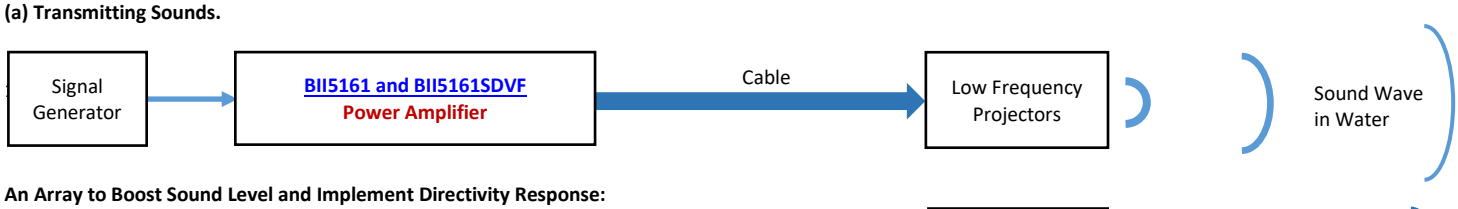
Low Frequency Transducer

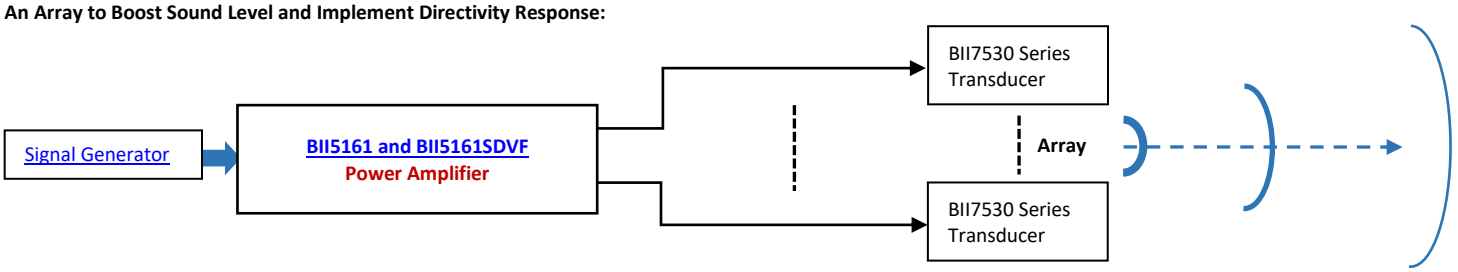
BII7530 Series low frequency transducers are designed for uses in noise simulation/generation and measurement of ocean, river, and lake, underwater communication, bioacoustics (marine mammals and fish sounds/behavior), and generation of sound fields of a small body of water. With underwater supportive mounting apparatus, multiple Low Frequency transducers can be set up to be a linear, planar, or curved array to produce higher underwater sound level or implement a particular directivity response.

SYSTEM CONFIGURATION

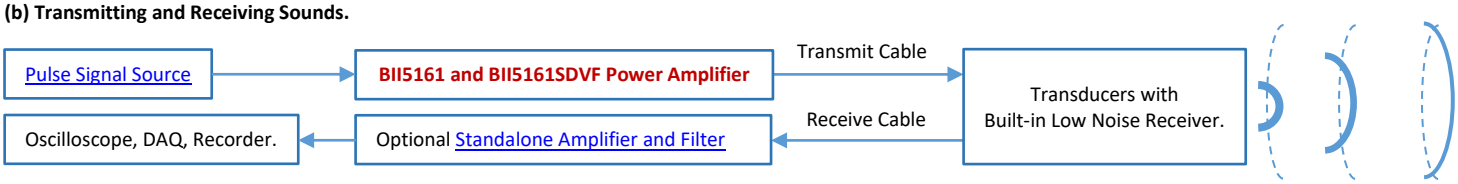
(a) Transmitting Sounds.



An Array to Boost Sound Level and Implement Directivity Response:



(b) Transmitting and Receiving Sounds.



Typical Applications

Array Elements, Artificial Acoustic Target.	Bioacoustics: Stimuli, Playback, Measurement, and Deterrent.
Noise Generation & Measurement.	Diver Recall System, Underwater Voice Communication.
Seismology, Geological Exploration, Ocean Waves.	Generation of Plane Wave/Standing Wave/Pressure/Acceleration Field.

Specifications

Part Number:	**BII7532BT**	**BII7532FR**	**BII7534BT**	**BII7534FR**	**BII7536BT**	**BII7536FR**
	BT: Sound Radiation from Bottom Face. **FR:** Sound Radiation from Front and Rear Faces.					
Status:	**ACTIVE**	**ACTIVE**	**ACTIVE**	**ACTIVE**	**ACTIVE**	**ACTIVE**
	ACTIVE: Product device recommended for new designs. **LIFEBUY**: BII has announced that the device will be discontinued, and a lifetime-buy period is in effect. **OBSOLETE**: BII has discontinued the production of the device.					
Resonant Frequency f_s:	7 kHz ± 20%					
Transmitting Frequency:	1 kHz to 20 kHz	1 kHz to 20 kHz	300 Hz to 20 kHz	300 Hz to 20 kHz	100 Hz to 20 kHz	100 Hz to 20 kHz
	Minimum Transmitting Frequency: None.					
	The sound level in low frequency range is proportional to the ratio of transducer radiation size to wavelength.					
Impedance Matching:	No impedance matching.					
Signal Type:	Recorded Sounds, Arbitrary Signals, Noises, Continuous Waveform, SINE Pulse, Chirp, PSK, FSK, Pulsed Square Waveform, etc.					
Radiation Faces:	Front Plane	Two Planes	Front Plane	Two Planes	Front Plane	Two Planes
Directivity Pattern:	Conical Beam at fs.					
-3dB Beam Width:	Omni@f≤3kHz; 180°@f≤ 10kHz; 120°@15kHz.	Omni@f≤8kHz; 180°@f≤10kHz; 120°@15kHz.	180°@f≤5kHz; 90°@10kHz; 60°@15kHz.	Omni@f≤4kHz; 90°@10kHz; 60°@15kHz.	180°@f≤3.3kHz; 60°@10kHz; 40°@15kHz.	Omni@f≤3kHz; 60°@10kHz; 40°@15kHz.
Side Lobe Level:	(a) No side lobes at -3dB Beam Width ≥ 50°. (b) ≤ -17.7 (dB) at -3dB Beam Width < 50°.					
Free Capacitance C_f:	1.3 nF	1.3 nF	5.2 nF	5.2 nF	10.0 nF	10.0 nF
	C_f: Free Capacitance at 1kHz.					
	With cable, C_f increases by [Cable Length * 0.1nF/meter] @ 1kHz.					
Dissipation D:	0.012 @ 1kHz					
Quality Factor Q_m at f_s:	≤ 3					
	-3dB bandwidth $\Delta f = f_s/Q_m$. Qm determines the transient response or the rise and fall rings of steady-state response.					
$\eta_{ea\ at\ fs}$ at f_s:	0.28 in Water, Electroacoustic Efficiency, Load Medium Dependent.					
η_{ea} at f << f_s:	at f << fs, $\eta_{ea} / \eta_{ea\ at\ fs} \approx 0.1225*(k*\Phi D)^2$. Wave Number $k = 2\pi/\lambda$; ΦD = Transducer Diameter.					
	1. Driving Transducer with Continuous Signals:					

