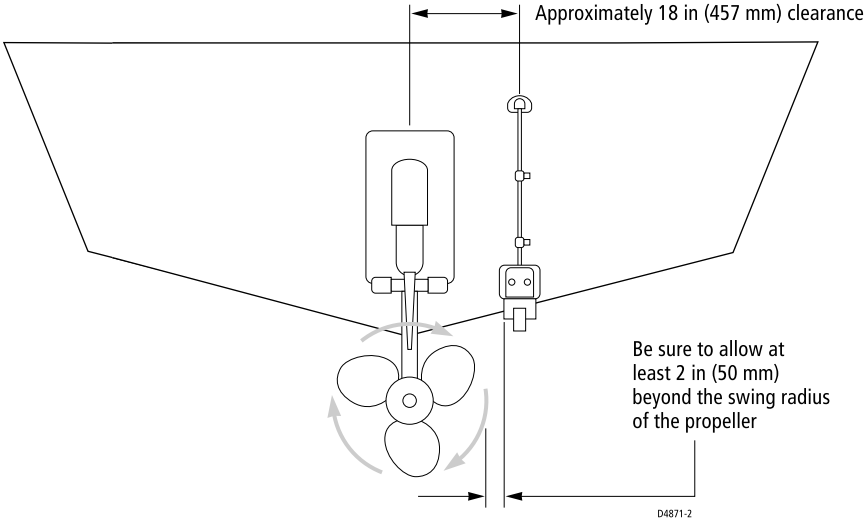


Figure 1-1: Transom Mount Transducer Location

- **Do Not** mount the transducer behind any hull fittings, intakes or other parts extending from the hull that may cause turbulence or air bubbles.
- The bracket has a quick-release mechanism, shown *Figure 1-2* . This allows the transducer to flip up if it hits any debris or the bottom. Allow enough clearance above the transducer for it to swing upwards completely – this is about 10" (254 mm), measured from the bottom of the transom.

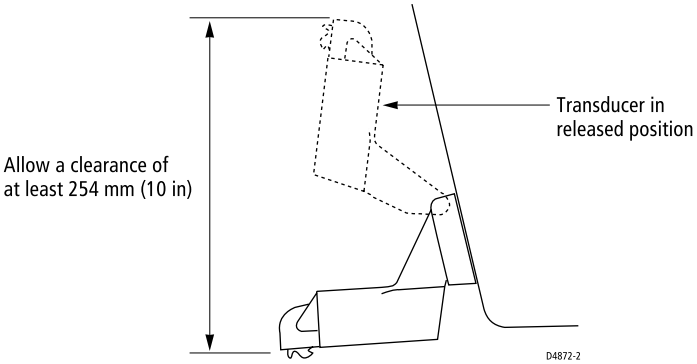


Figure 1-2: Transom Mount Transducer - Quick-release Bracket

- On a boat with a fiberglass hull, the leading edge of the transducer should extend 1/8" (3.2 mm) to 1/4" (6 mm) below the bottom edge of the hull as shown in *Figure 1-3* . On an aluminum hull, the transducer should extend a bit more – 1/4" (6 mm) to 3/8" (9 mm)
- If the boat will be trailered, be sure the transducer will not hit any rollers, bunks or fittings on the trailer.

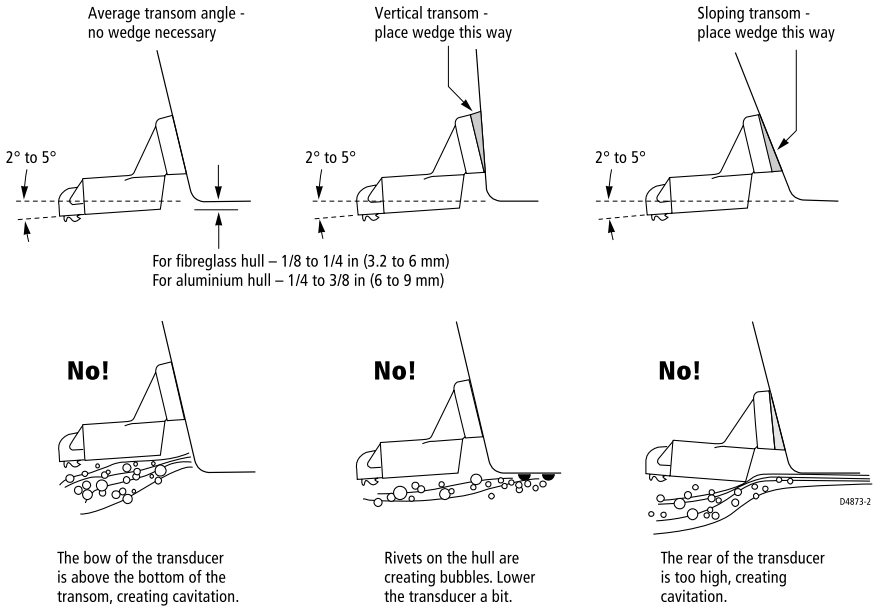


Figure 1-3: Transom Mount Transducer - Vertical Position

Thru-hull Transducer and In-hull Transducer

Similar consideration should be given to the location of thru-hull and in-hull transducers. *Figure 1-4* shows the best transducer location for different hull types.

- **Displacement hull powerboat** – Locate at 1/3 aft load waterline length (LWL) and 6 - 12" (150-300 mm) off the centerline on the side of the hull where the propeller is moving downward.
- **Planing hull powerboat** – Mount well aft, on or near the centerline, and well inboard of the first set of lifting strakes to ensure that it is in contact with the water at high speeds. Mount on the side of the hull where the propeller is moving downward.
  Outboard and I/O – Mount just forward of the engine(s).
  Inboard – mount well forward of the propeller(s) and shaft(s).
  Step-hull – Mount just ahead of the first step.
  Boats capable of speeds above 25 kn (29 m.p.h.) – Review transducer location and operating results of similar boats before proceeding.
- **Fin keel sailboats** – Mount to the side of the centerline and forward of the fin keel 1 - 2 ft (300-600 mm).
- **Full keel sailboats** – Locate amidships and away from the keel at the point of minimum deadrise angle.
- **Fiberglass Hulls** – Since the hull absorbs acoustic energy, transmitting through the hull reduces the sensor's performance. Fiberglass hulls are often reinforced in places for added strength. These cored areas contain balsa wood or structural foam, which are poor sound conductors. If you cannot avoid locating the sensor over coring, follow the instructions for *Installation in a Cored Fiberglass Hull* on *page 29*.
- **Thru-hull Transducer Headroom**– Allow adequate headroom inside the vessel for the height of the thru-hull housing, tightening the nuts and removing the insert. The minimum headrooms are:
  With fairing: 10" (254 mm)
  Without fairing: 12" (305 mm)
- **In-hull Transducer** – Find a location where the fiberglass is solid:
  There are no air bubbles trapped in the fiberglass resin.
  There is no coring, flotation material, or dead air space sandwiched between the inside skin and the outer skin of the hull.

