

# NORTHSTAR

## 491 ECHO SOUNDER



## INSTALLATION MANUAL

Rev A  
Part Number GM495

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# SECTION ONE – Introduction

## Welcome to the Northstar 491

An echo sounder is a device that provides information about the water directly beneath a vessel. The Northstar echo sounder system consists of:

- the Northstar 491 echo sounder sensor
- a Northstar navigation system such as the 962, 958 or 6000i
- a transducer

The 491 can be used with either a single-element transducer or a dual-element transducer. The 491 automatically pings both transmitters at power-up to determine the number of transducer elements connected. If a single element is detected, the 491 operates in single-frequency or dual-frequency interleaved mode (as determined by the operator) at 600 Watts. If two elements are detected, the 491 uses both elements at 1000 Watts.

Installation and setup procedures are different for the two basic types of Northstar navigators. The following terminology should be carefully followed:

- the term *961/962* indicates instructions that apply to the Northstar 961 and the 962 navigators
- the term *957/958/6000i* is used for these units
- the term *navigator* by itself identifies information that applies to all units

## Who should read this manual

This manual is for marine technicians who are installing the Northstar 491 and connecting it to a Northstar navigator and a transducer.

## Scope of this manual

In this manual, you'll find information about the following:


- mounting and wiring the 491
- connecting the 491 to the Northstar navigator
- installing a transducer (an overview is provided, but for such details as wiring, see the documentation provided by the transducer's manufacturer)

- connecting the 491 to a transducer (see also the *Transducer Connector Instructions*—GM492)
- troubleshooting and testing the system
- technical specifications for the 491

For information about obtaining technical support and returning the 491 for factory service, “SECTION FOUR – Troubleshooting and servicing the 491” beginning on page 21.

For details about operating the 491, see the *Northstar 491 Echo Sounder Operations Manual* (GM494) or Northstar 6000i’s Reference Manual, for that product.

## Installation considerations




<p><b>CAUTION!</b></p> 	<p><i>The following list of installation considerations isn’t a substitute for all the details in Section Three. To ensure that you meet all critical installation parameters, be sure to read that entire section and follow all of its recommendations.</i></p>
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1. Check the shipping carton for any damage, and immediately report any damage to the carrier. Save all packing material in case you have to return the 491 to the factory for repair or evaluation.
2. Unpack the carton, and check its contents. You should have received:
  - the Northstar 491 Echo Sounder
  - 10-foot (3-meter) data cable to connect the 491 to the navigator
  - 10-foot (3-meter) power cable for the 491
  - 491 parts kit (containing transducer cable end connector, back-shell, heatshrink tubing, and the *Transducer Connector Instructions*—GM492)
  - *Northstar 491 Echo Sounder Installation Manual* (GM495)
  - *Northstar 491 Echo Sounder Operations Manual* (GM494)
  - owner registration card
3. Fill out the owner registration card and mail it to Northstar.
4. Review all of the installation requirements as outlined in Sections Two and Three.
5. Install the transducer, then terminate the cable (see “Connecting the 491 to a transducer” starting on page 18).
6. Mount the 491. For instructions, see “Mounting the 491” beginning on page 14.
7. Connect the 491 to ship’s power and to the navigator. Connection information begins on page 15.

With the vessel in the water, turn on the system and verify proper operation.

# SECTION TWO – Installing the transducer

## Safety considerations

<p><b>WARNING!</b></p> 	<p><i>Be sure to turn the power off before starting the installation. Further, it is highly recommended that you keep power off while you're performing the installation. If power is left on or turned on during the installation, fire, electrical shock, or other serious injury may occur.</i></p> <p><i>Be sure to ground the equipment to prevent electrical shock and mutual interference.</i></p> <p><i>Be sure the transducer outputs are tied together before handling to avoid electrical charge build-up.</i></p>
<p><b>WARNING!</b></p> 	<p><i>Be sure to use a 3-amp fuse. Using the incorrect fuse can result in fire or damage to the 491.</i></p>
<p><b>CAUTION!</b></p> 	<p><i>Mounting the transducer requires drilling holes through the hull; make sure the installation does not cause the vessel to leak. A thru-hull installation should be performed by a professional installer. Do not attempt this unless you are fully qualified.</i></p> <p><i>Do not perform a thru-hull installation of the transducer when the vessel is actually in the water.</i></p> <p><i><b>Immediately</b> after installing the transducer, be sure to check for leaks, and don't leave the vessel in the water for more than three hours before checking it again.</i></p> <p><i>Northstar assumes no responsibility for improper installation of a transducer.</i></p>
<p><b>NOTE:</b></p>	<p><i>Be sure that the transducer doesn't interfere with any of the on-board systems. Check all other systems to ensure that their performance doesn't degrade when the transducer is connected.</i></p>

## Selecting a transducer

Northstar recommends using an Airmar transducer with the Northstar 491 echo sounder. The Airmar B260, B744 and P66 can be obtained from Northstar as an installation kit with connectors installed.

**Table 1: Northstar-recommended transducers**

Manufacturer	Housing	Power	Frequency	Northstar P/N
Airmar	B260	1 kW	50/200 kHz	TD1004
Airmar	B744V/B44V (with 3-wire speed)	600 W	50/200 kHz	TD1005
Airmar	P66	600 W	50/200 kHz	TD1006

A table of Airmar transducer elements is given below to assist in evaluating characteristics of other Airmar transducers.

**Table 2: Airmar transducer elements**

Transducer element	Single or Dual element	Used in Airmar P/N	Acoustic material	Beam Width (50 kHz)	Beam Width (200 kHz)	Rated Power
50/200A	Single	B744V B744VL P319 B117 SS555	Urethane	45°	12°	600W
50/200A	Single	P66 P79 P74	LPU	45°	11°	600W
50/200B	Single	B256	Urethane	23°	5°	1200W
50AE/200Riq	Dual	B45 B250-B B260	Urethane	19°	6°	1000W

Dealers can also purchase quantities of transducers directly from Airmar Technology Corporation at:


**Airmar Technology Corporation**  
**35 Meadowbrook Drive**  
**Milford, New Hampshire 03055-4613**  
**Phone 603/673-9570**  
**Fax 603/673-4624**  
**(www.airmar.com)**



## Installation considerations

The following basic setup information isn't a substitute for the installation instructions provided by the transducer's manufacturer. To ensure that you meet all critical installation parameters, be sure to read and follow all of the requirements in their instructions. Northstar assumes no responsibility for improper installation.

