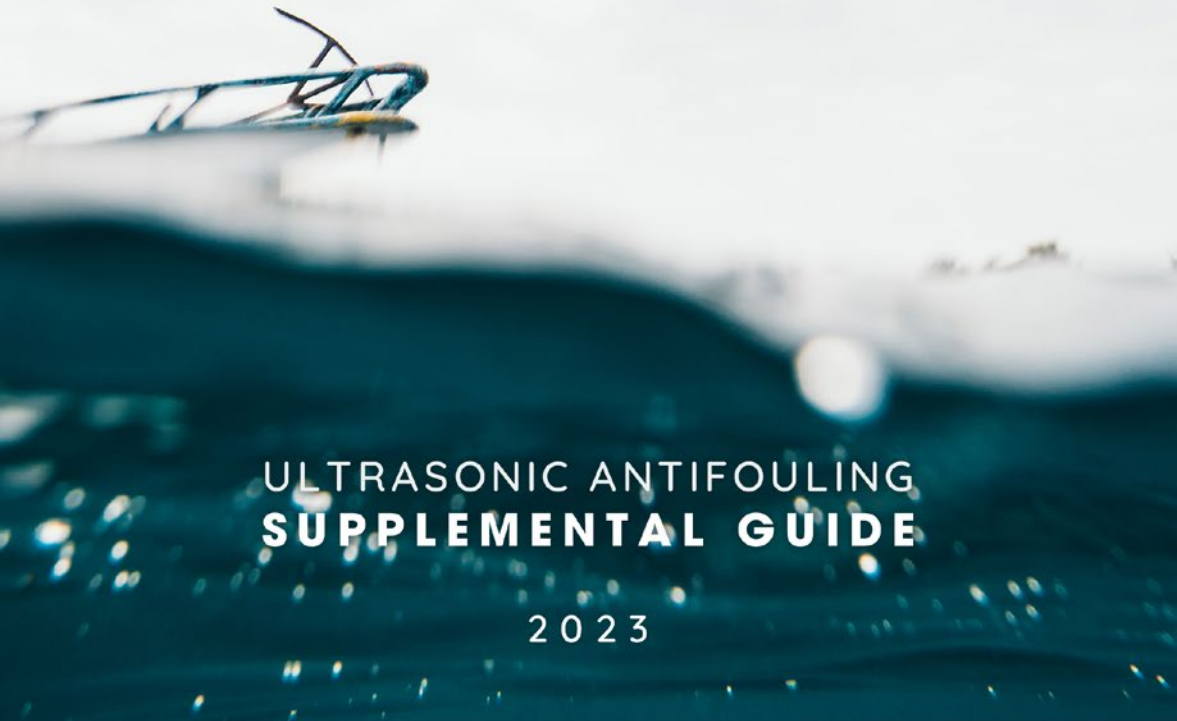
ULTRASOUND - THE FUTURE OF ANTIFOULING TECHNOLOGY

HULL SHIELD™



ULTRASONIC ANTIFOULING
SUPPLEMENTAL GUIDE

2023

HULL SHIELD™

Enjoy 24/7 anti-fouling protection with Hull Shield ultrasonic anti-fouling systems. Ultrasonic anti-fouling works to keep your hull and running gear clean by using the power of ultrasound.

Hull Shield technology has proven itself over and over again with years of successful service for boaters, praised by happy customers the world over, and has become a preferred choice for boaters wanting to save time and money. Our systems offer a fully automatic solution that works around-the-clock to keep your boat clean, so you don't have to.

Stay protected against marine fouling with an intelligent & powerful ultrasound system.

- Effectively halts hard fouling & barnacle growth.
- Significantly slows algae & biofilm accumulation on your hull.
- A cleaner hull leads to improved performance & fuel efficiency.
- Save money with fewer haul-outs, spend less time cleaning, & extend the life of your paint.
- Environmentally friendly & ocean safe.
- Easy installation and setup.

ECOPOWER
Low power consumption
works with wind & solar.

Ocean Safe & Environment Friendly

MADE IN USA

HD1

Single Transducer
Ultrasonic Anti-Fouling System

only $499

HD100

Four Transducer
Ultrasonic Anti-Fouling System

only $1699

the Problem

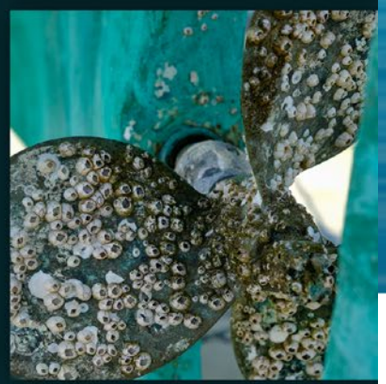
Effects of Marine Bio-Fouling

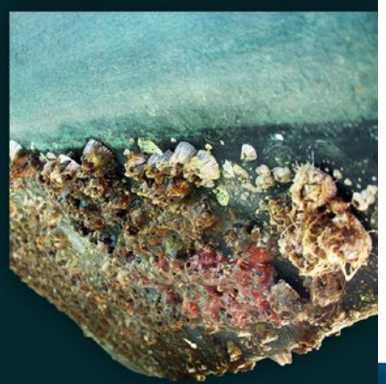
- Frequent Diver Cleaning
- Routine Bottom Painting
- Expensive Haul Outs
- Poor Fuel Efficiency
- Damaged Parts

