

HDR 650 Installation and Operations Manual

531874-1_B



Accessory Manual

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Your Humminbird® is designed for trouble-free use in even the harshest marine environment. In the unlikely event that your Humminbird® does require repairs, we offer an exclusive Service Policy - free of charge during the first year after purchase, and available at a reasonable rate after the one-year period. For complete details, see the Warranty section included in this manual.

Contact our Customer Resource Center at **1-800-633-1468** or visit our Web site at **humminbird.com**.

WARNING! This device should not be used as a navigational aid to prevent collision, grounding, boat damage, or personal injury. When the boat is moving, water depth may change too quickly to allow time for you to react. Always operate the boat at very slow speeds if you suspect shallow water or submerged objects.

WARNING! Disassembly and repair of this electronic unit should only be performed by authorized service personnel. Any modification of the serial number or attempt to repair the original equipment or accessories by unauthorized individuals will void the warranty.

WARNING! This product contains chemicals known to the State of California to cause cancer and/or reproductive harm.

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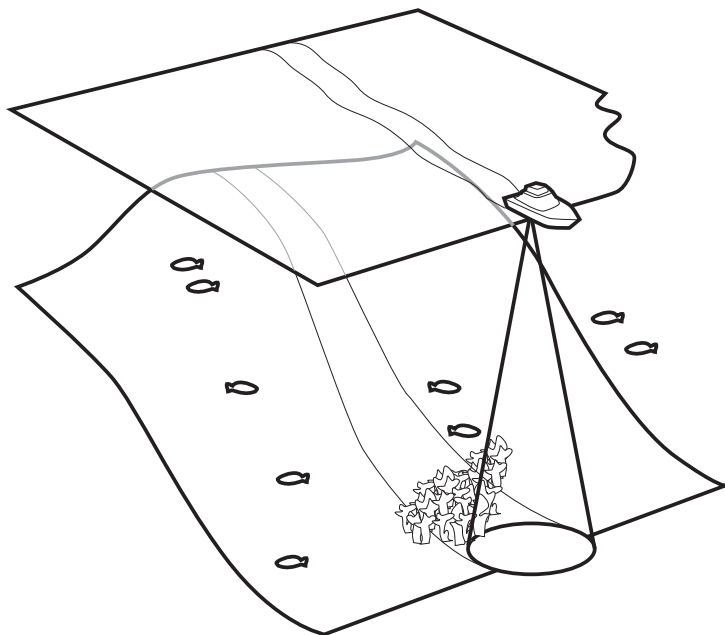
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How Sonar Works

Sonar technology is based on sound waves. The HDR 650 Digital Depth Sounder uses sonar to determine depth directly below the transducer. Your HDR 650 Digital Depth Sounder consists of two components: the HDR 650 sonar unit and the transducer. The sonar unit contains the transmitter and receiver, as well as the user controls and display. The transducer is mounted beneath the water surface and converts electrical energy from the transmitter into mechanical pulses or sound waves. The transducer also receives the reflected sound waves and converts them back into electrical signals for display on the sonar unit.



Sonar is very fast. A sound wave can travel from the surface to a depth of 240 ft (70 m) and back again in less than 1/4 of a second. It is unlikely that your boat can "outrun" this sonar signal.

Installation Overview

Before you start installation, we encourage you to read these instructions carefully in order to get the full benefit from your HDR 650 Digital Depth Sounder.

In addition to the hardware included in the installation kit, you will also need the following supplies:

- powered hand drill and various drill bits, including a 2 1/8" hole saw if your boat does not have an existing gauge hole
- Phillips-head and flat-head screwdrivers
- ruler or measuring tape
- pen or pencil
- 12 Volt power source (your boat's battery)
- marine-grade silicone sealant (for sealing drilled holes)
- two-part, slow-cure epoxy (for inside-the-hull transducer installation only)

NOTE: *If you are wiring directly to the boat's battery, you will also need a 1 Amp fuse and a fuse holder.*

Installing the HDR 650

You will install your HDR 650 depth sounder first, then your transducer. When you are done with both of these installation tasks, you should perform a final installation test before operating your HDR 650. Perform the following high-level steps by following the instructions in each numbered section to install the depth sounder:

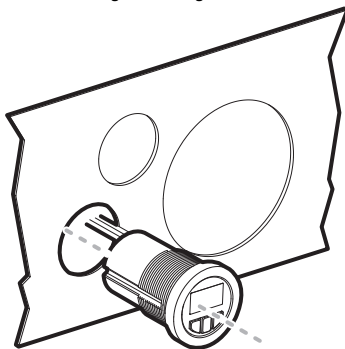
1. Locating the HRD 650 mounting position
2. Cutting the mounting hole
3. Customizing and assembling the HDR 650
4. Installing the HDR 650
5. Installing the buzzer
6. Connecting to the power supply
7. Installing the transducer

1. Locating the HDR 650 Mounting Position

You must select an appropriate mounting location for the HDR 650. Consider different positions on the console or deck of the boat, and note the following:

- The cables for the transducer and power must reach the mounting location. Extension cables are available.
- The mounting surface should be visible to the boat operator and adequately supported to protect the HDR 650 from excessive wave shock and vibration.
- Allow at least 2" clearance at the back, sides, and top of the unit for connection, air flow, and ease of installation and removal.

Choosing Mounting Hole Location



2. Cutting the Mounting Hole

Once you have selected your mounting location, perform the following steps:

1. Mark the desired mounting location, then drill a pilot hole.
2. Drill a 2 1/8" diameter hole using a hole saw and hand drill. This is a standard hole saw readily available for rental or purchase. If you prefer, any marine service shop can perform this task.

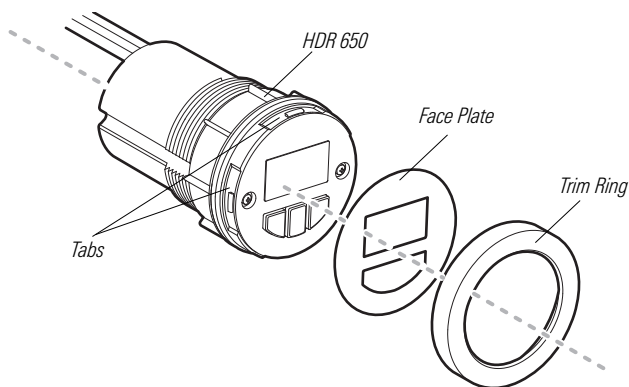
3. Customizing and Assembling the HDR 650

Your HDR 650 includes a variety of face plates and trim rings so that you can customize the appearance.

1. Select one face plate and one trim ring.
2. Peel off the protective backing from the face plate. Be careful not to let the adhesive touch anything prematurely.

CAUTION: *In order to provide a lasting, waterproof bond, the face plate adhesive is extremely sticky, and you will NOT be able to re-position it once you have stuck it onto the face of the HDR 650.*

3. Carefully line up the face plate with the face of the HDR 650. Press the face plate into place so that all keys are accessible and the display is visible (see illustration).
4. Align the inside tabs of the trim ring with the HDR 650 tabs, and snap the trim ring onto the front of the HDR 650 (see illustration).