## Choosing a mounting location

<p><b>CAUTION!</b></p> 	<p><i>Do not mount the transducer:</i></p> <p><i>behind strakes, fittings, or hull irregularities (mounting in those locations may increase turbulence, aeration, and cavitation) or near the keel</i></p> <p><i>near openings for water intake or discharge</i></p> <p><i>where it might be loosened by the vessel's vibration</i></p> <p><i>less than four feet away from the Northstar 961/962 processor or other similar equipment to minimize interference</i></p>
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The two most common problems with echo sounder installations stem from *electrical noise* and *cavitation*. Either of these situations can produce poor performance.

Electrical noise occurs when the transducer cable is routed too closely to noise-producing electronics, such as alternators, AC generators, radars, etc. To avoid problems with noise, route the transducer cable by itself (not in a bundle) and away from other wires or cables and the engine.

Cavitation can occur at high speeds. During cavitation, bubbles form between the transducer and the water. When this happens, the transducer can't get its energy into the water properly and won't be able to detect any echoes. To avoid cavitation, choose a mounting location with good water flow all around it at all speeds.

Before any drilling or cutting takes place, carefully choose a mounting location for the transducer that meets the following criteria (also see Figure 1 on page 7), depending on the type of vessel:

- the transducer is more than four feet away from the Northstar navigator and other similar equipment, to prevent mutual electrical and magnetic interference
- the transducer and its cable are as far as possible from other electrical cables
- there is space above the transducer for the transducer's stem, housing, and cable

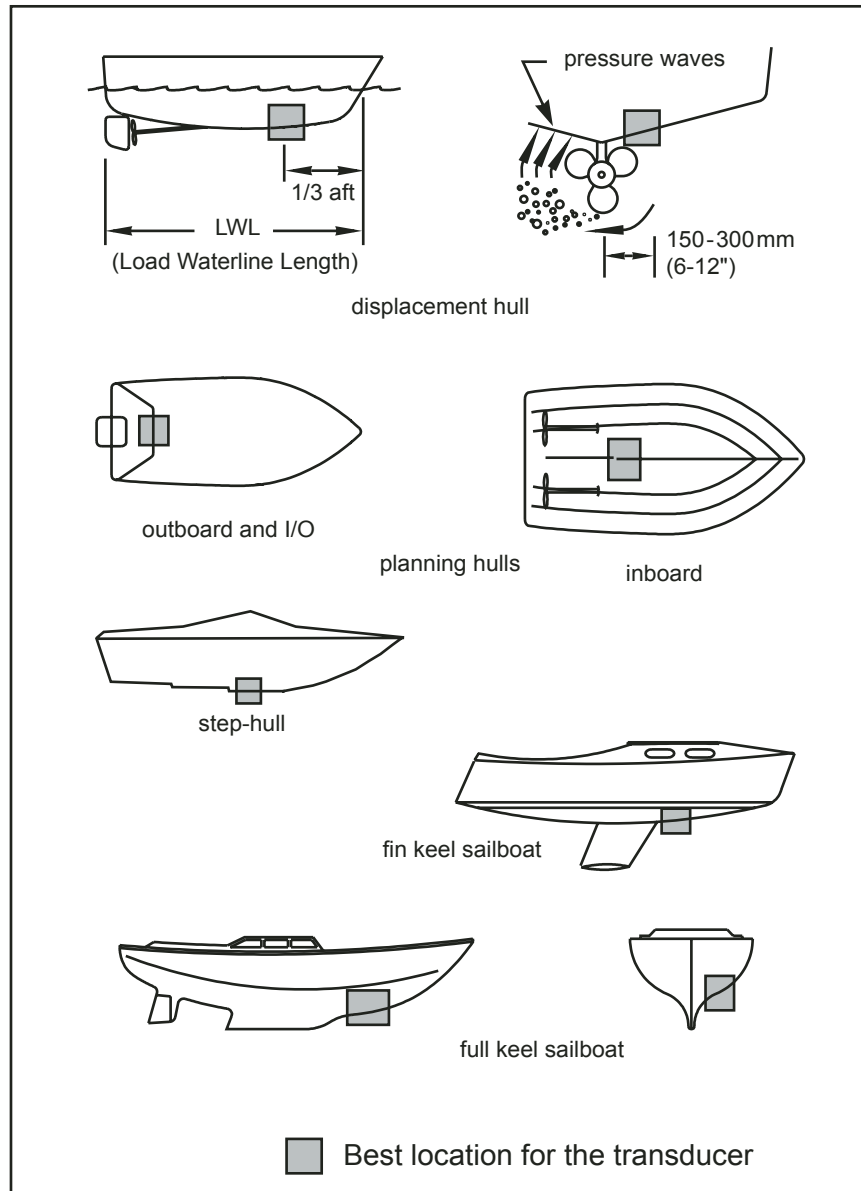
*Choose the mounting location to obtain the best possible performance from the transducer and the 491.*

*Take into account the vessel's maximum speed when selecting a mounting location, as turbulence can affect echo sounding capabilities.*

- the path for running the transducer's cable is reasonably direct—keep in mind that the transducer cable is 33 feet long (10 meters). To prevent damage, coil any excess cable and secure it
- water turbulence and noise are minimal, decreasing the amount of bubbles passing over the transducer face
- the transducer isn't behind hull irregularities or near eroding paint; both indicate areas subject to turbulence
- the transducer is as far as possible from the engine or propellers, and inboard of the lifting strakes
- the transducer always remains submerged and parallel to the water surface
- the transducer is easily accessible from inside the vessel for adjustments and maintenance
- the transducer's ultrasonic beams aren't obstructed by the keel, propeller shafts, or any other part of the vessel
- the hull thickness falls within the limits in Table 3 below (all dimensions are perpendicular to the waterline):

**Table 3: Hull thickness limits**

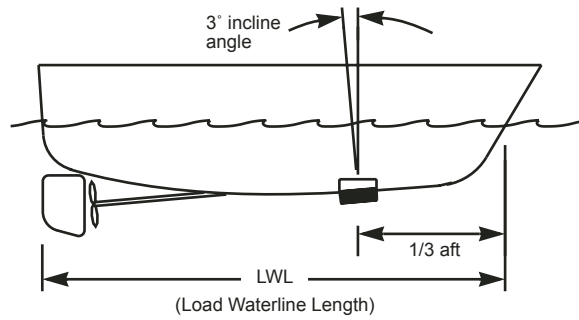
<b>Model</b>	<b>Minimum</b>	<b>Maximum</b>
AirMar B44V/B744V with fairing	6 mm (1/4 inch)	19 mm (3/4 inch)
AirMar B44V/B744V without fairing	6 mm (1/4 inch)	65 mm (2 1/2 inches)
AirMar B260 with fairing	—	45 mm (1 3/4 inches)
AirMar B260 without fairing	19 mm (3/4 inch)	114 mm (4 1/2 inches)