	(1). Electroacoustic Efficiency η_{ea} is quite low at f << f_s and drops gradually at f > f_s, so it is NOT recommended for transducers to emit high power sounds at frequencies far from f_s. Otherwise, transducer may be damaged by overheating. (2). Transducer can emit low power sounds at frequencies far from f_s. For example, input power $P_i \le \eta_{ea}$*MIPP at f ≤ 0.8*f_s and $P_i \le$ 0.2*MIPP at f ≥ 1.3*f_s. **2. Driving Transducer with Pulsing Signals such as SINE Pulses:** Electroacoustic Efficiency η_{ea} is quite low at f << f_s and drops gradually at f > f_s, so it is recommended for transducers to emit high power sounds at frequencies far from f_s with **Pulsing Signals with Duty Cycle ≤ 10%, Pulse Length ≤ 100mS**. Otherwise, transducer may be damaged by overheating.					
Power Factor at f_s:	0.03 ~ 0.1					
TVR:	Refer to **TVR Graph**, Transmitting Voltage Response.					
Radiation Sound Level:	SL = 20*logV_i + TVR, dB µPa@1m. Driving Voltage V_i is in unit of V_{rms}.					
Admittance:	Refer to **G-B Graph,** or Impedance.					
Driving Voltage V_i at f_s: (V_{imax}: Maximum V_i.)	**Pulsed Driving Signal and Duty Cycle D < 100%:** $V_{imax} = \sqrt{(MIPP/G_{max})}$ or **600**, whichever is less, in V_{rms}. **Continuous Operation at 100% Duty Cycle:** $V_{imax} = \sqrt{(MCIP/G_{max})}$, in V_{rms}.					
Input Power P_i:	$P_i = V_i^2 * G$. Refer to **G-B Graph:** G is conductance.					
MIPP at f_s:	3.5 Watts	3.5 Watts	760 Watts	760 Watts	1330 Watts	1330 Watts
MPW at MIPP and f_s:	Continuous	Continuous	4 Seconds	4 Seconds	4 Seconds	4 Seconds
MCIP at f_s:	3.5 Watts	3.5 Watts	53 Watts	53 Watts	108 Watts	108 Watts
MIPP: Maximum Input Pulse Power. **MPW**: Maximum Pulse Width. **MCIP**: Maximum Continuous Input Power. **f_s:** Resonance Frequency.						
How to determine pulse width, duty cycle and off-time with input pulse power (peak power): 1. Determine the input pulse power (IPP, peak power) with sound intensity required by the project. IPP MUST be less than MIPP; 2. Pulse Width ≤ (MIPP * MPW*(120°c-T)/103°c)/IPP; T: Water Temperature in °c. 3. Duty Cycle D ≤ MCIP*(120°c-T)/103°c)/IPP; 4. Off-time ≥ PW*(1-D)/D.						
FFVS: dB V/µPa.	-184.5 ± 2 dB V/µPa. Free-field Voltage Sensitivity, $Sensitivity\ Loss\ over\ extension\ cable\ at\ f_s\ (dB) = 20 * \log\{(1 + 2\pi f_s C_c/B)/\sqrt{[G^2 + (B + 2\pi f_s C_c)^2]/(G^2 + B^2)}\}$ G: Conductance at f_s; B: Susceptance at f_s; C_c: Capacitance of Extension Cable. Cable is of 100 pF/meter roughly. Please refer to online document **AcousticSystem.pdf** for conversion between G-B and Z-θ, if necessary. Simplification: Sensitivity Loss over Extension Cable (dB) = 20*log[C_h/(C_h+C_c)]. Valid for hydrophone without preamplifier. C_h: Hydrophone Capacitance; C_c: Capacitance of Extension Cable. Cable is of 100 pF/meter roughly.					
Receiving Frequency:	1.2 Hz to 8 kHz.	1.2 Hz to 8 kHz.	0.32 Hz to 8 kHz	0.32 Hz to 8 kHz	0.15 Hz to 8 kHz	0.16 Hz to 8 kHz
Receiving Sound Level:	SL = 20*logV_o - FFVS, dB µPa. Receiving Voltage V_o is in unit of V_{rms}.					
Operating Depth:	Maximum 150 m (1.5 MPa Pressure), and Limited by the cable length if the cable has wire leads or a non-waterproof connector.					
Mounting Options:	1. Default: Free Hanging (**FH**) 2. Thru-hole Mounting with Single O-ring (**THM-7/16" or THM-5/8".)** 3. Thru-hole Mounting with Double O-ring (**THDO-7/16"**) 4. Bolt Fastening Mounting (Stainless Steel) (**BFM-7/16" or BFM-5/8".**) 5. Bolt-Fastening Mounting with Free Hanging (**BFM-FH-M8 or BFM-FH-3/8".)** 6. Free-hanging with Male Underwater Connector (**FHUWC-2P, FHUWC-3P, FHUWC-4P, FHUWC-6P.**) 7. End-face Mounting (**EFMS**) 8. Flange Mounting (**FGM-Φ220, FGM-Φ165, or FGM-Φ80.**)					
	Please refer to online document **AcousticSystem.pdf** for a complete list of Mounting Options and more details.					
Cable Options:	1. Two Conductor Shielded Cable (**SC**), Rubber or PVC Jacket. SC with Two Conductors for transmit signal; SC with 4 conductors for receive signal. 2. 50 Ω RG58 Coax (**RG58**) 3. Two Conductor Unshielded Cable (**USC**) for Underwater Connector 2 pins.					
	Handling: Do not use the cable to support transducer weight in air and water if the transducer has a mounting part. Do not bend the cable.					
Cable Length:	1. Default: 15 m with non-underwater connector. 0.6m with Underwater Mateable Connector (2 pins) (**UMC2P**). 2. Custom-fit.					
Connector Options:	1. Default: Wire Leads (**WL**), for Transmit, Receive Signal, and DC Power Supply. 2. Underwater Mateable Connector (2 pins) (**UMC2P**) (Max. Diameter Φ21.5 to Φ35 mm). Locking Sleeve: DLSA-M. Underwater Mateable Connector (3 pins) (**UMC3P**) (Max. Diameter Φ21.5 to Φ35 mm). Locking Sleeve: DLSA-M. Underwater Mateable Connectors are fixed with 0.6m unshielded cable. UMC is from global manufacturers of underwater connectors. Its part number is listed in quote in detail. 3. MIL-5015 Style (3 pin) (**MIL3P**) (Max. Diameter Φ19 to Φ30 mm). 4. XLR Receptacle with 3 Male Pins (**XLR3P**), (Max. Diameter Φ20.2 mm), for SE or DF. 5. Male BNC (**BNC**) (Max. Diameter Φ14.3 mm), for Transmit or Receive Grounded Signal. 6. 1/8" (3.5mm) TRS Plug (**TRS**) (Max. Diameter Φ10.5 mm), for Receive Signal ONLY.					
	Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.					
Size ΦDxH:	Φ60x24 mm	Φ60x24 mm	Φ114x24 mm	Φ114x24 mm	Φ168x24 mm	Φ168x24 mm
	Actual length depends on Mounting Parts.					
Weight:	0.8 kg with 15m cable.		1.4 kg with 15m cable		2.2 kg with 15m cable	
	Actual weight depends on Mounting Parts, Cable Types and Length.					
Operation Temperature:	-10°C to +60°C or 14°F to 140°F.					
Storage Temperature:	-20°C to +60°C or -4°F to 140°F.					
Potable Transmitter:	BII5160 series Low Frequency Power Amplifiers for portable acoustic transmitters **achieving low frequency sounds down to 100Hz**.					
Power Amplifier:	BII5000 Power Amplifiers for SONAR, NDT, HIFU. Order Separately as standalone devices.					

WARNING: DANGER — HIGH VOLTAGE on wires. Wires shall be insulated for safety. DO NOT TOUCH THE WIRES BEFORE THE DRIVING SIGNAL IS SHUT DOWN. Cable shield must be grounded firmly for safety.
for 50Ω BNC/SMA/SMC connector, it is buyer's sole responsibility to make sure that the BNC/SMA/SMC shield of the signal source is firmly grounded for operating safety before hooking up transducer/hydrophone to the signal source. Coax with BNC/SMA/SMC is not intended for hand-held use at voltages above 30Vac/60Vdc.

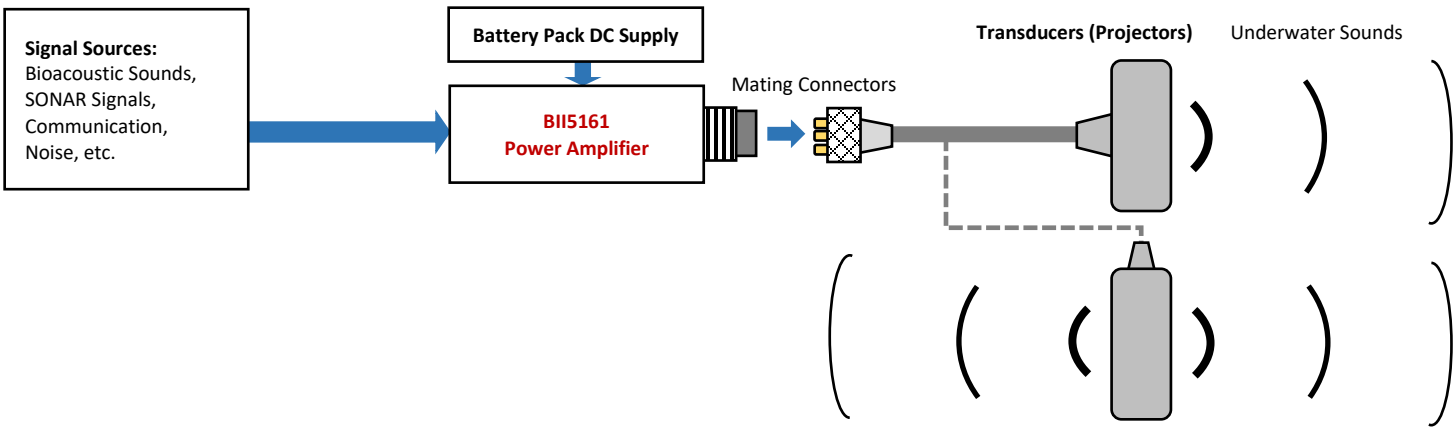
Wiring Information.