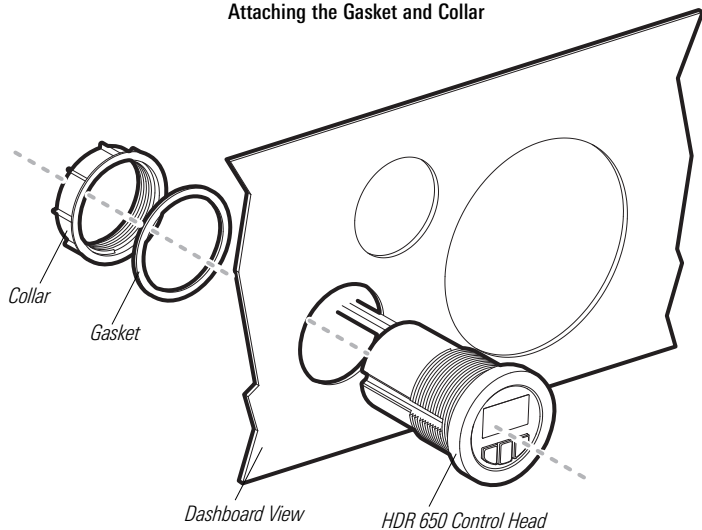


4. Installing the HDR 650

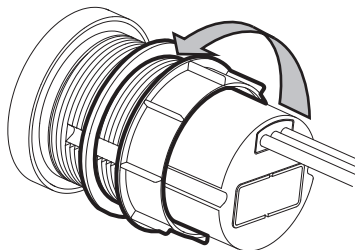
After the mounting hole has been cut (see section 2), continue the installation as follows:

1. Insert the HDR 650 through the front hole of the dashboard.
2. From the rear of the dashboard, install the gasket and collar onto the HDR (see illustration).

Attaching the Gasket and Collar



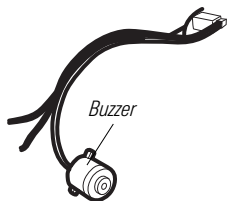
Hand-tightening the Collar



3. Hand-tighten the collar until the HDR is securely mounted in the dashboard. Make sure that the face of the HDR stays oriented upright.

5. Installing the Buzzer

Securing the Buzzer

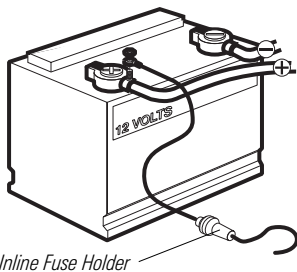
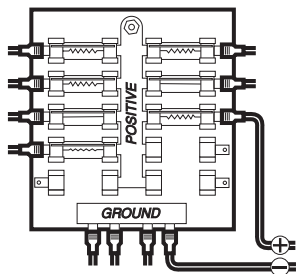


Secure the buzzer to a nearby wire bundle using the cable ties (included).

6. Connecting to the Power Supply

Use the following information to connect your HDR 650 to an appropriate power supply:

- If your boat has an electrical system, there is probably a fuse panel in the console area that can be used to attach the HDR 650 power cable.
- If a fuse terminal is available, use crimp-on type electrical connectors (not included) that match the terminal on the fuse panel. Attach the black wire to ground and the red wire to 12 VDC power. You must use a 1-Amp fuse in the connection.
- 36" of power cable is included; you may shorten or lengthen this cable using 18-gauge, multi-strand copper wire.



Inline Fuse Holder

CAUTION: Some boats have 24 or 36 Volt electrical systems. Make sure that your HDR 650 is connected to a 12 VDC power supply. Use a voltage conditioner for variable inputs.

NOTE: Humminbird® is not responsible for over-voltage or over-current failures. The control head must have adequate protection through the proper selection and installation of a 1 amp fuse.

- 1a. If a fuse terminal is available, use crimp-on type electrical connectors (not included) that match the terminal on the fuse panel. Attach the black wire to ground (-), and the red wire to positive (+) 12 VDC power. Install a 1 amp fuse (not included) for protection of the unit. Humminbird® is not responsible for over-voltage or over-current failures.

or...

- 1b. If you need to wire the HDR 650 directly to a battery, obtain and install an inline fuse holder and a 1 amp fuse (not included) for the protection of the unit. Humminbird® is not responsible for overvoltage or overcurrent failures.

7. Installing the Transducer

Proceed to **Transducer Installation Overview** for installation instructions. Before you start installation, we encourage you to read the instructions carefully so that you may understand the installation requirements.

Transducer Installation Overview

Find the correct section for your transducer installation type. If you have a transom mount transducer, you can mount it on the transom (preferred), in the hull, or you can purchase the trolling motor adapter and mount it on your trolling motor.

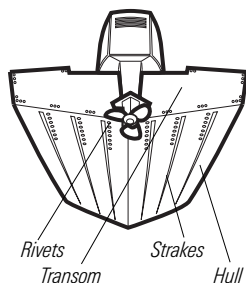
The included transducer is designed for transom mounting on the boat (directly exposed to the water). On fiberglass hull boats, this same transducer can be bonded to the inside of the hull. When mounted inside the hull, the sonar signal actually passes through the hull of the boat. One of these two mounting techniques will produce acceptable results on most boats. There are, however, several situations that may demand a different type of transducer. Inboard boats, wood or metal hulls, and sailboats often have unique transducer mounting requirements.

Transom Transducer Installation

1. Locating the Transducer Mounting Position

NOTE: If transom mounting is not possible because of a stepped hull or cavitation noise, and you have a single layer fiberglass hull, In-hull installation is an option. See *Inside the Hull Transducer Installation* for more information.

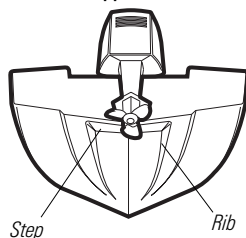
Areas of Possible Turbulence



Turbulence: You must first determine the best location on the transom to install the transducer. It is very important to locate the transducer in an area that is relatively free of turbulent water. Consider the following to find the best location with the least amount of turbulence:

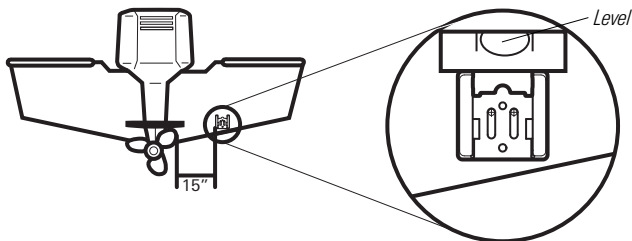
- As the boat moves through the water, turbulence is generated by the weight of the boat and the thrust of the propeller(s) - either clockwise or counter-clockwise. This turbulent water is normally confined to areas immediately aft of ribs, strakes or rows of rivets on the bottom of the boat, and in the immediate area of the propeller(s). Clockwise propellers create more turbulence on the port side. On outboard or inboard/outboard boats, it is best to locate the transducer at least 15" to the side of the propeller(s) (see the illustration **Turbulence-Free Location**).
- The best way to locate turbulence-free water is to view the transom while the boat is moving. This method is recommended if maximum high-speed operation is a high priority. If this is not possible, select a location on the transom where the hull forward of this location is smooth, flat and free of protrusions or ribs (see the illustration **Areas of Possible Turbulence**).

Stepped Hull

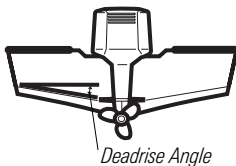


- On boats with stepped hulls, it may be possible to mount the transducer on the step. Do not mount the transducer on the transom behind a step to avoid popping the transducer out of the water at higher speeds; the transducer must remain in the water for the control head to maintain the sonar signal (see the illustration **Stepped Hull**).
- If the transom is behind the propeller(s), it may be impossible to find an area clear from turbulence, and a different mounting technique or transducer type should be considered, such as an Inside the Hull Transducer.
- If you plan to trailer your boat, do not mount the transducer too close to trailer bunks or rollers to avoid moving or damaging the transducer during loading and unloading of the boat.
- If high speed operation is critical, you may want to consider using an In-Hull transducer instead of this Transom Mount transducer.