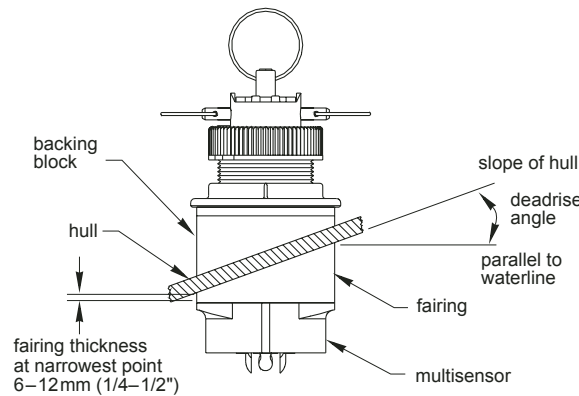
**FIGURE 1: Recommended installation locations for a transducer**

## Installing the transducer

A flat-bottom hull provides the best environment for mounting the transducer: It provides a horizontal surface and a constant water flow over the transducer, with little turbulence (see Figure 2 for the recommended transducer incline angle). If the vessel has a deadrise angle greater than 5 degrees, mount the transducer on a fairing block to create a horizontal surface and keep the transducer perpendicular to the waterline (see Figure 3). You must order the fairing block, if needed, from the transducer's manufacturer.



**FIGURE 2: Recommended transducer incline angle**



Deadrise angle and fairing thickness (B44V shown)

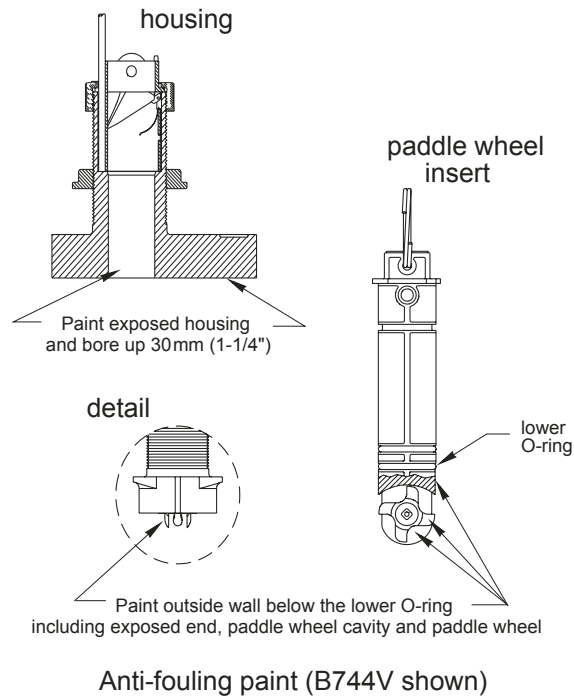
**FIGURE 3: Typical finished thru-hull installation with a fairing block (Airmar B744V)**

## Maintaining the transducer


Do not expose the transducer's face or plastic housing to gasoline or strong solvents, such as acetone. These solvents can penetrate and degrade many plastics and reduce their strength.

### Using anti-fouling paint

The transducer should be coated with water-based anti-fouling paint to prevent aquatic growth.



**FIGURE 4: Anti-fouling paint areas (for Airmar B744V)**

<p><b>CAUTION!</b></p> 	<p><i>Use special transducer paint. Other paints may contain copper, which is conductive and can burn out the transducer within minutes!</i></p>
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### **Cleaning a transducer**


To clean the transducer of heavy debris or foul sea growth, use a stiff brush or putty knife, but don't scratch the surfaces. Check the transducer every few weeks, maximum.


Use sanding sparingly, as repeated sanding may affect the transducer's performance at high speeds. For lighter cleaning, the surface may be wet-sanded with #220 or finer wet/dry sandpaper.