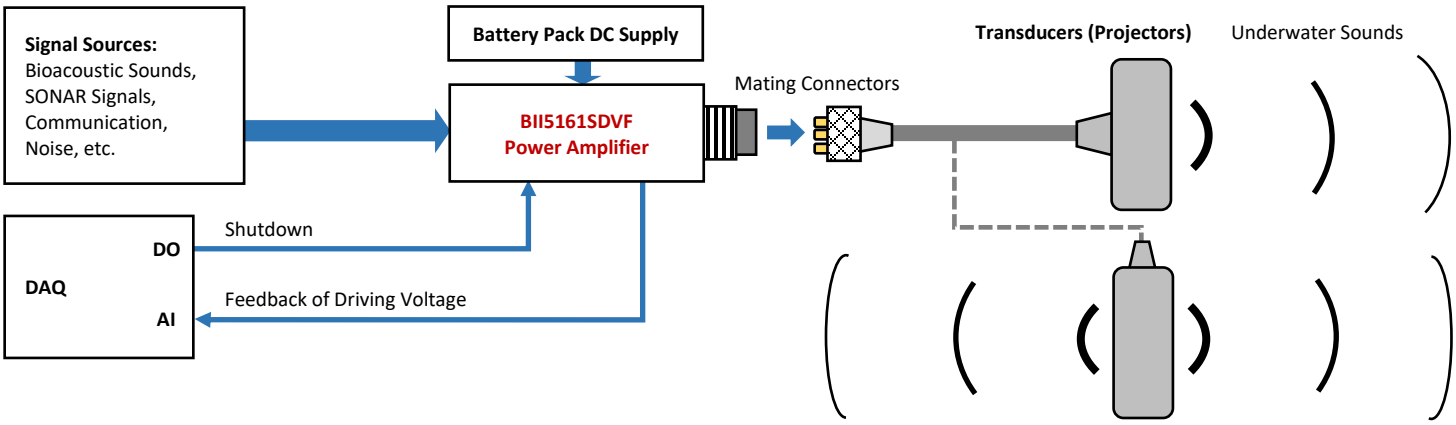
Transducer Wiring:	**Shielded Cable**	**Coax, BNC.**	**UMC3P**	**MIL3P**	**XLR3P**
Signal:	White or Red	Center Contact	Contact 2	Contact C	Pin 2
Signal Common:	Black	Shield	Contact 1	Contact B	Pin 3
Shielding and Grounding	Shield	Shield	Contact 3	Contact A	Pin 1
Wiring of Unshielded Cable:	**Wire Leads WL**	**UMC2P** (0.6m USC Cable originally coming from manufacturer of the connector, Fixed.). Locking Sleeve: DLSA-M.			
Signal	White	Contact 2			
Signal Common	Black	Contact 1			

How to Order Transducers. The default options are for stock items which are regularly available.

FH: Free Hanging. **SC for Transmit**: Shielded Cable (Rubber Jacket, 600V) with 2 conductors. **Coax**: 50 Ω Coaxial Cable. **WL**: Wire Leads.				
Part Number	-Mounting	-Cable Length	-Cable Type	-Connector for Transmit signals
BII753xBT, BII753xFR.	Default: **FH, BFM-5/8", BFM-FH-M8, or, BFM-FH-3/8".**	Default: **15m or 0.6m**.	**SC, RG58 Coax, USC**, etc.	Default: **WL**.
Example:	**Description**			
BII7536BT-BFM-FH-3/8"-0.6m-SC-UMC3P	BII7536BT Transducer, Bolt Fastening Mounting with Free Hanging: BFM-FH-3/8, 0.6m Shielded Cable, Male Underwater Mateable Connector with Locking Sleeve: DLSA-M.			
BII7536FR-BFM-5/8"-15m-RG58-BNC	BII7536FR Transducer, Bolt Fastening Mounting (Stainless Steel) BFM-5/8", 15m RG58 Coax, Male BNC.			
BII7536FR-FH-15m-SC-WL	BII7536FR Transducer, Free Hanging, 15m Shielded Cable, Wire Leads for Transmit Signal.			

System Block Diagram: Generate Low Frequency Sounds.





Transducer Specifications with Built-in Low Noise Receivers for Sound Transmitting and Receiving.

Note: the Receiving Sensitivity in this table will replace the FFVS (Free-field Voltage Sensitivity) stated in previous Specifications.	
Part Number:	BII753xBT-LNR or BII753xFR-LNR
	Refer to Transducer Specifications for specs of BII753xBT and BII753xFR. This table lists specifications of add-on part of Low Noise Receiver.
Sound Receiver:	**-LNR:** Low Noise Receiver.
Receiving Sensitivity V/µPa:	-160 dB. Note: bespoke **Receiving Sensitivity** is available upon request.
	Refer to Graph of FFVS vs. Frequency. Free-field Voltage Sensitivity.
-3dB Bandwidth: (Band Pass)	2.6 Hz to 300 kHz. Note: bespoke -3dB Bandwidth (Band Pass) is available upon request. Minimum available -3dB high pass frequency: 2.6 Hz.
	Band Pass Filter: 1st order, 20 dB/Decade Roll-off.
	1. **Reduce Noise**. Both ocean ambient noises and the self-noises of electronic devices decrease when frequency increases. It is recommended to choose a built-in high pass filter to reject noises in low frequency range. For example, if you are interested in the signals greater than 1kHz, you may specify a high pass filter with -3dB cut-off frequency at 200Hz to improve signal to noise ratio of the signals of the interest. 2. **Avoid Saturation**. Saturation may occurs when there are strong low frequency noises, disturbances, and/or vibrations, resulting from rough surface waves and/or mechanical movements of the platform. It is recommended to choose a high pass filter to avoid hydrophone saturation in these low frequency ranges.
Signal Conditioning:	Optional, Standalone Amplifier and Filters to compensate the loss of sound propagation and spreading or filter out noises. Order separately.
Pressure Noise Density:	Refer to Graph of Pressure Noise Density, Referred to Input (RTI), in µPa/√Hz.
Input Dynamic Range:	≥ 100 dB at 20 kHz Bandwidth.
Output Signal Type:	Differential
Output Impedance:	10 Ω
Cable Drive Capability:	200 m
Cable:	Four Conductor Shielded Cable
Receiving Connector:	1. Default: Wire Leads (**WL**), for Transmit, Receive Signal, and DC Power Supply. 2. Underwater Mateable Connector (3 pins) (**UMC3P**) (Max. Diameter Φ21.5 to Φ35 mm). Locking Sleeve: DLSA-M. Underwater Mateable Connector (4 pins) (**UMC4P**) (Max. Diameter Φ21.5 to Φ35 mm). Locking Sleeve: DLSA-M. Underwater Mateable Connectors are fixed with 0.6m unshielded cable. UMC is from global manufacturers of underwater connectors. Its part number is listed in quote in detail. 3. MIL-5015 Style (3 pin) (**MIL3P**) (Max. Diameter Φ19 to Φ30 mm). MIL-5015 Style (4 pin) (**MIL4P**) (Max. Diameter Φ19 to Φ30 mm). 4. XLR Receptacle with 3 Male Pins (**XLR3P**), (Max. Diameter Φ20.2 mm), for SE or DF. XLR Receptacle with 4 Male Pins (**XLR4P**), (Max. Diameter Φ20.2 mm), for SE or DF. 5. DIN Receptacle with 3 Male Pins (**DIN3P**), (Max. Diameter Φ17 mm), for SE or DF. DIN Receptacle with 4 Male Pins (**DIN4P**), (Max. Diameter Φ17 mm), for SE or DF. 6. Male BNC (**BNC**) (Max. Diameter Φ14.3 mm), for Transmit or Receive Grounded Signal. **BNC with RG178 Coax**: Service Temperature up to 165°C or 329°F. 7. 1/8" (3.5mm) TRS Plug (**TRS**) (Max. Diameter Φ10.5 mm), for Receive Signal ONLY.
	8. +9VDC Battery Snap (**BS**), +18VDC power supply. 9. 4mm Banana Plug Pair (Red and Black Color) (**BP**), DC power supply.
	Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.
Power Supply of Receiving Circuit	
Supply Voltage V_S:	+8.5 to +32 VDC
Current (Quiescent):	6.8 mA
Suggested DC Supply:	+9VDC Battery, Marine Battery, Automobile Battery, Fixed DC Linear Power Supply, Not Included. DO NOT use variable power supply whose maximum supply voltage is higher than the above rated voltage. DO NOT use switching mode DC power supply.
DC Supply Connector:	Refer to **Receiving Connectors**.

Wiring Information of Transmitting Sounds.

Transducer Wiring:	**Shielded Cable**	**Coax, BNC.**	**UMC3P, Locking Sleeve: DLSA-M.**	**MIL3P**	**DIN3P**	**XLR3P**
Signal:	White or Red	Center Contact	Contact 2	Contact C or G	Pin 3	Pin 2
Signal Common:	Black	Shield	Contact 1	Contact B	Pin 1	Pin 3
Shielding and Grounding	Shield	Shield	Contact 3	Contact A	Pin 2	Pin 1
Wiring of Unshielded Cable:	**Wire Leads WL**	**UMC2P** (0.6m USC Cable originally coming from manufacturer of the connector, Fixed.). Locking Sleeve: DLSA-M.				
Signal	White	Contact 2				
Signal Common	Black	Contact 1				

Wiring Information of Receiving Sounds.