Turbulence-Free Location



Find a turbulence-free location at least 15" from the propeller(s) and not in line with trailer bunks or rollers.



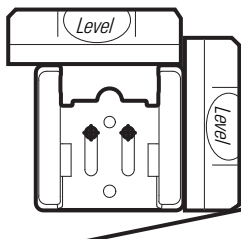
NOTE: The hydrodynamic shape of your transducer allows it to point straight down without deadrise adjustment.

NOTE: If you cannot find a transom mount location that will work for your high-speed application, find an In-Hull Transducer by contacting our Customer Resource Center at either **1-800-633-1468** or by visiting our Web site at **humminbird.com**.

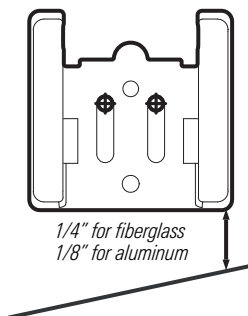
2. Preparing the Mounting Location

In this procedure, you will determine the mounting location and drill two mounting holes, using the transducer mounting bracket as a guide.

Positioning the
Mounting Bracket



Boat Hull Types Require
Different Mounting Positions

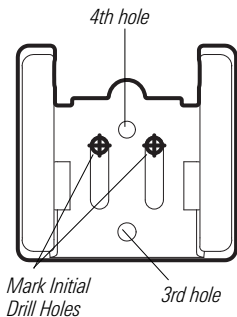


1. Make sure that the boat is level on the trailer, both from port to starboard and from bow to stern, by placing your level on the deck of the boat, first in one direction, then in the other.
2. Hold the mounting bracket against the transom of the boat in the location you have selected. Align the bracket horizontally, using the level; make sure that the lower corner of the bracket does not protrude past the bottom of the hull, and there is at least 1/4" clearance between the bottom of the bracket and the bottom of the transom for fiberglass boats, and 1/8" clearance for aluminum boats (see the illustration ***Boat Hull Types Require Different Mounting Positions***).

NOTE: If you have a flat-bottomed aluminum boat, some additional adjustment may be needed to accommodate the rivets on the bottom of the boat (i.e. the gap may need to be a little smaller than 1/8"). This will help you to avoid excessive turbulence at high speeds.

NOTE: If your propeller moves clockwise (in forward, as you're facing the stern of the boat from behind), mount the transducer on the starboard side, and align the bottom right corner of the mounting bracket with the bottom of the boat. If your propeller moves counter-clockwise (in forward, as you're facing the stern of the boat from behind), mount the transducer on the port side, and align the bottom left corner of the mounting bracket with the bottom of the boat.

Using the Mounting Bracket to Mark the Initial Drill Holes



3. Continue to hold the bracket on the transom of the boat, and use a pencil or marker to mark where to drill the two mounting holes. Mark the drill holes near the top of each slot, making sure that your mark is centered in the slot (see the illustration *Using the Mounting Bracket to Mark the Initial Drill Holes*).

NOTE: The third hole should not be drilled until the angle and height of the transducer is finalized, which you will not do until a later procedure.

4. Make sure that the drill bit is perpendicular to the actual surface of the transom, NOT parallel to the ground, before you drill. Using a 5/32" bit, drill the two holes only to a depth of approximately 1".

NOTE: On fiberglass hulls, it is best to use progressively larger drill bits to reduce the chance of chipping or flaking the outer coating.

3. Assembling the Transducer and Initial Mounting

In this procedure, you will assemble the transducer using the hardware provided, then mount it and make adjustments to its position without locking it in place.

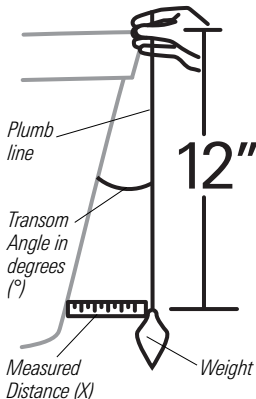
NOTE: You will initially assemble the transducer and the pivot arm by matching the two ratchets to a numbered position on the transducer knuckle. Further adjustments may be necessary.

- 1a. If you already know your transom angle, refer to the chart below for the initial position to use to set the ratchets. If your transom is angled at 14 degrees (a common transom angle for many boats) use position 1 for the ratchets. In either case, go to step 2. If you do not know your transom angle, go to step 1b.

or...

Bead Alignment Number	1		4			2		5			3		1		4		2		5			3		1									
Transom Angle (°)	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Measured Distance (x)	0.0 cm 0"			1.1 cm 1/2"			2.5 cm 1"		4.3 cm 1 5/8"			5.9 cm 2 3/8"		7.6 cm 3"		9.3 cm 3 5/8"		11.1 cm 4 3/8"		12.9 cm 5"			14.9 cm 5 7/8"			16.9 cm 6 5/8"							

Measuring the Transom Angle



- 1b. If you do not know your transom angle, measure it using a plumb line (weighted nylon string or monofilament line) exactly 12 inches long. Hold the top of the plumb line against the top of the transom with your finger, and wait until the line hangs straight down. Using a ruler, measure the distance from the bottom of the plumb line to the back of the transom, then use the chart.

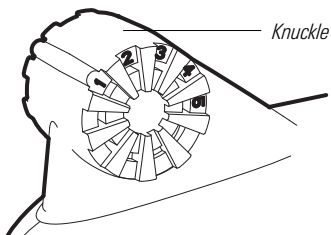
NOTE: It is important to take your measurement in the location shown in the illustration **Measuring the Transom Angle**, from exactly 12 inches down from the top of the transom.

- Place the two ratchets, one on either side of the transducer knuckle, so that the beads on each ratchet line up with the desired position number on the knuckle (see the illustration **Transducer Knuckle Positions**). If you are setting the ratchets at position 1, the beads on each ratchet will line up with the rib on the transducer knuckle to form one continuous line on the assembly (see the illustration **Ratchets Placed in Position 1**).

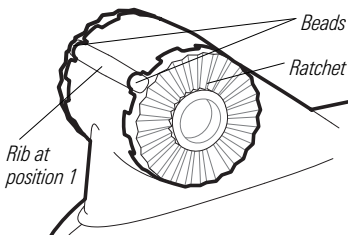
NOTE: The ratchets are keyed; make sure that the square teeth on each ratchet face the square teeth on the transducer knuckle, and the triangular teeth face outward.

Hold the ratchets on the transducer knuckle with one hand and fit the pivot arm over them until it snaps into place with the other hand. Refer to the illustration **Fitting the Mounting Bracket Over the Ratchet**.

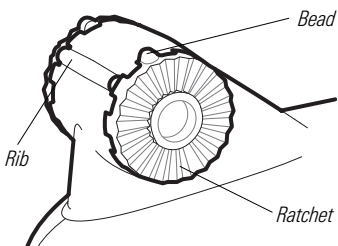
Transducer Knuckle Positions



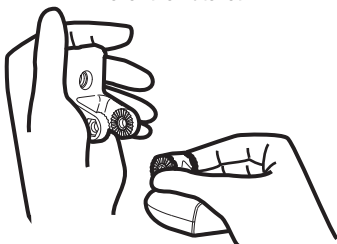
Ratchets Placed in Position 1



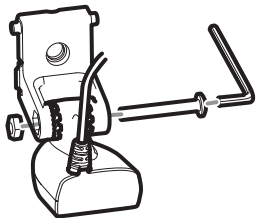
Ratchets Placed in Position 2



Fitting the Mounting Bracket over the Ratchet



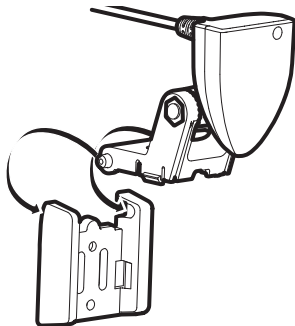
Inserting the Pivot Bolt



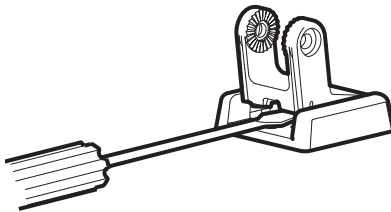
- Put the pivot bolt through the assembly to hold it in position and loosely install the nut, but do NOT tighten the nut at this time (see the illustration *Inserting the Pivot Bolt*). Insert the pivot arm assembly into the mounting bracket (see the illustration *Inserting the Pivot Arm Assembly Into the Mounting Bracket*). Do NOT snap the assembly closed, as you will need to access the mounting bracket in the next step.

