

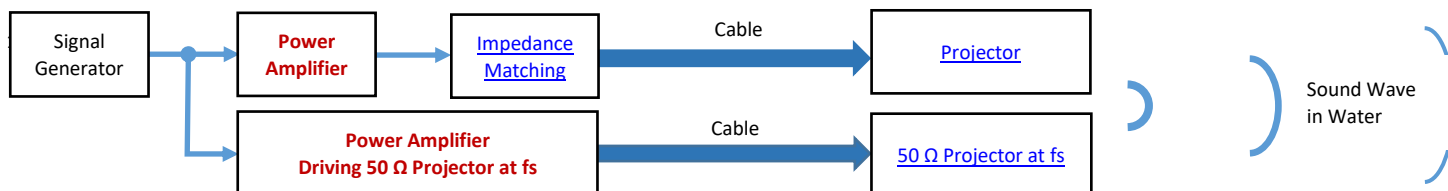


### BII5060 Series Power Amplifier

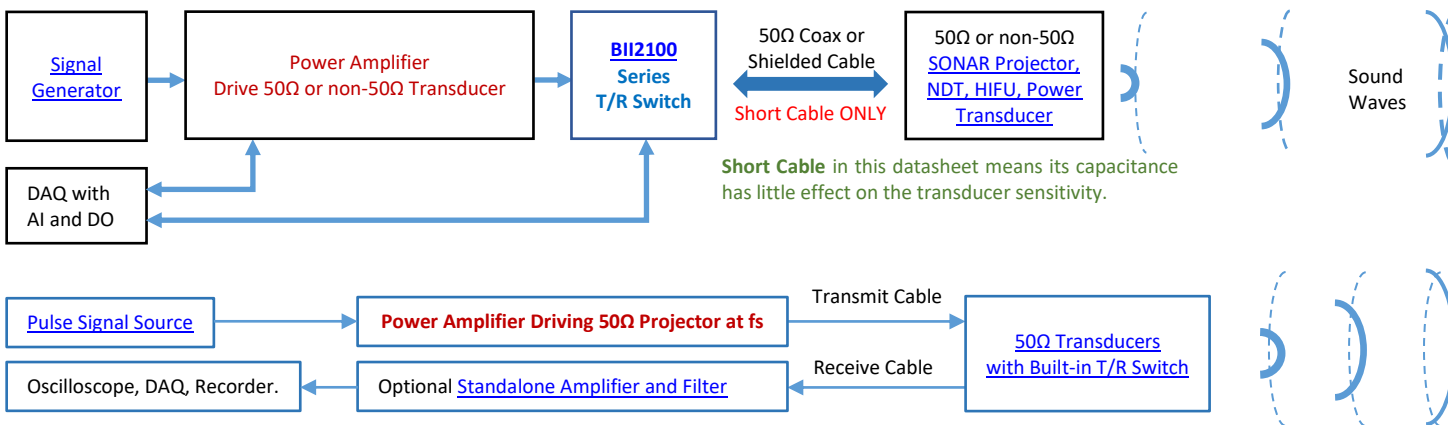
BII5060 series are 100 Hz to 100kHz linear power amplifiers driving low frequency acoustic transducers to generate sounds (acoustic waves) in water, air, and solids.

#### SYSTEM CONFIGURATION

##### (a) Transmitting Sounds.



##### (b) Transmitting and Receiving Sounds.



#### Related Product:

<a href="#">Underwater Transducer</a> : SONAR, NDT, and HIFU.	<a href="#">Impedance Matching</a> between Transducers and Amplifiers.
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#### APPLICATIONS

SONAR, Sub-bottom Investigation, Echo Sounding	Phantom Echo Generation, Phantom Clicks, Sound Playback, Bioacoustics, Acoustic Deterrent
Navigation, Obstacle Avoidance, Inspection and Survey	Communication, Modem, Beacon, Positioning, Chirp, FSK, PSK and Spread Spectrum System

#### ABSOLUTE MAXIMUM RATINGS

Power Amplifier	BII5062	BII5061, BII5065.	BII5067MIL	BII5068MIL
DC Supply Voltage:	+60 VDC	+60 VDC	+60 VDC	+60 VDC
Input Voltage:	10 Vpp	10 Vpp	10 Vpp	10 Vpp
Output Peak Current:	20 A	10 A	4.5 A	3.2 A

**SPECIFICATIONS** at T = +17 °C, Vs = +24 VDC, Load: BII7522 transducer, C<sub>0</sub> = 32 nF at 10 kHz, unless otherwise noted.

