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FLS 2D
FORWARD LOOKING SONAR INSTRUCTIONS

Daniamant
Be safe at sea

ECHOPILOT

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Thank you for purchasing the EchoPilot Forward Looking Sonar

Your new EchoPilot has been manufactured to the highest standards by the dedicated staff of a company with many years of experience in marine electronics. You have invested in the most up to date technology available and in a product rigorously tested in the laboratory and at sea.

All goods of our manufacture are backed by a 2 year warranty. Expert advice and guidance are always available by Telephone 0045 4737 3839 - just ask for customer service. We welcome the opportunity to talk to our customers.

Nobody enjoys reading manuals, but please continue to read this one!
Installing your instrument correctly is vital to get the maximum performance, pleasure and safety from your equipment, so please take the time to read the instructions.

Please observe the following warnings:

Please do not cut the transducer cables - they are fine multi-core cable matched to the transducer.

Please do not remove the transducer plug from its cable - if a hole is too small make the hole bigger! Any join in the cable will reduce sensitivity / performance.

Disclaimer

EchoPilot makes no warranty as to the accuracy or completeness of data that is included or may be downloaded or used in connection with this product, and EchoPilot disclaims any and all express, implied or statutory warranties including the implied warranty of merchantability and implied warranty of fitness for a particular purpose. It is the user's responsibility to use this product prudently. This product is intended to be used only as a secondary aid to navigation and must not be used for any purpose requiring precise measurement of distance, depth, location, or topography.

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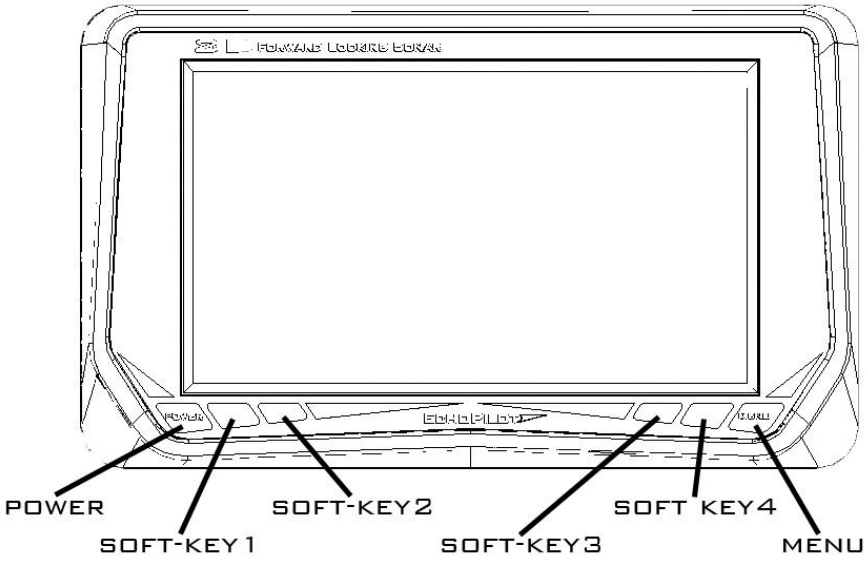
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FLS 2D Operating Instructions



Switching On

The FLS 2D is switched on by pressing and holding the power key until the white display appears. The unit will then display the introduction screen that includes the unit software version, shortly followed by the FLS sonar display.

The sonar data displayed on the screen will depend on the seabed below the transducer. The unit will always switch on in 'Auto Range' mode which means that if a good seabed signal is received, a suitable range will be chosen for the current depth. Pressing the up or down arrows will turn off auto mode and the user will now have control of the range with the up and down buttons. Up is soft key 4, down is soft key 1, as shown on the LCD.

Keypad Operation - Overview

Power Key: Switches the unit on and off.

Menu Key: Selects the menu which allows the user to modify the unit settings. See the section **Changing the Unit Settings** for more information on the menu.