NOTE: If the pivot assembly is snapped closed over the mounting bracket, use a flat head screwdriver or similar tool to gently pry the assembly away from the mounting bracket (see the illustration *Prying the Assembly Away from the Mounting Bracket*).

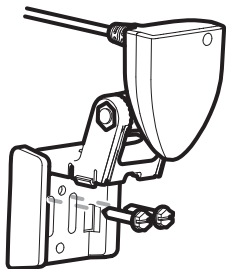
Inserting the Pivot Arm Assembly Into the Mounting Bracket



Prying the Assembly Away from the Mounting Bracket



Mounting the Assembly to the Transom



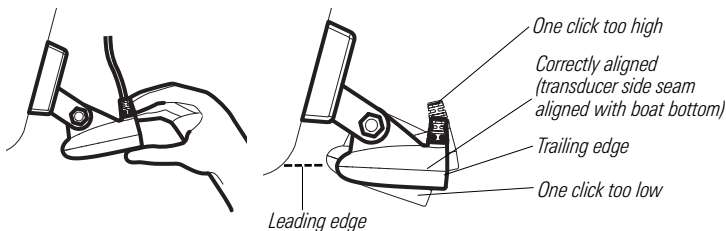
4. Align the mounting bracket transducer assembly with the drilled holes in the transom. With a 5/16" socket driver, mount the assembly to the transom using the two #10 - 1" long screws provided (see the *illustration Mounting the Assembly to the Transom*).

NOTE: Make sure that the mounting screws are snug, but do not fully tighten the mounting screws at this time to allow the transducer assembly to slide for adjustment purposes.

5. Snap the pivot arm down into place.

- Adjust the initial angle of the transducer from back to front by rotating the transducer until the side seam on the transducer is almost parallel with the bottom of the boat, one click at a time in either direction (see the illustration ***Adjusting the Initial Transducer Angle***).

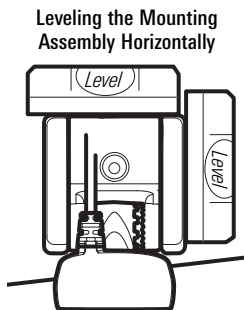
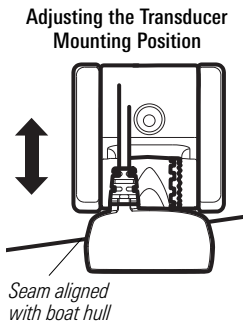
Adjusting the Initial Transducer Angle



- Adjust the transducer assembly vertically, until the seam on the leading edge of the transducer (the edge closest to the transom of the boat) is level and just slightly below the hull (see the illustration ***Adjusting the Transducer Mounting Position***).

NOTE: The transducer has a natural downward slant of 4-5 degrees from leading edge (closest to the boat transom) to trailing edge (farthest away from the boat). Looking at the back of the transducer, the seam should be slightly below the bottom of the hull.

- Continue to adjust until the bracket is also level from port to starboard (horizontally level as you look at the transducer from behind the boat (see the illustration ***Leveling the Mounting Assembly Horizontally***).



9. Mark the correct position on the transom by tracing the silhouette of the transducer mounting bracket with a pencil or marker.
10. Tighten the pivot bolt, using the pivot screw and nut to lock the assembly.
Hand tighten only!
11. Snap open the assembly and hand-tighten the two mounting screws, then snap the assembly closed.

NOTE: You will drill the third mounting hole and finalize the installation after you route the cable and test and finish the installation in the following procedures.

4. Routing the Cable

The transducer cable has a low profile connector, which must be routed to the point where the control head is mounted. There are several ways to route the transducer cable to the area where the control head is installed. The most common procedure routes the cable through the transom, into the boat.

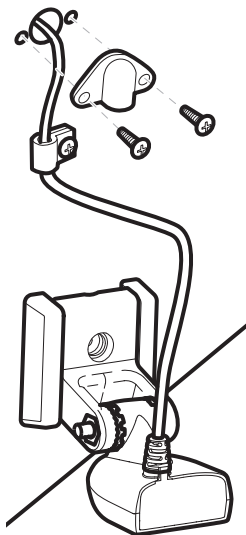
NOTE: Your boat may have a pre-existing wiring channel or conduit that you can use for the transducer cable.

1. Unplug the other end of the transducer cable from the control head (if it is already connected). Make sure that the cable is long enough to accommodate the planned route by running the cable over the transom.

CAUTION! Do not cut or shorten the transducer cable, and try not to damage the cable insulation. Route the cable as far as possible from any VHF radio antenna cables or tachometer cables to reduce the possibility of interference. If the cable is too short, extension cables are available to extend the transducer cable up to a total of 50'. For assistance, contact the Customer Resource Center at humminbird.com or call **1-800-633-1468** for more information.

NOTE: The transducer can pivot up to 90 degrees in the bracket. Allow enough slack in the cable for this movement. It is best to route the cable to the side of the transducer so the transducer will not damage the cable during movement.

Routing the Cable



- 2a. If you are routing the cable over the transom of the boat, secure the cable by attaching the cable clamp to the transom, drilling 9/64" diameter holes for #8 x 5/8" wood screws, then skip directly to procedure 5, **Connecting the Cable**.

or...

- 2b. If you will be routing the cable through a hole in the transom, drill a 5/8" diameter hole above the waterline. Route the cable through this hole, then fill the hole with marine-grade silicone sealant and proceed to the next step immediately (see the illustration **Routing the Cable**).
3. Place the escutcheon plate over the cable hole and use it as a guide to mark the two escutcheon plate mounting holes. Remove the plate, drill two 9/64" diameter x 5/8" deep holes, and then fill both holes with marine-grade silicone sealant. Place the escutcheon plate over the cable hole and attach with two #8 x 5/8" wood screws.

4. Route and secure the cable by attaching the cable clamp to the transom; drill one 9/64" diameter x 5/8" deep hole, then fill hole with marine-grade silicone sealant, then attach the cable clamp using a #8 x 5/8" screw.

Storing Excess Cable



NOTE: If there is excess cable that needs to be gathered at one location (as shown in the illustration), dress the cable routed from both directions so that a single loop is left extending from the storage location. Doubling the cable up from this point, form the cable into a coil. Storing excess cable using this method can reduce electronic interference (see the illustration **Storing Excess Cable**).

5. Connecting the Cable

If you unplugged the transducer cable at the beginning of this procedure, plug it back into the depth sounder.

NOTE: The connector is keyed to prevent reverse installation, so be careful not to force the plug into the connector the wrong way.

