

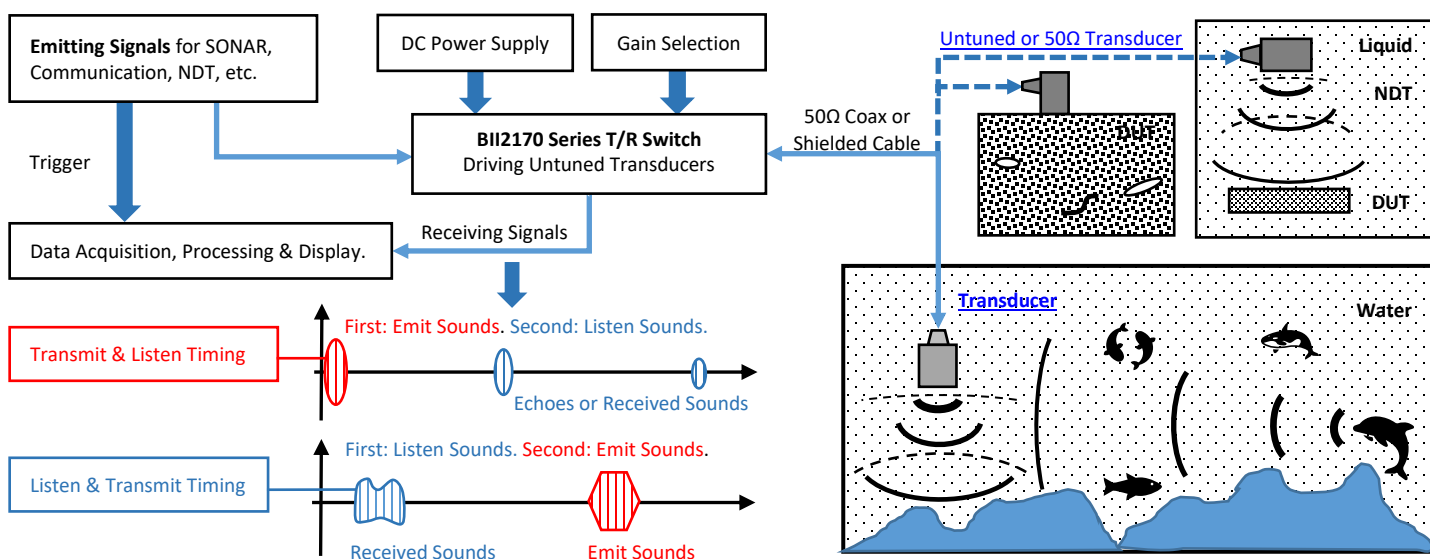
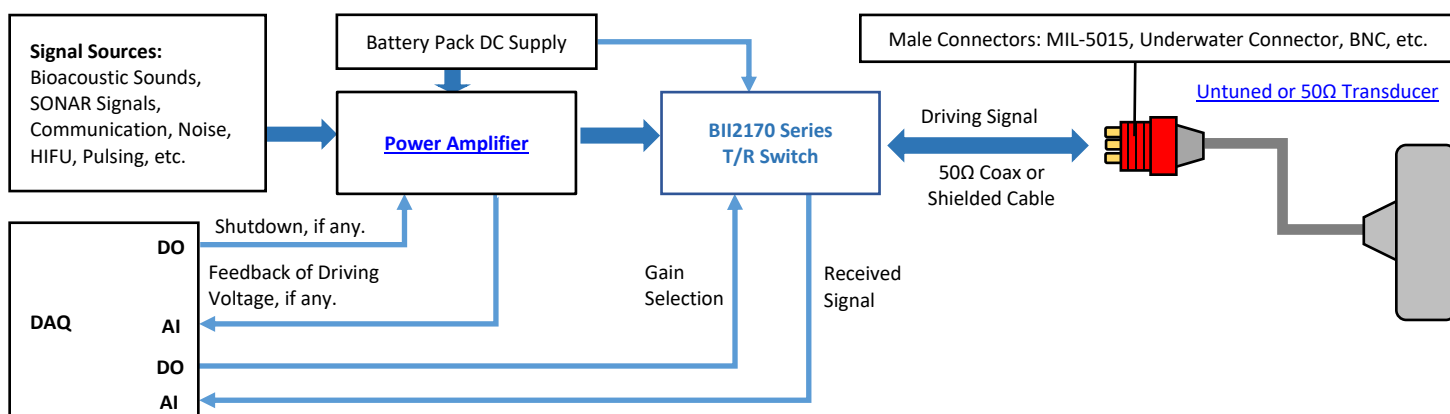
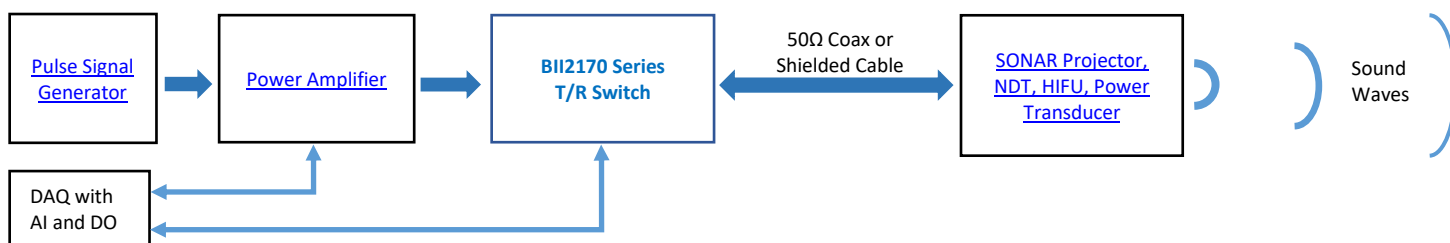


BII2170 Series T/R (Transmitting and Receiving) Switch Modules for SONAR & NDT Transducers

A BII2170 Series T/R switch module is an integrated solution for a wide range of acoustic applications based on Emitting and Listening Timing Techniques. The device works at active mode (Transmitting Sounds) and passive mode (Listening Sounds) with a **transducer** which can radiate and receive sounds. A BII2170 device integrates an impedance matching network, a T/R switch, a bandpass filter, and a low noise DPGA preamplifier (Digitally Programmable Gain Amplifier) or a Fixed Gain Amplifier (FGA) into one compact housing. Gain-selection is accomplished by a two-bit or one-bit digital word (TTL/CMOS level compatible). The built-in impedance matching network is customized to match impedance between the power amplifier and the transducer at operating frequency, generally at resonance frequency f_s .

Tips: Separation of transmitting element and receiving element below 1MHz can improve receiving performances such as lower noise level, optimum directivity, and higher sensitivity etc. BII manufactures [transducers with separated transmitting elements and receiving elements](#) to achieve better acoustic performances below 1MHz.

Acoustic Transmitting and Receiving System with Untuned or 50Ω Transducers



Typical Applications

Echo Sounder (Navigation/Object Avoidance, Depth/Distance Sounder, Wave-height Sensor), Target Strength Measurement, Sub-bottom Profilers, Side-scan SONAR, Fishery SONAR, Transponders, Positioning, Beacon, Communication and Telemetry, Artificial Acoustic Target, Acoustic Speedometers (Doppler SONAR), Sound Velocity Profiler, Marine Bioacoustics, Acoustic Deterrent Devices, Ocean Current Profiling, Flow Meter, NDT (Non-destructive Test), Diagnostic Ultrasounds, Ultrasonic Test and Analysis, Material Study.