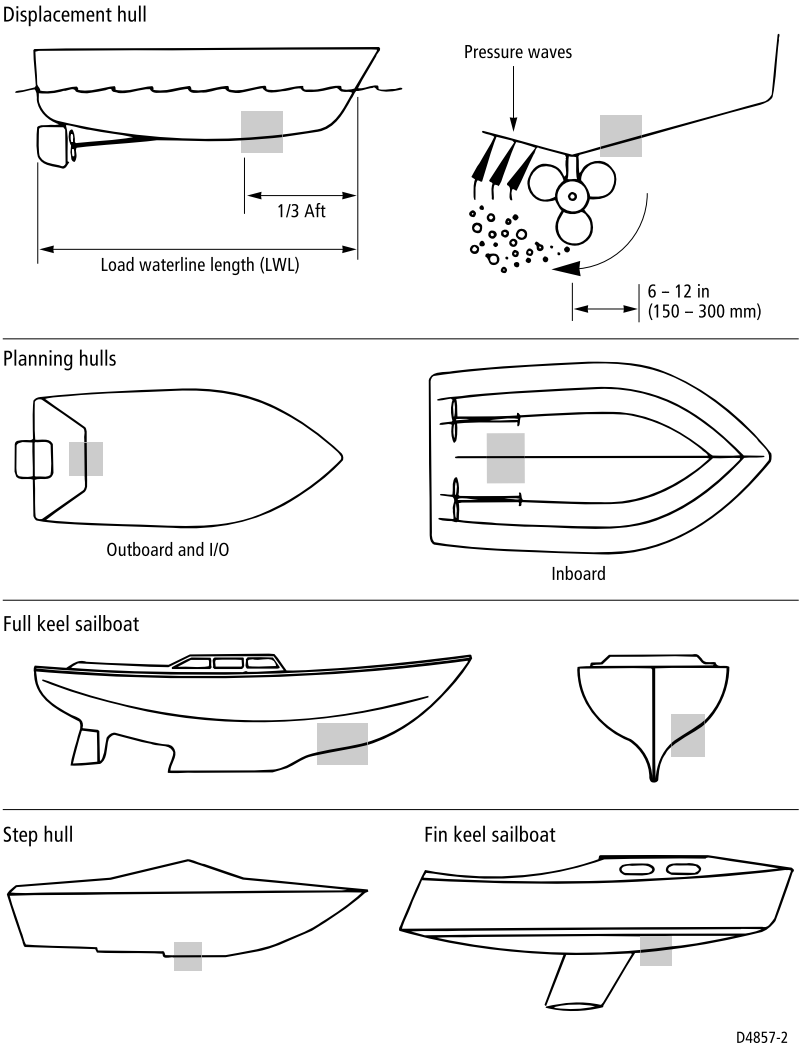


Figure 1-4: Best Location for Thru Hull Transducer

1.5 Cable Runs

Consider the following before installing the system cables:

- You need to attach the power cable and the transducer cable. Additional cables will be required if you are installing an integrated system.
- All cables should be adequately secured, protected from physical damage and protected from exposure to heat. Avoid running cables through bilges or doorways, or close to moving or hot objects.
- Acute bends must be avoided
- Where a cable passes through an exposed bulkhead or deckhead, a watertight feed-through should be used.
- Secure cables in place using tie-wraps or lacing twine. Coil any extra cable and tie it out of the way.

Transducer Cable

A 30 ft (10m) cable is supplied with the transducer. The transducer cable may be extended up to a maximum of 60 ft (20 m) using optional extension cables.

The transducer cable connector has a nut that has been removed to aid installation. To allow you to complete the installation without cutting the cable, ensure that any holes you drill are large enough to accept the connector, with the nut removed.

After the cable has been run through the holes, this nut must be attached before the cable can be connected, as described in *Transducer Cable Connections* on *page 39*.

CAUTION:
Do not cut the transducer cable or remove the connector. Do not try to shorten or splice the cable. If the cable is cut, it cannot be repaired. Cutting the cable will also void the warranty.

- For a Transom mount installation – route the cable up and over the top edge of the transom as shown in *Figure 1-5* . Secure the cable using cable clamps (available from your local marine equipment supplier).

If you do not want to expose the cable on deck, you may drill a hole 13/16" (21 mm) through the transom for the cable (with connector attached). To seal the opening, use a feed-thru cap where the cable passes through the transom.

- For either type of installation – run the cable through the interior of the boat.
- If the 30 ft (10 m) cable is not long enough, extension cables are available from your Raymarine dealer. See *Table 1-2* on *page 6*. **Total cable length from the transducer to the fishfinder must not exceed 60 ft (20 m)**. When you attach the extension cable, be sure that the connections are watertight. Use Dow Corning DC-4 or an equivalent sealing compound to protect the connector assemblies.

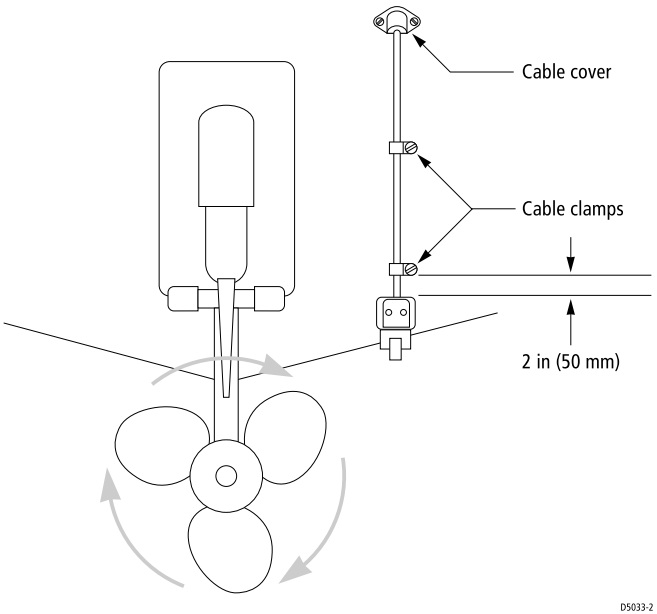


Figure 1-5: Installing the Cable on a Transom Mount Transducer

Chapter 2: Installation

This chapter gives details on how to install your transducer. Instructions are divided into the following sections:

- **Transom Mount Transducers** - recommended for personal watercraft and powerboats with outboard, inboard-outboard and jet drives.
- **Thru-Hull Transducers** - recommended for boats with straight-shaft inboard engines.
- **In-Hull** transducers- recommended for fiberglass hulls, especially in high speed power boats and racing sailboats.

2.1 Installing the Transom Mount Transducer

Preparation

Transducer Mounting Bracket

When installed, the lower surface of the transducer should tilt down toward the rear at a slight angle (2° to 5°). The mounting bracket includes a wedge; depending on the angle of the transom on your boat, you may need to install this wedge to get the correct transducer angle.

1. To attach the transducer to the bracket, insert the transducer mounting lugs into the slot in the bracket as shown in *Figure 2-1* .

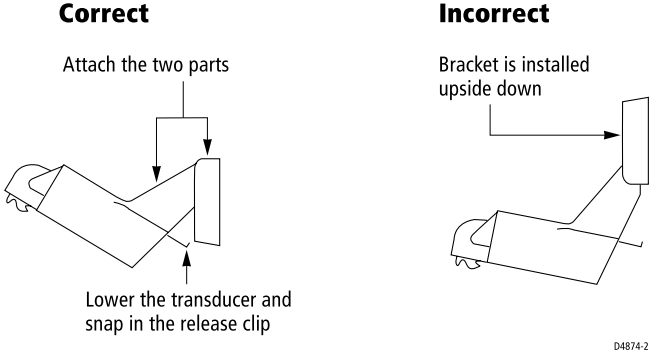


Figure 2-1: Fitting the Transducer to the Bracket

2. Looking at the rear of the boat, be sure the bracket is vertical (perpendicular to the water line) and hold the bracket (plus the wedge, if used) against the transom.
   Trace the position of the screw slots, then mark the screw positions as shown in *Figure 2-2* . The outer two screws should be placed about 1/4" (6 mm) up from the bottom of each slot, the center screw should be placed about 1/4" (6 mm) down from the top. This will allow the bracket to be adjusted up or down.
   Remove the bracket.

