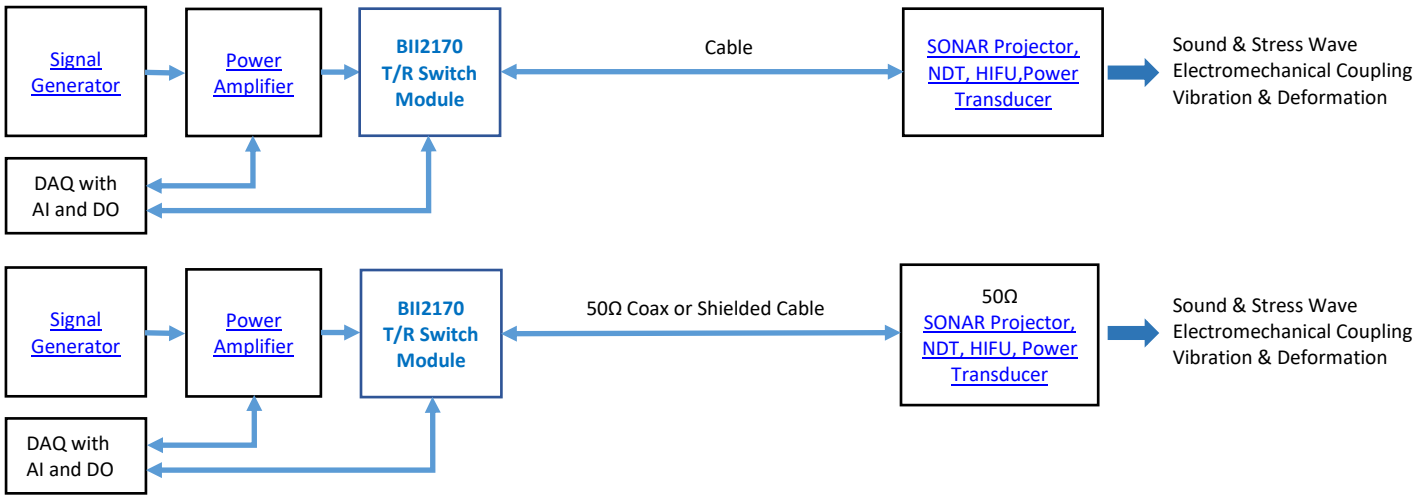

## BII2170 Series T/R (Transmitting and Receiving) Switch Modules for SONAR & NDT Transducers

A BII2170 Series T/R switch module provides 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). It integrates an impedance matching network, a T/R switch, a bandpass filter, and a low noise DPGA preamplifier (Digitally Programmable Gain Amplifier) 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 power amplifiers and the transducers at operating frequency, generally at resonance frequency fs.

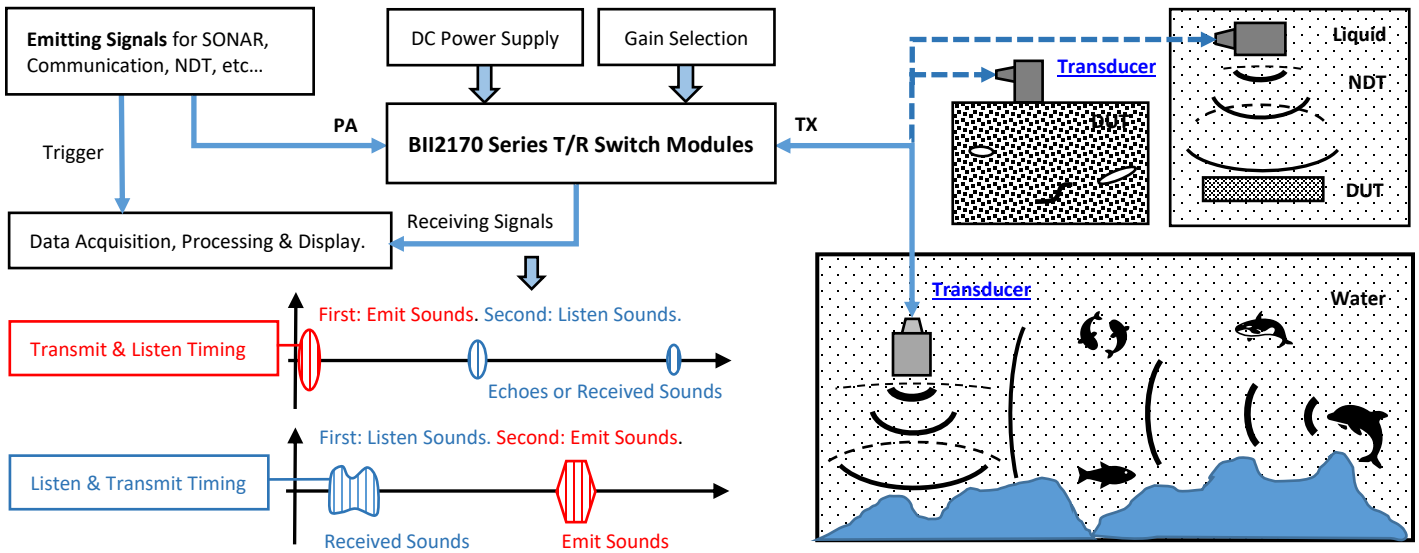
**Typical Applications**

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.