Up/Down Keys: (Soft key 4 / soft key 1) When in FLS Mode (sonar data displayed), changes the sonar range up or down accordingly. When in the menu, the up and down arrows change the selected option. See the section **Changing the Unit Settings** for more information on the menu.

Mode Key: **(soft key 3)** When in the menu, the mode key returns the user to the current mode.

Page Key: **(soft key 2)** Switches between menu pages.

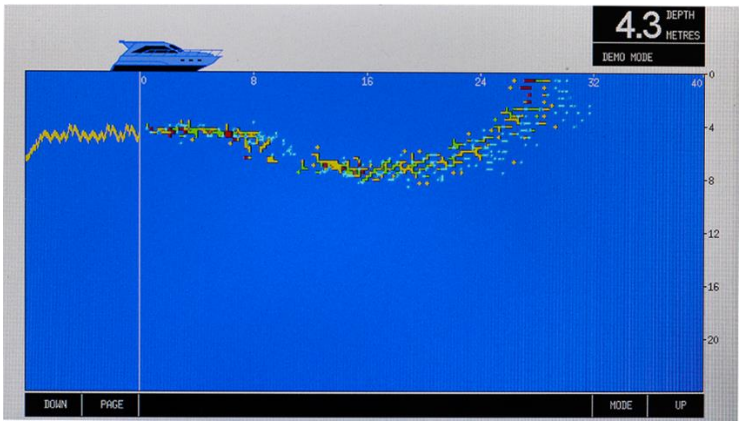
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Operating Modes

FLS Mode
FLS Mode is the sonar operating mode that displays the sonar image of the seabed ahead and below the transducer. There are eight forward range settings (20m, 40m, 60m, 80m, 100m, 150m, 200m and Auto) that are selectable with the up and down arrow keys. When the upper range is reached with the up arrow (200m), a further press puts the unit onto the 'Auto' range. Similarly, when the lower range is reached with the down arrow, a further press puts the unit onto the Auto range. A press of either arrow key while Auto is on will switch the Auto off and the user will retain manual control of the range.

When returning to manual range, the range selected will be the last range selected by the Auto function until the user presses an arrow key to change range.

Auto Range
When Auto range is selected, the range will automatically be set, based on the current digital depth (displayed in the top right-hand corner). If the digital depth is invalid due to a poor sonar signal (indicated by the depth figure flashing) the range will remain on the last selected range for a valid depth. The status indicator box in the top right-hand corner of the display shows whether Auto range has been selected.



The sonar display in FLS Mode

History Display
The FLS 2D displays a 15 second history to the left of the vertical line (0m line) on the sonar display. The history plot is based on the digital depth readout and gives the user a little more information about the shape of the seabed behind the vessel.
As the history plot is the last 15 seconds of seabed, the area of seabed covered will depend on the speed of the vessel. For example, if the vessel speed is 5 knots (2.5 metres per second), then the history plot will cover a distance of 38m. Higher speeds will give greater distances but with less accuracy.

The desired menu option is chosen using the menu key. When the arrow cursor is alongside the appropriate option, pressing the up or down arrow keys changes the setting.

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Pressing the page key presents the user with another set of options.

There are 3 menu pages:

· *Main Options*
· *Display Options*
· *Depth Options*

The unit will return to the sonar display after 10 seconds if no buttons are pressed within that time. Alternatively, the user can return to the sonar display by pressing the mode key.

Shallow Alarm
The Shallow Alarm can be set to Off or 1m to 20m. When a certain number of echoes occur above this setting, an alarm will sound (1 second on, 1 second off). The alarm setting is retained after power down.

The shallow alarm is provided as a guide to warn the user that echoes are appearing above the set level. It should be noted that in some conditions (particularly in noisy sonar conditions) the alarm may be triggered by echoes from the sea surface (in choppy water), or turbulence generated by other vessels. As experience is gained with the FLS, the user should be able to identify this kind of noise.