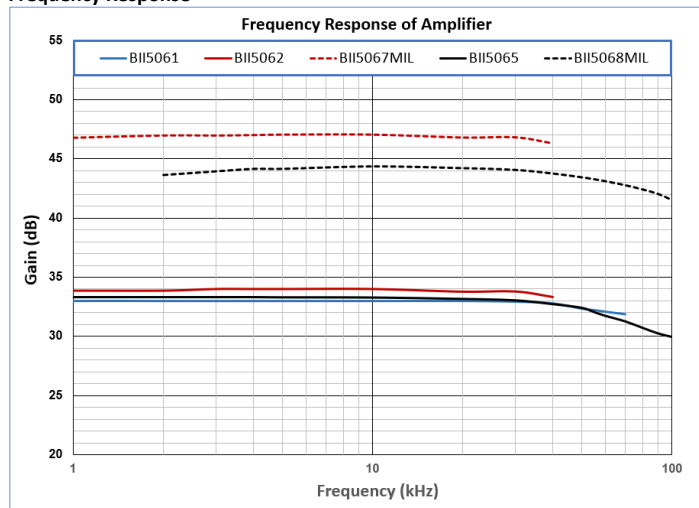
	BII5062	BII5061	BII5065	BII5067MIL	BII5068MIL
Power Amplifier					
Status:	ACTIVE	LIFEBUY	ACTIVE	ACTIVE	ACTIVE
Waterproof:	Not waterproof. <b>Always use the device in Dry Air for electrical safety.</b>				
Operating frequency: (Small Signal)	100 Hz to 60 kHz	100 Hz to 100 kHz	100 Hz to 120 kHz	1 to 60 kHz.	1 to 100 kHz.
Signal Type:	SINE Pulse/Burst, Chirp/FM, FSK and PSK, Arbitrary Waveform, Spread Spectrum, Marine Animal Sound, Continuous Signals, etc.			<b>Pulse Signal Only:</b> Duty Cycle D ≤ 25%, Pulse Duration PD ≤ 10 Seconds.	
Source Level Capability:	196+DI	193+DI	193+DI	196+DI	193+DI