**Transmitting and Receiving System Configuration**




**System Block Diagram (PA: Power Amplifier; TX: Transducer.)**



**Specifications**

| | | | | |
|---|---|---|---|---|
| **T/R Switch Modules** | **BII2172WR** | **BII2172MIL** | **BII2173BNC** | **BII2174BNC** |
| | **ACTIVE** | **ACTIVE** | **ACTIVE** | **ACTIVE** |
| | **WR:** Wire/Cable Bundles; **MIL:** Panel-Mount MIL-5015 Connector; **BNC:** Panel-Mount BNC. | | | |
| | **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: | Embedded Device<br>Driving Voltage ≥ 900Vrms<br>RMS Power ≥ 1000 W | Standalone Device<br>Driving Voltage ≤ 900Vrms<br>RMS Power ≤ 1000 W | Standalone Device<br>Driving Voltage ≤ 500Vrms<br>RMS Power ≤ 316 W | Standalone Device<br>Driving Voltage ≤ 500Vrms<br>RMS Power ≤ 316 W |
| | Half-duplex Acoustic System: transmitting sounds and receiving sounds occur at separate timing. | | | |
| Overall Frequency Range: | 2 kHz to 1 MHz | 2 kHz to 1 MHz | 20 kHz to 5 MHz | 20 kHz to 10 MHz |
| 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 | ≥ 0.03 m at 20 to 100 kHz.<br>≥ 3 mm at f > 100 kHz. | ≥ 0.03 m at 20 to 100 kHz.<br>≥ 3 mm at f > 100 kHz. |
| | Dependent on the **near-field distance**, bandwidth, and operating frequency of a transducer. | | | |
| Transducers: | Transducers which can transmit and receive sounds. | | | |
| | **For general-purpose applications**, all kinds of piezoelectric transducers work with BII2170 series T/R Switch. | | | |
| | **For better receiving performance** such as lower threshold or larger dynamic range, following transducers are recommended. | | | |
| | Transduces with neither impedance matching nor tuning | | 50Ω Transducer | |
| Supply Voltage Vs: | +8.5 to +32 VDC. | | | |
| Current (Quiescent): | 22 mA | 22 mA | 15 mA | 17 mA |
| Fuse and Fuse Holder: | None | Panel Mount Fuse Holder. | | |
| | None | 0.3A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4". | | |
| Power Supply Cable: | DC-PCWL-24 | DC-PPBP-24 | DC-PPBP-24 | DC-PPBP-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: | None | Turn ON/OFF power supply. Installed for standalone devices ONLY. | | |
| Grounding Stud: | None | #10-24 Screw. | #10-24 Screw. | #10-24 Screw. |
| Grounding Cable: | None | GWL18. | GWL18. | GWL18. |
| Housing: | Plastic Housing | Metal Enclosure | Metal Enclosure | Metal Enclosure |
| 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),<br>104x104x(100 to 150), or<br>120.5x120.5x(100 to 150). | 180.5x110.3x93. | 146.9x91.7x85, or<br>180.5x110.3x93. | 146.9x91.7x85, or<br>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** | | | | |
| Operating Frequency fs: | 2 to 500 kHz | 2 to 500 kHz | 20 kHz to 5 MHz | 20 kHz to 8 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.<br>2. A shorter pulse width PW and a lower duty cycle D allow a BII TR switch to handle a higher power without damage. | | | |
| Transmitting Voltage Gain: | $10*\log(1/(R_s*G_s))$, 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. | | | |

***Duty Cycle D and Pulse Length (or Pulse Duration) PW vs. Driving Current and Voltage. Applicable to all models of BII2100 series.***

| | | | | | | |
|---|---|---|---|---|---|---|
| *Duty Cycle D:* | *D ≤ 15%* | *15% < D ≤ 20%* | *20% < D ≤ 38%* | *38% < D ≤ 70%* | *70% < D ≤ 90%* | *90% < D ≤ 100%* |
| *Maximum Pulse Width:* | *40 mS* | *50 mS* | *150 mS* | *290 mS* | *400 mS* | *Continuous* |
| *Maximum Driving Current:* | *10 Arms* | *8 Arms* | *5 Arms* | *3 Arms* | *2 Arms* | *1 Arms* |
| *Max. Driving Voltage $V_{drive}$:* | *Depending on the impedance of a specific transducer. Enclosed in datasheet emailed to buyers after T/R SW manufacturing.* | | | | | |

| | | | | |
|---|---|---|---|---|
| Cable Length: | 0.3m | N/A | N/A | N/A |
| Cable: | AWG18 Wires (WR) | N/A | N/A | N/A |
| Connector: | Wire Leads (WL) | MIL-5015 Type Connector (MIL) | Panel Mount BNC Jack | Panel Mount BNC Jack |

**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.<br>In-line BNC: Input uses Pin, output uses Socket.<br>Panel Mount BNC: Both Input and Output use BNC Jacks. | 500Vrms, 316W.<br>Used for Metal Enclosures or Coax Cables. |
| | 3. MIL-5015 Type Connector (**MIL**), Thread Fastening. | 500Vrms, 13 A; Up to +125°C or 257°F, or, |