Gain Level
The gain level controls the amount of sonar signal level accepted by the FLS. The higher the value, the more signal will be accepted and give a stronger echo on the display - but will also increase the amount of noise that will show. A lower value will filter more of the signal and reduce the amount of noise - but will give a weaker echo on the display.

Noise Filter
This setting allows the user to reduce the amount of ‘clutter’ on the sonar display. The filter level sets the number of times an echo must occur within a similar location before it is displayed.

Setting the filter to off means that echoes only need to appear once in order to be displayed. This gives much more detail and responsiveness on the display but will also increase the amount of noise displayed (from air bubbles for example) which is more random. The low, medium and high settings increase the filter gradually and hence reduce the responsiveness and number of echoes displayed.

The medium setting is recommended as a starting point for most users.

Backlight Level
Adjusts the LCD backlight brightness from 1-no backlight to 6-maximum brightness.

Depth History
Allows the user to switch on or off the depth history display.

Key Bleep
Allows the user to switch on or off the key bleep

Colour Mode

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6 colour modes are provided to allow a choice of colour sets to be selected by the user. 3 sets are for daytime use (light background colours) and 3 for night-time use (dark background colours).

Echoes Colour
The echoes displayed in FLS Mode can be either strength encoded or 'mono'. Strength encoded echoes use colours to show strength variations between echoes - with red being the strongest echo, then green, then yellow, then light blue for the weakest echoes. Mono colour selects a single suitable colour that all echoes will be displayed as, depending on the colour mode chosen.

Boat Type
3 boat types are available to the user: 2 motor boats and 1 sailing boat.

Boat Length
Allows the user to set the displayed boat length to match their own boat (up to a maximum of 20m).

Bow Offset
This is the distance from the boat's bow to the transducer position and allows the user to obtain a more realistic picture of the seabed with respect to the vessel.

Language
Allows one of the currently available languages to be selected for unit operation.

Depth Units
Units can be set to Metres or Feet.

Depth Offset
The Depth Offset can be set from -3.0m to +3.0m. If the offset is positive, the set offset will be added to the calculated depth below transducer to give depth below the surface If the offset is negative, the set offset will be subtracted from the calculated depth below transducer to give depth below the keel.
This offset only applies to the digital depth readout in the top right-hand corner of the display and NOT the graphical seabed picture.

Operating a Repeater Unit

A repeater display unit is different to a master display it is missing the connection for transducer. Repeaters can only be driven by displays that are repeater enabled. This must be linked to the master display with a data cable, and also supplied with power. These master displays have a third plug marked repeater, in the normal display this plug is blanked.

It should be noted that changing range on a repeater unit will be independent of the master unit so they may both be on different ranges (unless both units are set to Auto Range). However, it is the range selected on the master unit that will dictate the transmission pulse length set by the transmitter circuit.

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Demo Mode

To enter demo mode, ensure the unit is switched off first. Then press and hold the power button until a second beep is heard. The sonar display should appear with one of the 3 demo seabeds. 'Demo Mode' will appear in the Status Indicator box in the top right-hand corner of the display.

Pressing the up or down arrow key will cycle the demo display around 3 demo screens. The menu is operational, but some settings will have no effect in demo mode. In particular, shallow alarm (although the alarm bell will be shown), gain level, noise filter, colour mode and echoes colour will not work in demo mode.

How FLS Technology Works

Sonar Beam

The EchoPilot FLS is a unique and patented invention. It can see through a full arc of 90 degrees, from straight ahead to straight down.

The transducer has a fairly narrow horizontal beam of approximately 15 degrees (port to starboard). In practice, as sensitivity reduces with distance (especially at the edges of the beam), the polar diagram looks more like an elongated balloon.



Forward Beam

Distance Ahead

The distance ahead that the FLS can see depends on the depth of water below the vessel, and the laws of physics. The transmit 'ping' radiates at all angles down and out from the vessel, hits the seabed and some of it is returned to the transducer's receiver.