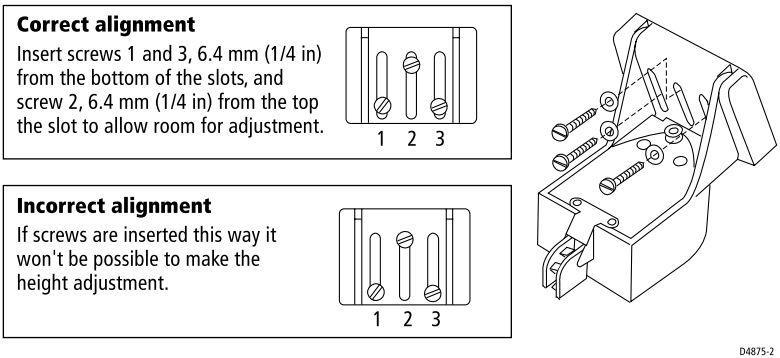


Figure 2-2: Position of Screws in Mounting Bracket

Installation

1. On a fiberglass hull, to minimize surface cracking of the gel coat: Before drilling the pilot holes, use a 1/4" (6 mm) drill bit to drill a shallow hole (chamfer) at each location about 1/16" (1.5 mm) deep.
   Drill pilot holes 3/4" (19 mm) deep using a 9/64" (3.6 mm) drill bit.
   To prevent drilling too deeply, wrap masking tape around the drill bit about 7/8" (22 mm) from the tip. Drill in only as far as the tape.
2. Apply a good quality marine sealant to the pilot holes to protect the hull from water penetration.
3. Attach the bracket to the hull using the panhead screws with flat washers. **Do not completely tighten the screws yet**.
4. Move the bracket up or down so the leading edge of the transducer has the clearance shown in *Figure 1-3* .
5. Once the bracket is in the correct position tighten the screws.

2.2 Installing the Thru-hull Transducer

Tools and Material Needed

Water-based antifouling paint (**mandatory for boats kept in salt water**)
Safety goggles
Dust mask
Electric drill
Drill bit: 1/8" (3 mm)
Hole saw:
- Drill
- Fiberglass or wood 2" (51 mm)
- Aluminium or steel hull 2-1/8" (54 mm)

Sandpaper
File (for installation in a metal hull)
Mild household detergent or weak solvent (alcohol)
Marine sealant
Slip-joint pliers
Silicone grease or petroleum jelly
Tie-wraps
Cored fiberglass hull installation:
- Hole saw for hull interior 2-3/8" (60 mm)
- Cylinder, wax, tape and casting epoxy

Fairing (required with E66020, E66029 and E66043 transducers; optional for E66024, E66033 and E66035
Level and protractor (installation with a fairing)
Band saw or hand saw (installation with a fairing)
Rasp (installation with a fairing)

Preparation

Fairing

Most vessels have a deadrise angle at the transducer's mounting location. If the transducer is mounted directly to the hull, the sonar beam will be tilted off-vertical at the same angle as the deadrise. To offset this deadrise angle, you can install a transducer fairing.

Different fairings are available to fit various transducers. Fairings are required for installing the E66020, E66029 and E66043 thru-hull transducers.

WARNING:

If the E66020, E66029 and E66043 thru-hull transducers are not carefully installed and fitted to the shape of the hull, the vessel may take on water. To ensure proper alignment and a secure fit, these transducer models MUST be installed with a fairing. In addition to improving fishfinder performance at all speeds, the fairing allows better fitting to the hull and dramatically increases the sealing surface.

Fairings are also strongly recommended for use with other high performance transducers. See the table that follows.

The fairing is used to:

- Vertically orient the sound beam by mounting the transducer parallel to the water surface
- Minimize aerated water flowing over the transducer's face by mounting it in deeper water
- Reduce drag by directing the water around the multisensor

The fairing is made of high impact urethane with an integrated cutting guide. It can be shaped to accommodate a deadrise angle of up to 25° and a range of hull thicknesses as follows:

Fairing No.	Used with Transducer No.	Max. Hull Thickness with Fairing
E26017	E66035	2" (50mm)
E66023	E66020	1" (26mm)
E66023	E66029	3-3/4" (87mm)
E66025	E66024	1-3/4" (45mm)
E66034	E66033	1-3/4" (45mm)
E66045	E66043	1/2" (14mm)

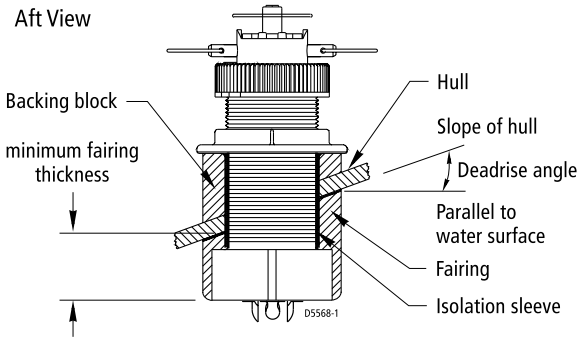


Figure 2-3: Deadrise Angle and Fairing Thickness

Backing Block

A backing block is used inside the hull to provide a level surface for the hull nut to seat against (see *Figure 2-3*). After cutting the fairing, use the remaining section with the cutting guide as the backing block (see *Figure 2-4*).

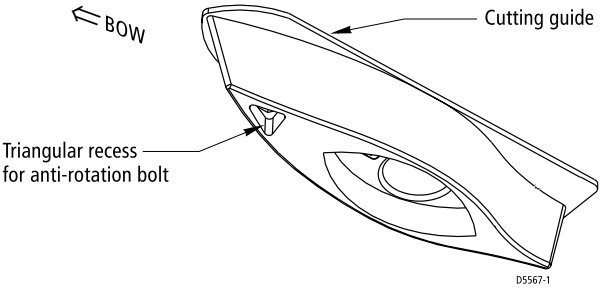


Figure 2-4: Transducer Fairing E66023

Cutting the Fairing

1. Measure the deadrise angle of the hull at the selected location using a digital level, or bubble level and protractor (see *Figure 2-3*).
2. Tilt the band saw table to the measured angle and secure the cutting fence (see *Figure 2-5*).

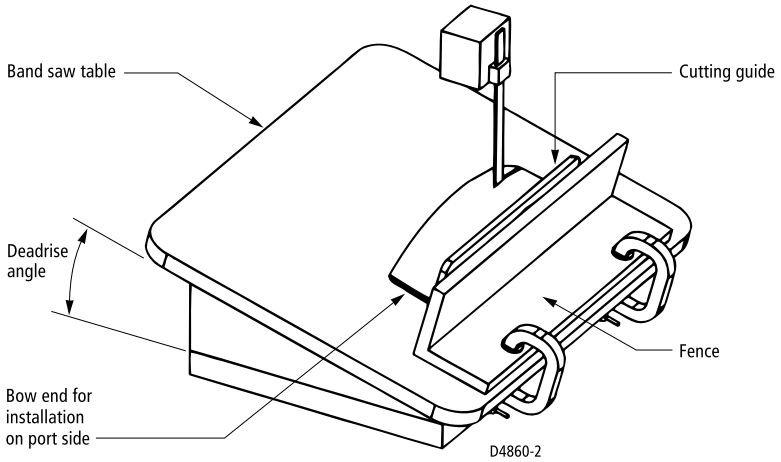


Figure 2-5: Cutting the Fairing

CAUTION:
The arrow on the fairing always points forward towards the bow. Be sure to orient the fairing on the band saw so the angle cut matches the intended side of the hull.

3. Place the fairing on the table so the cutting guide rests against the fence. The arrow/blunt end will point toward you for installation on the port side and away from you for installation on the starboard side of the boat.

WARNING:
Always wear safety goggles and a dust mask when drilling.

4. Recheck steps 1 through 3, then cut the fairing.
5. Shape the fairing to the hull as precisely as possible with a rasp or power tool.

Antifouling Paint

Marine growth can accumulate rapidly on the transducer's surface, reducing performance in weeks. Surfaces exposed to salt water must be coated with antifouling paint.

Use water-based antifouling paint only.
Never use ketone-based paint since ketones can attack many plastics, possibly damaging the transducer.

Reapply paint every six months or at the beginning of each boating season.