Divers use an abrasive process that removes paint while cleaning - this loose paint pollutes our waterways. Some states have restricted divers from cleaning boats for this reason.

Fouling begins accumulating on your hull as soon as the diver leaves. Every day you lose more fuel efficiency until the next cleaning.

Excessive paint wear by diver cleaning and power-washing reduces the lifespan of the bottom coating. This process leads to frequent haul outs and new applications of expensive bottom coatings.





the Solution

Ultrasound repels fouling before it can attach to the hull. With Hull Shield Ultrasonic Antifouling, you won't need a full-time diver. Less diver cleaning and scraping results in your paint staying where it belongs, on your hull - not loose in our waterways damaging the ecosystem.

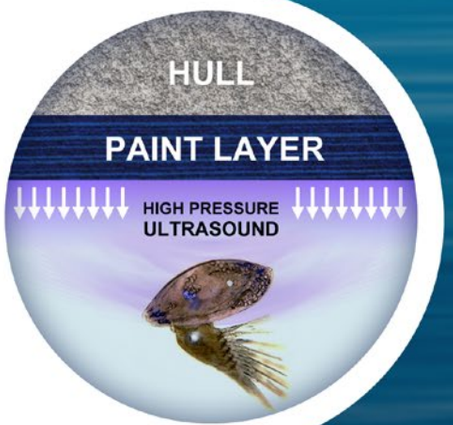
Hull Shield protects your boat surfaces continuously - 365 days a year. Your vessel will operate at peak performance and fuel efficiency year-round.

How Ultrasonic Antifouling Works

Hull Shield works by emitting pulses of sound waves that physically repel organisms away from surfaces. Bio-fouling is prevented from attaching to the hull and protected surfaces.

Sound in Action

Each pulse creates a microscopic shockwave that runs across the hull and drive gear. These ultrasonic waves work to ablate, loosen, and repel fouling which is contacting the hull and drive surfaces.



HULL SHIELD

cost Effective

Ultrasound repels fouling before it can attach. This means you won't need a frequent diver who will be constantly removing layers of valuable paint in the cleaning process. The bottom paint stays on your hull, which dramatically increases the functional lifespan of your bottom coating. As a result, having Hull Shield will save on diver costs while eliminating costs associated with new bottom paint applications - haul out fees, yard fees, paint and material fees, hazmat fees, and labor.

▶ No Routine Diver Cleaning

Ultrasound repels fouling - the surface stays clean longer.

▶ Less Re-Painting

Re-Applying your bottom coating is expensive.

- Haul-Outs
- Yard Space Fees
- Hazmat Fees
- Expensive Paints & Materials
- Labor & Unexpected Costs
- Damage From the Process

▶ No Drag - Better Fuel Efficiency

Fouling starts to accumulate on your hull as soon as the diver leaves. Hull Shield protects your bottom from fouling 24/7 - 365 days a year.

ESTIMATED ANNUAL SAVINGS FOR A 50' CRUISER

	1 YEAR	2 YEARS	3 YEARS	4 YEARS
Without Hull Shield	*$5,900*	*$5,900*	*$5,900*	*$5,900*
Hull Shield	***$3,398***	***$0***	***$0***	***$0***
SAVINGS	***$2,502***	***$5,900***	***$5,900***	***$5,900***

HULL SHIELD PAYS FOR ITSELF IN JUST 8 MONTHS

Calculation based on a self-install on a 50' boat with an estimated annual maintenance cost of $5,900 ($2,400 in diver fees & $3,500 bottom painting costs per year). Hull Shield costs include the cost of two HD100 systems for protection of the hull and drives.

eco Friendly

Join us on a mission to ensure our waters a safer place for all life.

Hull Shield systems help reduce the levels of harmful paint in our marine ecosystems. Our products empower boaters to maintain cleaner hulls while reducing their contribution of harmful substances into the environment. While our systems do not eliminate the need for bottom paint, they can reduce the impact by up to 75% - that's a major step in the right direction.

▶ Safe for All Marine Life

Ultrasound physically repels fouling, it does't harm it. Furthermore, ultrasound does not interfere with sea-mammal communication.