As the 'ping' travels further away from the boat, it hits the seabed at an increasingly acute angle. At a certain point the angle will be so acute that the 'ping' is not returned, and the seabed information is lost - this determines the maximum view ahead.

When on a flat muddy bottom (e.g. river or estuary) the FLS will show the seabed up to three to five times the depth away from the boat. This ratio increases to eight to nine times if the seabed shoals upward. Rocky bottoms are better targets than muddy ones, and hard vertical surfaces like quay walls, rocks or coral reefs will often be seen at considerable distances.

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Some Guidance on Use

The Digital Depth Display

This ADDITIONAL information (in the top right-hand corner) is the calculated depth from the angle data that is received and processed by the FLS. Unlike older FLS models, the depth can now be calculated regardless of the selected range and therefore can be useful for the user in selecting the correct range. The depth relies on a good quality sonar signal and care should be taken in poor sonar conditions (e.g. turbulence from passing boats or another sounder running at the same frequency causing excessive noise). Care has been taken to prevent false depth readings in noisy sonar conditions but cannot be guaranteed in all conditions.

Practice

When learning to interpret the screen practice with clear targets, e.g. a quay wall. Try moving around an obstruction very gently to see what the maximum range is that different targets become visible.

!!!!! WARNING !!!!!

If approaching a target, select a range longer than you think you need. Most people (including us!) seriously underestimate distances to quays, buoys, walls etc.

Note that going astern can push turbulence past the transducer reducing sensitivity or sometimes obliterating all the picture so take care! Maneuver with the minimum use of astern (reverse) power, especially with the propeller (on twin screw vessels) on the side of the transducer.

Turbulence from other vessels, especially in shallow water can also adversely affect performance. Algae (normally in spring), Plankton and pollution can all show up as ‘noise’ on the LCD screen.

Operating the FLS 2D at Speed

Ultrasonic signals travel well through solids and liquids but are greatly attenuated in air. It follows that a stream of turbulence and air bubbles will limit the performance of the FLS system, or any depth system for that matter. However, if a place can be found on the hull where there is a clear flow of water, then good results can be obtained even at speed.

Transducer Installation

The choice of transducer position will have a major effect on final performance so please consider carefully all factors and if in any doubt, contact the factory.

Motor Boats

On a small planing hull fit the transducer as far aft as reasonably possible. On a stern drive boat (inboard or outboard) typically fit just in front of the engine(s). On a shaft driven boat (not V drive) forward of the shaft log or stern gland, but behind the gearbox. On larger vessels fit further forward to increase effective range.

Keep inboard of the lower spray rail if possible.

Do not fit downstream of any other through hull fittings (for example intakes, log, toilet sea cocks etc) and choose a location with good access for withdrawing the transducer for cleaning.

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The transducer should ideally be vertical in the fore and aft plane at running trim. If it leans forward the seabed will appear to slope up, and if it rakes aft then a degree of surface clutter may show. Some heel to port or starboard is acceptable, to a maximum of 5 degrees.

Avoid the temptation to fit the transducer too far forward as it may then be out of solid water when at speed or pitching. Also remember the transducer looks down as well as ahead, so when maneuvering in shallow waters you may wish to see there is water for the propellers and rudders.

Sonar cannot see around corners so before installing stand under the boat with your head near the proposed position and check that you can see from your toes up to above the horizontal ahead. If the boat has a full or deep forefoot and is shallow aft a forward mounted transducer maybe necessary.

Sailing Boats

On a fin keeled boat, alongside the keel and perhaps 60cm or 2 feet out - because the beam is approximately 15 degrees overall in the horizontal plane, is often a well protected position. But this is unsuitable for a winged keel or large bulb as the signal from the transducer could impinge on these. Just forward of the keel is an alternative, but take care when hoisting the boat in a sling!