# SECTION THREE – Installing the 491


## Safety considerations

<p><b>WARNING!</b></p> 	<p><i>Be sure to turn the power off before starting the installation. Further, it is highly recommended that you keep the power off while you're performing the installation. If power is left on or turned on during the installation, then fire, electrical shock, or other serious injury may occur.</i></p> <p><i>Be sure to ground the equipment to prevent electrical shock and mutual interference.</i></p> <p><i>Be sure that the voltage of the power supply is between 10 and 36 volts DC. Connecting to the wrong power supply can result in fire or damage to equipment.</i></p> <p><i>Be sure to use a 3-amp fuse. Using the incorrect fuse can result in fire or damage to the 491.</i></p>
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<p><b>CAUTION!</b></p> 	<p><i>Keep the following safe compass distances from the 491: 1.0 m standard, 0.8 m steering.</i></p>
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<p><b>CAUTION!</b></p> 	<p><i>Be sure that the 491 doesn't interfere with any of the on-board systems. Check all other systems to ensure that their performance doesn't degrade when the 491 is turned on.</i></p> <p><i>If the vessel is out of the water when the echo sounder is turned on, the transducer may be damaged.</i></p>
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<p><b>CAUTION!</b></p> 	<p><i>Do not open the 491. There are no serviceable parts inside. Unauthorized tampering with the unit will automatically void the warranty.</i></p>
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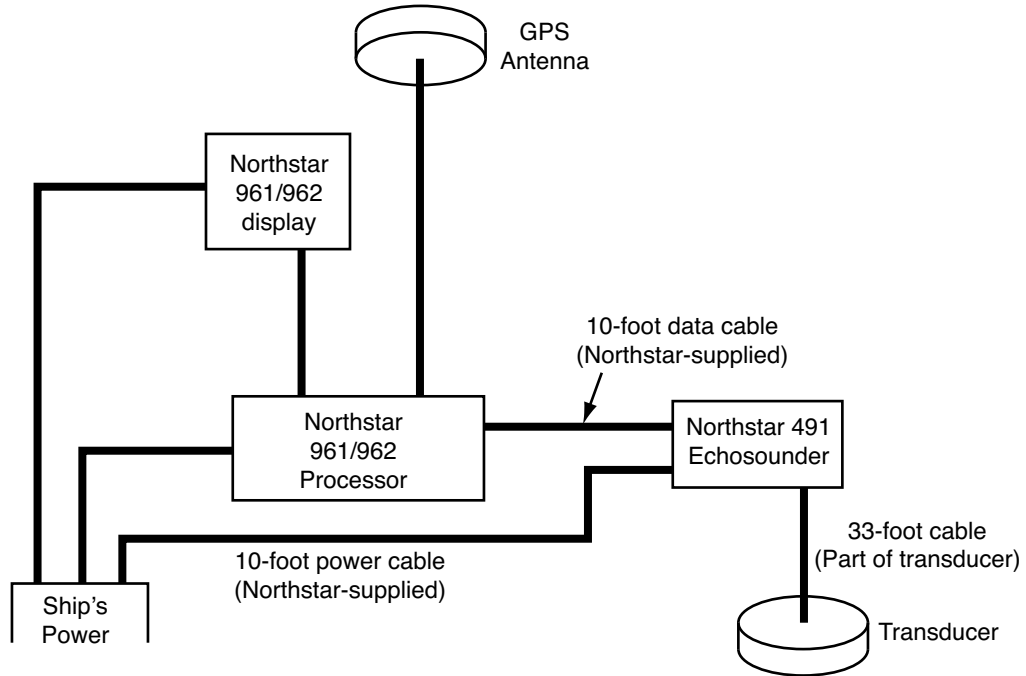
<p><b>CAUTION!</b></p> 	<p><i>Do not mount the 491 in the bilge. It is not designed to resist heavy exposure to water and chemicals.</i></p>
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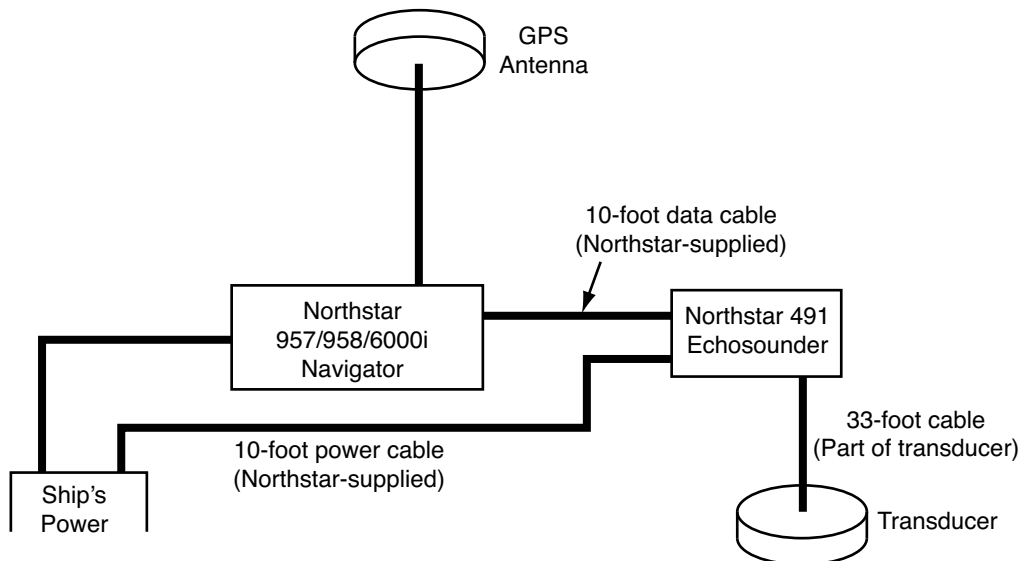


## System components

Figure 5 on page 13 shows a configured 961/962 echo sounder system, and Figure 6 on page 13 shows a configured 957/958/6000i echo sounder system.



**Figure 5: Echo sounder system components with the Northstar 961/962**



**Figure 6: Echo sounder system components with the Northstar 957/958/6000i**

## Choosing a mounting location

Before any drilling or cutting takes place, carefully choose a mounting location for the 491 module that meets the following criteria:

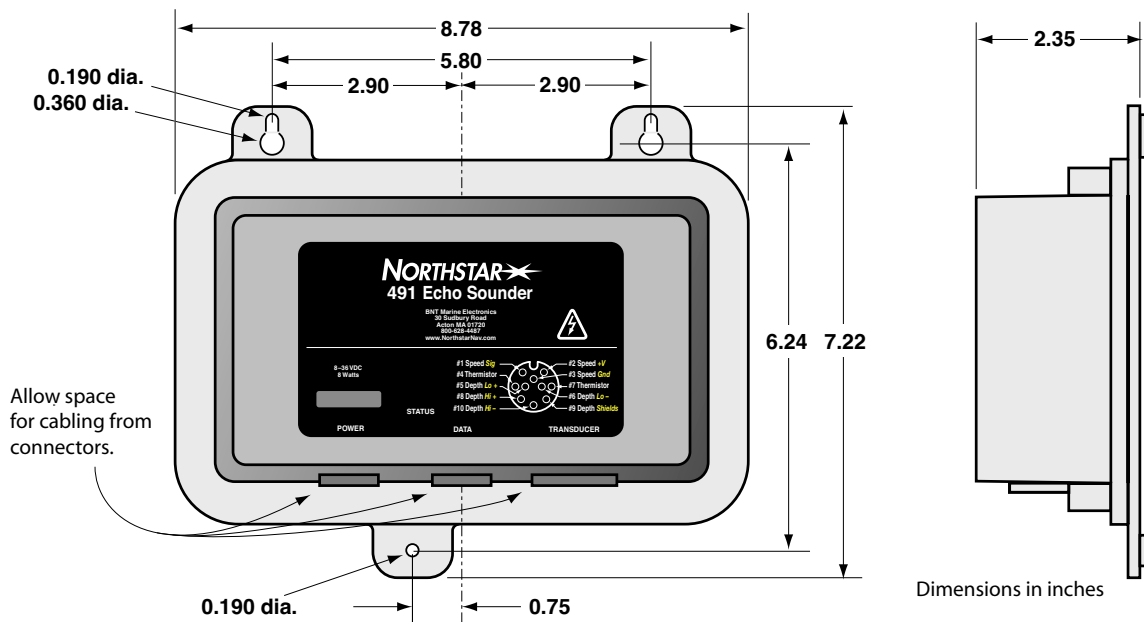
- where the transducer cable is kept securely away from other wires
- where the path for running the required electrical cabling is reasonably direct; keep in mind the different cable lengths
- where the 491 won't be exposed to water
- where the status indicator (on the front of the 491) can be observed for system testing and troubleshooting.

**NEVER MOUNT THE 491 MODULE IN THE BILGE!**

## Mounting the 491

Figure 7 shows the mounting dimensions for the 491. The 491 may be mounted either horizontally or vertically.

The mounting template supplied with the unit may be helpful in planning the installation and locating the mounting holes. The keyhole slots make installation in hard-to-reach areas easier, but be sure to tighten all mounting screws securely. Leave room for installing and removing cables.