SPECIFICATIONS

T/R Switch Modules	BII2171WR	BII2172MIL	BII2173BNC	BII2174BNC
		BII2172WR	BII2173WR	
	ACTIVE	ACTIVE	ACTIVE	ACTIVE
	WR: Wire/Cable Bundles with Wire Leads for embedded applications; MIL: Panel-Mount MIL-5015 Connectors; BNC: Panel-Mount BNCs. x in Part Number: 1, 2, or 3 , for example, BII217xWR = BII2171WR, BII2173WR, or BII2173WR. 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.			
Typical Applications:	Half-duplex Acoustic System: transmitting sounds and receiving sounds occur at separate timing.			
	Driving Voltage ≥ 900Vrms. RMS Power ≥ 1000 W.	Driving Voltage ≤ 900Vrms. RMS Power ≤ 1000 W.	Driving Voltage ≤ 500Vrms. RMS Power ≤ 316 W.	Pulsing Voltage ≤ 500 Vpeak. Pulsing Power ≤ 316 W.
Package and Installation:	1. Standalone Instrument BII217xMIL, BII217xBNC: Enclosure with Mounting Flange (4 mounting holes) and Panel-mount Connectors.			
	2. Embedded Components BII217xWR: Enclosure with Mounting Flange (4 mounting holes/Slots), Cable/Wire Bundles, and Wire Leads, for being Installed in end user's enclosures such as underwater case, submersibles, floating platform, Onshore/offshore work stations, etc.			
Overall Frequency Range:	Refer to Transmitting Frequency Range and Receiving Frequency Range .			
Power Capacity:	Refer to Cable and Connector Information .			
Signal Type:	Spike, SINE Pulse, Chirp, PSK, FSK; Pulse, Square Waveform; Continuous Waveform, etc...			
Echo Sounding Distance:	≥ 0.3 m	≥ 0.3 m	≥ 3 mm to 0.03 m	≥ 3 mm to 0.03 m
	Dependent on the near-field distance , bandwidth, and operating frequency of a transducer.			
Transducers:	Transducers which can radiate and receive sounds.			
	For general-purpose applications, all kinds of piezoelectric transducers work with BII2170 series T/R Switch.			
	Untuned transducers are recommended for better receiving performance such as lower threshold or larger dynamic range. A Untuned Transducer is the one which has no any add-on component to tune or adjust its acoustic parameters or performances.			
Supply Voltage Vs:	+8.5 to +32 VDC.	+8.5 to +32 VDC.	+14 to +35 VDC.	+14 to +35 VDC.
Current (Quiescent):	22 mA	22 mA	19 mA	14.4 mA
Fuse and Fuse Holder:	BII217xMIL, BII217xBNC: Panel Mount Fuse Holder, 200 mA, Fast-acting, 5x20mm.			
	BII217xWR: None.			
Power Supply Cable:	BII217xMIL, BII217xBNC: DC-PPBP-24			
	BII217xWR: DC-PCWL-24			
Suggested DC Supply:	9V Battery, Marine Battery, Automobile Battery, Battery Pack, Subsea Battery, or DC Power Supply with Grounded Output and Protection of Output Current Limit.			
DC Switch:	BII217xMIL, BII217xBNC: Turn ON/OFF power supply.			
	BII217xWR: None.			
Grounding Stud:	BII217xMIL, BII217xBNC: #10-24 Screw.			
	BII217xWR: None.			
Grounding Cable:	BII217xMIL, BII217xBNC: GWL18 .			
	BII217xWR: None.			
Housing:	Plastic Housing	Metal Enclosure	Metal Enclosure	Metal Enclosure
	Note: BII uses third-party's metal housing in production. Because of variation of suppliers' production, BII can NOT guarantee that BII can use metal housing for the devices. In case of metal housing is NOT available, BII will choose enclosures made from other materials such as plastics at BII's discretion.			
Mounting:	Four holes and/or slots for installing the device to a firm base. Refer to the respective drawings for the size.			
	Fasteners (Screws, Washers, Nuts, etc.) for installing or mounting the devices: not included .			
Size LxWxH, ΦDxH (mm): Depending on Power.	Φ104x(100 to 150). 104x104x(100 to 150). 120.5x120.5x(100 to 150).	147.2x67.2x55. 146.9x91.7x56. 146.9x91.7x85. 180.5x110.3x93.	147.2x67.2x55. 146.9x91.7x56. 146.9x91.7x85. 180.5x110.3x93.	147.2x67.2x55. 146.9x91.7x56. 146.9x91.7x85. 180.5x110.3x93.
Weight:	2 to 6 kg.	0.9 to 3 kg.	0.2 to 2 kg	0.2 to 2 kg
Operation Temperature:	-10 to +60 °C, or 14 to 140 °F.			
Storage Temperature:	-20 to +60 °C, or -4 to 140 °F.			
Sound Transmitting				
Signal Type:	Pulsing Signals ONLY:			
	SINE/Chirp Pulses, PSK/FSK Pulses; Positive/Negative Burst Pulses, Burst Pulse Trains.			Positive/Negative Voltage Spikes.
	Warning: Continuous Waveform destroys the devices by overheating.			
Pulsing Parameters:	Pulse Width (Pulse Duration): ≤ 10 mS. Duty Cycle: ≤ 10%.			
	Pulse Voltage and Power: refer to Typical Applications .			
	Pulsing Parameters of a system are also limited by pulsing capability of transducers. Warning: Pulsing parameter exceeding the parameters specified above may destroy the devices by overheating.			
Frequency Range fs:	5 to 300 kHz	5 to 300 kHz	5 kHz to 2 MHz	0.1 to 10 MHz
	One BII's T/R Switch ONLY support one fs. Specify only one fs when ordering BII TR Switch.			
	fs is resonant frequency of a transducer at which maximum TVR exists.			
Impedance Matching:	Yes, built-in, Impedance matching between Signal Source and Transducer for maximum power delivery.			
Driving Voltage V _{drive} :	1. Refer to Cable Options and Connector Options . 2. A shorter pulse width PW and a lower duty cycle D allow a BII TR switch to handle a higher pulse power without damage.			
Transmitting Voltage Gain:	10*log ₁₀ (1/(R _s *G _s)), in dB. R _s : Output Resistance of Signal Source. G _s : Conductance of the transducer at fs.			
Maximum Power:	Limited by the transducer, cable, and duty cycle and pulse length of the signal, whichever is less.			
Cable Length:	BII217xWR: 0.15 m			
Cable:	BII217xWR: AWG18 Wires (WR)			
Input/Output Connector:	BII217xMIL: MIL-5015 Type Connector.			

	BII217xBNC: Panel Mount BNC Jack.			
	BII217xWR: None, Wire Leads.			
Cable and Connector Information for High Power Signals (from Power Amplifier and to Transducers). Non-UL Uses.				
Cable Options:	Wire and Cable Types		Ratings of Voltage, Current or Power, and Temperature.	
	1. AWG18 Wires (WR)		3000 Vrms, 10 Arms.	
	2. Two Conductor Shielded Cable (SC)		600 Vrms, 5 Arms.	
	3. High Temperature Shielded Cable (HTSC199)		600 Vrms, 6 Arms, up to +199°C or 390 °F, Non-waterproof.	
	4. Coax RG58 (50Ω) (RG58)		1400 Vrms, 4 Arms.	
	5. Coax RG174/U (50Ω) (RG174)		1100 Vrms, 1.6 Arms.	
	6. Coax RG178B/U (50Ω) (RG178).		750 Vrms, 0.86 Arms, up to +200°C or 390°F.	
Connector Options:	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. Used for 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. Underwater Mateable Connector (UMC), Thread Fastening. Panel Mount or In-line. Input uses Pin, output uses Socket.		600Vrms, 10A. Waterproof, IP68. 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 fs. Note: $G/(G^2+B^2)=3\ k\Omega$ is the resistive load of the transducer in load medium at fs. Driving voltage to transducer $V_{drive} = \sqrt{1000 * 3000} = 1732\ V_{rms}$. The current to 3 kΩ transducer $I_{drive} = V_{drive}/R_L = 1732Vrms/3000\Omega = 0.57733\ A_{rms}$. Therefore, AWG18 Wire and Wire leads are suitable.				
Case 2. Deliver 500 Wrms to 300 Ω transducer at fs. Note: $G/(G^2+B^2)=300\ \Omega$ is the resistive load of the transducer in load medium at fs. Driving voltage to transducer $V_{drive} = \sqrt{500 * 300} = 387.3\ V_{rms}$. The current to 300 Ω transducer $I_{drive} = V_{drive}/R_L = 387.3Vrms/300\Omega = 1.291\ A_{rms}$. 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 fs. Driving voltage to transducer $V_{drive} = \sqrt{300 * 50} = 122.5\ V_{rms}$. The current to 50 Ω transducer $I_{drive} = V_{drive}/R_L = 122.5Vrms/50\Omega = 2.45A_{rms}$. Therefore, 50Ω RG58 Coax and BNC are suitable.				
Please contact us for bespoke wirings of differential transducers such as dipole, quadrupole, multimode rings, and flextensional sources.				
Sound Receiving				
Receiving Gain (dB):	20, 40, 60, 80.	20, 40, 60, 80.	20, 60.	30, 60.
Gain Vs. Frequency:	Frequency Response of Receiving Gain.			
Receiving Frequency:	2 kHz to 1 MHz/350 kHz	2 kHz to 1 MHz/350 kHz	2 kHz to 4.5 MHz	100 kHz to 10 MHz
Band Pass Filter:	-3 dB bandwidth of receiving signal processing. Built-in, 2nd order, 40 dB/Decade Roll-off.			
	2 kHz to 5*fs or 1MHz whichever is less.	2 kHz to 5*fs or 1MHz whichever is less.	2 kHz to 5*fs or 4.5 MHz whichever is less.	10 kHz to 5*fs or 17 MHz whichever is less.
	Note: The narrower the pass band of the filter is, the lower the ambient and electronic noises are.			
Input Referred Noise: (at f ≥ 1 kHz)	6.6 nV/√Hz.	6.6 nV/√Hz.	6.6 nV/√Hz.	5.0 nV/√Hz.
	3.1 fA/√Hz.	3.1 fA/√Hz.	3.1 fA/√Hz.	4.0 fA/√Hz.
	Roughly electronic noise density at input, $RTI, V_n^2 = e_n^2 + [i_n * impedance\ of\ a\ transducer\ (or\ hydrophone)]^2$. RTI: Reference to Input.			
Input Dynamic Range:	90 dB			
Settling Time, 0.01%:	2 μs	2 μs	0.2 μs	42 ns
Received Signal				
Output Impedance:	50 Ω			
Cable Drive Capability:	200 m	200 m	≤ 20 m or 50Ω Coax.	≤ 20 m or 50Ω Coax.
Output Signal:	Waveform, AC Coupled.			
Output Signal Type:	Differential	Differential	Single Ended	Single Ended
Output Signal Range:	Supply Voltage Vs - 4, in Vpp.	Supply Voltage Vs - 4, in Vpp.	11 Vpp.	11 Vpp.
Cable Length:	BII217xWR: 0.15 m .			
Cable:	BII217xWR: Shielded Cable			
Connector:	BII217xWR: Wire Leads			
	BII217xMIL: Panel Mount, XLR 3 Female Contacts.			
	BII217xBNC: Panel Mount, BNC Jack.			
Receiving Gain Selection:				
Cable Length:	BII217xWR: 0.15 m .			
Gain Selection Cable:	BII217xWR: Shielded Cable			
Connector:	BII217xWR: Wire Leads			
	BII217xMIL: Panel Mount. DIN Jack.			
	BII217xBNC: Panel Mount, BNC Jack.			
Gain Selection:	A 2-bit digital output word. Shield wire: Digital Common.	A 2-bit digital output word. Shield wire: Digital Common.	A 1-bit digital output word. Shield wire: Digital Common.	A 1-bit digital output word. Shield wire: Digital Common.
	TTL/CMOS Compatible.			