Do not fit the transducer too far forward where it will come out of the water as the vessel pitches. The transducer looks ahead as well as down and you need to see what is under your boat as well as what is ahead. When maneuvering in shallows you will wish to know what is under the keel or rudder.

A long keel boat is harder, choose the position with the minimum angle of deadrise (ie the flattest area) and fit the transducer with a pair of wedge shaped chocks if necessary, so that it is as near to vertical as possible with the boat upright. On boats with slack bilges it may be necessary to fit the professional transducer, even on a small vessel, because its skin fitting has more useable thread. If the transducer leans forward the seabed will appear to slope up and if it leans aft there maybe surface clutter.

Choose a position with good access so that the transducer can be withdrawn for cleaning if necessary.

Remember that sonar cannot see around corners, so stand under the boat with your head near the proposed position. You must be able to see from your toes up to above the horizontal ahead. If the boat has a full or deep forefoot obstructing the view a more forward position maybe called for.

Fitting the Skin Fitting

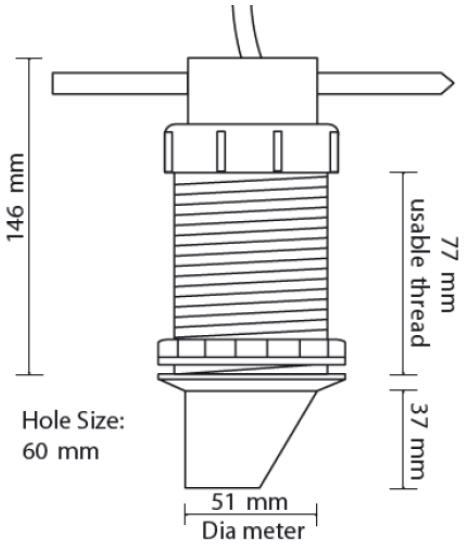
A hole in the boat must be taken seriously! - If in doubt use an experienced shipwright.

- For the standard plastic skin fitting - cut a 45 mm (1 $^{3}/_{4}$") diameter hole.
- For the Professional bronze skin fitting - cut a hole 60 mm (2 $^{1}/_{2}$") in diameter.
- Fit the skin fitting with reinforcing pads if needed or wedges if required to ensure the transducer is as near to vertical as possible (fore/aft AND port/starboard).
- Use plenty of underwater sealant, but take care to clean off the thread thoroughly afterwards.
- Secure with the nut on the inside. Do not use excessive force on the nut.
- If the vessel will be floated **before** the transducer is fitted, the blanking cap provided must be fitted to seal the skin fitting. (N.B. for our American customers, for “skin fitting” read “thru-hull fitting”).

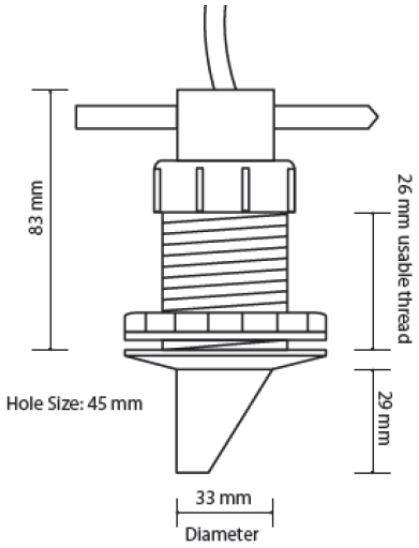
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Safety
The transducer provided is designed to shear off (in the event of a severe impact), flush with the hull, leaving the solid epoxy filled portion in the through hull fitting, and thus poses no risk of water ingress.

Professional Transducer



Standard Transducer



Transducer cable

The FLS 2D comes with a 2 Meter transducer cable, which is sealed into the transducer. The plug which connects to the display is moulded onto the cable. Please do not cut the cable.