**FIGURE 7: 491 mounting dimensions and connector locations**

## Wiring the 491

**CAUTION!**


*Make sure that fuse or circuit-breaker protection is provided at the power source.*

The majority of installation problems are caused by shortcuts taken with system cables. When installing the 491, be sure that you:

- assemble connectors carefully
- don't make sharp bends in the cables
- leave service and drip loops, so that moisture won't run down the cables and into the 491 or the navigator
- tie-wrap all cables to keep them secure
- if cables are shortened, lengthened (not recommended), or re-terminated, seal all wiring splices
- prevent interference from the transducer cable

### Electrical power requirements

The 491 is a negative-ground system that is reverse-polarity and over-voltage protected. The unit requires 8 to 36 VDC power at 8 Watts.

### Connecting the 491 to ship's power

The connection between ship's power and the 491 requires the 10-foot (3-meter) power cable supplied with the 491.

The wires in the power cable must be connected as follows (black and white can be connected together at the power source):

- Red → Positive (+) (fused lead)
- Black → Negative (-)
- Green → Ground (earth)

**NOTE:**

*The 491 should be grounded to the vessel to eliminate interference. Secure the green wire to the vessel's nearest grounding point. Without an earth grounding, performance may be degraded.*

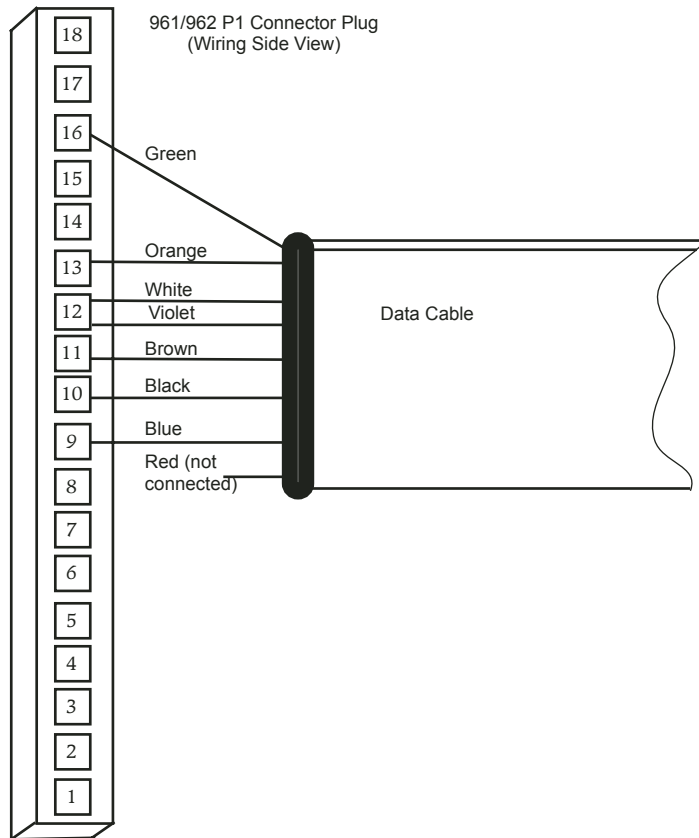
### Connecting the 491 to the 961/962

The connection between the 961/962 and the 491 uses the 10-foot (3-meter) data cable supplied with the 491. The cable connects to the P1 slot on the back of the navigator.

The cable is shipped with a round 6-pin connector that attaches to other Northstar navigators. To install the 491 with a 961 or 962, you must cut off and discard the 6-pin connector, and wire the cable as shown below.

**Be sure you don't cut off the 8-pin connector that plugs into the 491!**

Figure 8 below illustrates the wiring at the 961/962 end of the cable. Table 4 describes the pin's functions.



**FIGURE 8: Interface cable connection from 961/962 to 491**

**Table 4: Cable connection between the 961/962 and 491**

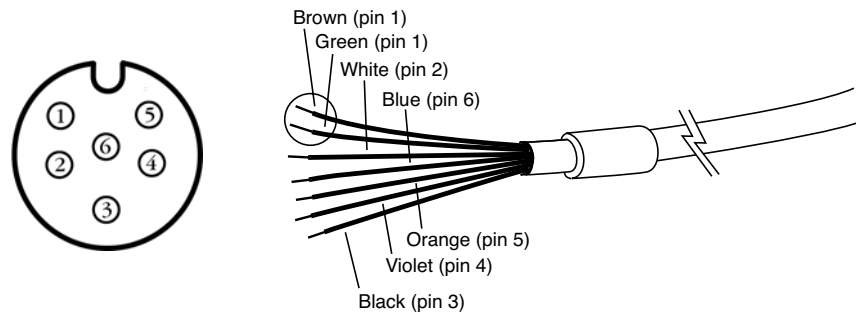
961/962 pin number	961/962 P1 signal name	Cable wire color
9	Port 3 In (A)	Blue
10	Port 3 In (B)	Black
11	Ground	Brown
12*	Port 3 Out (A)	Violet
12*	Port 3 Out (A)	White
13	Port 3 Out (B)	Orange
16	Ground	Green
**	Not connected	Red
* Connector P1, pin 12 on the 961/962 requires two connections from the cable.		
**The red wire is not connected on the 961/962 end, and should be insulated and capped.		

## Connecting the 491 to the 957/958/ 6000i

The connection between the 957/958/6000i and the 491 requires the 10-foot (3-meter) data cable supplied with the 491. The cable connects to the AUX port on the back of the navigator.

The cable is shipped with the connector installed – the following information is provided for cases where it is necessary to remove and reinstall the connector.

Figure 9 below illustrates the wiring for the navigator end of the cable. Table 5 describes the pin's functions.



**Figure 9: Interface cable connection from 957/958/6000i to 491**

**Table 5: Cable connection between the 957/958/6000i and 491**

navigator pin number	AUX port signal name	Cable wire color
1*	Shield/Gnd	Brown
1*	Remote On Gnd	Green
2	Remote On input	White
3	NMEA AUX In (B)	Black
4	NMEA AUX Out (A)	Violet
5	NMEA AUX Out (B)	Orange
6	NMEA AUX In (A)	Blue
<p>* Pin 1 on the 957 AUX port requires two connections from the cable. The red wire is not connected on the navigator end, and should be insulated and capped.</p>		

## Connecting the 491 to a transducer

Transducers purchased from Northstar (see page 4) are shipped with a connector installed. The following information is supplied for transducers purchased elsewhere and for cases where it is necessary to remove and reinstall the connector.