(dB re $\mu$ Pa at 1m)	DI: Directivity Index (dB) of the transducer.				
Operating Mode:	Linear				
Impedance Matching:	No Built-in Impedance Matching.			Built-in Impedance Matching.	
Gain:	34 dB or x50	32.5 dB or x42	34 dB or x50	47 dB or x223.6	44 dB or x158
Input Type:	Single ended				
Input Connector:	On-board			BNC Jack	
Input Impedance:	20 K $\Omega$    7 pF				
Maximum Input Level:	Maximum Output Level/Gain, or 2 Vpp, whichever is less.				
Output Type:	Differential			Single ended	
Output Connector:	On-board			MIL-5015 Connector, Socket.	
Voltage Output:	Vo $\leq$ 2*Supply Voltage Vs – 16, in Vpp.			Vo $\leq$ 4.47*(2*Vs – 16), in Vpp.	Vo $\leq$ 3.16*(2*Vs – 16), in Vpp.
Current Output:	Io $\leq$ 20 A peak	Io $\leq$ 10 A peak	Io $\leq$ 10 A peak	Io $\leq$ 4.47 A peak	Io $\leq$ 3.16 A peak
Load:	$\geq$ Vo/Io			<a href="#">50<math>\Omega</math> Transducers</a>	
Shut-down Control:	On-board ON/OFF Switch: Manually or Digitally			Not used	
Shut-down Switch:	<b>OFF Position:</b> Output Enabled. Operates normally. <b>DIO Position:</b> TTL/CMOS Logic High: Output Enabled. TTL/CMOS Logic Low: Output Disabled.			N/A	
Stand-by Control Voltage: (Shutdown)	TTL/CMOS Compatible. <b>Logic Low “0”:</b> Output Disabled. Logic Low "0": 0 to +0.8 VDC. <b>Logic High “1”:</b> Output enabled. Logic High "1": +2.4 VDC to Vs.			N/A	
Output Disable Time:	1 $\mu$ S				
Output Enable Time:	3 $\mu$ S				
Full Power Bandwidth:	135 Hz to 40 kHz	135 Hz to 90 kHz	135 Hz to 90 kHz	1.7 to 40 kHz	2 to 70 kHz
	<b>Warning: DO NOT operate the device at frequencies lower than the minimum frequency stated above to avoid performance degradation and device damage.</b>				
RMS Power Capability: (SINE Signal)	415W@+58VDC. 315W@+48VDC. 195W@+36VDC. 75W @+24VDC.	208W@+58VDC. 158W@+48VDC. 98W @+36VDC. 38W @+24VDC.	208W@+58VDC. 158W@+48VDC. 98W @+36VDC. 38W @+24VDC.	415W@+58VDC. 315W@+48VDC. 195W@+36VDC. 75W @+24VDC.	208W@+58VDC. 158W@+48VDC. 98W @+36VDC. 38W @+24VDC.
Power Efficiency: (Operating at Io <sub>max</sub> )	Driving Tuned Transducers (Resistive load): 67% at +58 VDC. 64% at +48 VDC. 60% at +36 VDC. 50% at +24 VDC. Driving Untuned Transducers: Power Efficiency of driving tuned transducers*cos $\theta$ . $\theta$ : Impedance Phase of Untuned Transducers.				
DC Supply Voltage Vs:	+8 to +58 VDC <b>Warning: DC Supply voltage greater than <a href="#">MAXIMUM RATINGS</a> will damage the devices.</b>				
DC Supply Current Is: (at Maximum Power)	14.2 A.	7.1 A.	7.1 A.	14.2 A.	7.1 A.
	<b>DC Supply Current of Pulsing Signals:</b> When a device works with pulsing signals such as SINE pulse or voltage spikes, the DC current from DC power supply is much less than the rating. <i>Current = Rated DC Supply Current * <math>\sqrt{D}</math></i> . D: Duty Cycle of the pulsing signal = Pulse Width / Period. For example: BII5065 drives a transducer with SINE pulse whose D = 1%, DC current from DC power supply Is = 7.1A * $\sqrt{0.01}$ = 0.71 A.				
	Marine Battery, Automobile Battery, or DC Power Supply with Grounded Output and Protection of Output Current Limit. <b>Fully charged 12V Automobile or Marine Battery are from 12.6 to 14.4 VDC. Ensure that voltage of battery pack is less than maximum DC supply voltage.</b>				
Quiescent Current:	Active: 104 mA Shutdown: 27 mA	Active: 59 mA Shutdown: 24 mA	Active: 59 mA Shutdown: 24 mA	104 mA	59 mA
DC Supply Connector:	On-board			Sheathed Banana Jack	
Fuse:	None	None	None	Installed	Installed
Accessory Cable:	6" or 0.15m wires			1. DC Power Supply Cables: <a href="#">DCBP18</a> .	
Cable Connector:	Wire Leads			2. Grounding Cable: <a href="#">GWL18</a> .	
Package:	Rectangular PCB	Round PCB	Rectangular PCB	Metal Enclosure	
Grounding Terminal:	N/A			Grounding Stud #10-24.	
Mounting Hole:	6x4.87mm (Φ0.192")	4xΦ4.87mm (Φ0.192")	4xΦ4.87mm (Φ0.192")	4 x Φ5.5mm (Φ0.217")	
Size LxWxH (mm):	139.7x95.25x46.5	ΦDxH=Φ101.6x50.8	112x69x46.5	254.2x147.7x94	231x120x75
Weight in Air:	0.4 kg	0.2 kg	0.225 kg	2.2 kg	1.8 kg
Operating Temperature:	-20 to 70°C or -4 to 158°F				
Storage Temperature:	-20 to 70°C or -4 to 158°F				
<b>Note: Forced-air cooling by a fan is recommended to cool down the amplifier (PCB Package) during service of full power and continuous waveform.</b>					
<b>WARNING: The buyer should observe 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.</b>					