| | | |
|---|---|---|
| | Panel Mount or In-line. Input uses Pin, output uses Socket. | 900Vrms, 13 A; Up to +125°C or 257°F.<br>Used for Metal Enclosures or Shielded Cables. |
| | 4. Underwater Mateable Connector (**UMC**), Thread Fastening.<br>Panel Mount or In-line. Input uses Pin, output uses Socket. | 600Vrms, 10A. Waterproof, IP68.<br>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 = 2.45$A_{rms}$.
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. | 40, 80. | 50. |
| Frequency Range: | 2kHz to 1MHz: 20/40/60dB.<br>2 to 350kHz: 80dB. | 2kHz to 1MHz: 20/40/60dB.<br>2 to 350kHz: 80dB. | 20 kHz to 5 MHz | 20 kHz to 10 MHz |
| Gain Vs. Frequency: | Frequency Response of Receiving Gain. | | | |
| Band Pass Filter: | -3 dB bandwidth of receiving signal processing. Built-in, 2nd order, 40 dB/Decade Roll-off. | | | |
| | 0.1 kHz to 3*fs (or 350 kHz) whichever is less. | | 0.1 MHz to 3*fs (or 10 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:<br>(at f ≥ 1 kHz) | 5.2 nV/√Hz.<br>3.1 fA/√Hz. | 5.2 nV/√Hz.<br>3.1 fA/√Hz. | 1.0 nV/√Hz.<br>1.6 pA/√Hz. | 1.0 nV/√Hz.<br>1.6 pA/√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 | 0.4 µs | 0.4 µs |
| **Received Signal** | | | | |
| Output Impedance: | 50 Ω | | | |
| Cable Drive Capability: | 50 m | | | |
| Output Signal: | Waveform, AC Coupled. | | | |
| Output Signal Type: | Differential | Differential | Single Ended | Single Ended |
| Output Signal Range: | Supply Voltage Vs - 4, in Vpp | | | |
| Cable Length: | 0.3m . | N/A | N/A | N/A |
| Cable: | Shielded Cable | N/A | N/A | N/A |
| Connector: | Wire Leads | Panel Mount<br>XLR 3 Female Contacts | Panel Mount<br>BNC Jack | Panel Mount<br>BNC Jack |
| **Receiving Gain Selection:** | | | | |
| Cable Length: | 0.3 m | N/A | N/A | N/A |
| Gain Selection Cable: | Shielded Cable | N/A | N/A | N/A |
| Connector: | Wire Leads | Panel Mount 1/8" TRS Jack | Panel Mount BNC Jack | N/A |
| Gain Selection: | A 2-bit digital output word.<br>Shield wire: Digital Common. | A 2-bit digital output word.<br>Shield wire: Digital Common. | A 1-bit digital output word.<br>Shield wire: Digital Common. | N/A |
| | TTL/CMOS Compatible.<br>Logic Low 0: 0 to +0.8 VDC from digital outputs, or Gain Selection Wire is short to Digital COMMON.<br>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<br>0 0 20 1 MHz<br>0 1 40 1 MHz<br>1 0 60 1 MHz<br>1 1 80 350 kHz | A1 A0 Gain(dB) Bandwidth<br>0 0 20 1 MHz<br>0 1 40 1 MHz<br>1 0 60 1 MHz<br>1 1 80 350 kHz | A0 Gain(dB)<br>0 40<br>1 80 | N/A |

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, electric/insulating tape, 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.
3. Metal chassis and/or metal housing of the device MUST be grounded for operation safety.
4. Cable shield MUST be grounded for operation safety.
5. 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.

**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.

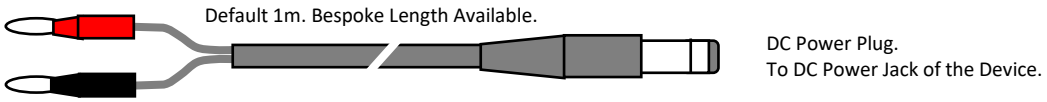
**Terminal to buyer's Grounding Terminal:**
a. Default: Wire Lead
b. One #10 Ring Terminal
c. One 4mm Banana Plug


**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. |

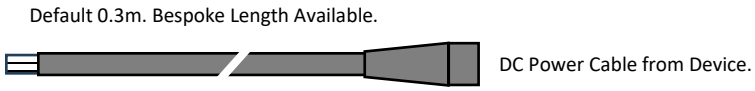
**a. Part Number: DC-PPBP-24.**
One 1m DC supply cable. One end of the cable is with DC Power Plug, another end is Red and Black Banana Plugs. Depending on output terminals of buyer's DC Supply, buyer may assemble other type of connectors to DC supply cable at buyer's cost.

**To Terminals of DC Supply:**
a. One Red 4mm Banana Plug.
b. One Black 4mm Banana Plug.

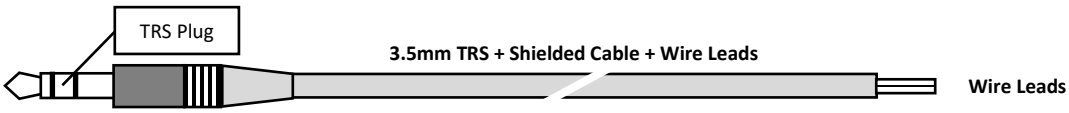



**b. Part Number: DC-PCWL-24.**

**To Terminals of DC Supply:**
Wire Leads.




**3. Gain Selection Cable.**
**Part Number: TRS-P-WL-1m,** Bespoke length cable with 3.5mm TRS Plug to Wire Leads. Default: 1m.




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


**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.

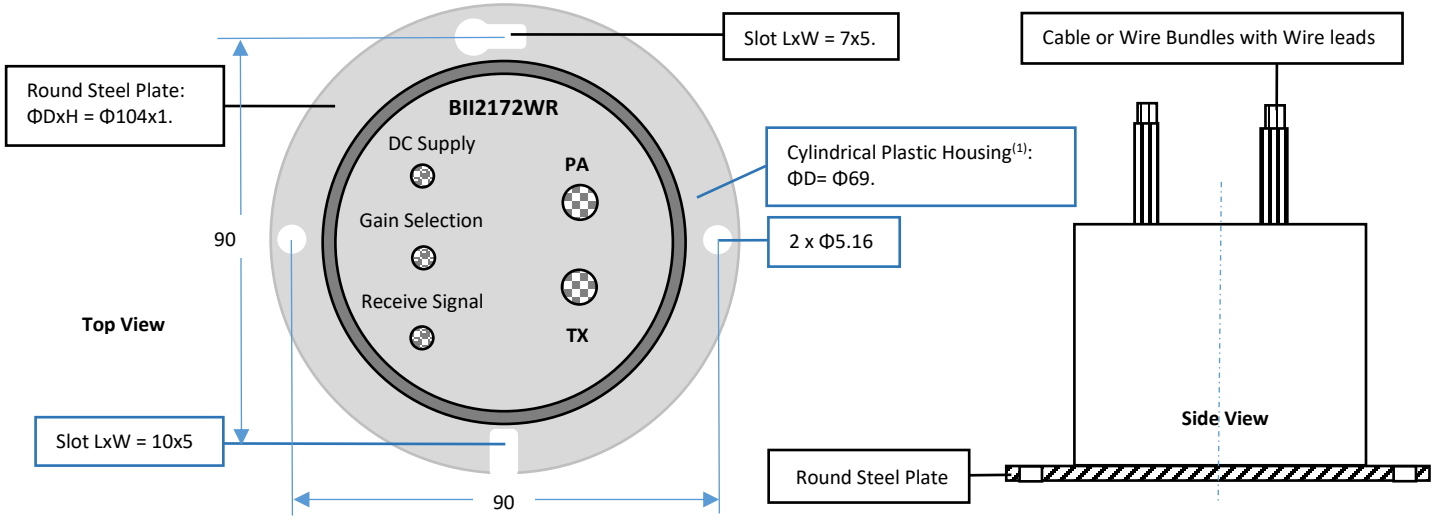
**How do I wire BII devices to audio connectors (XLR or TRS) of my recording devices?**
BII devices has panel-mount TRS or BNC jack as output connector. The custom-made adaptors are recommended such as BNC to XLR, BNC to TRS, etc. BII can manufacture these adaptors which bridge your devices and BII devices. Please discuss with BII for customizations.

