

Wide Band Echo Sounder Boards for CEESCOPE™ and CEE ECHO™

Description

Echo sounder operating frequencies may be set by the echo sounder electronics or the transducer used but in all cases the transducer frequency must match the frequency of the connected echo sounder. Transducers are designed to have peak performance at certain discrete frequencies; the physical characteristics of the transducer sets the frequency of operation. Very high frequency sonars not typically used for single beam bathymetry may have a frequency of 1000 kHz or more and might only be 1" (2.5") in diameter. Larger ceramic elements are able to produce lower frequency (longer wavelength) sonar pings and so a standard 200 kHz echo sounder transducer may be about 2.5" in diameter. To produce even lower frequency sonar pings, typically packaged in a dual frequency transducer at 24-33kHz the ceramic elements need to be substantially larger which leads to the much larger and heavier nature of dual frequency transducers. In addition to the frequency requirement, each transducer has a fixed defined beam angle for each frequency. The beam angle can be made narrower to provide a smaller footprint on the bottom and potentially more precise bathymetry data however this is only possible by incorporating larger ceramic elements. There is no magic solution of a small size narrow beam transducer! So, transducer design and selection is a compromise between a larger transducer for a narrow beam angle and a smaller one for more convenience relating to size and weight.

As transducers are sold with a fixed peak performance frequency (or a narrow range of acceptable frequencies), the echo sounder control electronics that are driving this transducer must be matched in frequency (as well as being compatible in other ways). For single frequency surveying, 200kHz is almost exclusively used as the "high" frequency channel and is typically used in dual frequency transducers that offer two frequency bands within the same transducer. Actually, the dual frequency transducer is simply two separate sets of ceramic elements cast into a single enclosure. CEESCOPE™ and CEE ECHO™ echo sounders have, since their launch, been offered with two low frequency control electronics options – 33kHz or 24kHz. This means the user must match the transducer and choose EITHER 24kHz or 33kHz "low" frequency in their dual frequency transducers.

From 2023 onwards, new CEE echo sounders have an updated control board that is able to drive a wide range of frequencies including BOTH 24kHz and 33kHz. Users now do not have to be concerned about transducer matching as either of these most common frequency transducers can be used interchangeably. The frequency of the transducer just needs to be input on the echo sounder setup menu.

It is possible to go further and produce very wide band echo sounders that can operate on many frequencies. Why not do this too? Well, everything comes down to the available transducers as it is irrelevant what frequency an echo sounder can operate at, if no transducers exist at that frequency! So, by simply expanding the frequency range of our low frequency channel to incorporate the two common transducer types – and considering that the 200kHz "high" frequency is an industry standard – further "frequency agile" capability presents little additional benefit.

The transducers we see most commonly used that will now be interchangeable (among others) are as follows:

Airmar M42 (24/200kHz). Large transducer. Has a relatively narrow beam angle at about 5 degrees for 200kHz and 20 degrees for 24kHz making this an excellent choice from a data quality standpoint. However, the drawback is the large size and weight in air.

Airmar M163 (33/200kHz). Medium transducer. Has a wider beam angle than the M42 of about 8 degrees for 200kHz but as it is a higher frequency than the M42 the 33kHz channel has a narrower beam angle of 19 degrees even though it is a smaller unit.

Airmar M195 (33/200kHz). Small – medium transducer. This has a 9 degree 200kHz channel and the small size is convenient but leads to a relatively wide beam angle of 26 degrees for the 33kHz channel.

Airmar M563 (24/200kHz). Medium-large transducer. Has a 9 degree 200kHz channel and is smaller and somewhat lighter than the M42 leading to a wider beam angle of about 25 degrees.

Comparing 33kHz and 24kHz, typically the lower frequency / longer wavelength will promote greater penetration range through water and bottom substrate. This means one can expect somewhat better sub bottom performance from the larger 24kHz transducers.