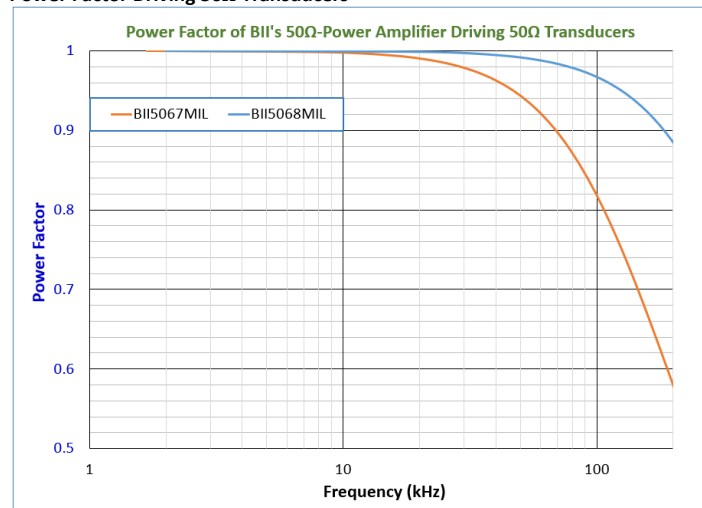
### Question: Are 50 $\Omega$ Power Amplifiers suitable to drive non-50 $\Omega$ transducers?