It is easier to apply antifouling paint before installation, but allow sufficient drying time. As illustrated in *Figure 2-6* paint the following surfaces:

Exposed area of the housing, including the acoustic window
Bore of the housing up to 1¼" (30 mm)
Outside wall below lower O-ring
Exposed end of the paddle wheel insert
Paddle wheel cavity
Paddle wheel
Blanking plug below the lower O-ring and the exposed end

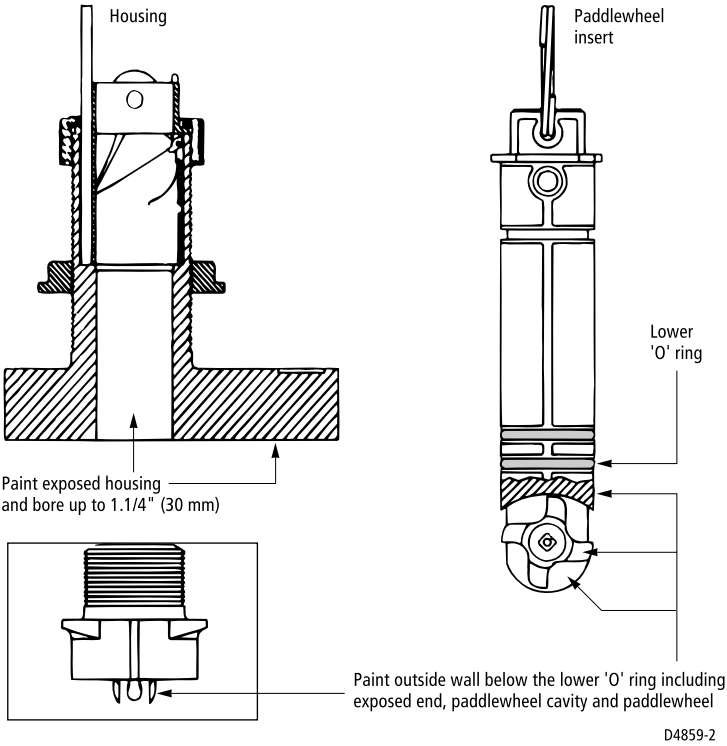


Figure 2-6: Applying Antifouling Paint

Installation

Note: *To install the thru-hull transducer in a cored fiberglass hull, follow the instructions in Installation in a Cored Fiberglass Hull on page 29.*

Drilling Holes

WARNING:

Always wear safety goggles and a dust mask when drilling.

1. Drill a 1/8" (3 mm) pilot hole perpendicular to the water line from inside the hull (see *Figure 2-3*).
   If there is a rib or strut near the mounting location, drill from the outside.
   If the pilot 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. Cut a hole from outside the hull:
   Fiberglass or wood hull – Use a 2" (51 mm) hole saw.
   Aluminium or steel hull – Use a 2 1/8" (54 mm) hole saw to accommodate the isolation sleeve used to prevent contact between the stainless steel housing and the metal 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 a mild household detergent or a weak solvent (alcohol) before sanding.
4. Remove one safety ring, the retaining pin, the cap nut, and the hull nut from the transducer (see *Figure 2-7*).

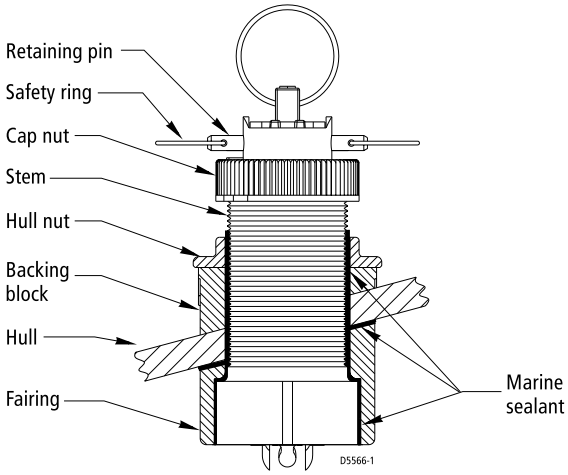


Figure 2-7: Seating

Dry Fit for Fairing

WARNING:

If a fairing is used, the anti-rotation bolt must be installed to prevent the fairing from rotating when the boat is underway.

1. Dry fit the transducer to locate the hole for the anti-rotation bolt.
2. Thread the transducer cable through the large hole in the fairing and through the mounting hole in the hull. Seat the transducer firmly in the recess in the fairing.

Note: *The transducer must be flush with the fairing. If it is recessed more than 1/64" (0.5mm) inside the fairing, you may carefully file or sand the fairing flush with the transducer.*

WARNING:

Always wear safety goggles and a dust mask.

3. Attach the drill bit to your drill appropriate for your fairing:

Fairing	Used with Transducer	Drill Size
E26017	E66035	3/8" (10mm)
E66023	E66020, E66029	3/8" (10mm)
E66025	E66024	1/2" (13mm)
E66034	E66033	1/2" (13mm)
E66045	E66043	3/8" (10mm)

4. Slide the transducer's stem with the fairing in place into the mounting hole. Be sure the triangular recess in the fairing is pointing forward toward the bow.
5. While holding the assembly in place and using the bolt hole in the fairing as your guide, drill a hole through the hull for the anti-rotation bolt.
6. Remove the assembly and cable from the mounting hole.
7. Sand and clean the area around the hole, inside and outside, to ensure that the sealant will adhere properly to the hull.
   Metal hull - Remove any burrs around both holes with a file and sandpaper.

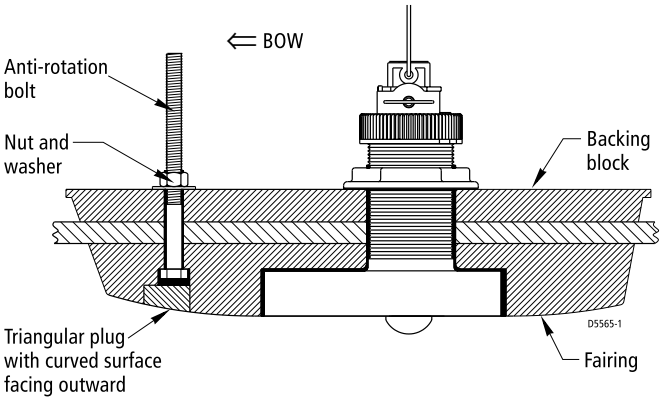


Figure 2-8: Using a Fairing and Backing Block

Seating

1. Remove the transducer from the fairing, if used.
2. **Stainless steel transducer in metal hull -** Slide the appropriate size isolation sleeve over the cable and onto the stem of the transducer as far down as possible (see *Figure 2-3*). Be sure the top of the isolation sleeve will be below the top of the backing block to prevent the sleeving from interfering with tightening the hull nut.

WARNING:

To prevent electrolytic corrosion, never allow direct contact between a stainless steel transducer and a metal hull.

3. Apply a 1/16" (2mm) thick layer of marine sealant to the sides of the transducer that will contact the fairing, if used, and up the stem 1/4" (6mm) higher than the combined thickness of the fairing, hull, backing block, and hull nut. This will ensure there is marine sealant in the threads to seal the hull and hold the hull nut securely in place (see *Figure 2-7*).

   Stainless steel transducer in metal hull - Apply the marine sealant to the outside of the sleeving instead of the stem itself.
4. If a fairing is used, thread the transducer cable through the fairing and seat the transducer firmly within the recess in the fairing.
5. Apply a 1/16" (2mm) thick layer of marine sealant to the surface of the fairing that will contact the hull, if used.

Attaching the Transducer

1. From outside the hull, thread the cable through the mounting hole.
2. Push the stem of the transducer (with the fairing in place) into the mounting hole using a twisting motion to squeeze out excess sealant.
3. From inside the hull, slide the backing block onto the transducer cable and stem, seating it firmly against the hull (*Figure 2-9*).

CAUTION:
Be careful to avoid cross threading the cap nut.

4. Screw the hull nut in place and tighten it with slip-joint pliers.
   Stainless steel transducer in metal hull - Be sure the top of the isolation sleeve is below the top of the backing block to prevent the sleeving from interfering with tightening the hull nut.
5. Apply a 1/16" (2mm) thick layer of marine sealant to the anti-rotation bolt, 1/4" (6mm) higher than the combined thickness of the fairing, hull, backing block, washer, and nut. This will ensure that there is marine sealant on the threads to seal the hull and hold the nut securely in place (see *Figure 2-8*).
6. Push the bolt through the fairing, if used, and into the hull.
7. From inside the hull, slide the washer and nut onto the bolt. Screw the nut in place and tighten it with slip-joint pliers.
   Wood hull - Allow for the wood to swell.