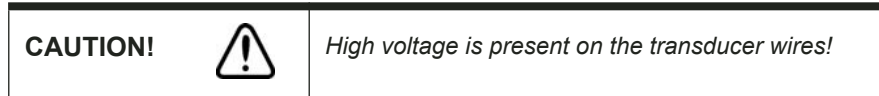
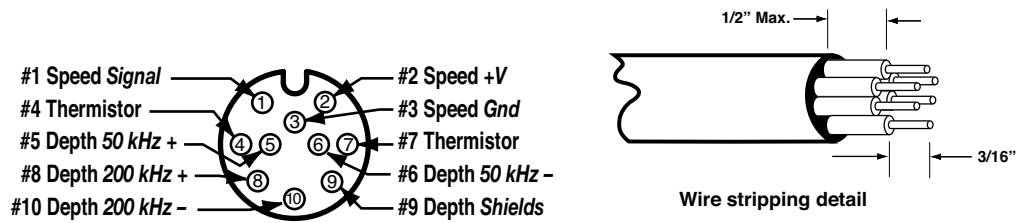


Figure 10 and Figure 11 below show how to install the connector on the cable.

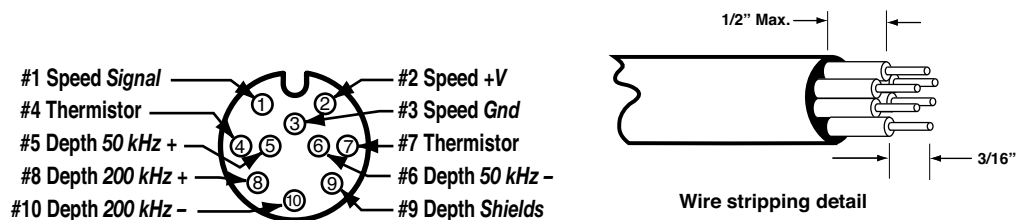
1. Slide the heat shrink tubing onto the transducer cable.
2. Slide the connector backshell onto the transducer cable.
3. Prepare each wire for insertion into its solder cup by stripping it as shown below and tinning it.
4. Carefully solder each wire to the appropriate cup as specified in the table.
5. Slide the backshell down the wire and screw it onto the connector body. It should be hand-tight.
6. Using the supplied screws, screw the strain relief onto the backshell.
7. Slide the heat shrink tubing onto the connector. Be sure to leave room for the locking collar to retract.
8. Heat the shrink tubing until it shrinks around the connector providing a watertight seal.

**Table 6: 491-to-transducer connector pin wiring**

Signal name	Pin no.	Wire color (Airmar B260 ONLY)	Wire color (Airmar B44/B744V and P66 ONLY)
Speed signal	1	N/A	Green
Speed +V	2	N/A	Red
Speed ground	3	N/A	Bare
Thermistor (temperature)	4	Brown	Brown
Depth 50 kHz + (unused on single-frequency transducer)	5	Yellow	N/A
Depth 50 kHz – (unused on single-frequency transducer)	6	Blk/Wht	N/A
Thermistor (temperature)	7	White	White
Depth 200 kHz +	8	Blue	Blue
Depth shields	9	Shields	Shields
Depth 200 kHz –	10	Black	Black



**FIGURE 10: Wiring of B260 transducer cable (solder-cup side of connector shown)**



**FIGURE 11: Wiring of B44/B744 and P66 transducer cable (solder-cup side of connector shown)**

Plug the transducer cable into the **TRANSDUCER** connector of the 491.

If your transducer doesn't support speed, you can connect a separate speed sensor, such as the Airmar ST650, to pins 1, 2 and 3, as shown in the table.

## Initial checkout

This section assumes that the 491, Northstar navigator, and transducer are now all properly connected. Turning on the navigator automatically turns on the 491 (be sure your vessel is in the water). To turn the navigator on, briefly press its **PWR** key.

### Turning the 491 on For the 961/962

To use the 491 echo sounder, the 961/962 *must* be running software version 3.0 or higher. If not, contact the factory to obtain the upgrade CD. To install the upgrade, follow the steps on the back of the jewel box.

You *must* set the 961/962's Port 3 to "490":

1. Press **STAR** to display the SERVICE MENU screen.
2. Press **PORT SETUP**.
3. Press **PORT 3**.
4. Set the FORMAT option to 490.

The **STATUS** indicator light on the 491 glows steady green when the 491's power is on.

### For the 957/958/6000i

You *must* set the navigator's AUX port to "Sounder":

1. Press the **STAR** key to display the OPTIONS/SERVICE INFO screen, then press the **PORT SETUP OPTIONS** key.
2. Set the AUX PORT option to **Sounder**, then press the **ENTER** key.

The **STATUS** indicator light on the 491 glows steady green when the 491's power is on and it is communicating with the navigator.


### Setting up the echo sounder

You'll need to set the echo sounder display options on the navigator's ECHO SOUNDER SETUP screen. Press the **STAR** key to display this screen and set these options. For details, see the *Northstar 491 Echo Sounder Operations Manual* (GM494).

### Turning the 491 off

To turn off the 491, turn off the navigator by pressing and holding **PWR** until the screen goes dark. The 491 will turn off automatically.

## Installation test checklist

<b>CAUTION!</b> 	<i>If the vessel is out of the water when the echo sounder is turned on, the transducer may be damaged. Perform all tests on the with the vessel in the water.</i>
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1. Make sure the vessel is in the water.
2. To test the system after installation, turn on the navigator and confirm that power is on with no errors. If echo sounder data isn't moving across the ECHO screen from right to left, see "Common 491 installation problems" beginning on page 21.



# SECTION FOUR – Troubleshooting and servicing the 491

## Common 491 installation problems

Typical problems you may encounter either during or after the 491 installation process are outlined in Figure 12 on page 22 and Figure 13 on page 23.