The plug has a locking ring combined with an o-ring seal, which not only maintains watertight integrity but also prevents the cable from working loose due to vibration. Please do not cut the cable.

The maximum diameter of the plug (WHICH MUST NOT BE REMOVED) is 20mm, which may be a consideration when planning your cable run or if you need to cut a hole in a bulkhead. Please do not cut the cable.

If the cable is too long, neatly coil up the excess in a convenient location. If the cable is too short, then contact us as we can supply 10 Meter extension cables. Please do not cut the cable.

You can use a maximum of two extension cables giving a maximum length of 22 Meter. It should be noted that each extension cable will cause a slight reduction in performance. Please do not cut the cable.
Every transducer is tuned to work with its own cable, as such cutting and re-joining the cable can have serious implications as to the performance and accuracy of your FLS system:

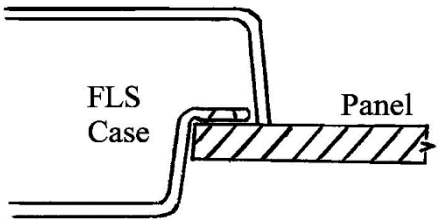
NEVER CUT THE TRANSDUCER CABLE

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Fitting the display

The FLS 2D is designed to be flush mounted on an instrument panel or bulkhead, or alternatively, bracket mounted. (The bracket is an optional extra).

FLUSH MOUNTING - to flush mount the instrument cut a rectangular hole: 206 mm x 119 mm. Set the instrument on a bed of RTV silicone (or similar sealant).



In order to secure the display when flush mounting there is a stainless-steel flush mount stirrup provided. This is attached using the plastic m6 studs and nuts provided. Please do not over tighten these mounting nuts as it may distort the case and cause water ingress. It may be easier to thread the power cable through the stirrup and plug it in before mounting the stirrup.

BRACKET MOUNT - The optional bracket may be mounted on any convenient horizontal or vertical surface using suitable screws or bolts.

· When the correct angle of view has been chosen, Put the 25mm diameter rubber washers onto the mounting Knobs.
· Slide the threaded stud of the knobs through the two holes near the radiuses at the edge of the bracket. (From the outside pointing in).
· Put the square nuts provided. loosely onto the threads of the knobs.
· Now slide the square nuts into the bracket locator on the back of the display, this may be easier to start one side at a time. And tighten knobs.

Interference

Other depth sounders especially those that operate at 200 kHz must be wired so they can be switched off if interference occurs. (This may appear as 'submarine' like echoes coupled with a reduction in sensitivity).

