SYSTEM OPERATION

When used on hulls, this product is designed with work with ablative bottom paint coatings. For best results, please ensure your current application of bottom paint is not depleted of ablative material. Once your Hull Shield system is installed, it will extend the life of your ablative surfaces.

All surfaces will need to be cleaned following the initial installation. Hull Shield systems work by preventing fouling from attaching to surfaces. The existing fouling accumulated prior to your Hull Shield installation must be removed. ***Even if the surfaces look clean, microscopic fouling will already have attached to surfaces and become visible at a later time***.

Your new Hull Shield Ultrasonic Anti-Fouling System is designed to operate fully automatically and provide maintenance-free operation. After all of the signal cables have been connected to the controller, you can power your system on and start protecting your boat with ultrasound.

AUTO CALIBRATION

When the system is first switched on, it will begin an initial calibration to calibrate and customize the output for each individual transducer. The LED indicator will blink rapidly during this process (both red and green). The calibration can last up to one minute. After the initial calibration, the system will re-calibrate approximately every six hours to ensure that each transducer is receiving an optimal signal.

AUTOMATIC RUNTIME

After calibration, the system will enter an automatic program that will transmit a unique pattern of ultrasonic signals to each transducer. During runtime, the LED indicator will blink green for each transducer / ultrasound burst. The HD100 has four transducer ports - the LED blink pattern will be four steady blinks followed by a fast blink to denote the start of a new "four-count" blink cycle. If one or more of the four blinks is red, a fault is detected - See FAULT EVENTS below.

POWER CONSERVATION MODE

Under normal circumstances (when docked or underway) a boat with maintained batteries will retain a charge above 12.7V. However, if the controller senses that battery levels are being depleted, it will begin to conserve power by increasing the time between ultrasound bursts. Power conservation begins at 12.6V. If voltage levels continue to drop, the Hull Shield system will continue to increase the time between bursts at a linear rate, until the voltage has dropped to 12.0V.

LOW BATTERY INDICATOR

When the battery voltage drops below 12.0V, the system will enter an idle SLEEP MODE to conserve battery power for other essential boating operations. The system will automatically resume operation when the battery level rises above 12.2V. While in sleep mode, the LED indicator will briefly flash red every eight seconds and the controller will emit a short beep (similar to a smoke detector).

FAULT EVENTS

The HD100 controller can detect signal cable fault events and continue operating the remaining transducers.

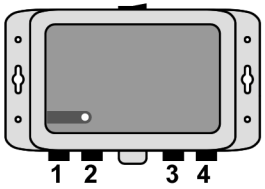
⚠ **NO TRANSDUCER DETECTED** - If the controller does not sense a transducer, or a connection to a transducer is interrupted, the system will ignore that port and continue to operate the remaining ports and transducers.

⚠ **SHORTED WIRES OR WATER INTRUSION IN A SINGAL CABLE** - If the controller senses an excessive current drain caused by water intrusion or a damaged signal cable, the system will ignore that port and continue to operate the remaining ports and transducers. The controller will emit an intermittent "BEEP" to alert this fault.

When the system flags a transducer fault on an associated port, the LED indicator blink for that port will be red instead of green to indicate the specific port with the problem. The remaining operational port blinks will remain green.

EXAMPLE: If the third transducer port has a fault, the LED blink pattern will be a short-green-blink (start of count) - then; green - green - red - green. The pattern will then repeat.

Please note that after the issue causing the fault has been isolated and resolved, the system must be turned off, then back on, to reestablish the port connection.



INSTALLATION SUPPORT

Check our online repsository for additional installation guides and media: ***https://hullshield.net/install***

When in doubt, ask...

We're here to help you acheive a successful installation.
Contact us with questions you have about your specific installation.