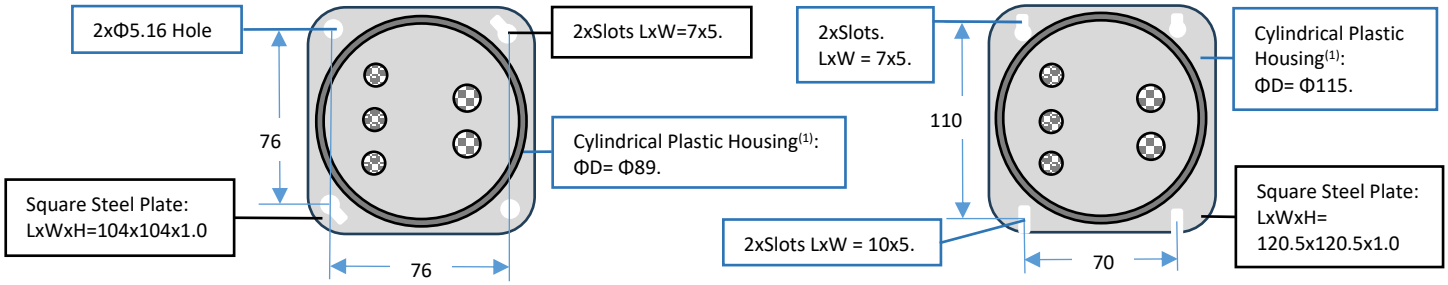
**What if my data acquisition device does not have Digital Output for Gain Selection?**
Besides Digital Output, the gain selection can be implemented with two switches connecting and disconnecting from A1 to Digital COMMON, and from A0 and Digital COMMON. Please refer to Gain Selection.

**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: 1MΩ||30pF, Signal Source: DDS Signal Generator.

**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 µS, mS, or S; **D:** Maximum Duty Cycle in %; **fs:** Frequency of Impedance Matching, in kHz or MHz; $\boldsymbol{Z_{TX}}$**:** Transducer Impedance, in Ω; **θ:** Transducer Phase in °; $\boldsymbol{Z_{IM}}$**:** 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. BII2172WR for High Power Application (Generally, Power ≥ 1000 Wrms, Driving Voltage ≥ 900Vrms).**
**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.**



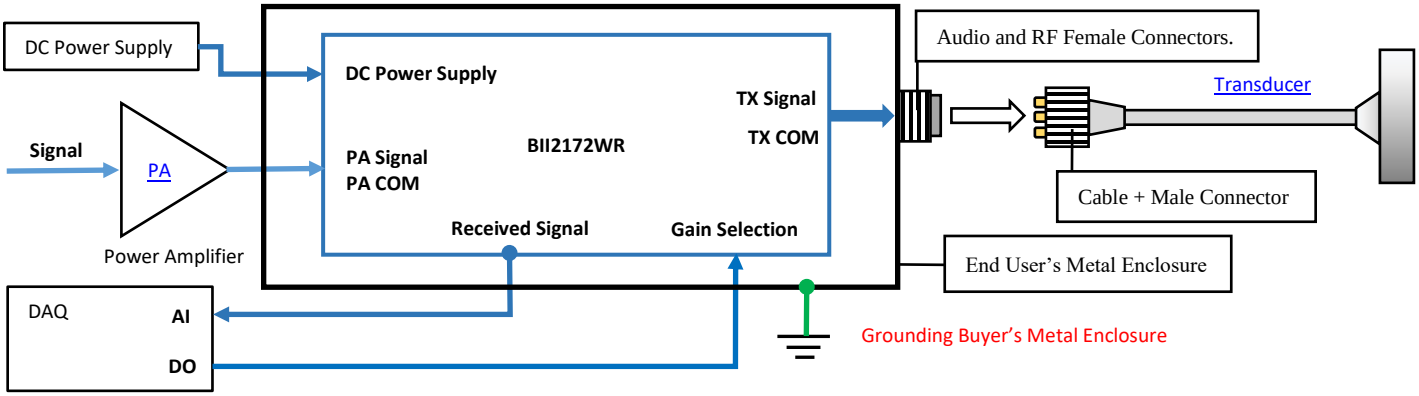




Note: (1) Height and Diameter of Cylindrical Plastic Housing and Round or Square Steel Chassis are determined by power rating.