Differential Output:	**Wire Leads**	**UMC4P/XLR4P**	**DIN4P**	**DIN3P/XLR3P + 9V BS**		**TRS + 9V BS**
+VDC	Red	Pin 3	Pin 4	Battery Female Snap		Battery Female Snap
Common	Black	Pin 1	Pin 1	Battery Male Snap		Battery Male Snap
Signal+	White	Pin 2	Pin 3	DIN Pin3	XLR Pin 2	TRS Tip
Signal-	Blue, Green, or Yellow	Pin 4	Pin 2	DIN Pin1	XLR Pin 3	TRS Ring
Signal Common	N/A	Pin 1	Pin 1	DIN Pin2	XLR Pin 1	TRS Sleeve
Shielding	Shield	Metal Shell	Metal Shell	Metal Shell		N/A

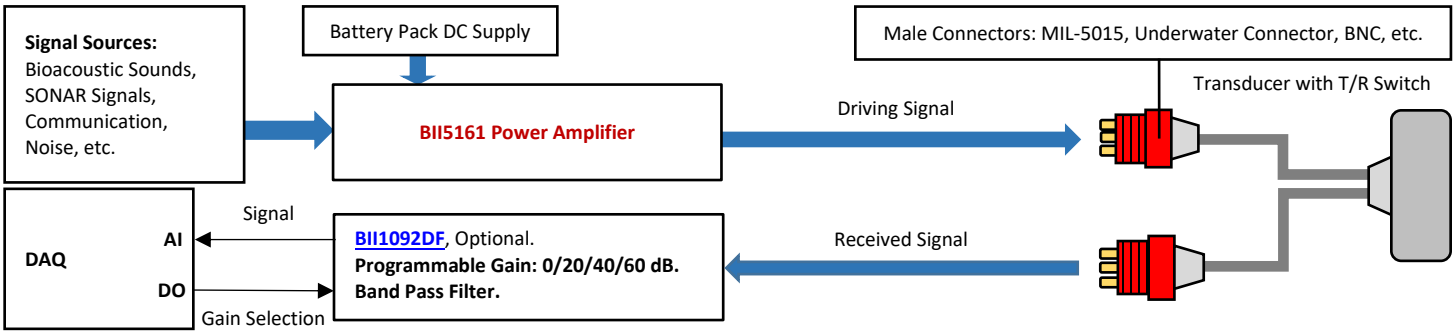
Optional DC Supply Connector: 4mm Banana Plug Pair, Red Plug for +VDC, **Black Plug** for Common of the DC power supply.

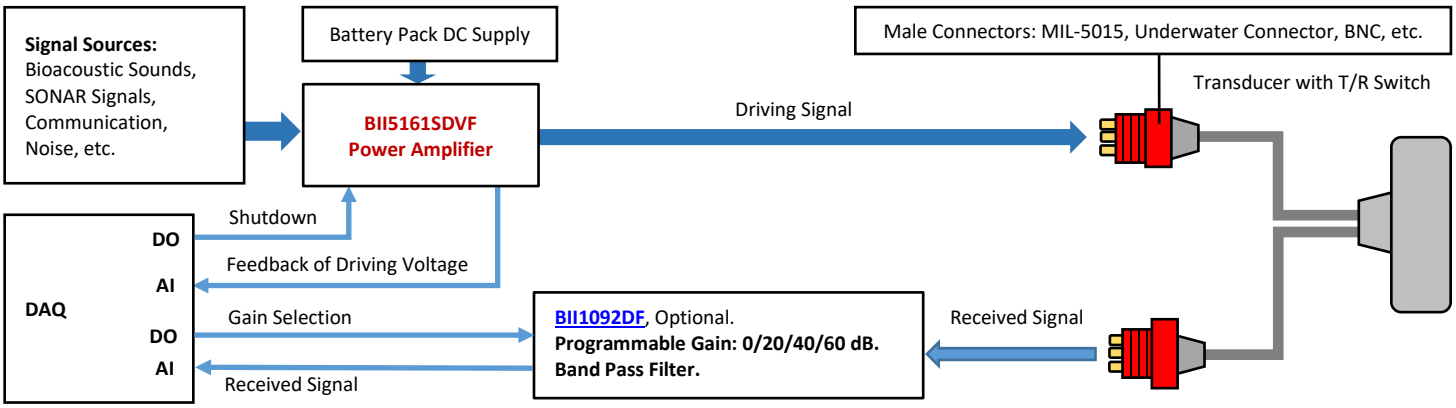
How to Order Transducers with built-in Low Noise Receiver. The default options are for stock items which are regularly available.

FH: Free Hanging. **SC for Low Frequency Transmit**: Shielded Cable (Rubber Jacket, 600V) with 2 conductors. **Coax for High Frequency Transmit:** 50 Ω Coaxial Cable. **SC for Low Frequency Receive**: Shielded Cable with 4 conductors. **Coax for High Frequency Receive:** 50 Ω Coaxial Cable. **WL**: Wire Leads. **HPF**: -3dB High Pass Filter Frequency. **LPF**: -3dB Low Pass Filter Frequency. **Cable of Temperature sensor** is two-conductor shielded cable. **Cable of DC Supply** is two-conductor shielded cable in case that receive cable is coax.				
Receiving Cable is fixed to be four-conductor Shielded cable. Transmitting cable can be customized to be Coax or two-conductor shielded cable.				
Length of Transmitting and receiving cables are same in default.				
Underwater Mateable Connector UMC2P and UMC4P are fixed with 0.6m unshielded cables.				
Part Number	**-Mounting**	**-Cable Length**	**-Transmit Cable**	**-Connector for signals of Transmit/Receive/DC Supply**
BII753xBT-LNR **BII753xFR-LNR**	Default: **BFM-FH-M8, or, BFM-FH-3/8".**	Default: **15m.**	**SC, USC, Coax.** Default: **SC**.	Default: **WL**.

Example:	**Description**
BII7536BT-LNR-BFM-FH-M8-15m-SC-WL	**BII7536BT Transducer, Built-in Low Noise Receiver, Bolt-Fastening Mounting with Free Hanging: BFM-FH-M8, 15m cables, Transmitting Cable: Shielded Cable, Wire Leads.**
BII7536BT-LNR-BFM-FH-M8-15m-SC-MIL3P/XLR4P/BS	BII7536BT Transducer, Built-in Low Noise Receiver, Bolt-Fastening Mounting with Free Hanging: BFM-FH-M8, 15m cables, Transmitting Cable: Shielded Cable, 3 Pin MIL-5015 Connector for Transmit Signal, 4 Pin XLR for Receive Signal, 9V Battery Snap for DC Supply.
BII7536BT-LNR-FH-15m-RG58-BNC/BNC/BS	BII7536BT Transducer, Built-in Low Noise Receiver, Free Hanging, 15m cables, Transmitting Cable: RG58 Coax, BNC Male Connector for Transmit Signal, BNC Male for Receive Signal, 9V Battery Snap for DC Supply.
BII7536BT-LNR-BFM-FH-M8-15m-SC-MIL3P/XLR4P/BS	BII7536BT Transducer, Built-in Low Noise Receiver, Bolt-Fastening Mounting with Free Hanging: BFM-FH-M8, 15m cables, Transmitting Cable: Shielded Cable, 3 Pin MIL-5015 Connector for Transmit Signal, 4 Pin XLR for Receive Signal, 9V Battery Snap for DC Supply.

System Block Diagram: Transmitting and Receiving Sounds





Question:

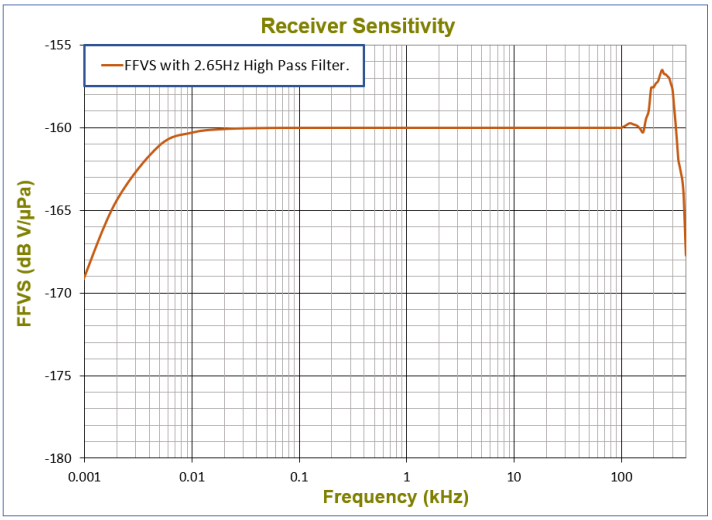
What if the mating connector of my DAQ module or recording device is NOT available from BII?

1. Buyer may order BII products with wire leads, and buyer assembles the mating connector to the cable end.
2. A connector adaptor might be assembled by BII by customization, and BII ships the adaptor to buyer as accessory of the device. Please contact BII for customizations.
3. Many adaptors for standard connectors are available in worldwide electronic suppliers such as BNC to SMA, BNC to SMC, XLR to TRS, etc. Check out your local suppliers.

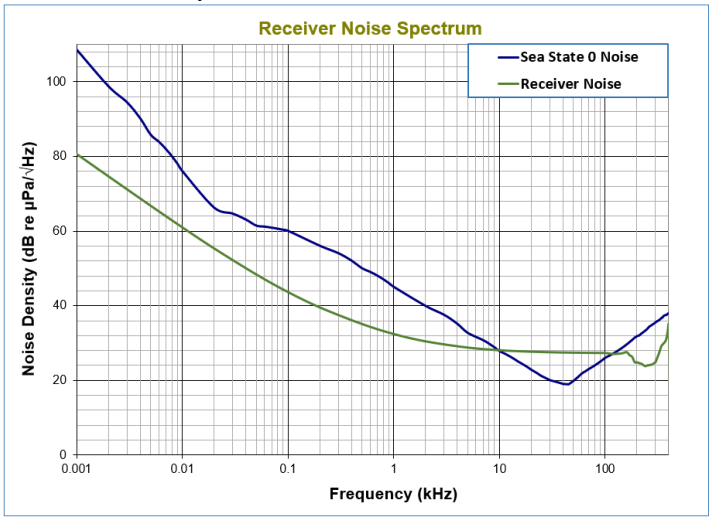
What are the features of the transducer when operating f << fs (fs is resonance frequency)?

