Transducer Technology
OVERVIEW

- Broadband Transducers
- Wide beam Transducers
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- Transducer performance photos
- NMEA 2000® Products
- Transducer Installation & Troubleshooting
## Transducer Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Power</th>
<th>‘Q’ Value</th>
<th>TVR(dB)</th>
<th>RVR(dB)</th>
<th>FOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>B744V</td>
<td>600W</td>
<td>28 @50kHz</td>
<td>155@50kHz</td>
<td>-174@50kHz</td>
<td>-31@50kHz</td>
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<tr>
<td></td>
<td></td>
<td>31 @200kHz</td>
<td>164@200kHz</td>
<td>-184@200kHz</td>
<td></td>
</tr>
<tr>
<td>B260</td>
<td>1kW</td>
<td>8 @50kHz</td>
<td>162@50kHz</td>
<td>-173@50kHz</td>
<td>-14@50kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 @200kHz</td>
<td>175@200kHz</td>
<td>-183@200kHz</td>
<td></td>
</tr>
<tr>
<td>R199</td>
<td>2kW</td>
<td>3 @50kHz</td>
<td>167@50kHz</td>
<td>-174@50kHz</td>
<td>-9@50kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 @200kHz</td>
<td>177@200kHz</td>
<td>-182@200kHz</td>
<td></td>
</tr>
<tr>
<td>R209</td>
<td>2-3kW</td>
<td>2 @50kHz</td>
<td>171@50kHz</td>
<td>-177@50kHz</td>
<td>-7@50kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 @200kHz</td>
<td>172@200kHz</td>
<td>-184@200kHz</td>
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</tr>
</tbody>
</table>
200kHz Ceramic Performance

Non-Broadband 200kHz-
Matching layer B260
Q=8  Impedance 377Ω

Non-Broadband 200kHz-
NO Matching layer B260
Q=26  Impedance 132Ω

Overlay
Broadband B260
Q = 8 Impedance 90Ω

Non-Broadband 200kHz-
NO Matching layer B260
Q = 26 Impedance 132Ω

Overlay

Frequency (kHz)
(Transmit Voltage Response)

Frequency (kHz)
(Transmit Voltage Response)

Frequency (kHz)
(Transmit Voltage Response)
Echo Waveforms

Transducer: P319
Frequency: 200 kHz
Q=31  Cycles: 35

Transducer: B260
Frequency: 200 kHz
Q=8  Cycles: 10

Transducer: R99
Frequency: 200 kHz
Q=2  Cycles: 10
Broadband vs. No Broadband

Fish 6” above blends into bottom echo by long ring from high Q

- Individual fish are separated
- Fish 1” above the bottom is still detected by short ring from low Q
- Shows fish as “blobs”
- Fish less than 6” above bottom will blend in

Short Ring - Low Q

Long ring - High Q

Broadband Q = 2, 5° beam

Non-Broadband Q = 25, 5° beam

Individual fish blend together

Fish 6” above blends into bottom echo by long ring from high Q

Fish are detected 1” above the bottom

AIRMAR TECHNOLOGY CORPORATION
Sensing Technology
Compare depth measurement performance:

- changes in input power
- change transducer (use different FOMs)
- active sonar equation predicts the trend
50kHz Range Data

50 kHz B260 transducer, Received Voltage vs Bottom range

- +6 dB R99, R209
- +3 dB
- 0 dB B260
- -3 dB B258, SS270W
- -6 dB
- -9 dB B164
- -12 dB
- -15 dB
- -18 dB
- -21 dB B744V, B60
- 5 \( \mu \)Vrms (4 dB dashed line)

Relative level, dB

Depth, m

0 200 400 600 800 1000 1200 1400 1600

Signal too weak

Must be above this line to obtain a good measurement

30° 60° 90°

808 m
200kHz Range Data

200 kHz B260 transducer, Received Voltage vs Bottom range

- +6 dB: R99
- +3 dB: R209
- 0 dB: B260 1kW
- -3 dB
- -6 dB
- -9 dB: B164
- -12 dB
- -15 dB: B744V, B60
- -18 dB: SS270W
- -21 dB
- 5 μVrms (-106 dBV) det. thresh.