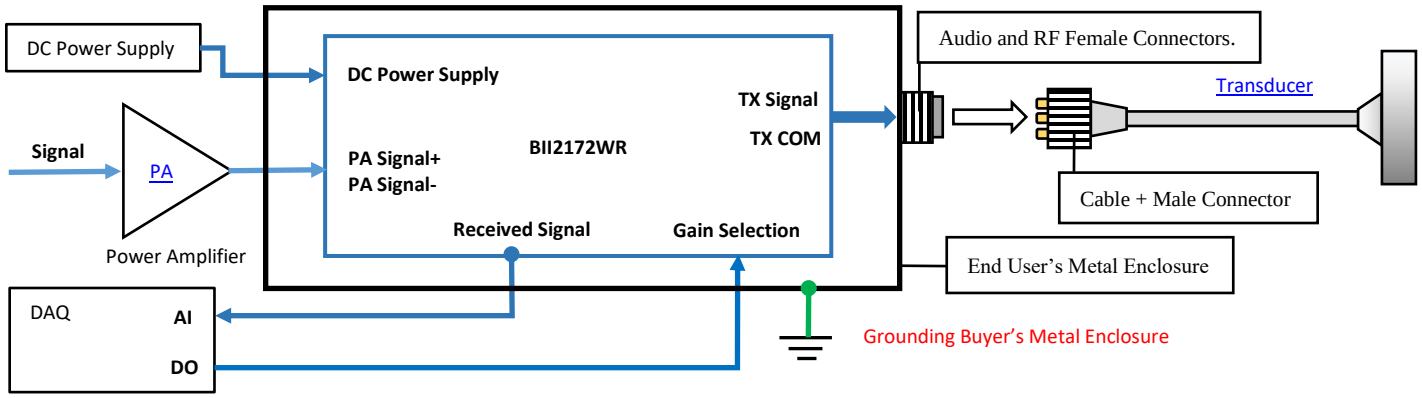
**BII2172WR with 0.3m Wire/Cable Bundles and Wire Leads as Embedded Components**.

- 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**

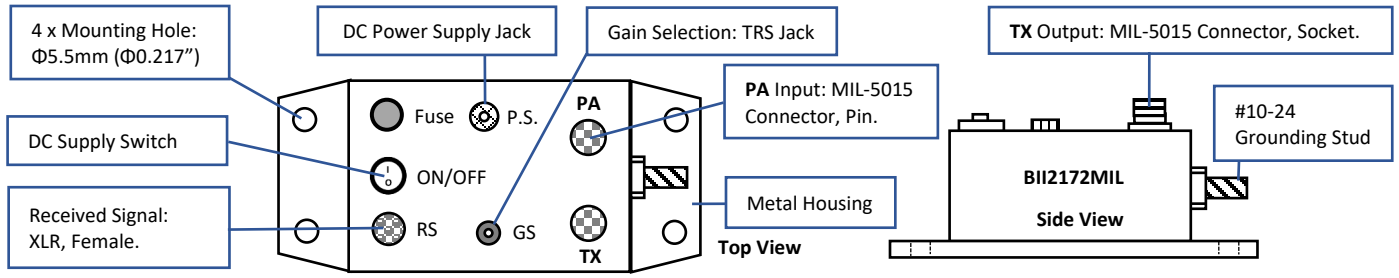
| **PA Wires as Input Wirings to Outputs of Power Amplifiers; TX wires as Output Wirings to Transducers.** | | |
|---|---|---|
| **Signals** | **BII2172WR T/R Switch Modules** | |
| **PA Signal:**<br>Coming from a Signal Source such as Power Amplifiers.<br>Warning: High Voltage ! | **Wire Bundles with Wire Leads,** Label "1". | |
| | Signal or Signal + | Red Wire, AWG18. |
| | Signal Common, or Signal - | Black Wire, AWG18. |
| **TX Signals:**<br>To a Transducer or Projector.<br>Warning: High Voltage ! | **Wire Bundles with Wire Leads,** Label "0". | |
| | Signal | Red Wire, AWG18. |
| | Signal Common | Black Wire, AWG18. |
| **Received Signal:**<br>To Differential Inputs of a Data Acquisition Module. | **Two Conductor Shielded Cable with Wire Leads** | |
| | Signal + | White Wire |
| | Signal - | Black Wire |
| | Signal Common | Shield |
| **Gain Selection:**<br>Coming from Digital Outputs of a Data Acquisition Module.<br>CMOS/TTL Compatible. | **Two Conductor Shielded Cable with Wire Leads** | |
| | Digital A1 | White Wire |
| | Digital A0 | Black Wire |
| | Digital Common | Shield |
| **Power Supply:**<br>Coming from DC Power Supply or Batteries.<br>+8.5 to +32 VDC, 22 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.<br>All exposed bare wires, metal wires, wire leads, and solders shall be insulated with insulation material such as heat shrink tubing, electric/insulating tape, 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.**

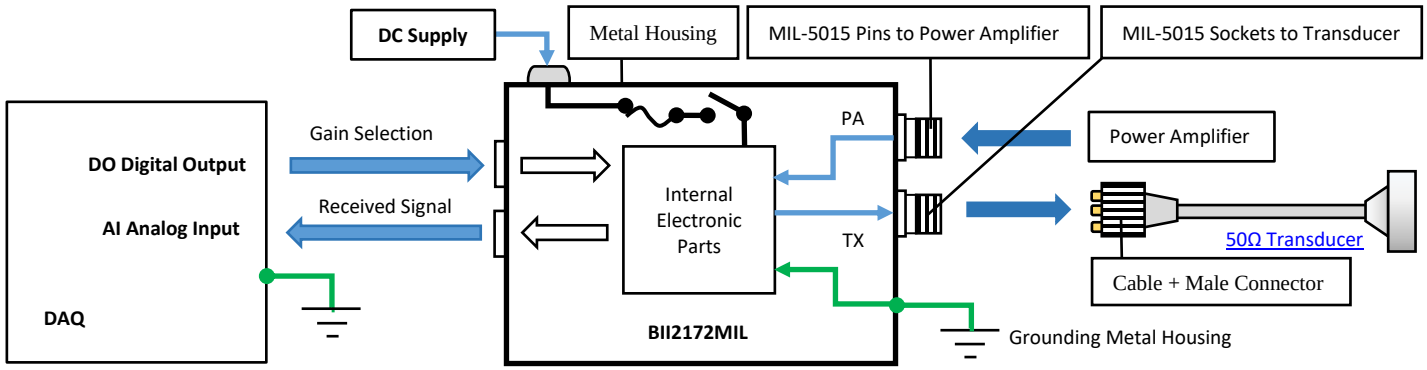
| **BII2172WR** | **-Power or Blank** | **-PW** | **-D** | **-fs-$Z_{TX}$/θ or BII Transducer PN** | **-$Z_{IM}$ or BII PA PN** | **-HPF/LPF** |
|---|---|---|---|---|---|---|
| **Example of Part Number:** | **Description** | | | | | |
| BII2172WR-2kWrms-10S-10%-30kHz-300Ω/-60°-50Ω-10kHz/50kHz | BII2172WR, T/R Switch Module, Transmitting Input and Output Cables: AWG18 Wires and Wire Leads, 2kW; Maximum Pulse Width: 10 Seconds, Maximum Duty Cycle 10%; Transmitting Frequency 30kHz, Impedance matching Transducer (Z=300Ω, θ=-60°) to 50Ω; Receiving Bandwidth (-3dB): 10 to 50 kHz. | | | | | |