1. Roughly, the TVR drops at 6dB/Octave or 20dB/Decade. 2. Power factor drops to be half per octave or one tenth per decade. 3. Efficiency drops with frequency decreasing. More and more electrical energy is consumed by transducer to be converted to heat which damage the transducer when the temperature inside transducer is over 100°C to 120°C (212°F to 248°F) roughly. Therefore, (1) when a transducer operates at f << fs, the driving power from power amplifier MUST be low enough to avoid damage: Low power continuous signals, or pulsing signals with 10% duty cycle and pulse length ≤ 100mS . (2) Use a low frequency transducer whose fs is at or very close to the frequencies of the interest.

FFVS of BII753xBT-LNR and BII753xFR-LNR



Pressure Noise Density of BII753xBT-LNR and BII753xFR-LNR



Cable and Connector Information for Signals of Hydrophones and Power Transducers (Projectors). Non-UL Uses.

	Wire and Cable Types	**Ratings of Voltage, Current or Power, and Temperature.**
Cables:	AWG18 Wires (**WR**).	3000 Vrms, 10 Arms.
	Two Conductor Shielded Cable (**SC**).	600 Vrms, 5 Arms. -50°C To +90°C, or -58°F to 194°F.
	Two Two-conductor Shielded Cable Bundle (**2SC**).	600 Vrms, 10 Arms. -50°C To +90°C, or -58°F to 194°F.
	Two, Four or Six Conductor Shielded Cable (**SCxx**).	60 to 600 Vrms, 0.2 Arms to 10A, for Hydrophone Use ONLY. -40°C to +80°C or -40°F to 176°F.
	High Temperature Shielded Cable (**HTSC199**).	600 Vrms, 6 Arms, up to +199°C or 390 °F, Non-waterproof.
	Twisted High Temperature Wire Bundles.	300 or 1000 Vrms, 6.5 Arms, up to +200°C or 392°F.
	Coax RG58 (50Ω) (**RG58**).	1400 Vrms, 4 Arms. -40°C To +80°C or -40°F to 176°F.
	Coax RG174/U (50Ω) (**RG174**).	1100 Vrms, 1.6 Arms. -40°C To +75°C or -40°F to 167°F.
	Coax RG178B/U (50Ω) (**RG178**).	750 Vrms, 0.86 Arms, -70°C To +200°C or -94°F to 392°F.
Connectors:	**Connector Type**	**Ratings of Voltage, Current or Power, and Temperature.**
	1. Wire Leads (**WL**).	Used for Cables or Wires.
	2. 50Ω BNC (**BNC**), Bayonet Lock. Panel Mount or In-line. In-line BNC: Input uses Pin, output uses Socket. Panel Mount BNC: Both Input and Output use BNC Jacks.	500Vrms, 316W. (1) -65°C ~ 165°C, or -85°F ~ 329°F. (2) -40°C ~ 85°C, or -40°F ~ 185°F. Used for Grounded Signal with Metal Enclosures or Coax Cables.
	3. MIL-5015 Type Connector (**MIL**), Thread Fastening. Panel Mount or In-line. Input uses Pin, output uses Socket.	500Vrms, 13 A; Up to +125°C or 257°F, or, 900Vrms, 13 A; Up to +125°C or 257°F. Used for Metal Enclosures or Shielded Cables.
	4. Circular Connector DIN EN (**DIN**), Thread Fastening. Panel Mount or In-line. Input uses Pin, Output uses Socket.	250Vrms, 10 A; -40°C to +100°C or -40°F to 212°F. Used for Metal Enclosures or Shielded Cables.
	5. XLR Connector (**XLR**), Positive Latchlock. Panel Mount or In-line. Input uses Pin, Output uses Socket.	133Vrms, 15 A; -25°C to +75°C or -13°F to +167°F. Used for Metal Enclosures or Shielded Cables.
	6. 3.5mm or 1/8" TRS (**TRS35**), Panel Mount with Jack, In-line with Plug, for analog audio signals.	30Vrms, 0.3A; -25°C to +75°C or -13°F to +167°F. Used for Metal Enclosures or Shielded Cables.
	7. Underwater Mateable Connector (**UMC**), Thread Fastening. Panel Mount or In-line. Input uses Pin, Output uses Socket.	600Vrms, 10A. Waterproof, IP68. 3000m Ocean Depth. -40°C ~ 60°C, or -40°F ~ 140°F. Used for Metal Enclosures or Shielded Cables.

How to choose cable and connector for BII devices: Driving Voltage V_{drive} (V_{rms}) = $\sqrt{RMS\ Power * \frac{G}{G^2+B^2}}$.

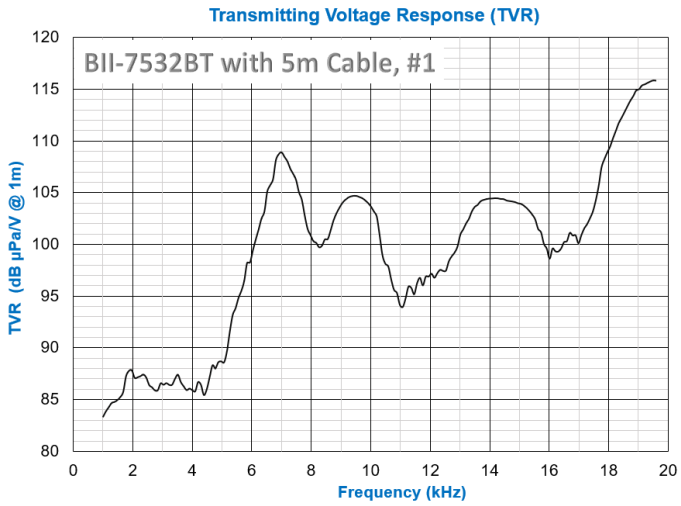
BII lists G-B data at fs and/or the graph of G-B vs Frequency in online datasheet.

Case 1. Deliver 1000 Wrms to 3 kΩ transducer at f_s. Note: $G/(G^2+B^2)$=3 kΩ is the resistive load of the transducer in load medium at f_s.
Driving voltage to transducer $V_{drive} = \sqrt{1000 * 3000}$ = 1732 V_{rms}. The current to 3 kΩ transducer $I_{drive} = V_{drive}/R_L$ = 1732Vrms/3000Ω = 0.57733 A_{rms}.
Therefore, AWG18 Wire and Wire leads are suitable.

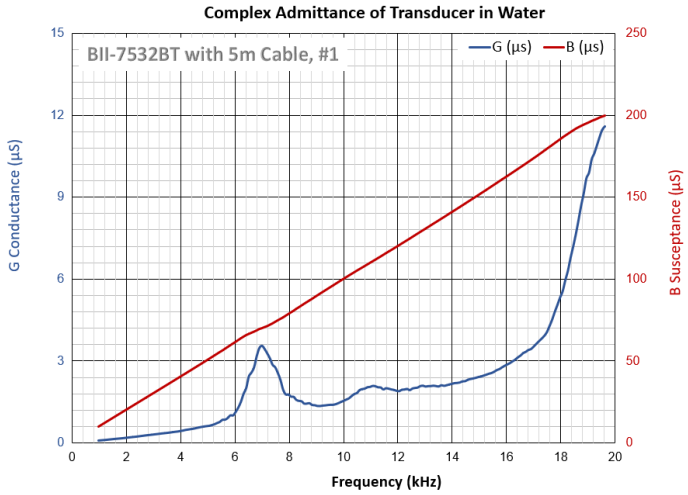
Case 2. Deliver 500 Wrms to 300 Ω transducer at f_s. Note: $G/(G^2+B^2)$=300 Ω is the resistive load of the transducer in load medium at f_s.
Driving voltage to transducer $V_{drive} = \sqrt{500 * 300}$ = 387.3 V_{rms}. The current to 300 Ω transducer $I_{drive} = V_{drive}/R_L$ = 387.3Vrms/300Ω = 1.291 A_{rms}.
Therefore, Two Conductor Shielded Cable and MIL-5015 Type Connector or Underwater Mateable Connector (UMC) are suitable.