	Logic Low 0: 0 to +0.8 VDC from digital outputs, or Gain Selection Wire is short to Digital COMMON. Logic High 1: +2.4 VDC to +Vs from digital outputs, or Gain Selection Wire Opens. Vs: Power Supply Voltage.													
Truth Table:	A1	A0	Gain(dB)	Bandwidth	A1	A0	Gain(dB)	Bandwidth	A0	Gain(dB)	Bandwidth	A0	Gain(dB)	Bandwidth
	0	0	20	1 MHz	0	0	20	1 MHz	0	20	4.5 MHz	0	30	17 MHz
	0	1	40	1 MHz	0	1	40	1 MHz	1	60	4.5 MHz	1	60	10 MHz
	1	0	60	1 MHz	1	0	60	1 MHz						
	1	1	80	350 kHz	1	1	80	350 kHz						

WARNING: The buyer observes the National Electrical Code or other related codes of buyer’s country to assemble and integrate this device into buyer’s product or system, and follow the code to ground and insulate this device. It is buyer’s sole responsibility to make sure the proper insulation and grounding for operating safety before putting the device into service.

Dangerous voltages, capable of causing injury or death, are present in this device. **DO NOT TOUCH THE DEVICE, ITS WIRES, CABLES, AND CONNECTORS BEFORE THE POWER SUPPLIES AND SIGNAL SOURCES ARE SHUT DOWN.**

1. All exposed bare wires, metal wires, wire leads, and solders 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.
2. This device **MUST** be firmly grounded for operation safety. Cable shield, if any, **MUST** be grounded for operation safety.
3. Coax with BNC is not intended for hand-held use at voltages above 30VAC/60VDC. It is buyer’s sole responsibility to make sure that the BNC shield of the signal source is firmly grounded for operation safety before hooking up the device to the signal source.

Ordering Information of BII2170 Series.

Power: RMS or Peak Power delivered to Transducer from PA, in RMS Watt (Sine/Chirp Pulses, etc.) or Peak Watt (Spike or Single Pulse for NDT). **The POWER can be ignored with blank if RMS power of the transducer and/or the amplifier is known. In these cases, BII will use RMS power of the transducer and/or the amplifier to design the power capacity of the device;** **PW:** Maximum Pulse Width in μ S, mS, or S; **D:** Maximum Duty Cycle in %; **fs:** Frequency of Impedance Matching, in kHz or MHz; **Z_{TX}:** Transducer Impedance, in Ω ; **θ :** Transducer Phase in $^{\circ}$; **Z_{IM}:** Impedance for Optimum Power Transfer from the PA to the Transducer, in Ω ; **PA:** Power Amplifier; **TX:** Transducer; **PN:** Part Number. **HPF:** -3dB High Pass Filter of Receiving, **LPF:** -3dB Low Pass Filter of Receiving.

Refer to [Power Amplifier](#) for available options and wirings. Refer to [Transducer](#) for available options and wirings.

1. BII2171WR for High Power Application (Generally, Power ≥ 1000 Wrms, Driving Voltage ≥ 900 Vrms).

T/R Switch Module as Embedded Components being installed into end user's grounded enclosure. Cylindrical Plastic Housing with Round or Square Steel Chassis, Four Hole/Slots for Mounting, Accept #10 and M5 Screw.

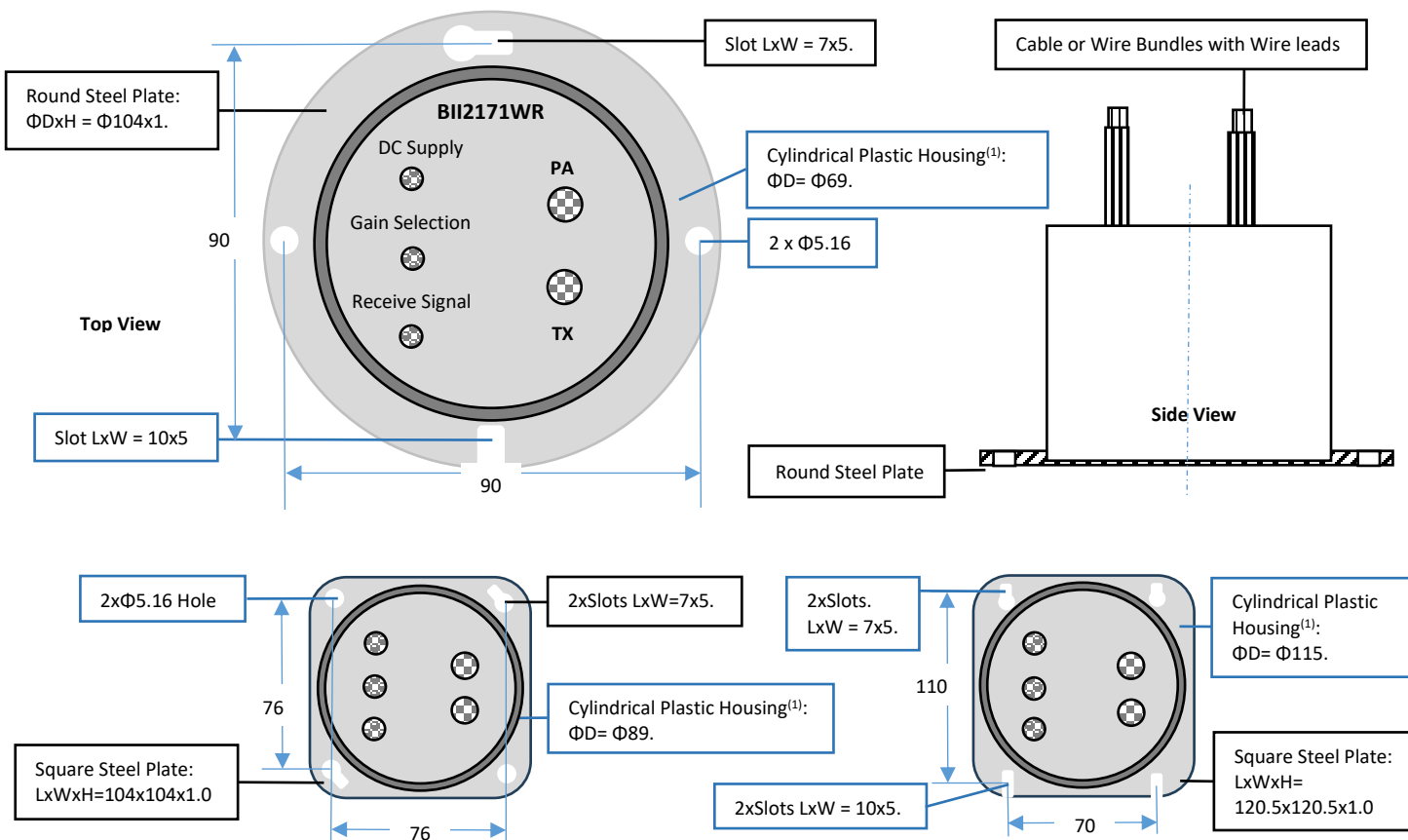
Outline Dimensions (mm), Illustration ONLY, scale is NOT 1:1.