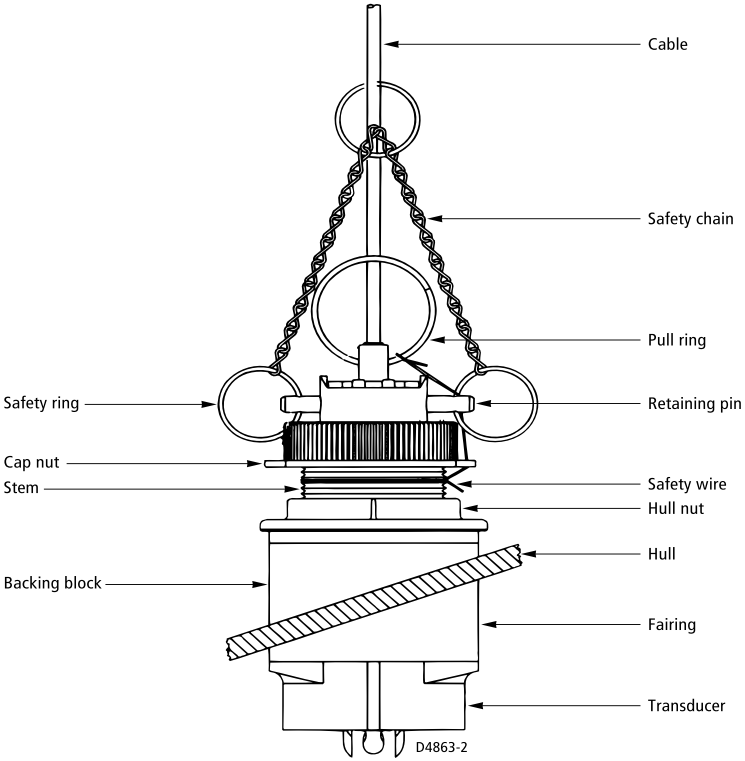


Figure 2-9: Fore View of Transducer Installation

8. If a fairing is used, apply marine sealant to the **flat** side of the triangular plug. Push the plug into the triangular recess in the fairing. **The triangular plug fits one way only**. Be sure the curved side of the plug is exposed, matching the curve on the outside of the fairing. Tap it into place with a mallet.

CAUTION:
For smooth water flow over the transducer's sensor, be sure that the external surface of the installed triangular plug is FLUSH with the external curved surface of the fairing.

9. Being sure the valve assembly is seated firmly in the housing, carefully screw the cap nut in place. Hand tighten it only; *do not over tighten*.
10. Remove any excess sealant on the outside of the hull to ensure smooth water flow over the transducer.

11. After the sealant cures, inspect and lubricate the O-rings on the paddle wheel insert with silicone grease or petroleum jelly (see *Figure 2-10*).
12. Slide the paddle wheel insert into the valve assembly with the arrow on the top pointing forward until it is fully seated (the insert fits one way only).
    Take care not to rotate the outer housing and disturb the sealant.
13. Slide the center ring of the safety chain onto the cable. Slide the retaining pin in place and reattach the safety ring (*Figure 2-9*).

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.

14. Wrap one end of the safety wire tightly around the stem of the housing and twist it together with the long end. Lead the wire straight up and through one eye in the cap nut, then through one of the safety rings. Loop the wire through the pull ring and twist it securely to itself.
15. Route the cable to the transducer, being careful not to tear the cable jacket when passing it through the bulkhead(s) and other parts of the boat.
16. Attach the connector nut to the cable per instructions in *Transducer Cable Connections* on *page 39*.
17. Attach the assembled connector cable to the transducer.
18. Route the other end of the cable to the fishfinder, 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 transducer cable from other electrical wiring and the engine.
19. Coil any excess cable and secure it in place using tie-wraps to prevent damage.

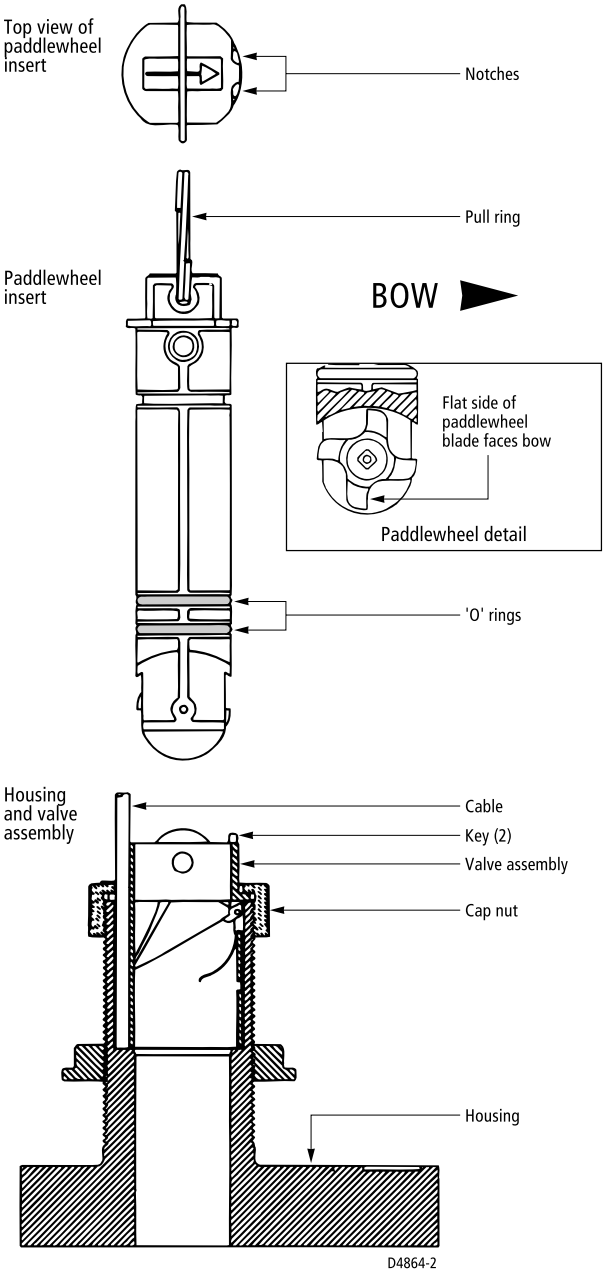


Figure 2-10: Servicing the Paddle Wheel Insert and Valve Assembly

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 when drilling.

1. Drill a 1/8" (3 mm) pilot hole perpendicular to the waterline from inside the hull. If there is a rib or strut near the selected mounting location, drill from the outside (see *Figure 2-10*). 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 2" (51 mm) hole saw, cut a hole from outside the hull through the **outer** skin only.
3. Using the 2 3/8" (60 mm) hole saw, cut through the **inner** skin and most of the core from inside the hull. 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

Note: *The optimal interior hole diameter is affected by the hull's thickness and deadrise angle. It must be large enough in diameter to allow the core to be completely sealed.*

4. Remove the plug of core material so the inside of the outer skin and inner core of the hull is fully exposed. Clean and/or sand the inner skin, core, and the outer skin around the hole.

CAUTION:

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

5. Coat a hollow or solid cylinder of the correct diameter with wax and tape it in place. Fill the gap between the cylinder and hull with casting epoxy. After the epoxy has set, remove the cylinder (see *Figure 2-11*).

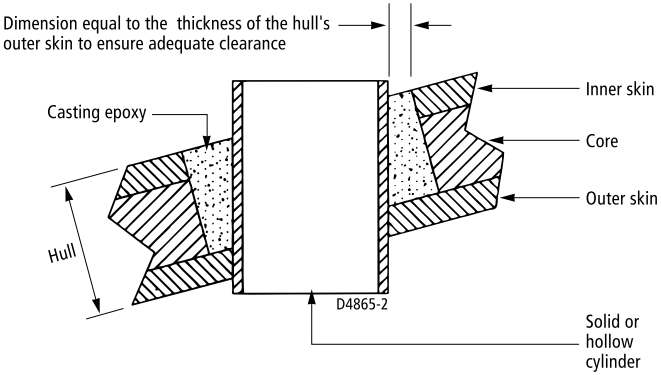


Figure 2-11: Preparing a Cored Fiberglass Hull

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 *Seating* on *page 24* and *Attaching the Transducer* on *page 25*.