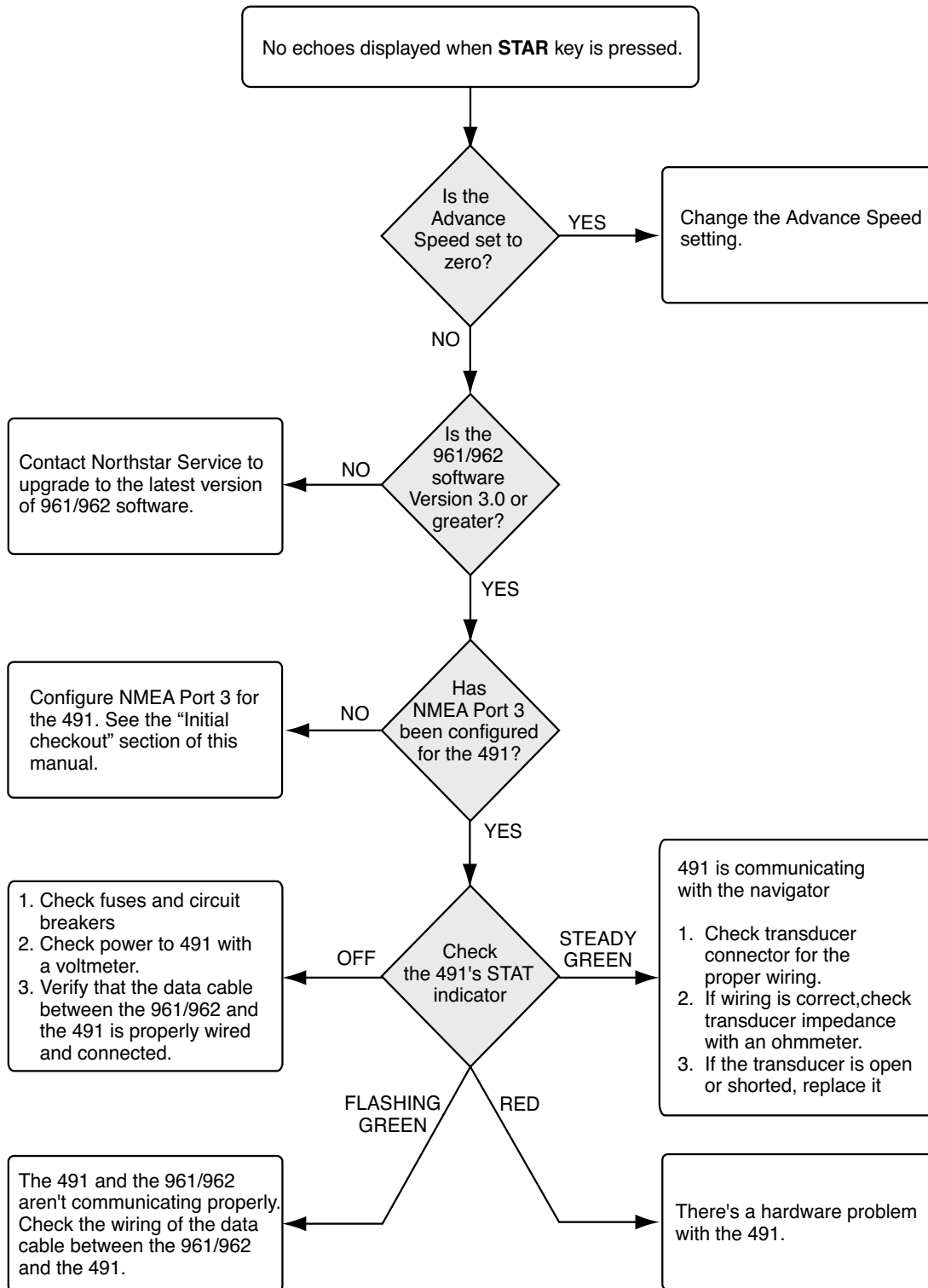
In the 961/962, the diagnostics screen may also help pinpoint a problem.

## The status LED

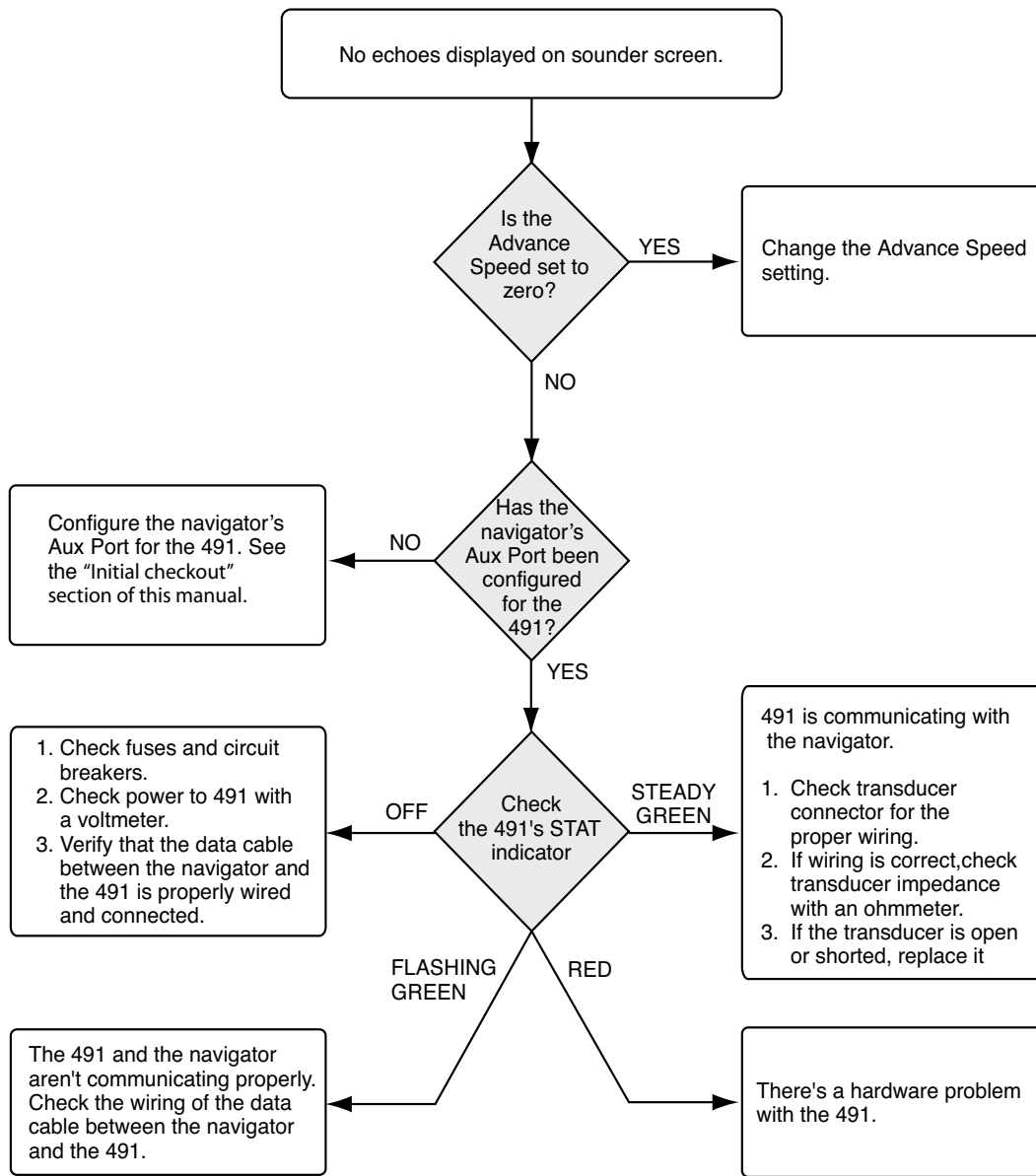
The two-color LED located behind the 491's front-panel STATUS window displays the unit's current condition.