Plastic Cylindrical Housing with a Round or Square Steel Chassis, Four Mounting Hole/Slots, Accept #10 or M5 Screw. Housing Height: Varies with Power Capacity.

Fasteners (Screw, Washer, Nut etc.) for mounting/installation are NOT included.

PA Wires as Input Wirings to Outputs of Power Amplifiers; TX wires as Output Wirings to Transducer.

Overall Size varies with Power Capacity: $\Phi D \times H = \Phi 104 \times (100 \text{ to } 150)$, $L \times W \times H = 104 \times 104 \times (100 \text{ to } 150)$, or $L \times W \times H = 120.5 \times 120.5 \times (100 \text{ to } 150)$.



Note: ⁽¹⁾ Height and Diameter of Cylindrical Plastic Housing and Round or Square Steel Chassis are determined by power rating.

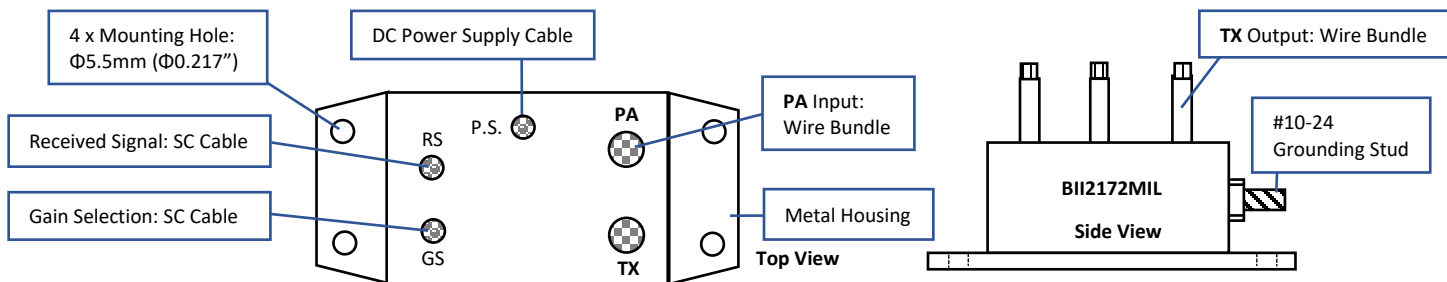
2. BII2172WR and BII2173WR with Cable Bundles and Wire Leads.

BII2172WR: Driving Voltage $\leq 900\text{Vrms}$, RMS Power $\leq 1000\text{ W}$.

BII2173WR: Driving Voltage $\leq 500\text{Vrms}$, RMS Power $\leq 316\text{ W}$.

T/R Switch Module as Embedded Components being installed into end user's grounded enclosure. [Metal Enclosure](#), Overall Size: LxWxH = 147.2x67.2x55, 146.9x91.7x56, 146.9x91.7x85 or 180.5x110.3x93 mm. Mounting Hole $\Phi 5.5\text{mm}$ ($\Phi 0.217''$) accepts M5 or #10 screw. Screws are not supplied.

Outline Dimensions (mm), Illustration ONLY, scale is NOT 1:1.

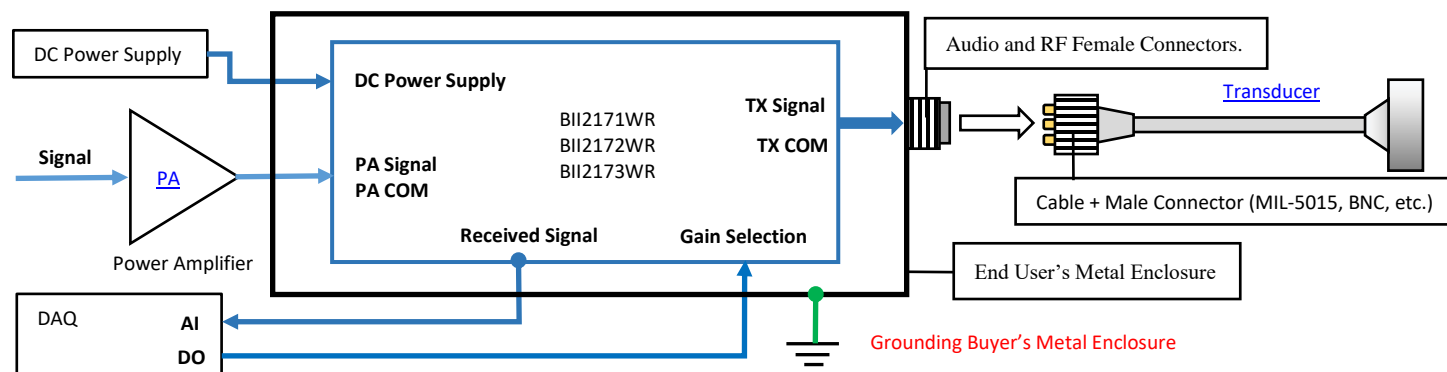


BII2171WR, BII2172WR, BII2173WR: 0.15m Wire/Cable Bundles and Wire Leads as Embedded Components.

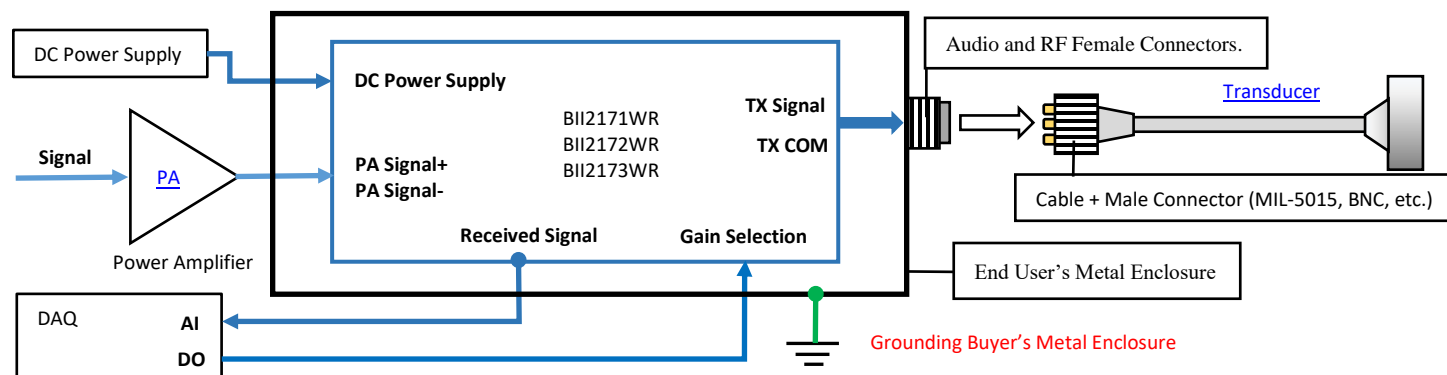
- Fuse/Fuse Holder, DC Switch, and Grounding Stud are NOT included.** Grounding Cable is NOT included, Buyer grounds buyer's enclosure for safety. Buyer applies suitable Fuse/Fuse Holder, DC Switch, and Grounding Stud in buyer's DC power distributing system.