Check for Leaks

WARNING:

Never install a thru-hull transducer and leave the boat unchecked for several days.

1. When the boat is placed in the water, **immediately** check around the thru-hull transducer 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 (probably not enough to cause water damage). If a leak is observed, repeat *Seating* on *page 24* and *Attaching the Transducer* on *page 25* immediately.

2.3 Installing the In-hull Transducer

Tools and Material Needed

Tape
Pole
Detergent
Weak solvent (alcohol)
Safety goggles
Dust mask
Disc sander
Thin, sealable plastic bag (optional)
Twist-tie
Petroleum jelly (Vaseline®)
Level and protractor
Carpenter's square
Pencil
Adhesive (Loctite #5699 or 3M #4200)
Screwdriver
Silicone grease (optional)
Mineral oil 2.4 fl oz. (71 mil)
Cored fiberglass hull installation:
- Drill
- Hole saw for hull interior 4" (100 mm)
- Miniature disk sander
- Casting epoxy (polyproxy #7035/7040) or resin
- Paper cup
- Stirrer

Testing the Selected Mounting Location

Establishing a Performance Baseline

The results of this test are used to determine the best in-hull location for a transducer.

1. Take the boat to the maximum depth for which your instrument is rated, or the maximum depth in which you will operate the fish-finder.
2. Connect the transducer to the fishfinder. Refer to *Transducer Cable Connections* on *page 39*.

3. Tape the transducer to a pole with the cable side up. Hold it over the side of the boat with the active face submerged in the water (see *Figure 2-12*). Keep the active face of the transducer parallel to the surface of the water.
4. Observe the Fishfinder's performance and depth reading.

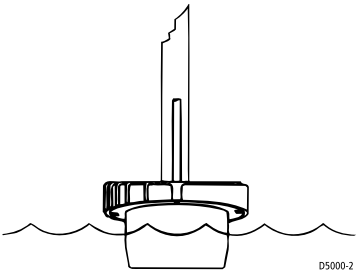


Figure 2-12: Establishing a Performance Baseline

Testing the Mounting Location

While the boat is moving around the same site (and depth of water), test the transducer at your selected mounting location inside the hull. Use one of the methods below:

1. This method is recommended if the sensor will be located near the stern and the boat has a minimum deadrise angle.
   i. Clean away any large build-up of dirt and/or grease using detergent or a weak solvent such as alcohol.
   ii. Place the sensor against the hull and allow bilge water to cover the surface where they touch (see *Figure 2-13* A).

WARNING:

Always wear safety goggles and a dust mask.

2. This method can be used at all hull locations.
   i. If the hull surface is not smooth, grind it with a disc sander.
   ii. Partially fill a thin plastic bag with water, place the sensor inside the bag and close it tightly with a twist-tie.
   iii. Wet the surface of the hull and press the sensor face against it through the bag (see *Figure 2-13* B).

WARNING:

Always wear safety goggles and a dust mask.

3. This is the least desirable testing method, as it may be difficult to remove all traces of the petroleum jelly before bonding the base to the hull.
   i. If the hull surface is not smooth, grind it with a disc sander.
   ii. Coat the face of the sensor with petroleum jelly.
   iii. Press it against the hull with a twisting motion (see *Figure 2-13* C).

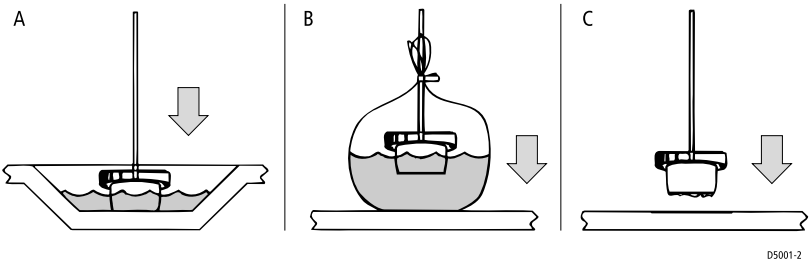


Figure 2-13: Testing the Transducer at the Selected Location

Observe the Fishfinder's performance and compare it to the baseline. Look for a stable depth reading that is similar to the baseline, compare the thickness and intensity of the bottom trace.

If the performance is close to the baseline, this is a good mounting location. Remember, some energy is lost transmitting through the hull.

If the test reading differs markedly from the baseline, you need to find another location to install the transducer.

If there is no reading or it is erratic, the sensor may be positioned over coring which is absorbing the acoustic energy. Choose another location. If no other spot is available, **check with the boat manufacturer to be certain coring is present before proceeding** with *Installation in a Cored Fiberglass Hull* on *page 37*.

Installation

1. Measure the deadrise angle of the hull at the selected location using a level and protractor (see *Figure 2-14*). Measure carefully, since the installed transducer must be within 5 ° of vertical.

WARNING:

Always wear safety goggles and a dust mask.

2. The hull surface to be bonded must be smooth and free of paint or any other finish. If the surface is rough, use a disc sander to smooth an area 4" (100 mm) in diameter.
3. Remove any dust, grease or oil with a weak solvent, such as alcohol, to ensure a good bond. Clean and dry both the selected area and the underside of the base.
4. Using a carpenter's square, draw a line on the hull perpendicular to the keel through the center of the mounting location. This will be used as a guideline to orient the base.

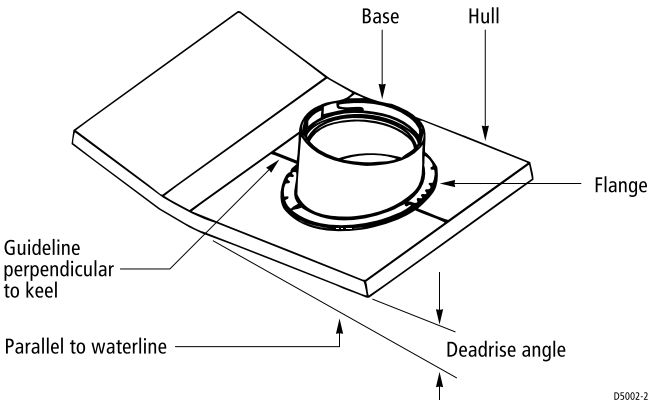


Figure 2-14: Deadrise Angle

5. The numbers on the flange of the base represent deadrise angles. Identify the number that most closely corresponds to the deadrise angle of your hull. Find its match on the opposite side of the flange. Keeping the keel direction arrows on the side of the base nearest the keel, align the two raised marks indicating your deadrise angle with the guideline drawn on the hull (see *Figure 2-15*).

CAUTION:
The base must be liquid-tight.

6. When you are satisfied that the location of the transducer is optimal and the orientation of the base corresponds to the deadrise angle of your boat, apply a bead of adhesive to the bottom of the base flange. (Follow the adhesive manufacturer's instructions for use).
   Press the flange firmly in place to form a liquid-tight seal and allow the adhesive to cure.

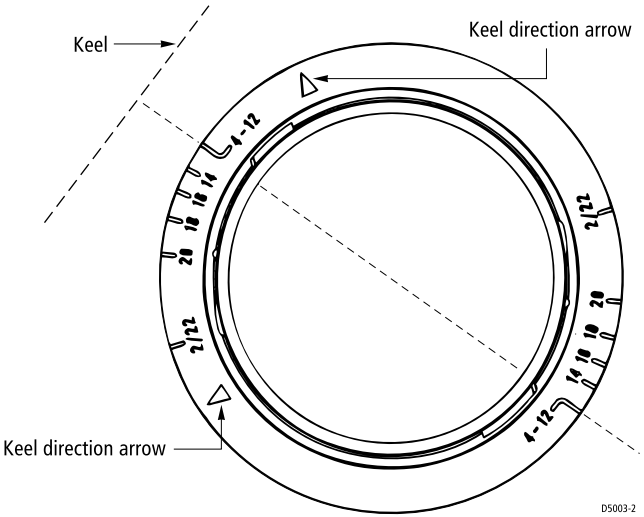


Figure 2-15: Aligning the Base Flange with 4–12° Deadrise Angle

7. Slide the transducer housing into the locking ring.Turn the housing until the rib that most closely corresponds to the deadrise angle of your hull is aligned with the angle indicator on the locking ring. To secure the housing to the locking ring, insert two screws (see *Figure 2-16*). **Do not** overtighten the screws.