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

## Frequency Response

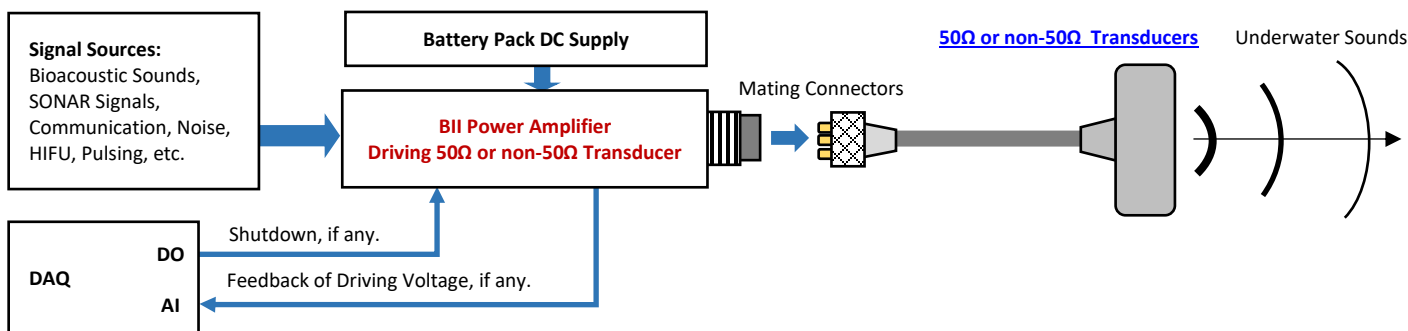


## Power Factor Driving 50Ω Transducers

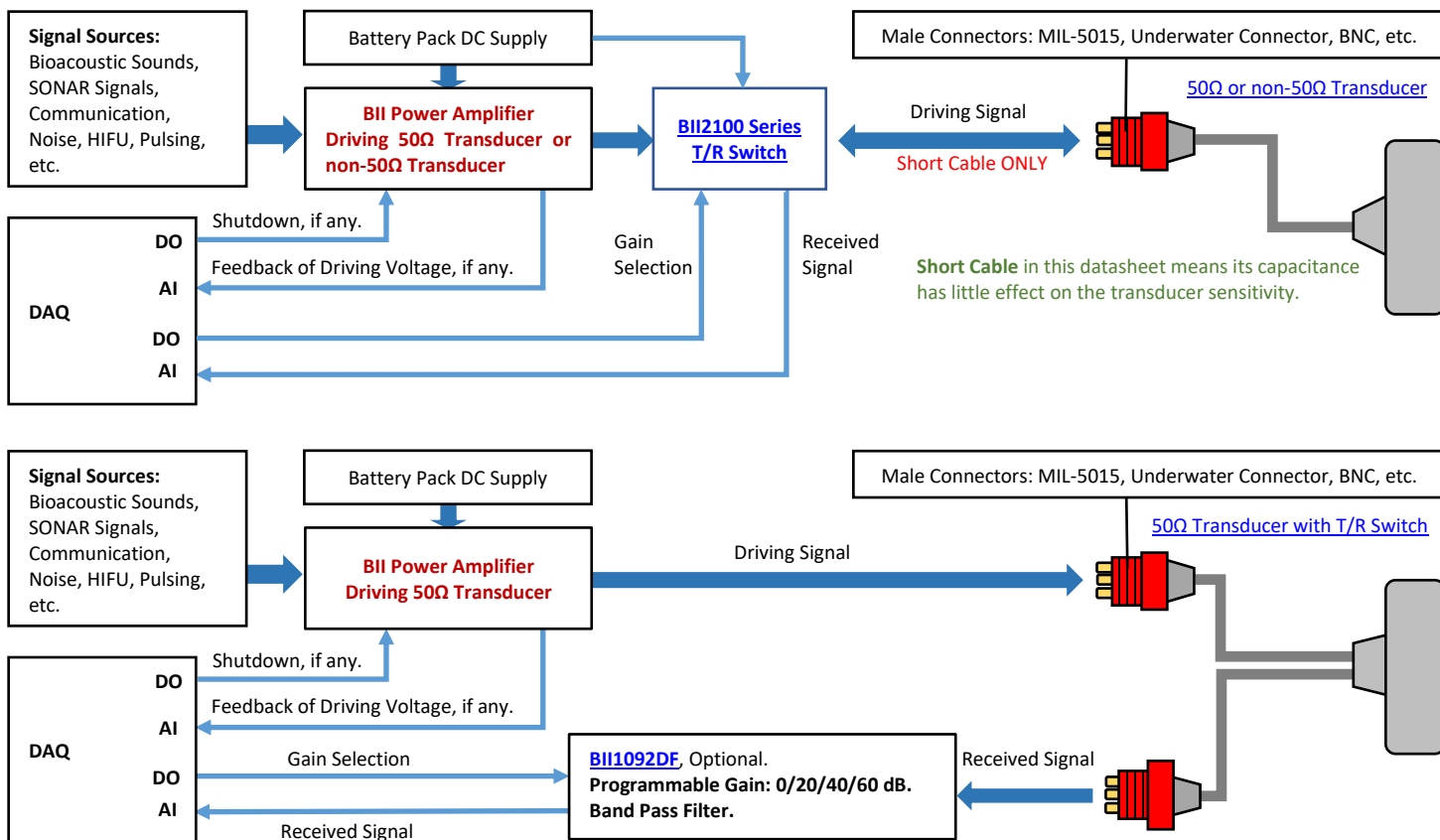


## Acoustic System Block Diagram

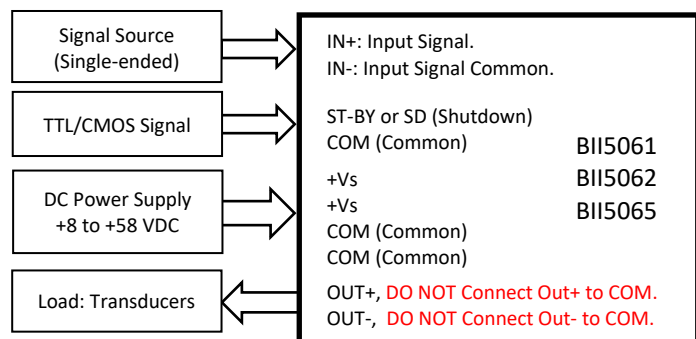
### 1. Generate Sounds and Waves.



### 2. Transmitting and Receiving Sounds and Waves



## SUGGESTED WIRING:



Configurations of ST-BY SWITCH (Shutdown SWITCH)		
OFF Position	DIO Position	
Output Enabled. Operates normally.	TTL/CMOS Logic High: Output Enabled.	TTL/CMOS Logic Low: Output Disabled.
When the Switch is open, the logic = "0" or low.		

## WARNING:

Outputs of the Power amplifier are differential, DO NOT Connect Out + or Out - to COM.