PHONE: +1-843-566-5892 **EMAIL: support@hullshield.net**

MAXIMUM INPUT VOLTAGE: **15.0V** PEAK CURRENT REQUIREMENT (1ms): **2A** AVERAGE CURRENT CONSUMPTION: **1Ah**	FULL POWER OUTPUT RANGE: **12.7V TO 15.0V** REDUCED POWER RANGE: **12.0V TO 12.6V** SLEEP / IDLE RANGE: **BELOW 12.0V**
FREQUENCY RANGE: **20kHz to 45kHz** ULTRASOUND BURST PERIOD: **400ms**	AUXILLARY INDICATOR OUTPUT VOLTAGE: **12V** AUXILLARY INDICATOR MAX CURRENT: **20mA**

HULL SHIELD™ *VERSION HD100/22.10A*

HD100

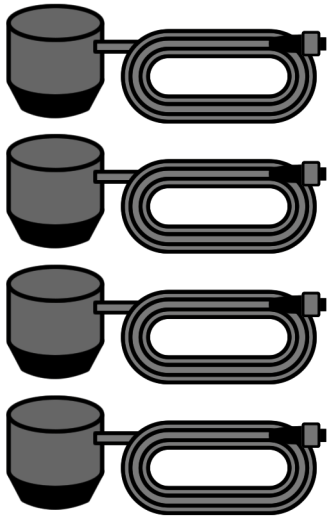
INSTALLATION & OPERATION GUIDE

Your Hull Shield Ultrasonic System must be installed correctly for optimum performance. Hull Shield systems are designed to operate 24 hours a day. Your battery system must be maintained and charged to ensure your Hull Shield system continues to provide around-the-clock anti-fouling protection. Power to the watercraft can be supplied through a standard battery maintainer or a dedicated shore-power hookup. Alternative power sources include solar and wind energy; however it is necessary to exercise additional precautions to minimize downtime when using these alternative charging sources.

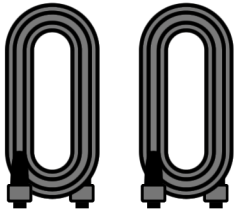
HD100 SYSTEM CONTENTS

1x HD100 Controller Module

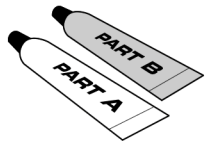
4x Ultrasonic Transducers



2x Signal Cable Extensions



1x Epoxy Adhesive Kit

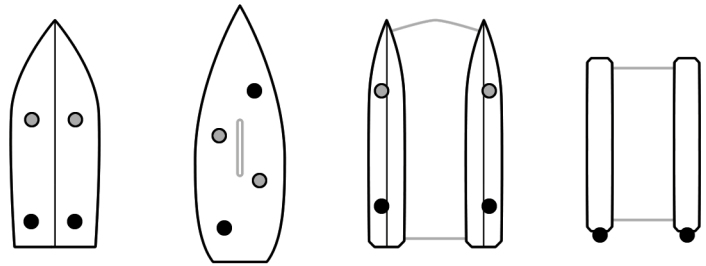


HULL MOUNTING LOCATIONS

Transducers are most often attached to the interior of the hull - situated at an elevation below the waterline. Locations are chosen to maximize effectiveness and achieve even coverage. A properly fitted system will produce excellent anti-fouling results. Transducer locations are determined by hull shape, size, and the number of transducers to be installed.

These images provide a general guide for transducer placement. The final position you choose will depend on available access to these areas.

- **Installation of Two (2) Transducers**
- **Installation of Four (4) Transducers**



OPTIONAL EXTERIOR TRANSOM & PONTOON ATTACHMENT - Hull Shield transducers are submersible and can be mounted to the exterior hull surface. This is required for pontoon boats. Exterior attachment can also be an ideal location for cored-hull boats under 32ft.

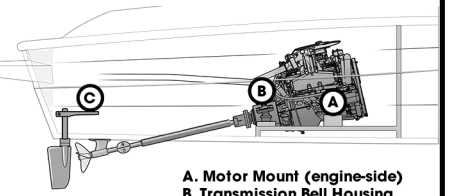
For exterior attachment on monohull transoms, two transducers are attached to the transom below the water - one per side.

For exterior attachment on pontoons, one transducer is attached to the rear face of each pontoon below the water.

DRIVE & ACCESSORY ATTACHMENT LOCATIONS

The drive system and other peripherals (rudders, swim platforms, trim tabs etc.) are isolated from the hull by sound dampening materials. Due to this isolation, each of these parts require a ultrasonic transducer dedicated to protecting them.

For **straight drive** shafts and props, transducers can be mounted on the engine-side of the motor mounts (location A), or directly to the transmission bell housing (location B). Rudders are also isolated from the hull and require a dedicated transducer. A transducer can be attached directly to the tiller arm/quadrant (location C). Please ensure the transducer does not interfere with tiller/quadrant rotation.