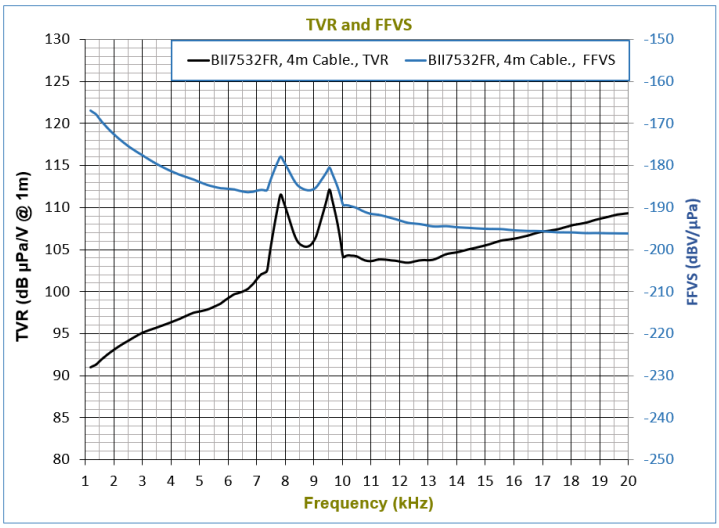
Case 3. Deliver 300 Wrms to 50 Ω transducer at f_s.
Driving voltage to transducer $V_{drive} = \sqrt{300 * 50}$ = 122.5 V_{rms}. The current to 50 Ω transducer $I_{drive} = V_{drive}/R_L$ = 122.5Vrms/50Ω = 2.45A_{rms}.
Therefore, 50Ω RG58 Coax and BNC are suitable.

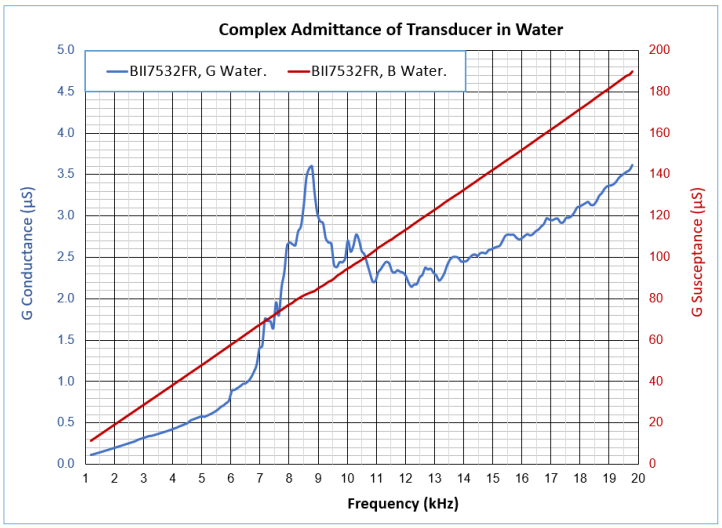
Transmitting Voltage Response (TVR)



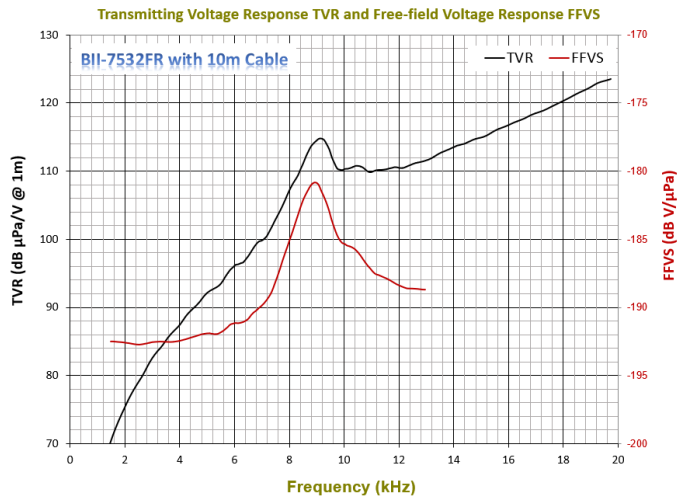
Admittance (Transdducer with 5m Cable)



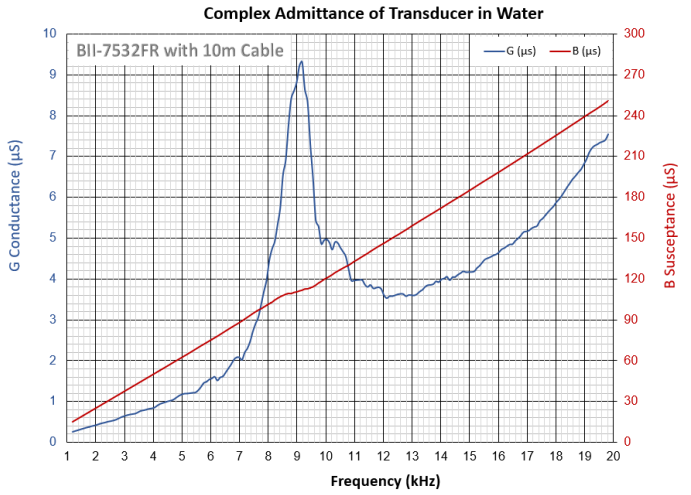




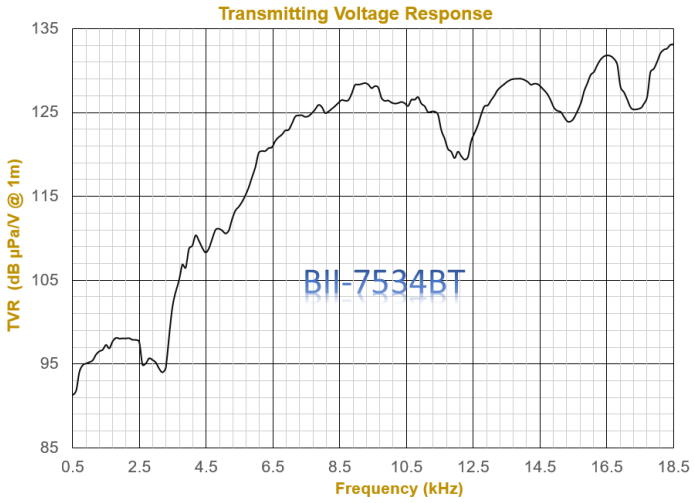
Transmitting Voltage Response (TVR)



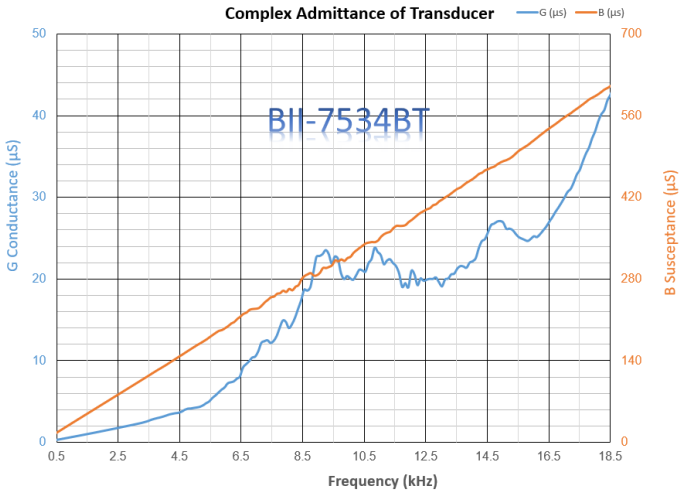
Admittance



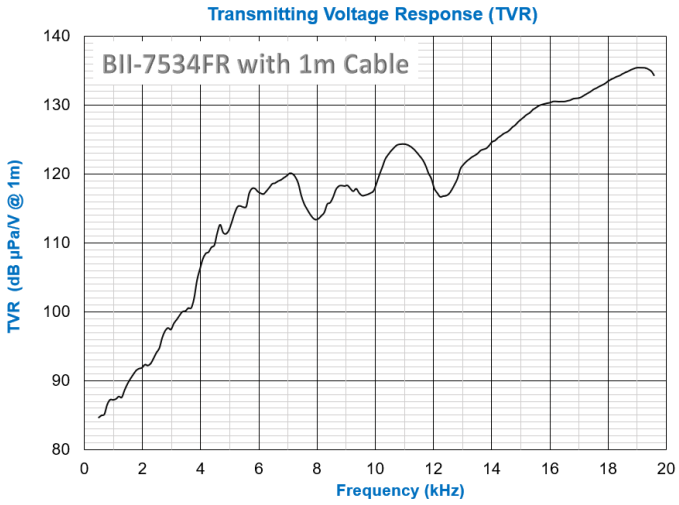
Transmitting Voltage Response (TVR)



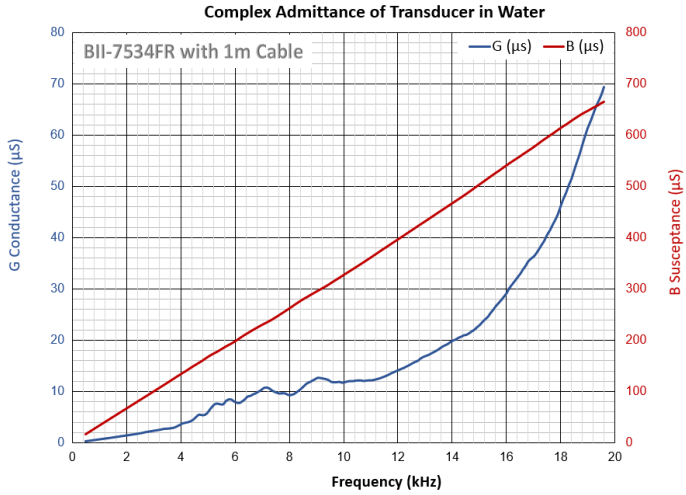
Admittance (Transducer with 1m Cable)