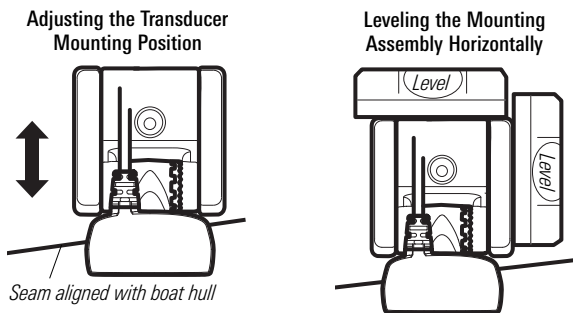
6. Test and Finish the Installation

Once you have installed both the HDR 650 and the transom transducer, and have routed all the cables, you must perform a final test before locking the transducer in place. Testing should be performed with the boat in the water although you can initially confirm basic operation with the boat out of the water.

1. Turn on the power source to power up the HDR. If the unit does not power up, make sure that the connector holder is fully seated in the receptacle and that power is available.
2. If all connections are correct and power is available, the Humminbird® control head will enter Normal operation.
3. If the digital depth readout displays on the screen, the unit is working properly. Make sure that the boat is in water greater than 2' but less than the depth capability of the unit, and that the transducer is fully submerged, since the sonar signal cannot pass through air.

NOTE: The transducer must be submerged in water for reliable transducer detection.

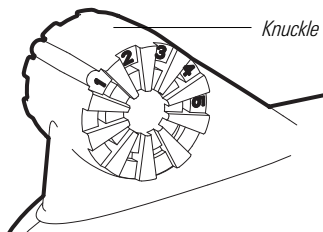
4. If the unit is working properly, gradually increase the boat speed to test high-speed performance. If the unit functions well at low speeds, but begins to skip or miss the bottom at higher speeds, the transducer requires adjustment.
5. If you have the correct angle set on the transducer, yet lose a bottom reading at high speed, adjust the height and the running angle in small increments to give you the ideal transducer position for your boat. First, adjust the height in small increments (see the illustration **Adjusting the Transducer Mounting Position**).



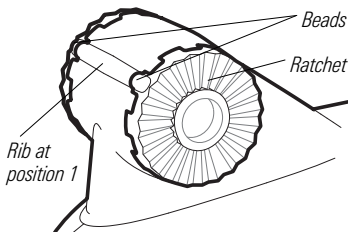
NOTE: The deeper the transducer is in the water, the more likely that a rooster tail of spray will be generated at high speeds, so make sure that the transducer is as high as it can be and still be submerged in the water.

If you are still not getting good high speed readings, you may need to disassemble the transducer mounting assembly and re-position the ratchets (see the illustrations **Transducer Knuckle Positions**, **Ratchets Placed in Position 1**, **Ratchets Placed in Position 2**, and **Fitting the Mounting Bracket Over the Ratchet**).

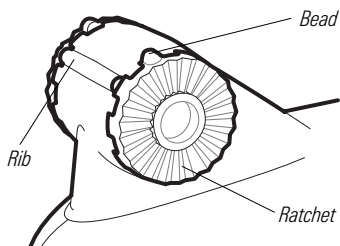
Transducer Knuckle Positions



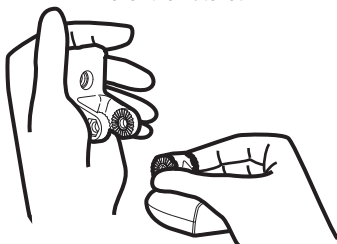
Ratchets Placed in Position 1



Ratchets Placed in Position 2



Fitting the Mounting Bracket over the Ratchet



If you do change the transducer position, re-trace the position of the mounting bracket before proceeding.

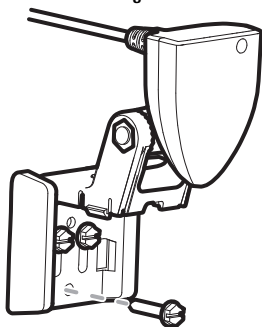
NOTE: It is often necessary to make several incremental transducer adjustments before optimum high speed performance is achieved. Due to the wide variety of boat hulls, however, it is not always possible to obtain high speed depth readings.

6. Once you have reached a consistently good sonar signal at the desired speeds, you are ready to lock down the transducer settings. Force the pivot to the Up position to gain access to the mounting screws, then re-align the mounting bracket against the transom of the boat to match the traced silhouette. Check the bracket position with the level again to make sure it is still level, then mark the third mounting hole using a pencil or marker. Unscrew and remove the mounting screws and the transducer assembly and set aside.

7. Drill the third mounting hole, using a 5/32" drill bit. Use a marine-grade silicone sealant to fill all three drilled mounting holes, especially if the holes penetrated the transom wall.

NOTE: *On fiberglass hulls, it is best to use progressively larger drill bits to reduce the chance of chipping or flaking the outer coating.*

**Fully Tighten All Three
Mounting Screws**

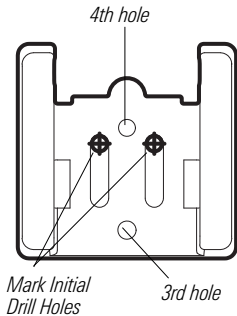


8. Re-position the transducer assembly against the transom of the boat, then hand-install all three screws. Make sure that the transducer location and the pivot angle have not changed, then fully tighten all three mounting screws (see the illustration **Fully Tighten All Three Mounting Screws**). Snap the pivot back down. If you have performed the preceding procedures correctly, the transducer should be level and at the right height for optimal operation.

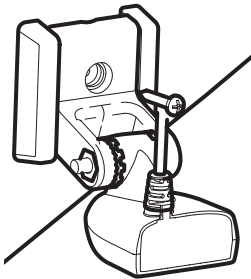
7. Locking Down the Transducer (Optional)

NOTE: You have the option to lock down the Two Piece Kick Up bracket if you do not want the transducer to kick up. Please be aware, however, that the transducer can be damaged if it is locked down and it strikes debris in the water.

Using the Mounting Bracket to Mark the Initial Drill Holes



Locking the Pivot Arm



1. To lock down the transducer, trace the position of the mounting bracket. Force the pivot to the Up position to gain access to the mounting screws, then re-align the mounting bracket against the transom of the boat to match the traced silhouette. Check the bracket position with the level again to make sure it is still level, then mark the fourth mounting hole using a pencil or marker (see the illustration **Using the Mounting Bracket to Mark the Initial Drill Holes**). Unscrew and remove the mounting screws and the transducer assembly and set aside.
2. Drill the fourth mounting hole, using a 9/64" drill bit. Use a marine grade silicone sealant to fill all four drilled mounting holes, especially if the holes penetrate the transom wall.
3. Re-position the transducer assembly against the transom of the boat, then hand install the first three screws (two on the outside edges and one in the 3rd mounting hole). Make sure that the transducer location and the pivot angle have not changed, then fully tighten all three mounting screws (see the illustration **Fully Tighten All Three Mounting Screws**). **Hand-tighten only!** Snap the pivot back down.
4. Install #8 x 1" wood screw into the 4th hole to lock down the pivot arm (see the illustration **Locking the Pivot Arm**). Hand-tighten only!

Inside the Hull Transducer Installation

In-hull mounting generally produces good results in single-thickness fiberglass-hulled boats. Humminbird® cannot guarantee depth performance when transmitting and receiving through the hull of the boat, since some signal loss occurs. The amount of loss depends on hull construction and thickness, as well as the installation position and process.