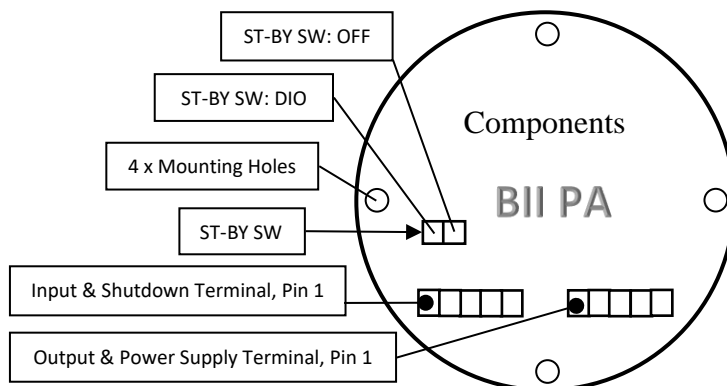
## BII5061 TERMINALS and WIRINGS

### Input and ST-by (Shutdown) Terminal

Pin 1: ST-BY (Shutdown)	White,	6" Wire
Pin 2: COM (Common)	Black,	6" Wire
Pin 3: IN+ (Input Signal)	Blue,	6" Wire
Pin 4: IN- (Input Common)	Yellow,	6" Wire
Pin 5: COM (Common)	Black,	6" Wire

### Output and Power Supply Terminal

Pin 1: +Vs	Red,	6" Wire
Pin 2: +Vs	Red,	6" Wire
Pin 3: COM (Common)	Black,	6" Wire
Pin 4: OUT+	Blue,	6" Wire
Pin 5: OUT-	Yellow,	6" Wire



## BII5062 TERMINALS and WIRINGS

### Input and Shutdown (SD) Terminal

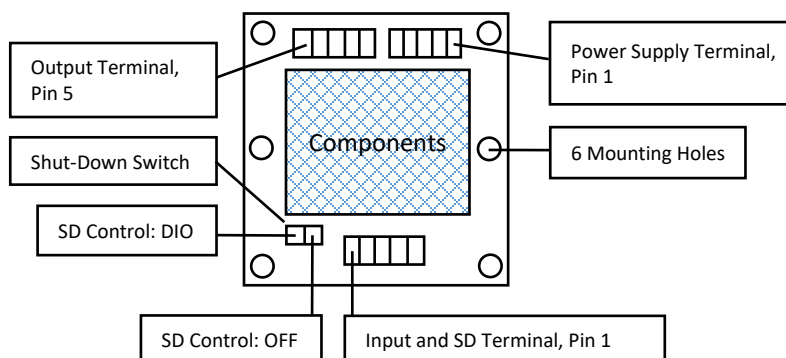
Pin 1: SD (Shutdown)	White,	6" Wire
Pin 2: COM (Common)	Black,	6" Wire
Pin 3: IN+ (Input Signal)	Blue,	6" Wire
Pin 4: IN- (Input Common)	Yellow,	6" Wire
Pin 5: COM (Common)	No Wire.	

### Power Supply Terminal

Pin 1: +Vs	Red,	6" Wire
Pin 2: +Vs	Red,	6" Wire
Pin 3: COM (Common)	Black,	6" Wire
Pin 4: COM (Common)	Black,	6" Wire
Pin 5: COM (Common)	No Wire.	

### Output Terminal

Pin 1: COM (Common)	No Wire.	
Pin 2: OUT-	Yellow,	6" Wire
Pin 3: OUT-	Yellow,	6" Wire
Pin 4: OUT+	Blue,	6" Wire
Pin 5: OUT+	Blue,	6" Wire



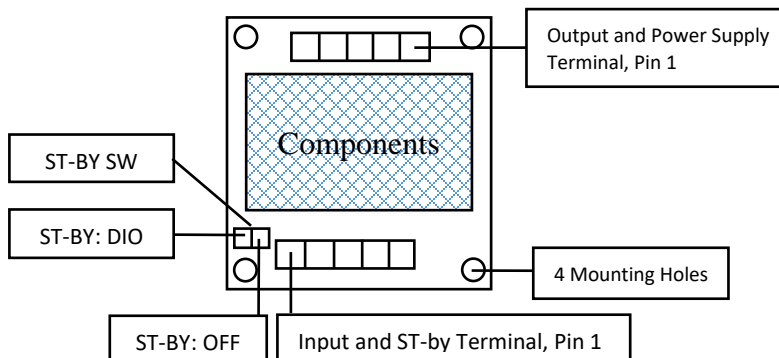
## BII5065 TERMINALS and WIRINGS

### Input and ST-by Terminal

Pin 1: ST-BY (Shutdown)	White,	6" Wire
Pin 2: COM (Common)	Black,	6" Wire
Pin 3: IN+ (Input Signal)	Blue,	6" Wire
Pin 4: IN- (Input Common)	Yellow,	6" Wire
Pin 5: COM (Common)	Black,	6" Wire