System Block Diagram as Embedded Components.

(1) Power Amplifier with Single-ended Output



(2) Power Amplifier with Differential Output



Wiring Information of Wire Bundles and Wire Leads

PA Wires as Input Wirings to Outputs of Power Amplifiers; TX wires as Output Wirings to Transducers.		
Signals	BII2171WR, BII2172WR, BII2173WR, T/R Switch Modules.	
PA Signal: Coming from a Signal Source such as Power Amplifiers. Warning: High Voltage !	Wire Bundles with Wire Leads, Label "1".	
	Signal or Signal +	Red Wire, AWG18.
	Signal Common, or Signal -	Black Wire, AWG18.
TX Signals: To a Transducer or Projector. Warning: High Voltage !	Wire Bundles with Wire Leads, Label "0".	
	Signal	Red Wire, AWG18.
	Signal Common	Black Wire, AWG18.
Received Signal: To Differential Inputs of a Data Acquisition Module.	Two Conductor Shielded Cable with Wire Leads	
	Signal +	White or Red Wire
	Signal -	Black Wire
	Signal Common	Shield
Gain Selection: Coming from Digital Outputs of a Data Acquisition Module.	Two Conductor Shielded Cable with Wire Leads	
	Digital A1	White or Red Wire

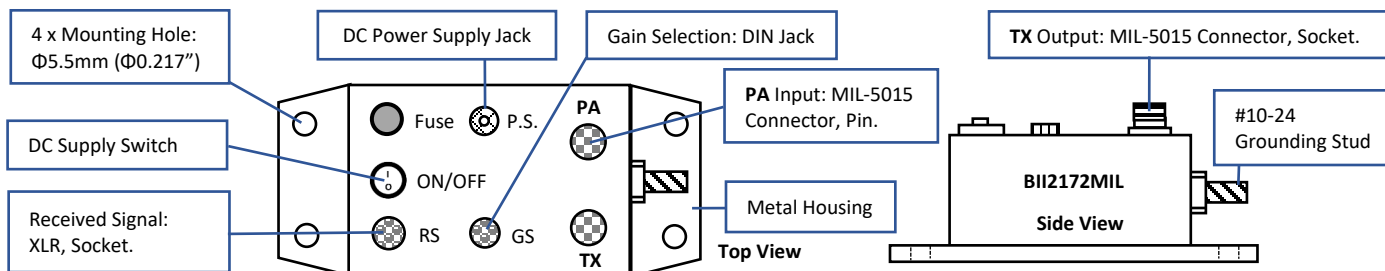
CMOS/TTL Compatible.	Digital A0	Black Wire
	Digital Common	Shield
Power Supply: Coming from DC Power Supply or Batteries. BII2171WR, BII2172WR: +8.5 to +32 VDC, 22 mA. BII2173WR: +14 to 35 VDC, 19 mA.	Two Conductor Shielded Cable , DC-PCWL-24.	
	+VDC	Red Wire
	Common	Black Wire
	Shielding	Shield
Wire/Cable Bundle Length: 0.3m.		
Warning: Install the device into End User's metal enclosure, and grounding metal enclosure for Operating Safety. All exposed bare wires, metal wires, wire leads, and solders shall be insulated with insulation material such as heat shrink tubing, fully insulated wire splicing connectors, etc. The insulation voltage must be greater than at least TWO TIMES the source voltage.		

How to Order, refer to [Ordering Information of BII2170 Series](#) for explanations of the terms or initials.

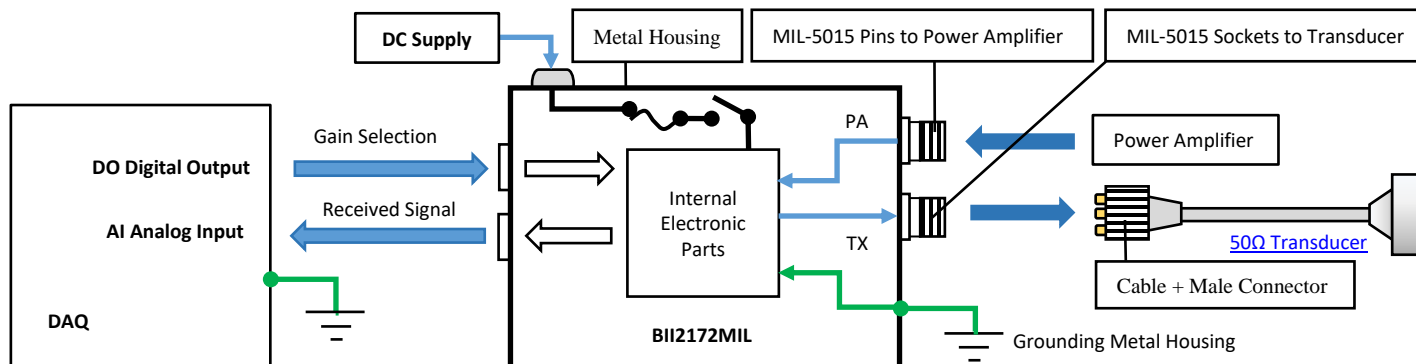
BII2171WR, BII2172WR, BII2173WR	-Maximum Pulse Parameters: Power/PW/D or Blank if BII transducer and BII PA are used.	-fs/Z _{TX} /θ or BII Transducer PN	-Z _{IM} or BII PA PN	-HPF/LPF
Example of Part Number:	Description			
BII2171WR-2kWrms/10mS/10%-30kHz/300Ω/-60°-50Ω-5kHz/100kHz	BII2171WR, T/R Switch Module, Transmitting Input and Output Cables: AWG18 Wires and Wire Leads, Maximum Pulse Parameters: Pulse Power ≤ 2kWrms, Pulse Width ≤ 10mS, Duty Cycle ≤ 10%; Transducer: 30kHz, Z=300Ω, θ=-60°, Impedance Matching to 50Ω; -3dB Receiving Bandwidth: 5 to 100 kHz.			
BII2171WR-BII7563/70-BII5101-7kHz/350kHz	BII2171WR, T/R Switch Module, Transmitting Input and Output Cables: AWG18 Wires and Wire Leads, Transducer: BII7563/70 , Impedance Matching to BII5101 ; -3dB Receiving Bandwidth: 7 to 350 kHz.			

3. BII2172MIL with Panel-mount Connectors as Standalone Devices.

Outline Dimensions (mm), Illustration ONLY, scale is NOT 1:1. PA Connector to Outputs of Power Amplifiers: MIL-5015 Type Connector, Pins. **TX Connector to Transducer:** MIL-5015 Type Connector, Socket. **MIL-5015 Rating: 500Vrms or 900Vrms, 13A.** [Metal Enclosure](#), Overall Size: LxWxH = 180.5x110.3x93 mm. Mounting Hole Φ5.5mm (Φ0.217") accepts M5 or #10 screw. Screws are not supplied.



System Block Diagram and Wirings



Signals	BII2172MIL T/R Switch Modules		
PA Signal: Coming from a Signal Source such as Power Amplifiers. Warning: High Voltage !	MIL-5015 Style Connector, Panel Mount, 3-Contact Mating Connector, Pin.		
	Signal or Signal +		Contact C
	Signal Common, or Signal -		Contact B
	Shielding and Grounding		Contact A
TX Signals: To a Transducer or Projector. Warning: High Voltage !	MIL-5015 Style Connector, Panel Mount, 3-Contact Mating Connector, Socket.		
	Signal of Transducer		Contact C
	Signal Common of Transducer		Contact B
	Shielding and Grounding		Contact A
Received Signal: To Differential Inputs of a Data Acquisition Module.	Received Signal	XLR Plug	Shielded Cable/Wire Leads
	Signal+	Pin 2, Positive/Hot.	Red or White Wire
	Signal-	Pin 3, Negative/Cold.	Black Wire
	Signal Common	Pin 1, Shield/Ground.	Shield
	Shielding	Shell	
Gain Selection: Coming from Digital Outputs of a Data Acquisition Module.	Gain Selection	DIN Plug	Shielded Cable/Wire Leads
	A1	Pin 3	Red Wire