WARNING! *This installation requires slow-cure two-part epoxy. Do not use silicone or any other soft adhesive to install the transducer, as this material reduces the sensitivity of the unit. Do not use five-minute epoxy, as it has a tendency to cure before all the air bubbles can be purged, thus reducing signal strength.*

NOTE: *In-hull mounting requires an installed and operational depth sounder.*

1. Locating the Transducer Mounting Position

Decide where to install the transducer on the inside of the hull. Consider the following to find the best location:

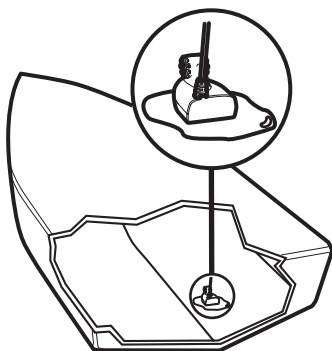
- Observe the outside of the boat hull to find the areas that are mostly free from turbulent water. Avoid ribs, strakes and other protrusions, as these create turbulence.
- As a general rule, the faster the boat can travel, the further aft and closer to the centerline of the hull the transducer has to be located in order to remain in contact with the water at high speeds.

2. Trial Installation

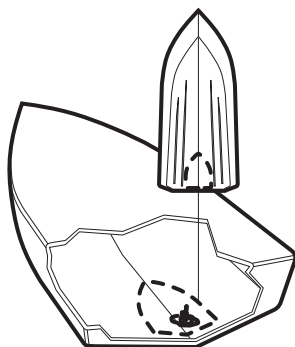
You will not be able to adjust the mounting after an inside the hull transducer is installed. It is best, therefore, to perform a trial installation first that includes running the boat at various speeds, in order to determine the best mounting area before permanently mounting the transducer.

1. Plug the transducer into the depth sounder, then power up the depth sounder. When the depth sounder detects a functioning transducer, it will automatically enter Normal operating mode.

Positioning the Transducer



Preferred Mounting Area



2. View the sonar signal at its best by holding the transducer over the side, immersed in the water, so that it is pointing straight down over a known flat bottom. Use the display to benchmark against the sonar signal that will be detected once the transducer is placed in the hull.
3. Place the transducer body face down at the identified mounting location inside the hull, with the pointed end towards the bow (see the illustrations *Positioning the Transducer* and *Preferred Mounting Area*).

4. Fill the hull with enough water to submerge the transducer body. Use a sand-filled bag or other heavy object to hold the transducer in position. The transducer cannot transmit through air, and the water purges any air from between the transducer and the hull, and fills any voids in the coarse fiberglass surface.
5. View the sonar signal on the display and compare against what was observed in Step 2, making sure that the boat is in the same location as it was during your observations in Step 2. If the results are comparable, move on to Step 6. Otherwise, locate a new position in the hull and repeat Steps 3 through 5.
6. Run the boat at various speeds and water depths while observing the screen on the depth sounder. If depth performance is required, test the transducer in water at the desired depth. If the performance is acceptable, move on to Step 7. If the performance is not acceptable, repeat Steps 3 through 6.
7. Once you have determined the best mounting location using the above steps, mark the position of the transducer.

3. Routing the Cable

1. Once the mounting location is determined and you have marked the position of the transducer, route the cable from the transducer to the depth sounder.

CAUTION! Do not cut or shorten the transducer cable, and try not to damage the cable insulation. Route the cable as far as possible from any VHF radio antenna cables or tachometer cables to reduce the possibility of interference. If the cable is too short, extension cables are available to extend the transducer cable up to a total of 50' (15 m). For assistance, contact the Customer Resource Center at humminbird.com or call 1-800-633-1468 for more information.

4. Permanently Mounting the Transducer

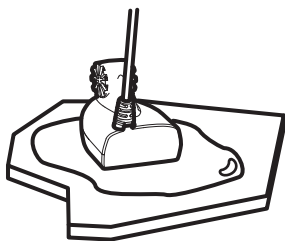
NOTE: Once permanently mounted, you will not be able to make further adjustments to the transducer.

Coating the Transducer with Epoxy



1. Make sure the position of the transducer is marked.
2. Remove the water from inside the hull and thoroughly dry the mounting surface. If the surface is excessively rough, it may be necessary to sand the area to provide a smooth mounting surface.
3. Mix an ample quantity of two-part slow cure epoxy slowly and thoroughly. Avoid trapping air bubbles.
4. Coat the face of the transducer and the inside of the hull with epoxy (see the illustration *Coating the Transducer with Epoxy*).

Pressing the Transducer Into Place



5. Press the transducer into place with a slight twisting motion to purge any trapped air from underneath, keeping the pointed end of the transducer body pointed forward, towards the bow (see the illustration *Pressing the Transducer Into Place*).

NOTE: Proper operation requires the pointed end of the transducer body to face towards the bow.

6. Weight the transducer so that it will not move while the epoxy is curing.

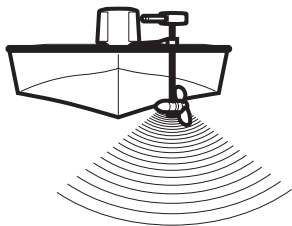
NOTE: When the epoxy cures, no water is necessary inside the hull.

7. If you unplugged the transducer cable at the beginning of this procedure, plug it back into the depth sounder.

NOTE: The connector is keyed to prevent reverse installation, so be careful not to force the plug into the connector the wrong way.

NOTE: Neither water, spilled gasoline, nor oil will affect the performance of the transducer.

Trolling Motor Transducer Installation



Several styles of the transducer are compatible with trolling motor mounting. If you have a trolling motor bracket, refer to the separate installation instructions that are included with the bracket.

Trolling Motor Transducer Options

If you don't have a trolling motor transducer, there are several options:

- You may purchase a Trolling Motor Adapter kit that will allow you to mount the transducer on the trolling motor.
- You may also exchange your NEW and UNASSEMBLED transducer (with mounting hardware included) for a trolling motor transducer.

NOTE: There are also several transducer switches available that support the configuration of two depth sounders with one transducer or two transducers with one depth sounder.

NOTE: Call the Humminbird® Customer Resource Center at **1-800-633-1468** for details and pricing, or visit **humminbird.com** for more information.

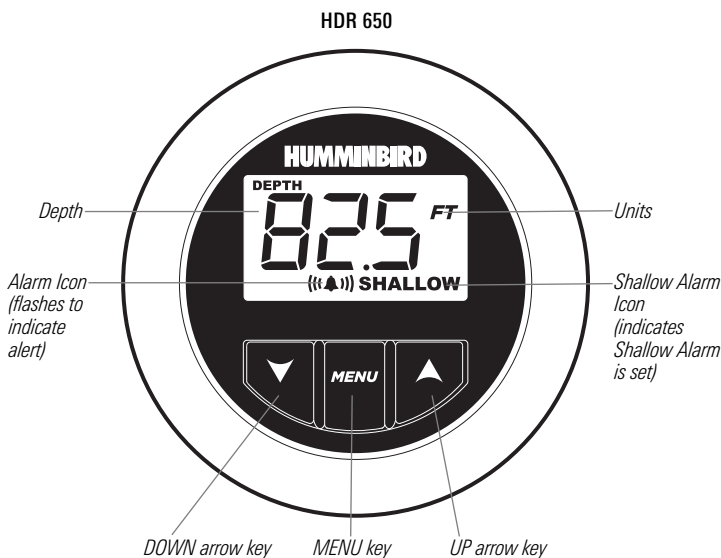
Operating the HDR 650

Your HDR 650 Digital Depth Sounder sends a sound wave signal and determines distance by measuring the time between the transmission of the sound wave and when the sound wave is reflected off of an object. As your HDR 650 transducer receives sonar signals, it converts them to a digital depth that is shown on the HDR 650 display. The depth reading is continuously updated as you travel across the water. The liquid crystal display (LCD) offers sharp viewing, even in bright, direct sunlight, and is continuously lit for nighttime operation.