**2. 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**




**Wirings:**

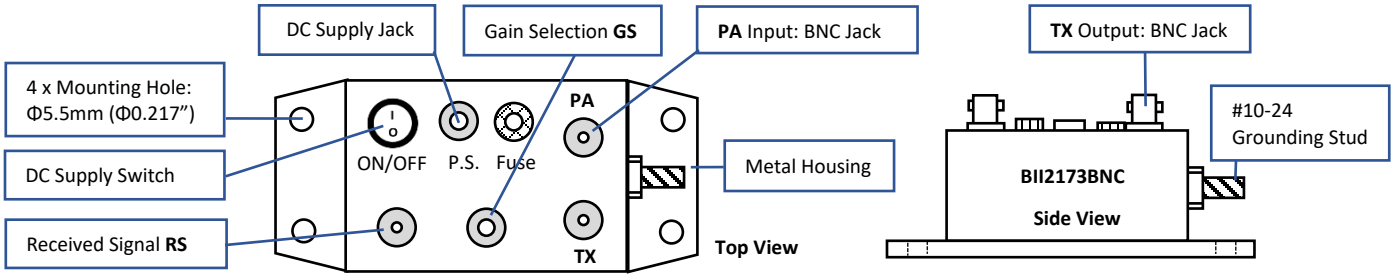
| Signals | BII2172MIL T/R Switch Modules | | |
|---|---|---|---|
| **PA Signal:** Coming from a Signal Source such as Power Amplifiers. Warning: High Voltage ! | **MIL-5015 Style Connector, Panel Mount, 3-Contact Mating Connector, Pin.** | | |
| | Signal or Signal + | | Contact C |
| | Signal Common, 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 (Bespoke)** | **Shielded Cable/Wire Leads** |
| | Signal+ | Pin 2, Positive/Hot. | White Wire |
| | Signal- | Pin 3, Negative/Cold. | Yellow or Blue Wire |
| | Signal Common | Pin 1, Shield/Ground. | Black Wire |
| | Shielding | Shell | Shield |
| **Gain Selection:** Coming from Digital Outputs of a Data Acquisition Module. CMOS/TTL Compatible. | **Gain Selection** | **3.5mm TRS Plug** | **Shielded Cable/Wire Leads** |
| | A1 | Tip | White Wire |
| | A0 | Ring | Red Wire |
| | Digital Common | Sleeve | Shield |
| **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:** 0.3A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4", included one. | | | |
| **Accessories Included:** 1. One DC supply cable **DC-PPBP-24.** 2. One Grounding Cable **GWL18**. 3. One Gain Selection Cable **TRS-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.**

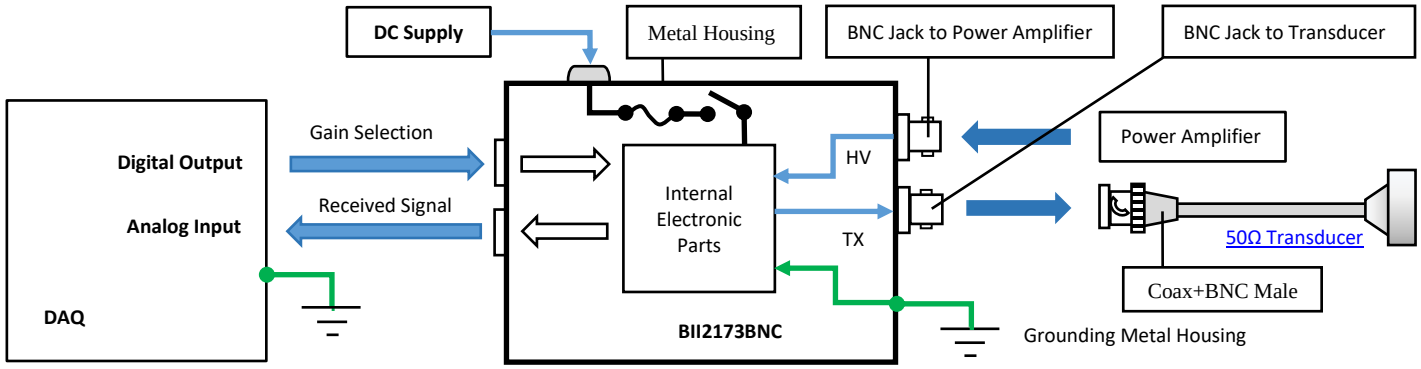
| BII2172MIL | -Power or Blank | -PW | -D | -fs | $-Z_{TX}/\theta$ or BII Transducer PN | $-Z_{IM}$ or BII PA PN | -HPF/LPF |
|---|---|---|---|---|---|---|---|
| **Example of Part Number:** | **Description** | | | | | | |
| BII2172MIL-400Wrms-10S-10%-35kHz-BII7523-50Ω-10kHz/60kHz | BII2172MIL, T/R Switch Module, Transmitting Input and Output Connectors: MIL-5015 Connectors, 400W; Maximum Pulse Width: 10 Seconds, Maximum Duty Cycle: 10%; Transmitting Frequency: 35kHz, Impedance matching Transducer BII7523 to 50Ω; Receiving Bandwidth (-3dB): 10 to 60 kHz. | | | | | | |
| BII2172MIL-400Wrms-10S-10%-35kHz-200Ω/-60°-50Ω-10kHz/60kHz | BII2172MIL, T/R Switch Module, Transmitting Input and Output Connectors: MIL-5015 Connectors, 400W; Maximum Pulse Width: 10 Seconds, Maximum Duty Cycle: 10%; Transmitting Frequency: 35kHz, Impedance matching Transducer of (200Ω/-60°) to 50Ω; Receiving Bandwidth (-3dB): 10 to 60 kHz. | | | | | | |
| BII2172MIL-400Wrms-10S-10%-35kHz-200Ω/-60°-BII5065-10kHz/60kHz | BII2172MIL, T/R Switch Module, Transmitting Input and Output Connectors: MIL-5015 Connectors, 400W; Maximum Pulse Width: 10 Seconds, Maximum Duty Cycle: 10%; Transmitting Frequency: 35kHz, Impedance matching Transducer of (200Ω/-60°) to BII5065 Power Amplifier; Receiving Bandwidth (-3dB): 10 to 60 kHz. | | | | | | |