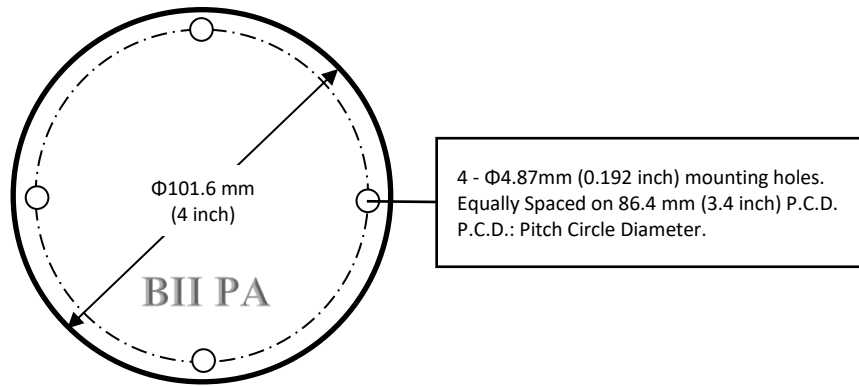
### Output and Power Supply Terminal

Pin 1: +Vs	Red,	6" Wire
Pin 2 <sup>(1)</sup> : +Vs	Red,	6" Wire
or COM (Common)	Black,	6" Wire
Pin 4: COM (Common)	Black,	6" Wire
Pin 4: OUT-	Blue,	6" Wire
Pin 5: OUT+	Yellow,	6" Wire

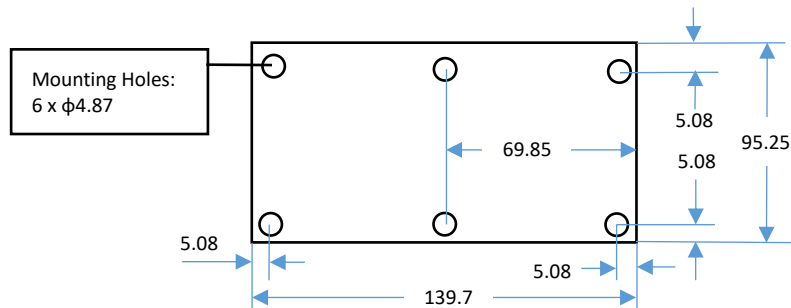


Note<sup>(1)</sup>: The Pin 2 is +Vs if its wire is Red, or COM (Common) if its wire is black.

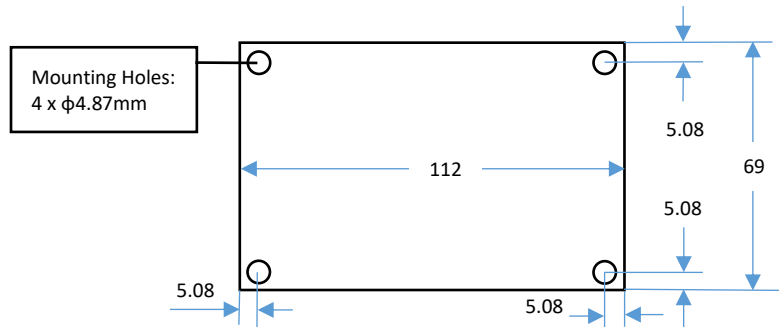
BII5061 Physical Size (unit mm):  $\Phi D \times H = \Phi 101.6 \times 50.8 \text{ mm}$



BII5062 Physical Size (unit: mm):  $L \times W \times H = 140 \times 95.25 \times 46.5 \text{ mm}$  or  $5.5'' \times 3.5'' \times 1.83''$



BII5065 Physical Size (unit: mm):  $L \times W \times H = 112 \times 69 \times 46.5 \text{ mm}$



### How to Extend Input and Output Wires of BII Power Amplifiers (PCB Package for Embedded Applications.)?

Input and output wires of BII PA (PCB Package) are 0.15m (6") **AWG16 wires** with wire leads.

1. **Butt Splice Connectors, Fully Insulated.** Buyers shall refer to the instructions of the manufacturer to strip proper wire leads and crimp the connector for secure connection. If possible, **heat shrink tube** is recommended to sheath the splice and function as strain relief.