***NOTE:** Actual depth capability depends on such factors as bottom hardness, water conditions, and transducer installation. Units will typically read to deeper depths in fresh water than in salt water.*

The HDR 650 Control Head

The HDR 650 uses a backlit display, together with a 3-button keypad, to control all user functions. The illustration below shows an example of the digital display.



Power On/Off

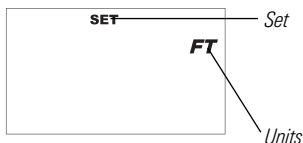
The power is controlled by the power source connected to the HDR 650. When the power source is turned on, the HDR 650 is powered on. When the power source is turned off, the HDR 650 is powered off.

Key Functions Overview

1. **Select a Function:** Press the MENU key repeatedly until you reach the appropriate menu.
2. **Adjust the Setting:** Press the UP or DOWN arrow key to adjust the setting. Press + Hold either key to scroll through the range of settings quickly.
3. **Save:** After your selection is made, wait 5 seconds for the unit to return to normal operation. Your settings are saved automatically even after the unit is powered off.

Units

The Units control function selects the units of measure for depth readout and alarm functions. You can set the units of measurement to feet, meters, or fathoms.

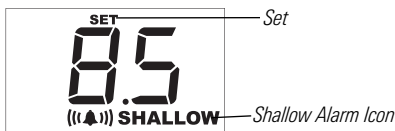


1. Press the MENU key until the Units icon is displayed and flashing on the screen.
2. Press the UP or DOWN arrow key to scroll through the available units. (FT = feet, M = meters, FA = fathoms).
3. After your selection is made, wait 5 seconds for the unit to return to normal operation. Your settings are saved automatically.

Shallow Alarm

The Shallow Alarm will sound when the measured depth is less than the setting.

1. Press the MENU key until the Shallow Alarm icon is displayed and flashing on the screen.



2. Press the UP or DOWN arrow key to change the setting.
(Off, 1 - 20 feet, .1 - 6 meters, or .1 - 3.2 fathoms; Default = Off)

NOTE: The maximum Shallow Alarm setting cannot meet or exceed the current Deep Alarm setting (see the **Deep Alarm** section).

3. After your selection is made, wait 5 seconds for the unit to return to normal operation. Your settings are saved automatically, and the Shallow icon will be visible on the display.
4. **Alarm:** If the depth of the water is less than the saved setting, the alarm will sound and the alarm icon will flash on the screen.

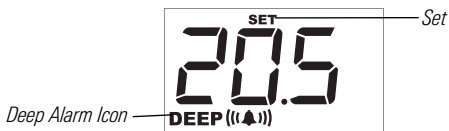
Mute: Press any key to mute the alarm.

Adjust: Press the MENU key and follow the instructions in step 2 to adjust the alarm setting.

Deep Alarm

The Deep Alarm will sound when the measured depth is greater than the setting.

1. Press the MENU key until the Deep Alarm icon is displayed and flashing on the screen.



2. Press the UP or DOWN arrow key to change the setting. (Off, 20 - 99 feet, 6 - 30 meters, or 3.3 - 16 fathoms; Default = Off)

NOTE: The minimum Deep Alarm setting cannot meet or drop below the current Shallow Alarm setting (see the **Shallow Alarm** section).

3. After your selection is made, wait 5 seconds for the unit to return to normal operation. Your settings are saved automatically, and the Deep icon will be visible on the display.
4. **Alarm:** If the depth of the water is greater than the saved setting, the alarm will sound and the alarm icon will flash on the screen.

Mute: Press any key to mute the alarm.

Adjust: Press the MENU key and follow the instructions in step 2 to adjust the alarm setting.

Set Offset (waterline or keel)

The Set Offset function adjusts the digital depth readout to display depth readings from the waterline or the keel (lowest point of the boat) instead of the transducer location.

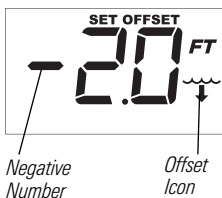
1. Choose to measure the depth from the **keel** or **waterline**.

Keel: Measure the vertical distance between the face of the transducer and the keel of the boat.

Waterline: Measure the vertical distance between the face of the transducer and the waterline of the boat.

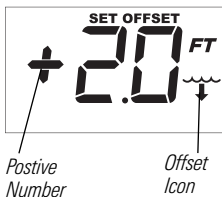
2. Press the MENU key until Set Offset is displayed and flashing on the screen.
3. Enter your chosen offset measurement as follows:

Keel Offset (Set a Negative Number)



Keel: Press the DOWN arrow key to enter the measurement from step 1 as a negative (-) number. (-1 to -10 feet, -.1 to -3.0 meters, or -.1 to -1.6 fathoms; Default = 0)

Waterline Offset (Set a Positive Number)



Waterline: Press the UP arrow key to enter the measurement from step 1 as a positive (+) number. (+1 to +10 feet, +.1 to +3.0 meters, or +.1 to +1.6 fathoms; Default = 0)

4. After your selection is made, wait 5 seconds for the unit to return to normal operation. Your settings are saved automatically, and the offset icon will be visible on the display.

Maintenance

To keep both your HDR 650 and your transducer working properly, perform the following maintenance tasks as needed.

HDR 650 Maintenance

If your HDR 650 unit comes into contact with salt spray, simply wipe the affected surfaces with a cloth dampened in fresh water. Do not use a chemical glass cleaner on the lens, as chemicals in the solution may cause cracking in the lens. When cleaning the LCD protective lens, use a chamois and non-abrasive, mild cleaner. Do not wipe while dirt or grease is on the lens. Be careful to avoid scratching the lens.

***WARNING:** Never leave your HDR 650 in a closed car or trunk; the extremely high temperatures generated in hot weather can damage the electronics.*

Transducer Maintenance

If your boat remains in the water for long periods of time, algae and other marine growth can reduce the effectiveness of the transducer. Periodically clean the face of the transducer with hot water. Pivoting the transducer up in the bracket may allow better access for inspection or cleaning.

If your boat remains out of the water for a long period of time, it may take some time to wet the transducer after it is returned to the water. Small air bubbles can cling to the surface of the transducer and interfere with proper operation. These bubbles will dissipate with time, or you may wipe the face of the transducer with your fingers after the transducer is in the water.

Troubleshooting

Before contacting the Humminbird® Customer Resource Center, please read the following section. Taking the time to review these troubleshooting guidelines may allow you to solve a performance problem yourself, and therefore avoid sending your unit back for repair.

NOTE: Do not attempt to repair the HDR 650 yourself, as there are no user-serviceable parts inside, and special tools and techniques are required for reassembly in order to maintain the waterproof integrity of the housing. Repairs should be performed only by authorized Humminbird® technicians.

HDR 650 Doesn't Power Up

If your HDR 650 doesn't power up, refer to the Installation section, and make sure that:

- the power cable is properly connected to the HDR 650;
- the power cable is wired correctly, with red to positive battery terminal and black to negative terminal or ground;
- the fuse is operational; a fuse can often appear to be good when in fact it is not; check the fuse with a tester or replace it with a known good fuse;
- if the unit is wired through a fuse panel, make sure that the panel is powered, as accessory fuse panels are often controlled by a separate switch, or even the ignition switch of the boat;
- the battery voltage of the power connector is between 10 and 20 VDC.

Correct any known problems, including removing corrosion from the battery terminals or wiring, or actually replacing the battery if necessary.

No Bottom Reading on the Display

If there is no bottom reading visible on the display, there are a number of possible causes for this condition, including:

- if the loss of bottom information occurs only at high boat speeds, then a transducer adjustment may be needed (refer to the Transducer Installation section);
- check the transducer cable connection on the back of the HDR 650 and make sure that the cable to the transducer has not been cut or pinched, as even a small abrasion in the cable can affect performance significantly.