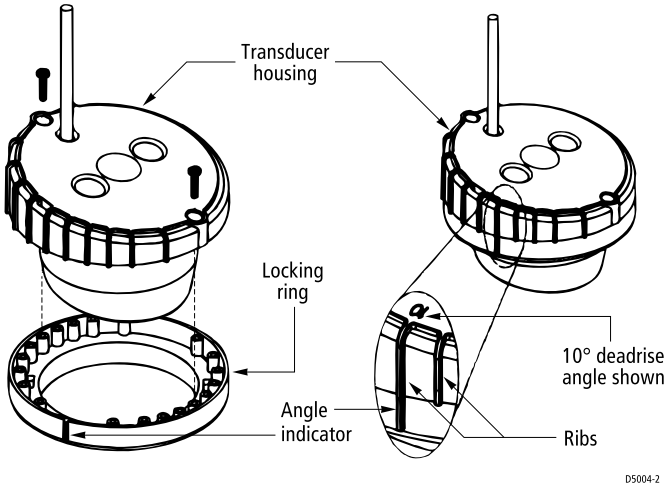


Figure 2-16: Joining the Transducer Housing to the Locking Ring

8. Lubricate the O-ring with silicone grease or petroleum jelly. Slide the O-ring onto the transducer assembly (see *Figure 2-17*).

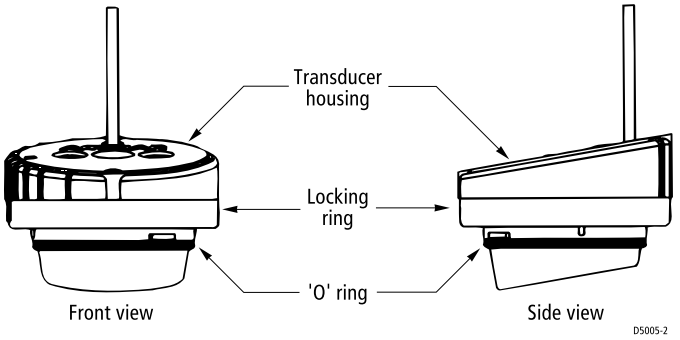


Figure 2-17: Installing the O-ring

9. When the adhesive on the base has cured, pour 2.4 fl. oz. (71 mil) of mineral oil into the base.
10. Lock the transducer assembly into the base by inserting the keys on the locking ring in the notches in the base. Press down and rotate clockwise until seated (see *Figure 2-16*).
11. Route the cable to the transducer, being careful not to tear the cable jacket when passing it through the bulkhead(s) and other parts of the boat.

12. Attach the connector nut to the cable per instructions in *Transducer Cable Connections* on *page 39*.
13. Attach the assembled connector cable to the transducer.
14. Route the other end of the cable to the fishfinder, 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 transducer cable from other electrical wiring and the engine.
15. Coil any excess cable and secure it in place using tie-wraps to prevent damage.

Note: *If you are using an extension cable, be sure to locate the mated 3-pin connectors well above the bilge waterline. To facilitate this, use cable clamps on either side of the connection.*

Installation in a Cored Fiberglass Hull

Installation in a cored hull is difficult. The objective is to bond the sensor to the **inside surface of the hull's outer skin** while preventing any moisture from penetrating the core.

CAUTION:
There is no way to determine if the outer skin is solid (no trapped air bubbles in the fiberglass) at the selected location before cutting the inner skin.

WARNING:
Always wear safety goggles and a dust mask.

1. Using a 4" (100 mm) hole saw, cut through the **inner** skin and the core at the selected location (see *Figure 2-18*). 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 hull.
2. Remove the plug of core material, so the inner core of the hull is fully exposed. Sand the **inside surface** of the outer skin using a miniature disc sander. Slightly undercut the surrounding coring if possible.
3. Clean and dry both the **inside surface** of the outer skin and the housing with a weak solvent, such as alcohol, to remove any dust, grease or oil.

CAUTION:
Do not proceed if the hull temperature is below 60° F (15° C) since the cure time of the casting epoxy will be greatly extended.

4. If the hull temperature is above 60° F (15° C), mix a half cup of casting epoxy stirring carefully to avoid trapping air in the mixture.
   Pour this around the housing until the cavity is full. Allow the casting epoxy to set for at least 1 hour.

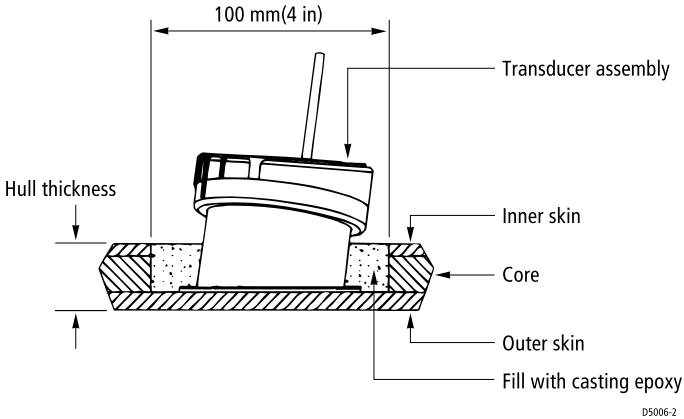


Figure 2-18: Installation in a Cored Fiberglass Hull

5. Proceed with step 7 of *Installation* on *page 34*.

2.4 Transducer Cable Connections

The transducer cable connector (and Y-connector, if supplied) has a nut that has been removed to aid installation. To allow you to complete the installation without cutting the cable, ensure that any holes you drill are large enough to accept the connector, with the nut removed (approximately 13/16" or 21mm).

Before attaching the transducer cable, you will need to attach the connector nut and split ring. These items, plus a wedge tool, are included in the transducer packaging.

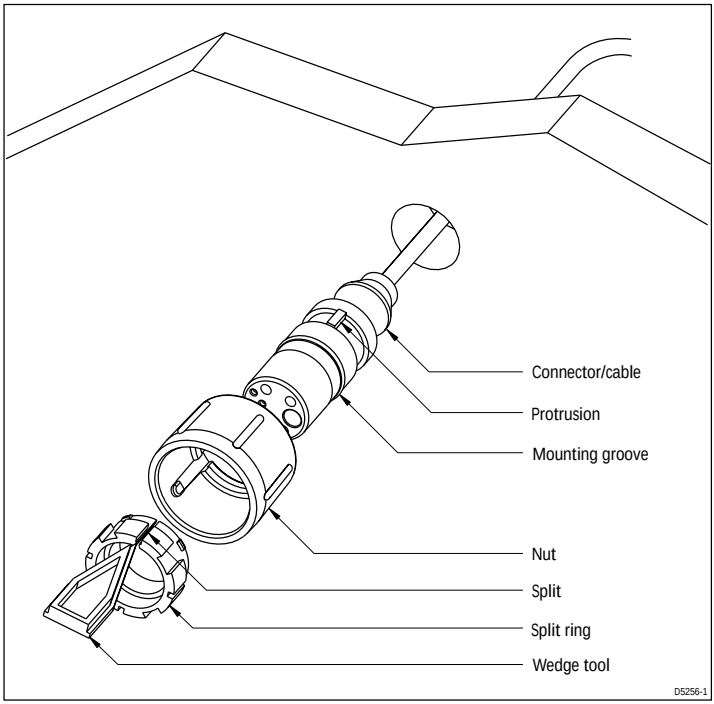


Figure 2-19: Assembling the Transducer Connector

CAUTION:
Take care not to pull on the cable – this can damage the transducer wires.