The LED presents the following information:

- solid green: System has power, self-test passed, and communicating with navigator.
- Flashing green: 491 is not communicating with the navigator.
- Red: Self-test failed



**Figure 12: 961/962 echo sounder system troubleshooting**



**Figure 13: 957/958/6000i echo sounder system troubleshooting**

## Getting technical support

*You can E-mail the Service Department directly from Northstar's website ([www.northstarnav.com](http://www.northstarnav.com)). Here, you also can access additional technical information under either the Manuals link (you can download manuals in PDF form) or Support link.*

After you've followed the instructions in this manual, if you need additional technical or operations support for the 491, or if you have any other service-related questions, you can contact either your dealer or the Northstar factory. You can reach the Service Department by E-mail, fax, U.S. mail, or phone as described in Table 7 below.

<b>NOTE:</b>	<p><i>Please have the following items available when you contact Northstar.</i></p> <ul style="list-style-type: none"> <li>• <i>the 491's serial number, located on the top of the unit</i></li> <li>• <i>the transducer manufacturer's name and the transducer's model and part number</i></li> </ul>
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Please be as complete and accurate as possible when describing the problem so that a service technician can research the problem and provide the quickest response.

The Northstar Service Department is available between 9:00 AM and 5:00 PM Eastern Time, Monday through Friday, excluding major holidays.

If you have questions about purchasing parts or finding an authorized Northstar dealer, or if you want basic product information and brochures, contact the Northstar Sales Department as described in the table below.

**Table 7: Contacting Northstar**

<p><b>Email:</b> Service: <a href="mailto:service@northstarnav.com">service@northstarnav.com</a> Sales: <a href="mailto:sales@northstarnav.com">sales@northstarnav.com</a></p>
<p><b>Fax:</b> Service: 978/897-1595 Sales: 978/897-7241</p>
<p><b>Telephone:</b> Main number: 978/897-6600 or 800/628-4487 Sales: 978/897-0770 Service: 978/897-6600</p>
<p><b>U.S. mail:</b> Northstar 30 Sudbury Road Acton, MA 01720</p>
<p><b>Website:</b> <a href="http://www.northstarnav.com">www.northstarnav.com</a> (you can send E-mail to Northstar directly from this site)</p>

## Hearing from you

Your feedback is important and helps Northstar ensure that this manual is a valuable resource for all marine technicians. Send your questions, comments, or suggestions about this manual to:

[docs@northstarcmc.com](mailto:docs@northstarcmc.com)

## Ordering replacement parts

To order spare parts or replacement/missing parts, call the Sales Department at 978/897-0770.

## Servicing the 491

Repair of the 491 is performed only at the factory. Service includes a complete hardware and software check-out.

<b>NOTE:</b>	<i>Field repairs are not authorized and will void the warranty!</i> <i>For transducer service, including parts and repairs, please contact the transducer manufacturer.</i>
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The 491 and any accessories returned for warranty repair that are determined to be without fault are subject to a handling charge.

## Returning a 491 for service

*Before returning the 491 to the factory, to prevent delays it is critical that you first obtain a Return Materials Authorization (RMA) number from the Northstar Service Department. If the 491 was purchased through a dealer, call the dealer with the 491 serial number so they can help you get an RMA number. The 491's serial number can be found on the label at the top of the 491.*

*Shipments without a proper RMA number will not be accepted!*

If you have overnight or second-day shipping requirements, before shipping the 491, please call Northstar for turnaround time, freight charges, and payment arrangements.

The 491 should be shipped only in a properly designed carton with packing material. Shipments to the Northstar factory should be made to the following address:

**Northstar  
Service Department  
30 Sudbury Road  
Acton, MA 01720 USA**

<b>NOTE:</b>	<i>Return the transducer to its manufacturer, not to Northstar.</i>
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# APPENDIX A – Technical specifications

**Table 8: 491 technical specifications**

<b>Performance characteristics</b>	
Frequencies	50 and 200 kHz
Output power	1000 watts with dual-element transducers 600 watts with single-element transducers
Pulse lengths	0.1 to 2 ms
Pulse repetition rate	30 to 600 pulses/min
Alarms	Fish, bottom, and temperature
Update rate	10 Hz maximum (depends on water depth) (up to 20Hz when used with the Northstar 6000i)
Zoom modes	Marker, bottom lock, bottom lock/center, bottom
Auto modes	Fishing or cruising
Navigation data	Shown on bottom of screen
Display modes	Single/dual frequency, split-screen, four zoom modes, A-Scope
<b>Physical characteristics</b>	
Dimensions	8.78 x 7.22 x 2.35 inches (including back-plate)
Weight	2 pounds
<b>Environmental characteristics</b>	
Temperature	-25°C to +60°C operating temperature -55°C to +90°C storage temperature
Standards	Waterproof, sealed design meets the following: EN60529 IP65; EN60945 emissions; CE
<b>Electrical characteristics</b>	
	8 to 36 VDC, 8 watts, reverse polarity and overvoltage protection Transducer outputs protected against open circuit/short circuit

**Table 8: 491 technical specifications (Continued)**

<b>Manual controls</b>	
Gain	0 to 75 dB
Clutter	0 to 9
Signal level	0 to 5
Noise limiter	ON/OFF
White level	Background color
Range	up to 3500 feet (1000 meters)
Advance speed	1/8 to 2/1
Depth units	Feet, meters, fathoms
Installation calibrations	Speed, temperature, gain, transducer depth/ offset



# Glossary

- cavitation** The formation of bubbles, which may negatively impact a transducer's readings by reducing its ability to put energy into the water.
- deadrise** The rise of the bottom of a vessel above a horizontal line at the center of the vessel; that is, the slope of the hull away from the horizontal.
- echo sounder** An instrument that uses sound waves to measure the depth of a body of water or an object (such as a school of fish) below the water's surface.
- fairing block** A block used to create a horizontal surface for mounting a thru-hull transducer when the vessel's deadrise is more than 5 degrees.
- transducer** The device mounted through the hull to send and receive ultrasonic beams that determine seabed conditions and locate fish. Essentially, a transducer is an energy converter, which changes electricity to sound (send) and sound to electricity (receive).
- water column** An imaginary column through the water created by the path of a single transducer ping and its echoes.



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