Must be above this line to obtain a good measurement

Signal too weak

407 m
Broadband = Less voltage needed to drive transducer

B260 Non-Broadband:
\[ \sqrt{(1000 \text{ RMS Watts} \times 8 \times 300\Omega)} = 1,549 \text{ Volts} \]

B260 broadband:
\[ \sqrt{(1000 \text{ RMS Watts} \times 8 \times 90\Omega)} = 849 \text{ Volts} \]
Individual fish below & along side baitfish

Individual fish holding tight to bottom
Broadband Transducer

Non-Broadband Transducer
Low ring =
Excellent Shallow-water operation
SS270W Wide Beam

- 25° degree beam at both frequencies
- Provides four times the beam width at 200kHz
- Can retrofit existing B260 installations
- Stainless Steel Housing
- Includes High Performance Fairing
- Built-in Temp sensor
SS270W
Twin 25° beams @ 50 and 200kHz
User Benefits

- Excellent at detecting mid to shallow water fish (bait, tuna, marlin etc.)
- Split screen 50/200kHz fishfinder display is more intuitive for novice users
- Same targets appear in both beams
- Advanced users can identify fish species
SS270W-Same bottom imaging @ both frequencies
Wide vs. narrow beam - Ping pong balls

SS270W  B260  SS270W  B260

50kHz  200kHz

SS270W  B260  SS270W

200kHz
SS270W @ 35 MPH
Benefits of Tunable Fishfinders with Broadband Transducers

- Frequency agility allows the user to adjust the frequency if the connected echosounder is "tunable".
- No loss of sensitivity across the frequency range
- Adjusting the frequency will change the beam width and depth capabilities.
- Certain fish are more detectable at specific frequencies so the fishfinder & transducer can be tuned to get the best echo return for the species being targeted (tuna, marlin, ground fish, bait).
Broadband R209 / R299
Q=2

Broadband B260
Q=8 Overlay
R209 External Mount / R299 In-Hull

- Broadband on both low and high frequencies.
- 24 low-frequency ceramics that can operate anywhere between 33kHz to 60kHz and can handle up to 3 kW of input power.
- High-frequency 3.5” single-ceramic can operate between 130kHz to 210 kHz and can handle up to 2 kW of input power.
- R309 and R399 units operate between 25kHz to 45kHz and 130kHz to 210 kHz.
Broadband and the future: CHIRP
-Frequency Modulated Transmissions

- Improved signal-to-noise ratio
- Very good performance from shallow to deep
- Better target definition
- Better performance at speed
- Variable beamwidths
- Better rejection of noise sources
Tilted Element™ Transducers
B164 1 kW Tilted Element™

- Engineered for Center console and sport fishing boats
- 50/200kHz: constructed of three dual frequency elements.
- Low-profile design leaves no protrusion below the hull
- No High Performance fairing required
- Built-in temp sensor
SS270W Wide Beam Tilted Element™ Pair

- SS270W split up into 2 transducers
- Same ceramics and performance as the SS270W
- Separate transducers for 50 kHz and 200 kHz
- Top of the line 1kW tilted element™
- Engineered for Center console and trailered boats
- Transducers can be sold separately
- No High Performance Fairing needed
- Built-in temp sensor
SS270W Tilted Element™ Pair Wiring
200kHz Wide / Narrow beam Switch box

- Allows SS270W 200kHz to work with existing B260 / M260 installations.

- User now has a switchable 200kHz wide or narrow beam for the specific type of fishing.
SS260 Narrow Beam Tilted Element™ Pair

- B260 split up into 2 transducers
- Same ceramics and performance as the B260
- Separate transducers for 50 kHz and 200 kHz
- Top of the line 1kW tilted element™
- Engineered for Center console and trailered boats
- Transducers can be sold separately
- No High Performance Fairing needed
- Built-in temp sensor
Transducer performance photos

<table>
<thead>
<tr>
<th>600W B744V</th>
<th>1kW B164</th>
<th>1kW B258</th>
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<tbody>
<tr>
<td><img src="image1.jpg" alt="Image" /></td>
<td><img src="image2.jpg" alt="Image" /></td>
<td><img src="image3.jpg" alt="Image" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>1kW B260</th>
<th>1kW M260</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.jpg" alt="Image" /></td>
<td><img src="image5.jpg" alt="Image" /></td>
</tr>
</tbody>
</table>

- Garmin GSD22
- Raymarine DSM300
- Furuno FCV585
R199 In-Hull Signal Loss

50kHz
No Fiberglass
Q = 3

50kHz
¾ inch Fiberglass
Q = 4.1
R199 In-Hull Signal Loss

200kHz
No Fiberglass
Q = 2

200kHz
\( \frac{3}{4} \) inch Fiberglass
Q = 4.5
- Airmar part number
- Housing style
- Serial number
- Ceramic element configuration
- Date of manufacture
- Acoustic window
- Impedance matching configuration
- Nominal frequency(s)
- Best transmit frequency(s)
- Power rating
- Beam pattern
NMEA 0183 and 2000® Smart Transducers