Maintenance

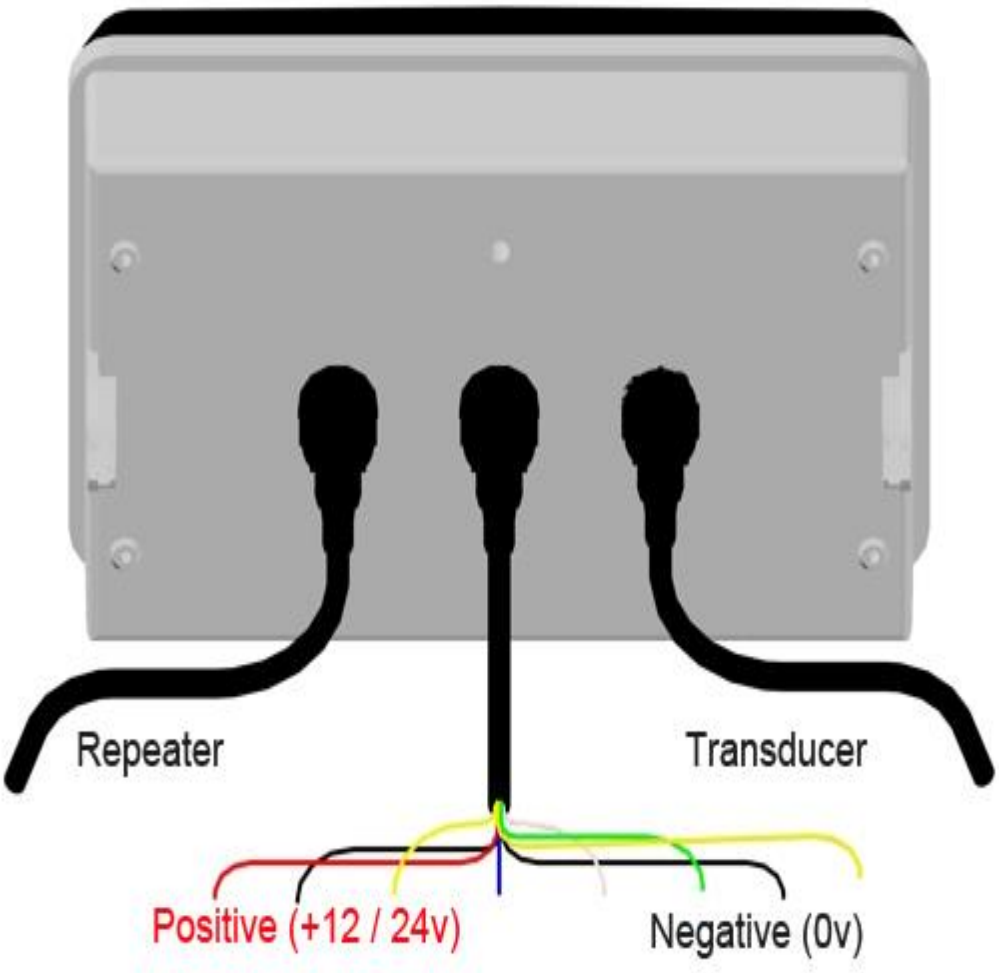
Protect plugs and cables from chafe. Clean the transducer face regularly and check for barnacles etc. The skin fitting / locking thread / transducer o-rings should be greased at least once per year. This must be done with silicone grease only, any other type of grease will cause the o-rings to swell. You may anti-foul the transducer. Avoid long term exposure of the LCD to direct sunlight.
EchoPilot accepts no responsibility for damage caused to the vessel or any persons aboard the vessel while providing transducer maintenance. If you are unsure get the maintenance performed by a professional when the boat is out of the water.

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Wirering Diagram

Red = positive supply (+ 12 / 24v)

Black = negative supply (0v)



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FLS 2D - Fault Finding

Some Common Faults

Display doesn't switch on (no display)
· Battery not connected
· Battery voltage too low

No display once switched on:-
· LCD Faulty

Poor seabed picture or excessive noise:-

· Suitable range not selected (try to fill screen with seabed)
· Poor connection of transducer
· Battery voltage low
· Transducer mounted at an angle
· Turbulence at transducer location
· Interference from other 200KHz sounders (same boat or other boats)
· Turbulence/wake from other boats
· Polluted water or Plankton bloom (usually early summer)
· Dirty transducer/covered with barnacles
· Choppy sea state - can cause surface noise

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Technical Specifications

Specification	FLS 2D
Voltage	12v or 24v DC
Current Consumption	Display-380mA with max brightness (150 mA min)
Operating frequency	200 kHz
LCD type	Transflective, LED Backlighting
Viewing Area	152 x 84mm 800 x 480pixels
Forward Range	20 to 200 metres
Depth Range	10 to 100 metres
Display Update Rates	1-2 updates per sec.
Repeater Option	Yes
Alarm	Shallow
Transducers	FLS 2D professional or standard

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WE ARE ALWAYS PLEASED TO TALK TO OUR CUSTOMERS.

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Protected by USA Patent 5530680 and European (UK) Patent 0624253

Author: Chris Phillips
Last Updated: 15.01.2020 (Claus Due Weng)

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