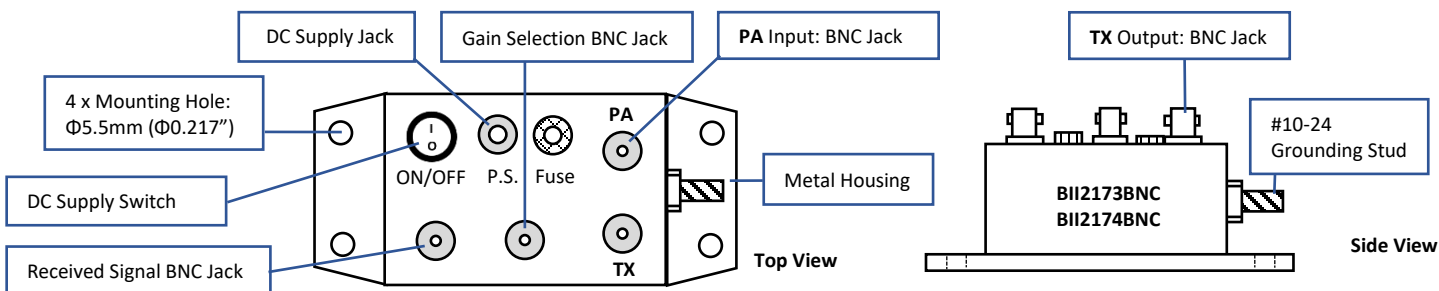
CMOS/TTL Compatible.	A0	Pin 1	Black Wire
	Digital Common	Pin 2	Shield
	Shielding	Shell	
Power Supply: Coming from DC Power Supply or Batteries. +8.5 to +32 VDC, 22 mA.	Panel Mount Power Jack and DC Supply Cable Pair: Part Number DC-PPBP-24 .		
	+VDC	Center Contact	Red Banana Plug
	Common and Shielding	Metal Shell Contact	Black Banana Plug
DC Supply Switch: Turn ON and Turn OFF DC Supply. “I” -> ON; “O” -> OFF.			
Fuse: One included, refer to Fuse and Holder .			
Accessories Included: 1. One DC supply cable DC-PPBP-24 . 2. One Grounding Cable GWL18 . 3. One Gain Selection Cable DIN-P-WL-1m . 4. One Receiving Signal Cable XLR-P-WL-1m .			
Grounding Metal Case for operating safety. Grounding Stud: #10-24 Screw 316SS. Nut and Washer are included.			
When A1 and A0 are open, their TTL/CMOS logic level is High or 1. Receiving Gain is maximum gain 80dB by default.			
1. Install the device to a safe solid object to avoid sliding. An air free-flowing area and good thermal conducting object allow the device to cool down.			
2. Never use the device in the event of slide happening, otherwise, loss of the device into water, property damage, and person injury may occur.			

How to Order, refer to [Ordering Information of BII2170 Series](#) for explanations of the terms or initials.

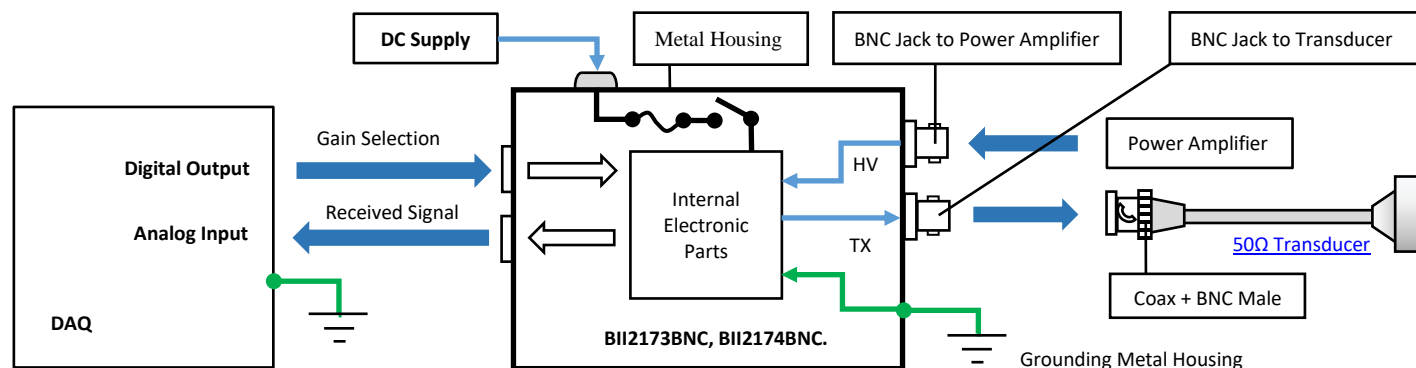
BII2172MIL	-Maximum Pulse Parameters: Power/PW/D or Blank if BII transducer and BII PA are used.	-Transducer: $f_s/Z_{TX}/\theta$ or BII Transducer PN	- Z_{TM} or BII PA PN	-HPF/LPF
Example of Part Number:	Description			
BII2172MIL-BII7523-50Ω-5kHz/100kHz	BII2172MIL, T/R Switch Module, Transmitting Input and Output Connectors: MIL-5015 Connectors, Transducer: BII7523, Impedance matching to 50Ω; Receiving Bandwidth (-3dB): 5 to 100 kHz.			
BII2172MIL-400Wrms/10mS/10%-40kHz/200Ω/-60°-50Ω-5kHz/200kHz	BII2172MIL, T/R Switch Module, Transmitting Input and Output Connectors: MIL-5015 Connectors, Maximum Pulse Parameters: Pulse Power ≤ 400Wrms, Pulse Width ≤ 10mS, Duty Cycle ≤ 10%; Transducer: 40kHz, Z=200Ω, θ=-60°, Impedance Matching to 50Ω; -3dB Receiving Bandwidth: 5 to 200 kHz.			
BII2172MIL-400Wrms/10mS/10%-40kHz/200Ω/-60°-BII5065-5kHz/200kHz	BII2172MIL, T/R Switch Module, Transmitting Input and Output Connectors: MIL-5015 Connectors, Maximum Pulse Parameters: Pulse Power ≤ 400Wrms, Pulse Width ≤ 10mS, Duty Cycle ≤ 10%; Transducer: 40kHz, Z=200Ω, θ=-60°, Impedance Matching to BII5065 Power Amplifier ; -3dB Receiving Bandwidth: 5 to 200 kHz.			

4. BII2173BNC and BII2174BNC

PA Connector to Outputs of Power Amplifiers: Panel Mount BNC Jack. **TX Connector to Transducer:** Panel Mount BNC Jack. **BNC Jack Rating: 500Vrms, 316W.**
[Metal Enclosure](#), Overall Size: LxWxH = 146.9x91.7x85 or 180.5x110.3x93mm. Mounting Hole Φ5.5mm (Φ0.217") accepts M5 or #10 screw. Screws are not supplied.