Correct any known problems, including adjusting the transducer, or actually replacing the transducer cable if necessary.

No Continuous Depth Display in Very Shallow Water

Losing continuous depth when the boat is in very shallow water is normal, because the automatic range control cannot lock onto the bottom in depths of one foot or less.

Screen Fades, Images are not Sharp

If the screen begins to fade, and images are not as sharp as normal, check the input voltage. The HDR 650 will not operate on input voltages below 10 VDC.

Bottom Reading Disappears During a Hard Turn

Losing the bottom reading temporarily when the boat is executing a hard turn is normal, as the transducer emerges from the water during such a turn; this condition should correct itself once the turn is completed.

1-Year Limited Warranty

We warrant the original retail purchaser that products made by Humminbird® have been manufactured free from defects in materials and workmanship. This warranty is effective for one year from the date of original retail purchase. Humminbird® products found to be defective and covered by this warranty will be replaced or repaired free of charge at Humminbird® option and returned to the customer freight prepaid. Humminbird® sole responsibility under this warranty is limited to the repair or replacement of a product that has been deemed defective by Humminbird®. Humminbird® is not responsible for charges connected with the removal of such product or reinstallation of replaced or repaired parts.

This warranty does not apply to a product that has been:

- Improperly installed;
- Used in an installation other than that recommended in the product installation and operation instructions;
- Damaged or has failed because of an accident or abnormal operation;
- Repaired or modified by entities other than Humminbird®.

Please retain your original receipt as a proof of the purchase date. This will be required for in-warranty service.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, OBLIGATIONS OR LIABILITIES ON THE PART OF HUMMINBIRD® AND WILL BE THE CUSTOMER'S EXCLUSIVE REMEDY, EXCEPT FOR ANY APPLICABLE IMPLIED WARRANTIES UNDER STATE LAW WHICH ARE HEREBY LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL PURCHASE. IN NO EVENT WILL HUMMINBIRD® BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY RELATING TO THE PRODUCTS.

Some states do not allow limitations on an implied warranty, or the exclusion of incidental or consequential damages, so the above exclusions may not apply to you. You may also have other rights, which vary from state to state.

Humminbird® Service Policy

Even though you'll probably never need to take advantage of our incredible service policy, it's good to know that we back our products this confidently. We do it because you deserve the best. We will make every effort to repair your unit within three business days from the receipt of your unit at our factory. This does not include shipping time to and from our factory. Units received on Friday are typically shipped by the following Wednesday, units received Monday are typically shipped by Thursday, etc.

All repair work is performed by factory-trained technicians to meet exacting factory specifications. Factory-serviced units go through the same rigorous testing and quality control inspections as new production units.

After the original warranty period, a standard flat rate service charge will be assessed for each repair (physical damage and missing parts are not included). Any repairs made after the original warranty will be warranted for an additional 90 days after service has been performed by our factory technicians. You can contact our Customer Resource Center or visit our web site to verify the flat rate repair fee for your product (visit the Product Support section):

<http://www.humminbird.com>

We reserve the right to deem any product unserviceable when replacement parts are no longer available or impossible to obtain. This Service Policy is valid in the United States only. This applies only to Humminbird® products returned to our factory in Eufaula, Alabama. This Service Policy is subject to change without notice.

DOMESTIC (USA) CUSTOMERS:

PLEASE DO NOT RETURN THIS PRODUCT TO STORE FOR SERVICE

For all technical issues please call **1-800-633-1468**
or visit **www.humminbird.com**, click **SUPPORT**.

Please reference product serial number and model number when contacting Humminbird®.

Returning Your Unit for Service

Before sending your unit in for repair, please contact the factory, either by phone or by email, to obtain a Repair Authorization Number for your unit.

NOTE: *Please do not return your Humminbird® to the store for service.*

Please have your product model name and serial number available before calling the factory. If you contact the factory by e-mail, please include your product model name and serial number in the e-mail, and use Request for Repair Authorization Number for your e-mail subject header. You should include your Repair Authorization Number in all subsequent communications about your unit.

For IN-WARRANTY service, complete the following steps:

- Obtain a Repair Authorization Number from the Humminbird® Customer Resource Center.
- Tag product with your name, street address, phone number and your assigned Repair Authorization Number.
- Include a brief written description of the problem.
- Include a copy of your receipt (to show proof and date of purchase).
- Return product freight prepaid to Humminbird®, using an insured carrier with delivery confirmation.

For OUT-OF-WARRANTY service, complete the following steps:

- Obtain a Repair Authorization Number from the Humminbird® Customer Resource Center.
- Include payment in the form of credit card number and expiration date, money order or personal check. Please do not send cash.
- Tag product with your name, street address, phone number and your assigned Repair Authorization Number.
- Include a brief written description of the problem.
- Return product freight prepaid to Humminbird®, using an insured carrier with delivery confirmation.

Specifications

Depth Capability	600 ft (180 m)
Power Cable Length	.36" (91 cm)
Operating Frequency	.200 kHz
Area of Coverage	.20° @ -10 dB
Power Output	.250 Watts (RMS), 2000 Watts (Peak to Peak)
Current Draw	.60 mA
Power Requirement	.10 - 20 VDC
Display	Liquid Crystal Diode (LCD)
Mounting	In-Dash 2 1/8" hole
Unit Housing	High-Impact Plastic
Transducer	.XNT 9 20
Transducer Cable Length	.20 ft (6 m)
IPX Rating	.IP67 Waterproof/Submersible @ 1 m for 30 minutes and dust tight

NOTE: Humminbird® verifies maximum stated depth in saltwater conditions, but actual depth performance may vary due to transducer installation, water type, thermal layers, bottom composition and slope.

NOTE: Product specifications and features are subject to change without notice.

ENVIRONMENTAL COMPLIANCE STATEMENT: *It is the intention of Humminbird® to be a responsible corporate citizen, operating in compliance with known and applicable environmental regulations, and a good neighbor in the communities where we make or sell our products.*

WEEE DIRECTIVE: *EU Directive 2002/96/EC "Waste of Electrical and Electronic Equipment Directive (WEEE)" impacts most distributors, sellers, and manufacturers of consumer electronics in the European Union. The WEEE Directive requires the producer of consumer electronics to take responsibility for the management of waste from their products to achieve environmentally responsible disposal during the product life cycle.*

WEEE compliance may not be required in your location for electrical & electronic equipment (EEE), nor may it be required for EEE designed and intended as fixed or temporary installation in transportation vehicles such as automobiles, aircraft, and boats. In some European Union member states, these vehicles are considered outside of the scope of the Directive, and EEE for those applications can be considered excluded from the WEEE Directive requirement.



This symbol (WEEE wheeled bin) on product indicates the product must not be disposed of with other household refuse. It must be disposed of and collected for recycling and recovery of waste EEE. Humminbird® will mark all EEE products in accordance with the WEEE Directive. It is our goal to comply in the collection, treatment, recovery, and environmentally sound disposal of those products; however, these requirements do vary within European Union member states. For more information about where you should dispose of your waste equipment for recycling and recovery and/or your European Union member state requirements, please contact your dealer or distributor from which your product was purchased.

Contact Humminbird®

Contact the Humminbird® Customer Resource Center
in any of the following ways:

By Telephone:

(Monday - Friday 8:00 a.m. to 4:30 p.m. Central Standard Time):

1-800-633-1468

By e-mail:

(typically we respond to your e-mail within three business days):

service@humminbird.com

For direct shipping, our address is:

Humminbird

Service Department

678 Humminbird Lane

Eufaula, AL 36027 USA



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