▶ Reduces the Use of Harmful Substances

Less diver scraping means less paint put into the ecosystem and less painting - less painting means less overall marine exposure to harmful substances.

for All Hull Types

Ultrasound will repel fouling on any type hull, and function with most matarials, regardless of hull shape or geometry. As long as the hull material is dense, the sound waves will propagate throughout the surface.

Hull Types

- Monohulls
- Catamarans
- Sailing / Keel
- Pontoon
- Barge

Hull Materials

- Fiberglass
- Aluminum
- Steel
- Carbon Fiber
- Kevlar

Please Note: Hull Shield will not work on boats with wood hulls.

easy Installation

Hull Shield systems are simple in function and installation and can be installed in a single day with no technical skills. Transducers are simply attached with epoxy and connected to the digital controller.

Versatile Options

Hull Shield transducers are waterproof and submersible. Transducers are most often attached in the bilge but can also be placed externally in special cases which may include scenarios where there is limited access to the bilge.

HULLS

Monohull

65ft
50' to 65'
6x Transducers

50ft
40' to 50'
4x Transducers

40ft
30' to 40'
3x Transducers

30ft
20' to 30'
2x Transducers

20ft
Up to 20'
1x Transducer

Catamaran

65ft
50' to 65'
6x Transducers

50ft
34' to 50'
4x Transducers

34ft
Up to 34'
2x Transducers

DRIVES

Not just for hulls - Hull Shield can protect your drives too. Drives are isolated from the hull by motor mounts, gaskets, seals, and other materials that block ultrasound from passing to the shaft and prop. Because of this, protection of the drive requires a dedicated transducer. Inboards, pods, sterndrives, and sail-drives can all be fitted with a transducer to get full protection. Rudders are isolated from the hull in the same way as the drives and will also need a dedicated transducer.

Pods
One Transducer per Drive

Inboards
Two Transducers per Drive (One for each Prop & One for each Rudder)

Sail-Drives
Two Transducers per Drive (One for each Prop & One for each Rudder)

Sterndrives
One Transducer per Drive

get Protected

Wether you have shafts or pods, a keel or catamaran, fiberglass, steel or foam-core - Hull Shield has you covered.

Inboards, Pods, Sail-Drive, & More



Rudders, Trim Tabs, & Parts



Foam-Core, Pontoon, & More


FAQ & Answers

Does Hull Shield need to be on all the time?
Yes. The system must operate continually to repel organisms away from the surface.

Will Hull Shield remove existing fouling?
No. Hull Shield functions as a deterrent - it cannot retroactively remove existing fouling which has cemented to the surface.

Will I need to clean my hull after installing Hull Shield?
Much less frequently. Depending on the conditions, Hull Shield can easily extend the time between cleaning to over 12 months.

Will Hull Shield work with my existing boat batteries?
Yes. Hull Shield systems are designed to integrate into your existing battery system - either directly to a 12V system, or through a DC/DC converter on 24V.

Will ultrasound damage my boat?
No. Ultrasound is perfectly safe for your boat and will not interfere with your sonar or depth finder ultrasound reception.

Does Hull Shield require drilling holes in the hull?
Never. Transducers are attached directly to the surface, there are no through-hulls.

Will I need a shore power connection?
No. Hull Shield systems are efficient low-power devices that will operate on battery systems connected to standard trickle chargers, maintainers, or even solar power.

Will I still need bottom paint?
Your results will be dramatically better when used in conjunction with a bottom paint. Bottom coatings also protect against staining, blistering, and other effects not caused by fouling.

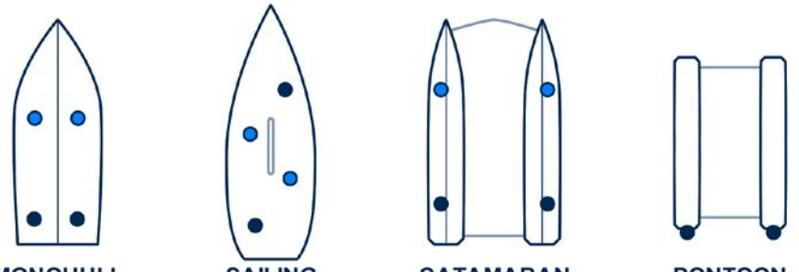
If you have questions or concerns - we can answer them.
Please contact us at **info@hullshield.net.**

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 antifouling results. Transducer placement is 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**



MONOHULL SAILING CATAMARAN PONTOON

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.

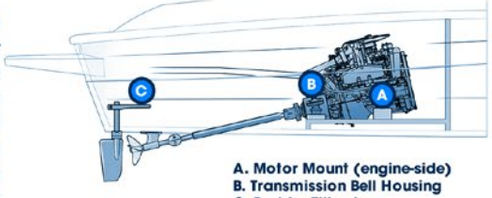
For exterior attachment on monohull transoms, two transducers are attached to the transom below the water - one per side.