System Block Diagram and Wirings



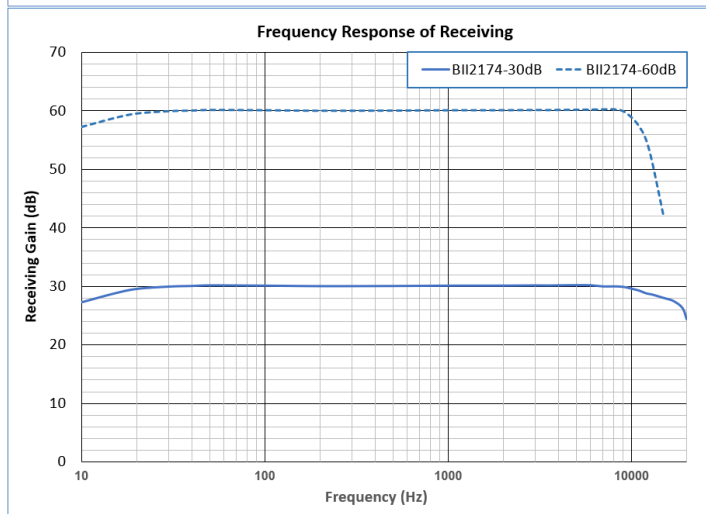
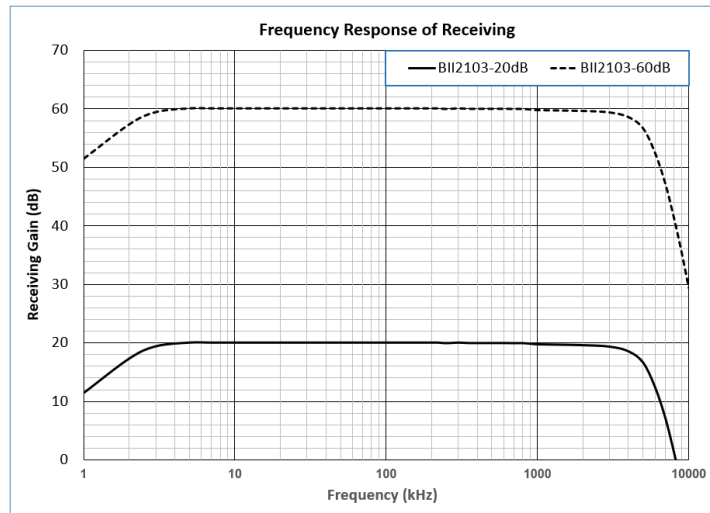
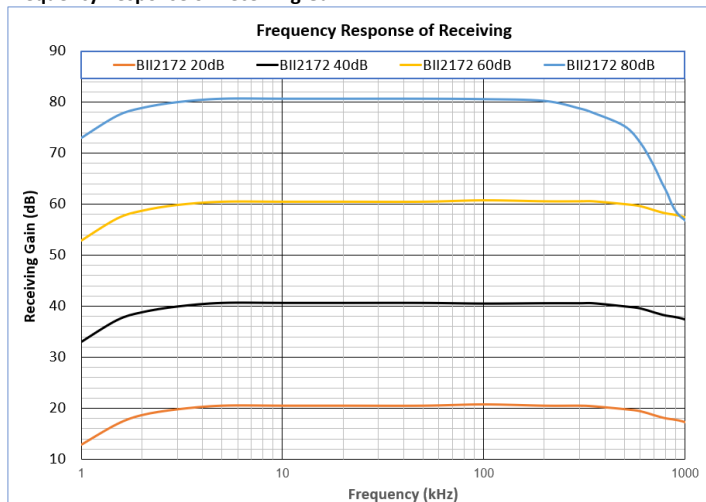
Signals	BII2173BNC, BII2174BNC, T/R Switch Modules.	
PA Signal: Coming from a Signal Source such as Power Amplifiers. Warning: High Voltage !	50Ω BNC Connector, Panel Mount, Jack.	
	Signal	Center Conductor
	Signal Common	Body Metal Shell.
	Shielding and Grounding	Body Metal Shell.
TX Signals: To a Transducer or Projector. Warning: High Voltage !	50Ω BNC Connector, Panel Mount, Jack.	
	Signal of Transducer	Center Conductor
	Signal Common of Transducer	Body Metal Shell.
	Shielding and Grounding	Body Metal Shell.
Received Signal:	Panel Mount BNC Jack.	

To Differential Inputs of a Data Acquisition Module.	Signal	Center Conductor
	Signal Common, Shielding, and Grounding	Body Metal Shell.
Gain Selection: Coming from Digital Outputs of a Data Acquisition Module. CMOS/TTL Compatible.	Panel Mount BNC Jack.	
	A0	Center Conductor
	Digital Common, Shielding, Grounding.	Body Metal Shell.
Power Supply: Coming from DC Power Supply or Batteries. +8.5 to +32 VDC, 22 mA.	Panel Mount Power Jack and DC Supply Cable Pair: Part Number DC-PPBP-24.	
	+VDC	Center Contact
	Common and Shielding	Red Banana Plug
		Black Banana Plug
DC Supply Switch: Turn ON and Turn OFF DC Supply. "I" -> ON; "O" -> OFF.		
Fuse: One included, refer to Fuse and Holder .		
Accessories Included: 1. One DC supply cable DC-PPBP-24 . 2. One Grounding Cable GWL18 .		
Grounding Metal Case for operating safety. Grounding Stud: #10-24 Screw 316SS. Nut and Washer are included.		
When A0 are open, their TTL/CMOS logic level is High or 1. Receiving Gain is maximum gain 60dB by default.		
1. Install the device to a safe solid object to avoid sliding. An air free-flowing area and good thermal conducting object allow the device to cool down.		
2. Never use the device in the event of slide happening, otherwise, loss of the device into water, property damage, and person injury may occur.		

How to Order, refer to [Ordering Information of BII2170 Series](#) for explanations of the terms or initials.

BII2173BNC, BII2174BNC.	-Maximum Pulse Parameters: Power/PW/D or Blank if BII transducer and BII PA are used.	-fs/Z _{TX} /θ or BII Transducer PN	-Z _{IM} or BII PA PN	-HPF/LPF
Example of Part Number:	Description			
BII2173BNC-100Wpeak/10μS/10%-1MHz/20Ω/-50°-50Ω-0.1MHz/4.5MHz	BII2173BNC, T/R Switch Module, Transmitting Input and Output Connector: BNC Jack, Maximum Pulse Parameters: Pulse Power ≤ 100Wpeak, Pulse Width ≤ 10μS, Duty Cycle ≤ 10%; Transducer: 1MHz, Z=20Ω, θ=-50°; Impedance Matching to 50Ω; -3dB Receiving Bandwidth: 0.1 to 4.5 MHz.			
BII2173BNC-100Wpeak/10μS/10%-BII7692-Φ12.7mmx1MHz-BII5121-0.1MHz/4.5MHz	BII2173BNC, T/R Switch Module, Transmitting Input and Output Connector: BNC Jack, Transducer: BII7692-Φ12.7mmx1MHz , Impedance Matching to BII5121 Power Amplifier ; -3dB Receiving Bandwidth: 0.1 to 4.5 MHz.			
BII2174BNC-100Wpeak/50nS/0.1%-5MHz/10Ω/-50°-50Ω-0.1MHz/10MHz	BII2174BNC, T/R Switch Module, Transmitting Input and Output Connector: BNC Jack, Maximum Pulse Parameters: Pulse Power ≤ 100Wpeak, Pulse Width ≤ 50nS, Duty Cycle ≤ 0.1%; Transducer: 5MHz, Z=10Ω, θ=-50°; Impedance Matching to 50Ω; -3dB Receiving Bandwidth: 0.1 to 10 MHz.			
BII2174BNC-100Wpeak/10μS/10%-BII7694-Φ9.5mmx5MHz-50Ω-0.1MHz/10MHz	BII2174BNC, T/R Switch Module, Transmitting Input and Output Connector: BNC Jack, Transducer: BII7694-Φ9.5mmx5MHz , Impedance Matching to 50Ω; -3dB Receiving Bandwidth: 0.1 to 10 MHz.			

Frequency Response of Receiving Gain



Accessories:

1. Grounding Cable and Terminals

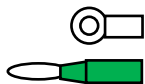
Grounding Cable, Part Number: GWL18 or GWL16, Support Single-Point Grounding with Multiple Devices.

One 1m AWG 18 or AWG 16 Green Wire with #10 Ring Terminal and Wire Lead. One #10 Ring Terminal and one 4mm Banana Plug (Green) are included.

Depending on buyer's grounding terminal type, buyer assembles #10 Ring Terminal, 4mm Banana Plug, or other type connector to grounding cable at buyer's cost.

Terminal to buyer's Grounding Terminal:

- Default: Wire Lead
- One #10 Ring Terminal
- One 4mm Banana Plug



Default 1m. Bespoke Length Available.



#10 Ring Terminal

#10-24 nut and #10 washer included.

2. DC Supply Cable.

Red Banana Plug or Red Wire Lead: +VDC.

Black Banana Plug or Black Wire Lead: Common.

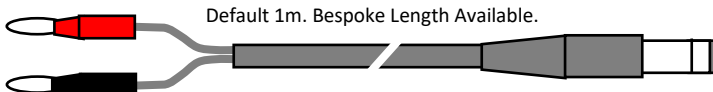
Cable Shield, if any: Shielding.

a. Part Number: DC-PPBP-24.

One 1m DC supply cable. One end of the cable is with DC Power Plug, another end is Red and Black Banana Plugs. Depending on output terminals of buyer's DC Supply, buyer may assemble other type of connectors to DC supply cable at buyer's cost.

To Terminals of DC Supply:

- One Red 4mm Banana Plug.
- One Black 4mm Banana Plug.

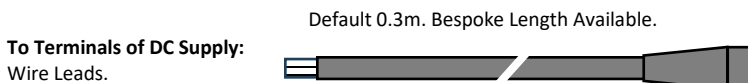


Default 1m. Bespoke Length Available.

DC Power Plug.

To DC Power Jack of the Device.

b. Part Number: DC-PCWL-24.