- All processing is done inside the transducer
- Operates at 235kHz
- No interference with on-board sounder
- Perfect for displaying digital depth/speed/temperature

- DT800- Retractable Tilted Element™ Thru-Hull Depth / Temperature
- DST800- Retractable Thru-Hull Depth / Speed /Temperature
- P39- Transom Mount Depth / Speed /Temperature
- P79- In-Hull Depth only
- T42- High performance Temperature
Installation & Troubleshooting

Basics: Mounting Location

- The water flowing across the hull must be smooth with a minimum of bubbles and turbulence (especially at high speeds).
- DO NOT MOUNT near water intake or discharge openings or behind strakes, fittings, or hull irregularities.
- The transducer must be continuously immersed in water.
- The transducer beam must be unobstructed by the keel or propeller shaft(s).
- Choose a location away from interference caused by power and radiation sources such as: the propeller(s) and shaft(s), other machinery, other echosounders, and other cables. The lower the noise level, the higher the echosounder gain setting that can be used.
- Choose a location with a minimum deadrise angle.
- Choose an accessible spot inside the vessel with adequate headroom for the height of the housing, tightening the nuts, and removing the insert.
Thru-hull location selection

Transducer placement should be aft and close to the centerline. It needs to be located low enough that the transducer is in the water at all times.
Thru-Hull Mounting Location

Consider items such as the lifting strap placement in the location as well as trailer bunks and rollers if it is a trailered vessel.
Thru-hull location selection

Be sure that the transducer signal will not intersect the prop shaft(s), keel or any other hull projections, and that it is not directly in-line with the prop(s).
Thru-hull location on stepped hulls

Thru hulls can be used on stepped hull vessels, but they must be located ahead of the trailing edge of the first step and low to the keel to operate well.
M260 and R199 In-Hull Tanks

- Now shipped with flat 90° tank bottom which can be easily cut for bow-stern or port-starboard mounting.
- To fill the new tank, we recommend using non-toxic propylene glycol (RV / Marine anti-freeze).
- To mount the tank to the hull, we recommend using fiberglass resin, Marine Tex® or Fusor® 100EZ / T10.
In-hull location selection

As with thru-hulls, the selected location should be aft and close to the centerline so that the hull below the transducer is in the water at all times.
In-hull location selection

The hull below and in front of the transducer must be free from any sources of turbulence, just as with a thru hull installation.
Testing for depth function

Using an EDI transducer test box you can determine the resonant frequency of a transducer and confirm that it is operating properly.

Red lead from transducer tester attaches to blue Airmar wire(+depth)

Black lead from transducer tester attaches to black Airmar wire(-depth)
Testing for Temperature

• Red lead from ohm meter attaches to brown Airmar wire.

• Black lead from ohm meter attaches to white Airmar wire.

With meter set to OHMS the reading should be in the 10,000 ohm range at 77 degrees F.
The resistance increases as the temp decreases.
The sensor will read correctly in or out of water.
Testing for Speed

• Apply Negative battery voltage to Airmar bare wire and attach black lead from volt meter

• Apply positive Battery voltage to Airmar red wire

• Attach red lead from volt meter to Airmar green wire

• Turn the paddlewheel slowly by hand. The volt meter should toggle between zero volts and the input voltage with each quarter turn of rotation.
Identifying Interference

• If the screen interference increases proportional to vessel speed this usually indicates that the transducer face is exposed to aerated water.

• If the interference appears at a specific rpm this could be a sign of electrical interference on the sounder’s power line. Try powering the sounder directly from a stand-alone battery.
Identifying flow noise

- If experiencing interference with a transom mounted transducer test drive the vessel to determine what speed the image is lost at. Move the transducer to it’s lowest position and retest.
- If screen image is improved repeat until you are satisfied with results. If screen image gets worse, move transducer up and re-test until improvement is seen.
Identifying flow noise

- Perform a slow but constant turn to the side of the hull that the transom transducer is mounted. Gradually increase rate of turn. If screen image improves the transducer needs to be mounted lower in the water.

- If screen image is worse when turning to the same side as the transducer try turning the opposite direction. This would indicate the transducer needs to be mounted higher in the water.
Questions?