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 an 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 ***sail-drives*** 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 your installation.

Transducers Step 1 - Surface Preparation

The bonding surface and the transducer must be flat, clean, and 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 when the transducer must be 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 the location where 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 fault conditions 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 having a 300V rating. 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!**

HD100

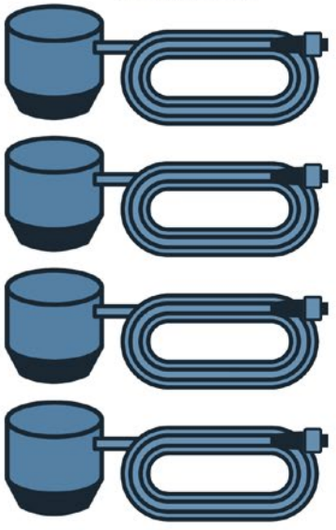
INSTALLATION & OPERATION GUIDE

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 antifouling 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 intermittent alternative charging sources.

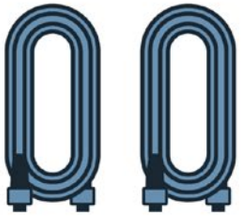
HD100 SYSTEM CONTENTS

1x HD100 Controller Module

4x Ultrasonic Transducers



2x Signal Cable Extensions



1x Epoxy Adhesive Kit

SYSTEM OPERATION

When used on hulls, this product is designed with work best with ablative bottom paint coatings. For best results, please ensure your current application of bottom paint is not worn or depleted of ablative material. Once your Hull Shield system is installed, it will extend the life of your bottom coating and 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 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 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 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 and mitigate fault events while continuing to operate the remaining transducers.

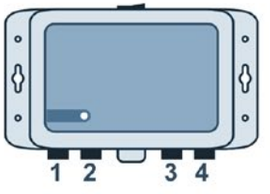
⚠ **NO TRANSDUCER DETECTED** - If the controller does not sense a transducer, or a connection to a transducer is interrupted, the system will ignore that port and continue to operate the remaining ports and transducers.

⚠ **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, the LED indicator for the associated port will blink red instead of green to indicate the specific port with the problem. The remaining operational ports 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 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: +1-843-580-2826 **EMAIL: support@hullshield.net**

MAXIMUM INPUT VOLTAGE: **18.0V** PEAK CURRENT REQUIREMENT: **2A** AVERAGE CURRENT CONSUMPTION: **1Ah**	FULL POWER OUTPUT RANGE: **12.7V TO 18.0V** 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**

HD1

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 antifouling 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 intermittent alternative charging sources.

HD1 SYSTEM CONTENTS

1x HD1 Controller

1x Ultrasonic Transducer

1x Epoxy Adhesive Kit

SYSTEM OPERATION

When used on hulls, this product is designed with work best with ablative bottom paint coatings. For best results, please ensure your current application of bottom paint is not worn or depleted of ablative material. Once your Hull Shield system is installed, it will extend the life of your bottom coating and 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 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 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 the transducer. During runtime, the LED indicator will blink green at each ultrasound burst. If the LED indicator blinks 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 elapsed 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 to conserve power.

LOW BATTERY INDICATOR

When the battery voltage drops below 12.0V, the system will enter an idle SLEEP MODE and stop consuming power - this is 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 five seconds.

FAULT EVENTS

The HD1 controller can detect fault events and shut down to protect the controller and transducer.

⚠ **SHORTED WIRES OR WATER INTRUSION IN A SINGAL CABLE (FAULT CODE 1)** - If the controller senses an excessive current drain caused by water intrusion or a damaged signal cable, the system will go into a fault state. While in the fault state - the LED indicator will indicate FAULT CODE 1 by blinking red once, then quickly alternating from green to red. This pattern will repeat indefinitely. The cables and connectors should be inspected for possible water intrusion or damage.

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

⚠ **NO TRANSDUCER DETECTED (FAULT CODE 2)** - If the controller does not sense the transducer, or a connection to the transducer is interrupted, the system will go into a fault state. While in the fault state - the LED indicator will indicate FAULT CODE 2 by blinking red twice, then quickly alternating from green to red. This pattern will repeat indefinitely until a connection is re-established. *The controller will auto recover and clear this fault if a connection is re-established.*

INSTALLATION SUPPORT

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MAXIMUM INPUT VOLTAGE: **18.0V** PEAK CURRENT REQUIREMENT: **2A** AVERAGE CURRENT CONSUMPTION: **0.25Ah**	FULL POWER OUTPUT RANGE: **12.7V TO 18.0V** 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**

FEATURED BOATTEST Tests You Can Trust

YouTube

SCAN QR Code to view the BoatTest.com review on YouTube.

HULL SHIELD™

843.580.2826

www.hullshield.net