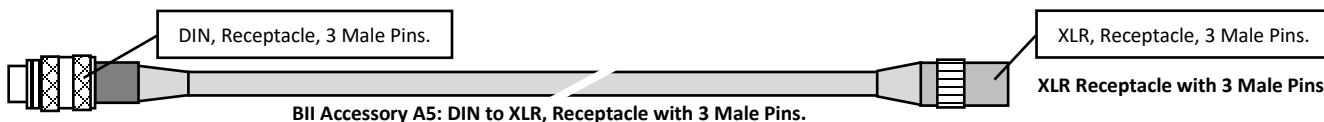
Default 0.3m. Bespoke Length Available.

To Terminals of DC Supply:
Wire Leads.

DC Power Cable from Device.

Accessory Cable.

A5 DIN to XLR Cable. Part Number: DIN3P-XLR3P-1m, Bespoke length cable with DIN Receptacle with 3 Male Pins to XLR3 Receptacle with 3 Male Pins. Default: 1m.



BII Accessory A5: DIN to XLR, Receptacle with 3 Male Pins.

A6 Gain Selection Cable. Part Number: DIN-P-WL-1m, Bespoke length cable with DIN Receptacle with 3 Male Pins to Wire Leads. Default: 1m.



BII Accessory A6: DIN3P to Wire Leads.

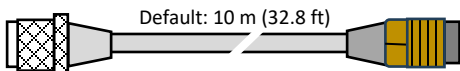
A7 Receiving Signal Cable. Part Number: XLR-P-WL-1m, Bespoke length cable with XLR Receptacle Male Pin to Wire Leads. Default: 1m.



BII Accessory A7: XLR3P to Wire Leads.

A8 MIL-SUMC, MIL-5015 (3 Pins) to Small UMC2S (Underwater Connector, 2 Sockets, Thread Locking, Size: $\Phi 22 \times 28 \text{mm}$)

MIL-5015
3 Pin



Default: 10 m (32.8 ft)

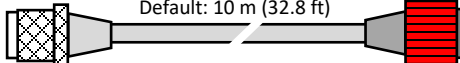
Underwater Connector, 2 Sockets.
Contact 2: Signal.
Contact 1: Common.



Transducer with 2-Pin Underwater
Connector and MCDLS-F Locking Sleeve.

A9 MIL-UMCF3S, MIL-5015 (3 Pins) to UMC3S (Underwater Connector, 3 Sockets, Locking Sleeve: DLSA-F, Size: $\Phi 35.5 \times 33.5 \text{mm}$)

MIL-5015
3 Pin



Default: 10 m (32.8 ft)

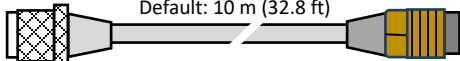
Underwater Connector, 3 Sockets.
Contact 2: Signal.
Contact 1: Common.
Contact 3: Shielding and Grounding.



Transducer with 3-Pin Underwater
Connector and DLSA-M Locking Sleeve.

A10 MIL-SUMC3S, MIL-5015 (3 Pins) to Small UMC3S (Underwater Connector, 3 Sockets, Thread Locking, Size: $\Phi 22 \times 28 \text{mm}$)

MIL-5015
3 Pin



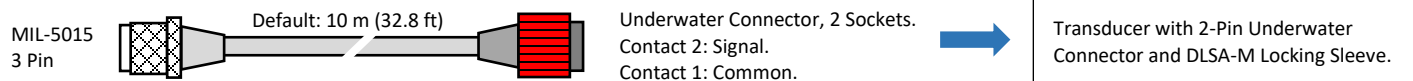
Default: 10 m (32.8 ft)

Underwater Connector, 3 Sockets.
Contact 2: Signal.
Contact 1: Common.
Contact 3: Shielding and Grounding.

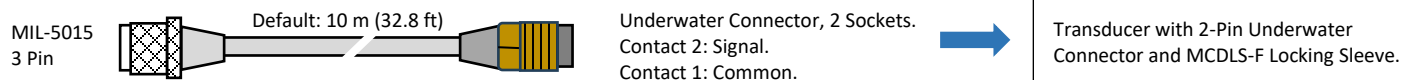


Transducer with 3-Pin Underwater
Connector and MCDLS-F Locking Sleeve.

A11 MIL-UMCF2S, MIL-5015 (3 Pins) to UMC2S (Underwater Connector, 2 Sockets, Locking Sleeve: DLSA-F, Size: $\Phi 35.5 \times 33.5$ mm)



A12 MIL-SUMC2S, MIL-5015 (3 Pins) to Small UMC2S (Underwater Connector, 2 Sockets, Thread Locking, Size: $\Phi 22 \times 28$ mm)



Questions:

How do I assemble #10 Ring Terminal or 4mm Banana Plug to Grounding Cable?

1. for #10 Ring Terminal, crimp or solder is acceptable. Please choose a suitable crimp tool to crimp connector and cable, or a suitable solder station for soldering.
2. for 4mm Banana Plug, solder is acceptable. Please choose a suitable solder station for soldering.

What if the connector of my transducer/projector is SMA or SMC Connector?

Buyer may order a BNC to SMA (or SMC) adaptor from local electronic distributors in buyer's country. BII may ship the adaptor as accessory of the device. Please discuss with BII for customizations.

What if connectors of my transducers and/or power amplifiers are NOT MIL-5015 type connectors?

The custom-made adaptors are recommended such as MIL-5015 to BNC, MIL-5015 to Underwater connectors, MIL-5015 to XLR, etc. BII can manufacture these adaptors which bridge your devices and BII devices. Please discuss with BII for customizations.

How do I wire BII devices to audio connectors (XLR or TRS) of my recording devices?

BII devices has panel-mount TRS or BNC jack as output connector. The custom-made adaptors are recommended such as BNC to XLR, BNC to TRS, etc. BII can manufacture these adaptors which bridge your devices and BII devices. Please discuss with BII for customizations.

What if my data acquisition device does not have Digital Output for Gain Selection?

Besides Digital Output, the gain selection can be implemented with two switches connecting and disconnecting from A1 to Digital COMMON, and from A0 and Digital COMMON. Please refer to [Gain Selection](#).

My acoustic applications are in MHz range, are TRS connectors of BII devices suitable for my applications?

Our test shows the TRS connectors (Plug and Jack) of BII preamps can be used up to 20 MHz. Test Conditions: TRS Jack with 0.2m cable and TRS plug with 1m cable. Oscilloscope: 1M Ω | 30pF, Signal Source: DDS Signal Generator.

How do I connector the wire of BII6000 device to my devices?

WARNING: HIGH VOLTAGES MAY BE PRESENT AT THE OUTPUT OF THIS UNIT. DO NOT TOUCH THE DEVICE, ITS WIRES, CABLES, AND CONNECTORS BEFORE THE POWER SUPPLIES AND SIGNAL SOURCES ARE SHUT DOWN.

1. **Wire Splicing Methods: Soldering or Crimp.** 2. **Proper Insulation for Safety:** All exposed bare wires, metal wires, wire leads, solders, and joints are insulated with insulation material such as heat shrink tubing, fully insulated wire splice connector, etc. The insulation voltage must be greater than twice the maximum voltage of the device. 3. **Grounding the device** (including metal chassis and/or metal housing, cable shield, etc.) firmly for operation safety.

Are 50 Ω Power Amplifiers suitable to drive non-50 Ω transducers?

if the impedance of a transducer is greater than 50 Ω at operating frequency, the 50 Ω Power Amplifiers can drive this non-50 Ω transducer, but the power delivered to non-50 Ω transducer is reduced.

How do I connector the wire of BII Power Amplifier to my devices?

WARNING: HIGH VOLTAGES MAY BE PRESENT AT THE OUTPUT OF THIS UNIT. DO NOT TOUCH THE DEVICE, ITS WIRES, CABLES, AND CONNECTORS BEFORE THE POWER SUPPLIES AND SIGNAL SOURCES ARE SHUT DOWN.

1. **Wire Splicing Methods: Soldering or Crimp.** 2. **Proper Insulation for Safety:** All exposed bare wires, metal wires, wire leads, solders, and joints are insulated with insulation material such as heat shrink tubing, fully insulated wire splice connector, etc. The insulation voltage must be greater than twice the maximum voltage of the device. 3. **Grounding the device** (including metal chassis and/or metal housing, cable shield, etc.) firmly for operation safety.

Metal Housings, Outline Dimensions (mm), Illustration only, the scale is not 1:1.