A. Motor Mount (engine-side)
B. Transmission Bell Housing
C. Rudder Tiller Arm

Pod drives only require one transducer per pod, attached directly to the pod on the hydraulic gear box.

Stern drives require one transducer per drive - mounted directly to the engine/transmission or motor mounts.

Attachment for props driven by ***saildrives*** require one transducer mounted directly to the gearbox on the vertical intermediate shaft.

TRANSDUCER INSTALLATION

FOR HULLS - Transducers must attach directly to the hull. Most watercraft will have composite stringer and bulkhead systems that provide structural support for the hull and decking. Composite materials WILL NOT CONDUCT ULTRASOUND and must be avoided - ultrasound will only transmit through solid/dense materials. Ultrasound is not transmitted through porous materials such as wood, foam and air. ACCEPTABLE materials include solid FRP/GRP fiberglass, aluminum, & steel. **This system IS NOT COMPATIABLE with wood or plastic hulls.**

REMOVE ALL PAINT from metallic surfaces at the bonding locations.
EXPOSE BARE METAL at all mounting locations.
SAND AND CLEAN the base of the transducer prior to applying the epoxy.
Have all TOOLS & CLAMPS prepared and ready before starting.

Transducers Step 1 - Surface Preparation

The bonding surface and the transducer must be flat, clean, & paint-free to achieve proper adhesion. Remove all dirt, grease, and other contaminates from the surfaces. Scuff both surfaces, including the base of the transducer, with a medium-grit sandpaper to expose fresh material. Remove sanding dust and clean the surface again.

Surface preparation is critical when bonding the transducer to a metallic part. When bonding to engine components, ALL PAINT MUST BE REMOVED at the desired location to expose bare metal.

Transducers Step 2 - Prepare and Mix Epoxy

Epoxy resin will thicken after mixing - mix the epoxy when you are ready to attach the transducer. Mix equal parts of A & B epoxy resin onto a disposable mixing surface - thoroughly mix both parts to an even consistency. Be sure to prepare enough to cover the base of the transducer.

Transducers Step 3 - Apply Epoxy Resin

Apply the prepared epoxy resin to the base of the transducer. Spread the epoxy resin outward and away from the center until you achieve a uniform coverage on the entire surface.

Transducers Step 4 - Position the Transducer

Place the transducer, epoxy side down, into the desired position. Twist the transducer while applying downward force to ensure the base makes even contact with the surface. It may be necessary to use an adhesive tape to hold the transducer firmly in place while the epoxy cures. When attaching transducers to motor mounts, a clamp can be used to secure the transducer in place - this is helpful where the transducer is placed in a horizontal position.

Transducers Step 5 - Wait for the Epoxy to Set

The epoxy resin must cure at least 24 hours prior to operation. Do not disturb the transducer during the cure process.

CONTROLLER INSTALLATION

The Hull Shield Controller Module supplies the power and signals required to operate the ultrasonic transducers. The controller module has flanges with holes to facilitate various mounting methods with fasteners. Use fasteners that are appropriate for the substrate you are attaching to.

Controller Step 1 - Attach the Power Cable to the Battery

Be sure that the controller is switch OFF when connecting to a power supply. Determine whether the power cable will span the distance between the battery and location you plan to mount the controller module. The power cable can be extended with 16 gauge 2-conductor wire.

CONNECT THE BLACK WIRE TO THE NEGATIVE TERMINAL OF THE BATTERY AND THE RED WIRE TO THE POSITIVE TERMINAL.

OPTIONAL EXTERNAL INDICATOR - The Hull Shield system power cable incorporates a YELLOW 12V signal wire that can be connected to an LED panel indicator lamp for monitoring the system status. This wire can be connected to the positive terminal of a standard 12V self-regulated marine LED indicator. This wire is protected against a fault condition and is current limited to 20mA.

Controller Step 2 - Signal Cables

Signal cables may need to be routed/fished through tight areas. The signal cables can be cut and spliced back together to facilitate cable routing. The cables can also be extended with 18AWG marine-grade multistrand speaker wire. Ensure that splices are strong and are encapsulated in a waterproof junction box or other sufficiently waterproof insulator.

Connect the transducer cables to inputs on the bottom of the controller module. Twist the blue locking ring clockwise onto the threads to secure the connectors. **DO NOT OVER-TIGHTEN!**