**3. BII2173BNC**

**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**




**Wirings:**

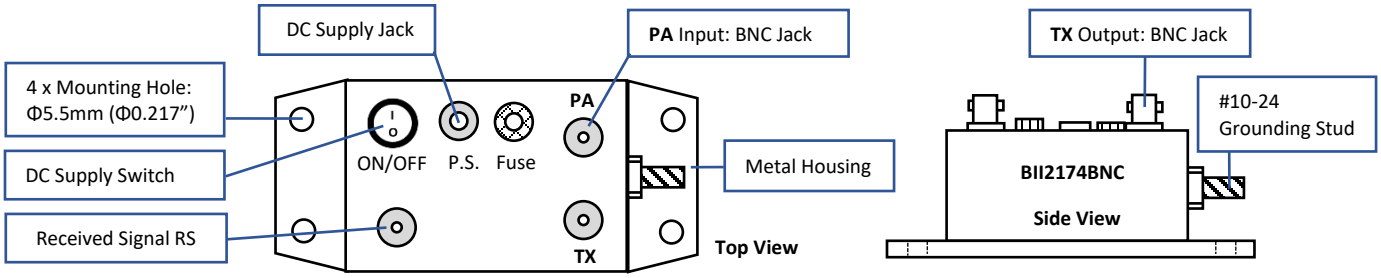
| Signals | BII2173BNC T/R Switch Modules | | |
|---|---|---|---|
| **PA Signal:** Coming from a Signal Source such as Power Amplifiers. Warning: High Voltage ! | **50Ω BNC Connector, Panel Mount, Jack.** | | |
| | Signal | | Center Conductor |
| | Signal Common | | Body Metal Shell. |
| | Shielding 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:** To Differential Inputs of a Data Acquisition Module. | **Panel Mount BNC Jack.** | | |
| | 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 TRS Jack and Inline TRS Plug with 0.6m Two Conductor Shielded Cable.** | | |
| | Reserved | | TRS Tip |
| | A0 | | TRS Ring |
| | Digital Common, Shielding, Grounding. | | TRS Sleeve |
| **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:** 0.3A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4". | | | |
| **Accessories Included:** 1. One DC supply cable **DC-PPBP-24.** 2. One Grounding Cable **GWL18**. 3. One Gain Selection Cable **TRS-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.**

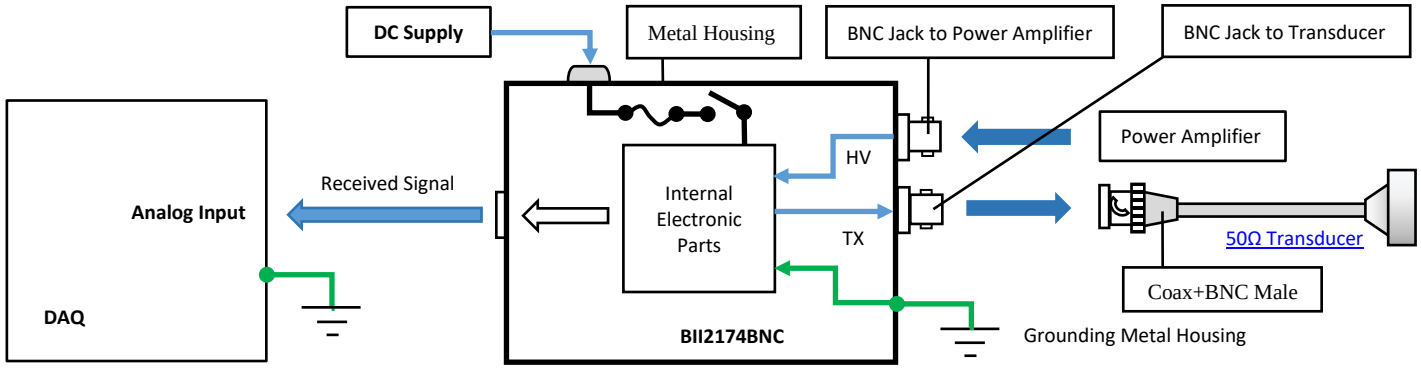
| BII2173BNC | -Power or Blank | -PW | -D | -fs-$Z_{TX}$/θ or BII Transducer PN | -$Z_{IM}$ or BII PA PN | -HPF/LPF |
|---|---|---|---|---|---|---|
| **Example of Part Number:** | **Description** | | | | | |
| BII2173BNC-100Wpeak-10μS-10%-BII7692-Φ12.7mmx1MHz-50Ω-0.5MHz/5MHz | BII2173BNC, T/R Switch Module, Transmitting Input and Output Connectors: BNC Jack; Power: 100Wpeak; Maximum Pulse Width: 10 μS, Maximum Duty Cycle 10%; Transmitting Frequency: 1MHz, Impedance matching BII7692-Φ12.7mmx1MHz to 50Ω; Receiving Bandwidth (-3dB): 0.5 to 5MHz. | | | | | |