➤ To attach the transducer cable connector:

1. Slip the nut over the connector cable end. Push it past the connector and over the cable.
2. Insert the wedge tool into the groove in the split of the split ring and slide the wedge tool until its squared end is flush with the larger edge of the split ring.
3. Slip the split ring and wedge tool over the connector body until aligned with the mounting groove on the connector.
4. Remove the wedge tool and seat the split ring in the mounting groove, making sure the connector protrusion falls into the split.
5. Slip the nut forward until it stops. Twist until the protrusions on the inside of the nut align with the grooves on the split ring.
6. Slip the nut forward and snap into place.

The transducer cable is attached to the 7 pin male connector marked TRANSDUCER on the fishfinder. How you connect the cable to the unit depends on the type of transducer you have installed:

- **Combined depth/speed/temp** transducers have a 7 pin female connector. Attach the transducer cable connector directly to the fishfinder.
- **Combined speed/temperature** transducers have a 3 pin female connector that requires the use of an additional Y-shaped cable (Raymarine part number E66022) to attach to the 7 pin connector on the fishfinder. This Y-cable is included with your speed/temperature transducer.
  Attach the 7 pin female connector on the Y-cable to the fishfinder unit then attach the transducer cable to the 3 pin male connector on the Y-cable.
- **Depth-only** transducers have a 7 pin female connector.
  Attach the transducer cable connector directly to the fishfinder.
  or
- If being installed in conjunction with a speed/temperature transducer, attach the 7 pin female connector on the Y-cable to the fishfinder then attach the transducer cable to the 7 pin male connector on the Y-cable.

Note: *If your system requires both a Y-cable and a transducer extension cable, ensure that you connect the Y-cable to the fishfinder and the extension cable to the transducer.*

CAUTION:
Do not cut the transducer cable or remove the connector. Do not try to shorten or splice the cable. If the cable is cut, it cannot be repaired. Cutting the cable will also void the warranty.

Chapter 3: Maintenance

Cleaning Instructions

Cleaning the Transducer

Sea growth can collect quickly on the bottom of the transducer, this can reduce the performance in just a few weeks. To prevent the build-up of sea growth, coat the transducer with a thin layer of paint. Use only a water-based antifouling paint, or a water-based paint specifically designed for transducers. Apply the paint with a brush.

If your transducer becomes fouled or stops working because of sand or sea growth, use a stiff brush to clean it. You may sand the surface with a fine-grit wet or dry sandpaper (#320 grade or finer), but this will affect the performance of the unit when the boat is moving at higher speeds.

The paddle wheel mechanism may become jammed by dirt, grit or barnacles. Work this out of the mechanism, then clean the unit with soap and water or alcohol.

Cleaning the Hull

Use caution when sanding or cleaning the outside of the hull near the transducer.

CAUTION:
Harsh cleaning solvents such as acetone may damage the transducer.

Servicing and Safety

- Raymarine equipment should be serviced only by authorized Raymarine service technicians. They will ensure that service procedures and replacement parts used will not affect performance. There are no user serviceable parts in any Raymarine product.
- Some products generate high voltages, so never handle the cables/connectors when power is being supplied to the equipment.
- When powered, all electrical equipment produces electromagnetic fields. These can cause adjacent pieces of electrical equipment to interact with one another, with a consequent adverse effect on operation.

- In order to minimize these effects and enable you to get the best possible performance from your Raymarine equipment, guidelines are given in the installation instructions, to enable you to ensure minimum interaction between different items of equipment, i.e., ensure optimum Electromagnetic Compatibility (EMC).
- Always report any EMC-related problem to your nearest Raymarine dealer. We use such information to improve our quality standards.
- In some installations, it may not be possible to prevent the equipment from being affected by external influences. In general this will not damage the equipment but it can lead to spurious resetting action, or momentarily may result in faulty operation.

Problem Solving

Common Problems and Their Solutions

Table 3-1: Common Transducer Problems

Problem	Correction
Fishfinder display "freezes"	Check the transducer cable for damage. If damaged, the cable and transducer must be replaced as a unit.
Fishfinder does not see bottom or fish	1. If you have a transom-mount transducer, check that the transducer hasn't kicked-up on hitting an object. 2. Check that the transducer is within 10° of vertical. 3. Check that the transducer face is not covered or fouled. If necessary clean the transducer.
Fishfinder does not display fish	Ensure the transducer is within 10 ° of vertical.
Fishfinder is unreliable at high boat speeds	Turbulence around the transducer may be confusing the unit.
Fishfinder displays a lot of background noise	Check that the transducer is mounted correctly and is clean.
Fishfinder speed or log readings are wrong	Check that the transducer paddle wheel is clean.

How to Contact Raymarine

On the Internet

Visit the Raymarine World Wide Web site for the latest information on Raymarine electronic equipment and systems at:

www.raymarine.com

Customer Support

Navigate to the **Customer Support** page for links to:

- Finding Factory Service locations and Authorized Dealers near you
- Registering your Raymarine products
- Accessing handbooks in Adobe Acrobat format
- Downloading RayTech software updates
- Accessing the Raymarine solution database

Clicking the **Find Answers** link routes you to our solution database. Search questions and answers by product, category, keywords, or phrases. If the answer you are seeking is not available, click the **Ask Raymarine** tab to submit your own question to our technical support staff, who reply to you by e-mail.

In the US

Accessories and Parts

Many Raymarine accessory items and parts can be obtained directly from your authorized Raymarine dealer. However, if you are in need of an item not available from the retailer, please contact Raymarine Technical Services at:

800-539-5539 ext. 2333, *or*
603-881-5200.

Technical Service is available Monday through Friday 4:00 AM to 6:00 PM Eastern Time.

Please have the Raymarine item or part number ready when calling if placing an order. If you are not sure which item is appropriate for your unit, you should first contact the Technical Support Department to verify your requirements.

Technical Support

For technical support, call:

800-539-5539 ext. 2444, *or*
603-881-5200.

Our Technical Support Specialists are available to answer questions about installing, operating and trouble-shooting all Raymarine products.

Questions can be sent directly to our Technical Support Department via the Internet. Point your browser to *www.raymarine.com* and click on the **Customer Support** link. From there, select **Find Answers** and click the **Ask Raymarine** tab.

Product Repair and Service

In the unlikely event your Raymarine unit should develop a problem, please contact your authorized Raymarine dealer for assistance. The dealer is best equipped to handle your service requirements and can offer timesaving help in getting the equipment back into normal operation.

In the event that repairs can not be obtained conveniently, product service may also be obtained by returning the unit to:

Raymarine, Inc.
Product Repair Center
22 Cotton Road, Unit D
Nashua, NH 03063-4219

The Product Repair Center is open Monday through Friday 8:15 a.m. to 5:00 p.m. Eastern Time. All products returned to the Repair Center are registered upon receipt. A confirmation letter will be sent to you acknowledging the repair status and the product's reference number. Should you wish to inquire about the repair status of your unit, contact the Product Repair Center at:

800-539-5539

Please have the product reference number, or unit serial number, ready when you call. We will do everything possible to make the repair and return your unit as quickly as possible.

In Europe

In Europe, Raymarine support, service and accessories may be obtained from your authorized dealer, or contact:

Raymarine Ltd
Anchorage Park
Portsmouth, Hampshire
England PO3 5TD
Tel +44 (0) 23 9269 3611
Fax +44 (0) 23 9269 4642

Technical Support

The Technical Services Department handles inquiries concerning installation, operation, fault diagnosis and repair. For technical helpdesk contact:

Tel:+44 (0) 23 9271 4713
Fax: +44 (0) 23 9266 1228

Questions can be sent directly to our Technical Support Department via the Internet. Point your browser to *www.raymarine.com* and click on the **Customer Support** link. From there, select **Find Answers** and click the **Ask Raymarine** tab.

Accessories and Parts

Raymarine accessory items and parts are available through your authorized Raymarine dealer. Please refer to the lists of component part numbers and optional accessories in the Installation chapter of this manual, and have the Raymarine part number ready when speaking with your dealer.

If you are uncertain about what item to choose for your Raymarine unit, please contact our Customer Services Department prior to placing your order.

Worldwide Support

Please contact the authorized distributor in the country. A list of worldwide distributors is supplied with your system.

Index