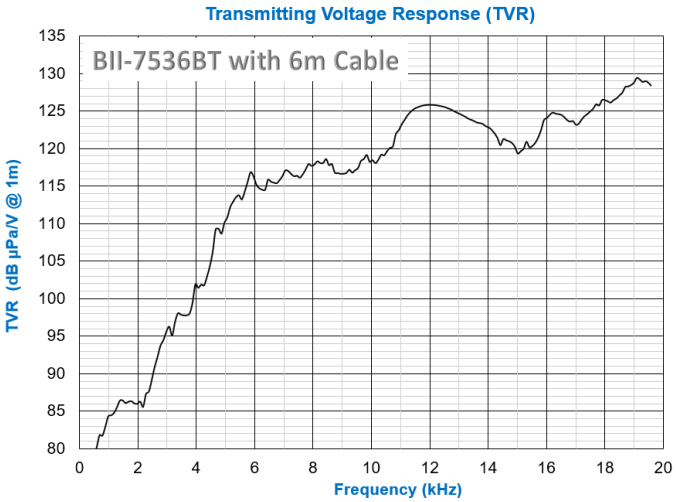
Transmitting Voltage Response (TVR)



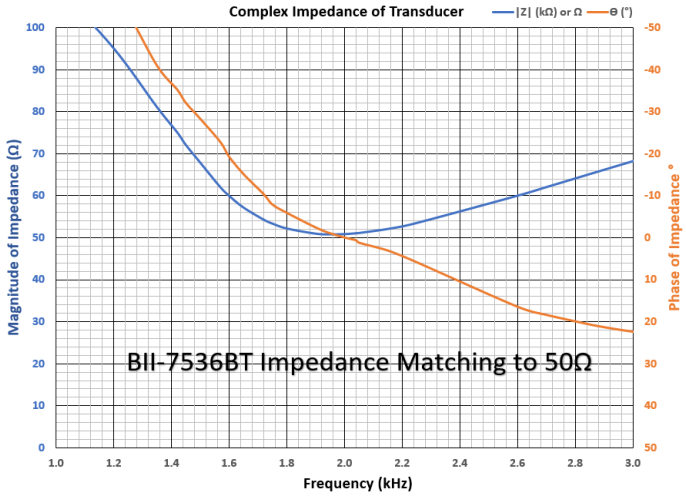
Admittance (Transducer with 1m Cable)



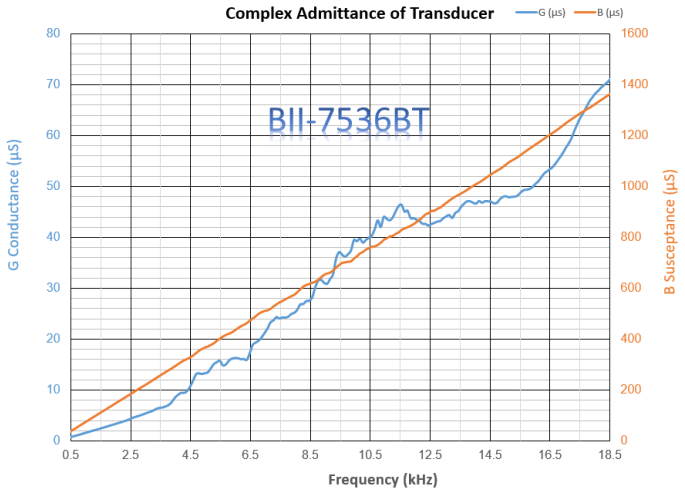
Transmitting Voltage Response (TVR)



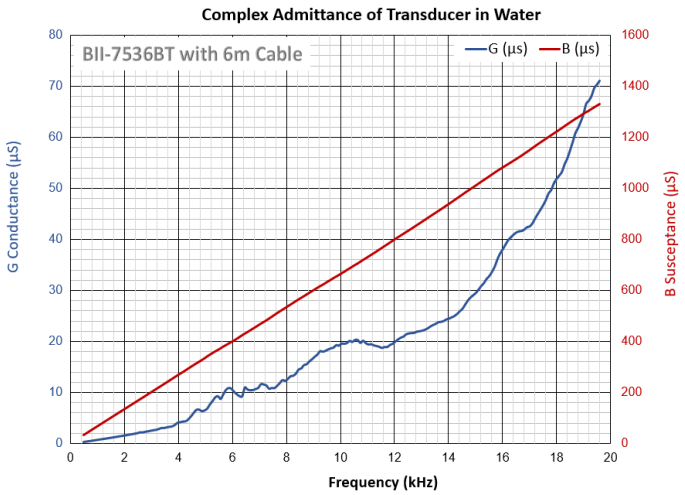
Customized Impedance Matching to 50Ω at 2 kHz



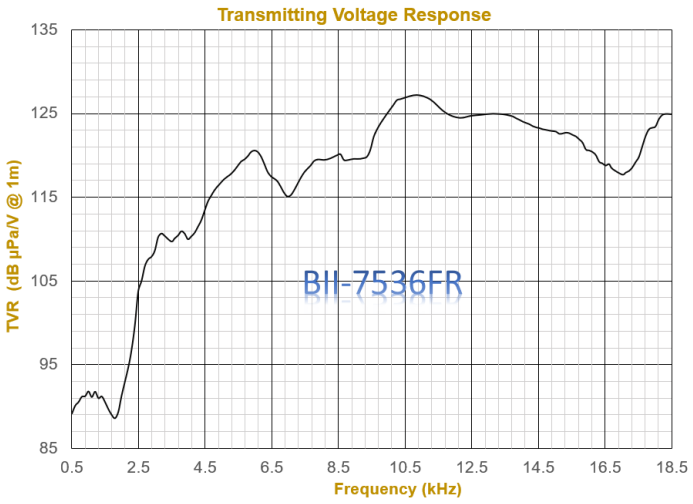
Admittance (Transducer with 1 m Cable)



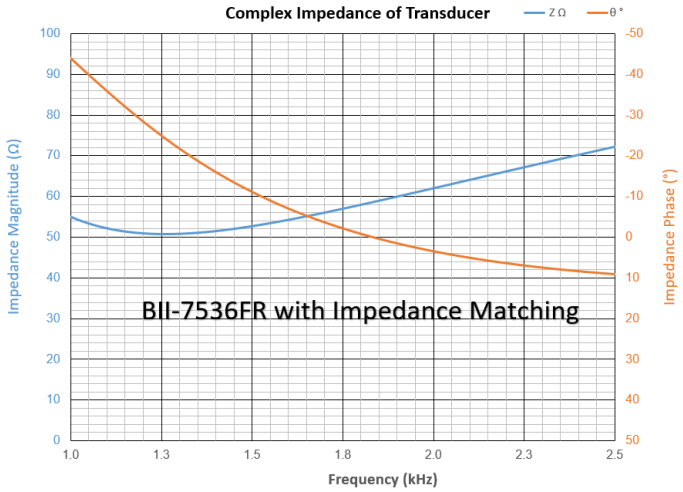
Admittance (Transducer with 6 m Cable)



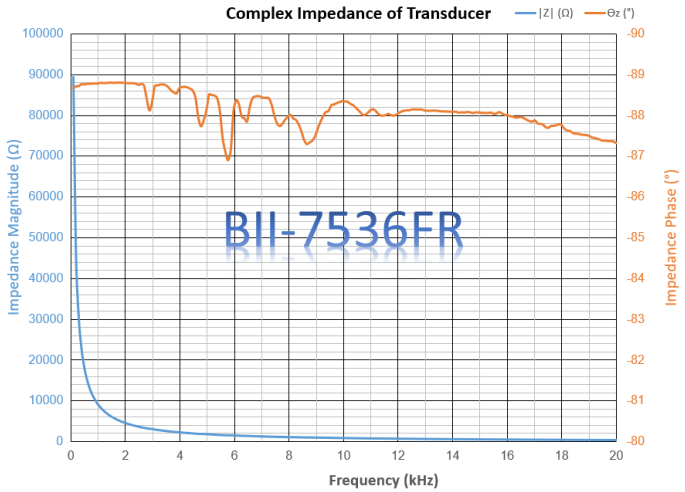
Transmitting Voltage Response (TVR)

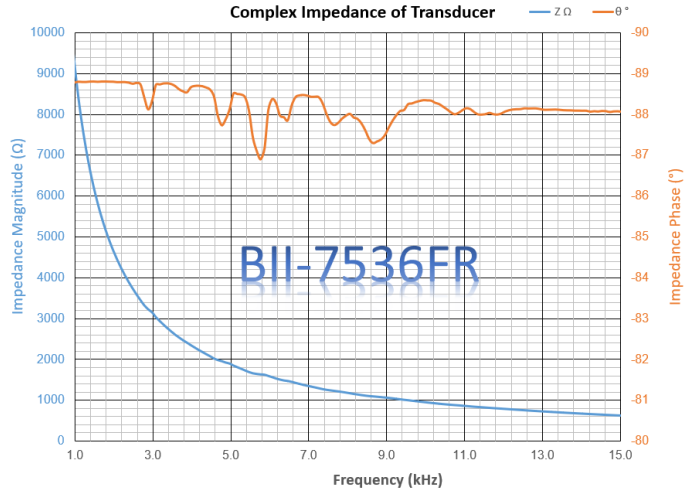


Customized Impedance Matching to 50Ω at 1.5kHz



Impedance (Transducer with 50m Cable)





Physical Size (Dimensional Unit: mm), Please contact BII for other bespoke installations.