**4. 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**



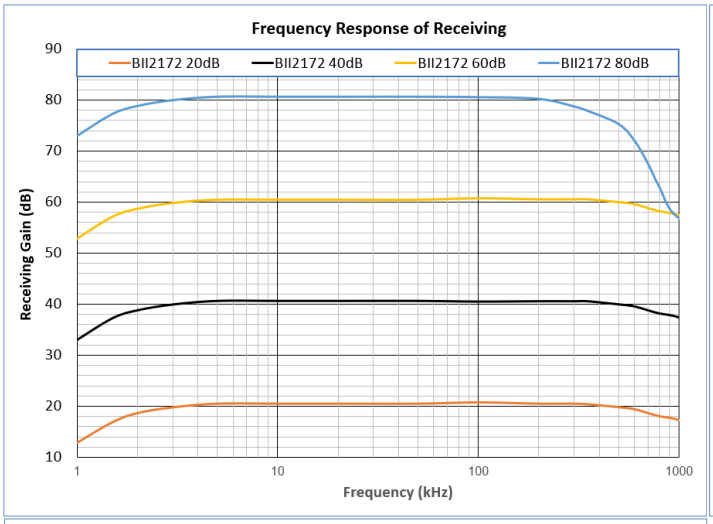

**Wirings:**

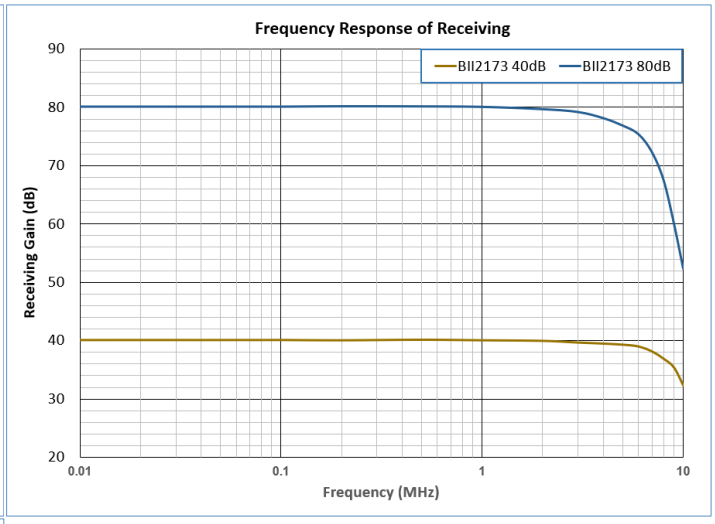
| Signals | BII2174BNC T/R Switch Modules | | |
|---|---|---|---|
| **PA Signal:** Coming from a Signal Source such as Power Amplifiers. Warning: High Voltage ! | **50Ω BNC Connector, Panel Mount, Jack.** | | |
| | Signal | | Center Conductor |
| | Signal Common | | Body Metal Shell. |
| | Shielding 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:** To Differential Inputs of a Data Acquisition Module. | **50Ω BNC Connector, Panel Mount, Jack.** | | |
| | **Signals** | | **BNC Connector, Jack.** |
| | Signal | | Center Conductor |
| | Signal Common, Shielding, and 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 | 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:** 0.3A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4". | | | |
| **Accessories Included:** 1. One DC supply cable **DC-PPBP-24**. 2. One Grounding Cable **GWL18**. 3. One Gain Selection Cable **TRS-P-WL-1m**. | | | |
| Grounding Metal Case for operating safety. **Grounding Stud:** #10-24 Screw 316SS. Nut and Washer are included. | | | |
| 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. | | | |

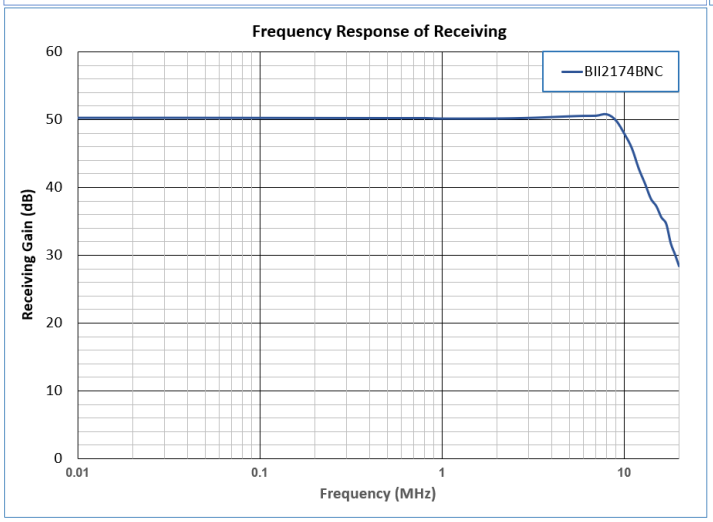
**How to Order, refer to Ordering Information of BII2170 Series for explanations of the terms or initials.**

| BII2174BNC | -Power or Blank | -PW | -D | -fs-$Z_{TX}$/θ or BII Transducer PN | -$Z_{IM}$ or BII PA PN | -HPF/LPF |
|---|---|---|---|---|---|---|
| **Example of Part Number:** | **Description** | | | | | |
| BII2174BNC-100Wpeak-10μS-10%-BII7692-Φ12.7mmx1MHz-50Ω-0.5MHz/5MHz | BII2174BNC, T/R Switch Module, Transmitting Input and Output Connectors: BNC Jack; Power: 100Wpeak; Maximum Pulse Width: 10 μS, Maximum Duty Cycle 10%; Transmitting Frequency: 1MHz, Impedance matching BII7692-Φ12.7mmx1MHz to 50Ω; Receiving Bandwidth (-3dB): 0.5 to 5MHz. | | | | | |

**Frequency Response of Receiving Gain**




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