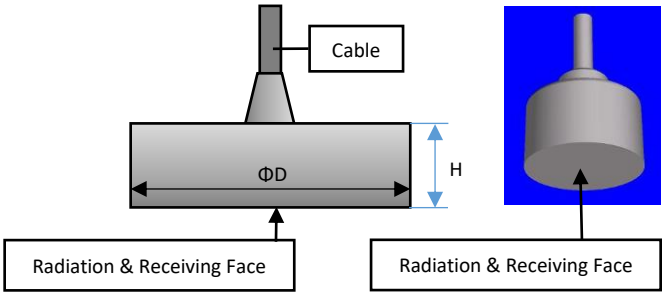
Note: physical size of BII753xBT-LNR and BII753xFR-LNR are same to BII753xBT and BII753xFR respectively except two cables of BII753xBT-LNR and BII753xFR-LNR.

Two-Conductor shielded cables: High Voltage Transmit Signal to the Transducer.

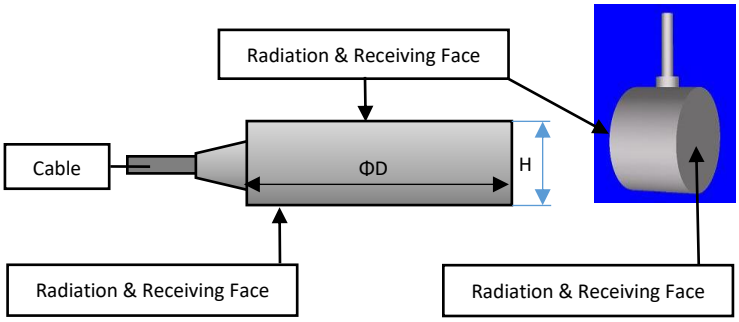
Four-Conductor shielded cables: ONLY for BII753xBT-LNR and BII753xFR-LNR, Received Signal from the Transducer.

1. Free Hanging FH

BII7532BT, BII7534BT, BII7536BT

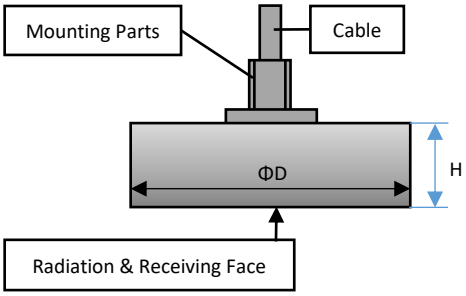


BII7532FR, BII7534FR, BII7536FR

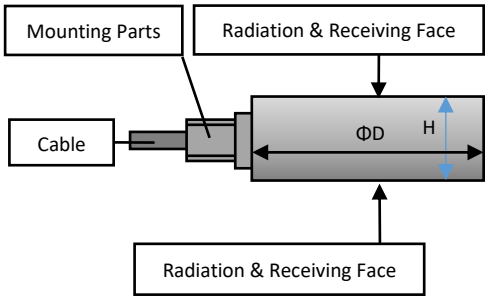


2. Bolt Fastening Mounting (Stainless Steel) THM-7/16", THM-5/8", BFM-7/16", BFM-5/8".

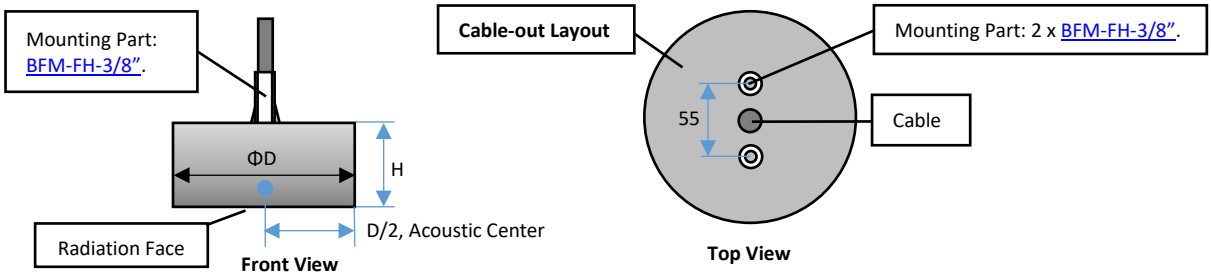
BII7532BT, BII7534BT, BII7536BT



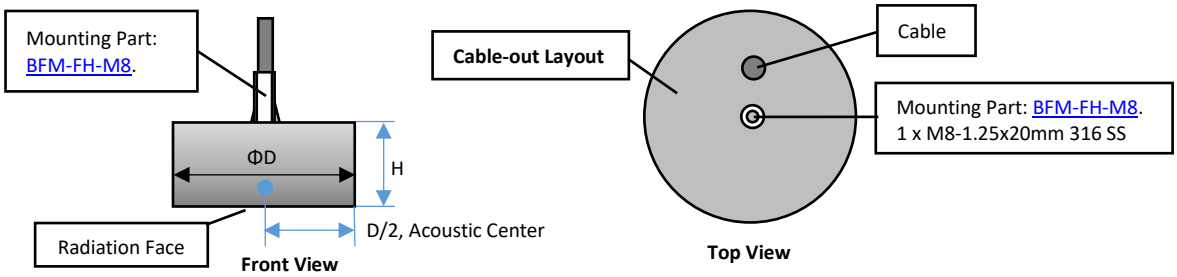
BII7532FR, BII7534FR, BII7536FR



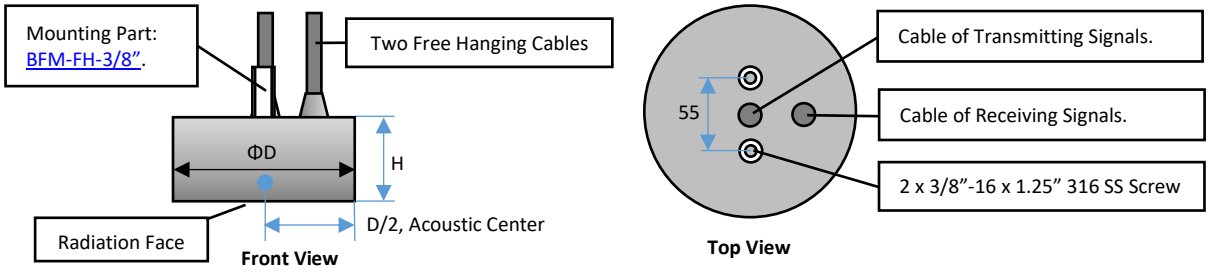
3. BII7534BT, BII7536BT, Bolt Fastening Mount with Free Hanging Cable (BFM-FH-3/8", 3/8"-16 x 1.25" 316 SS Screw).



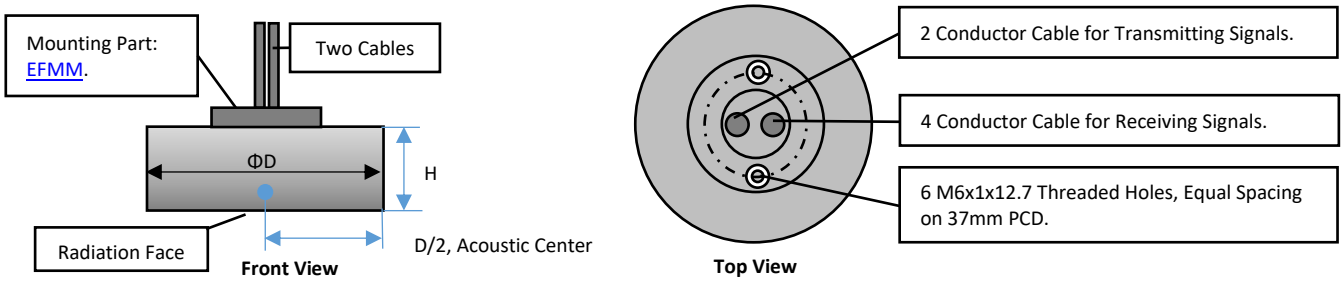
4. BII7532BT Bolt Fastening Mount with Free Hanging Cable (BFM-FH-M8, M8-1.25x20mm).



5. BII753xBT-LNR Cable-out Layout for Bolt Fastening Mount with Free Hanging Cable (BFM-FH-3/8"),



6. BII753xBT-LNR Cable-out Layout for End-face Mounting for Multi-Channel (EFMM).



Application Notes

BII7532BT and BII7532FR generate sound in water from 100Hz to 60kHz.

Setup at BII Laboratory

Warning: Dangerous High Voltage exists on cables and devices between BII5003 power amplifier and BII7532FR transducer. An End User MUST observe electrical codes of End User's country to ensure electrical safety for operators and devices, for example, Install both BII5003 and BII6014 in a firmly grounded instrument enclosure, and all exposed bare wires, metal wires, wire leads, solders, and joints shall be insulated with insulation material such as heat shrink tubing, fully insulated wire splicing connectors, etc. The insulation voltage must be greater than twice the maximum voltage of the device.

BII does NOT take any liability/responsibility for the setup's electrical safety.