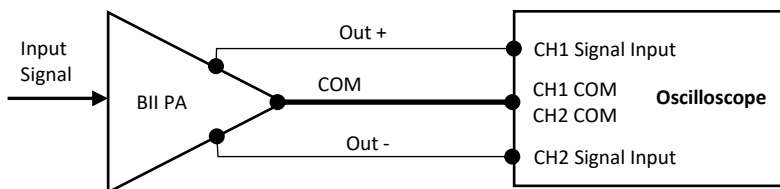
2. **Banana Jack and Plug, Fully Insulated, Free Hanging (In-Line).** Crimp or Solder. Crimp is recommended.

#### Note:

a. by default, BII does NOT provide these connectors. If buyer needs connectors, please specify when ordering.

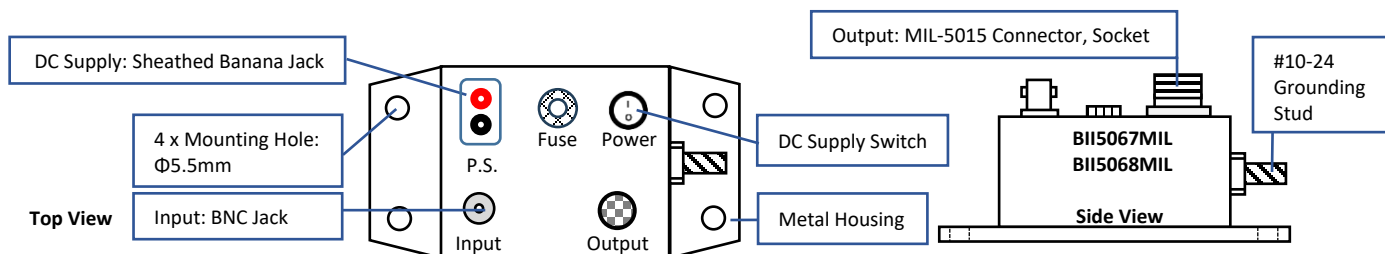
b. When wiring, please ensure insulation (avoid short circuit to damage the devices) and safety of operation.

### Measure Differential Output of BII Power Amplifiers

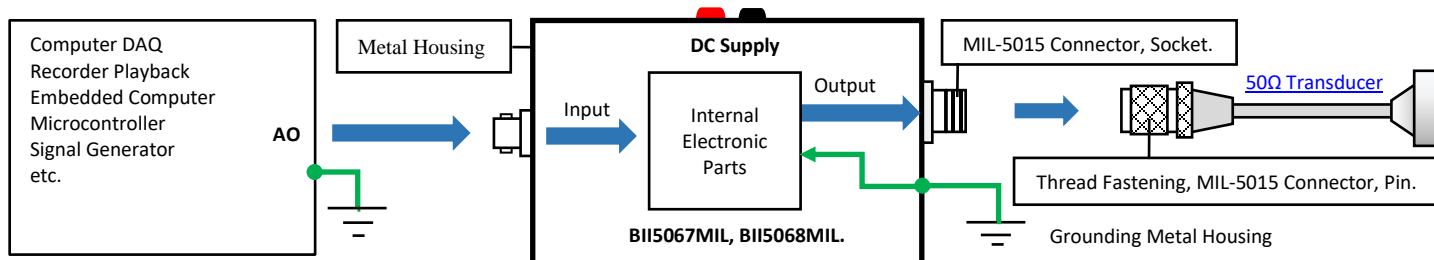


**Warning: Outputs of the Power amplifier are differential, DO NOT Connect Out + or Out - to any COM.**

**BII5067MIL and BII5068MIL:** Output Connector: MIL-5015 Connector, Socket. Mounting Hole  $\Phi 5.5\text{mm}$  ( $\Phi 0.217''$ ) accepts M5 or #10 screw. Screws are not supplied.  
**BII5067MIL Metal Enclosure, Overall Size:** LxWxH = 254.2x147.7x82 mm.  
**BII5068MIL Metal Enclosure, Overall Size:** LxWxH = 231.0x120.0x75 mm.



#### System Block Diagram and Wirings: Driving 50 $\Omega$ Transducer with MIL-5015 Connector, Pin.



Buyer's Signal Source	BII5067MIL, BII5068MIL.		Buyer's 50 $\Omega$ Transducer
	Input: BNC Jack	Output: MIL-5015 Connector, Socket.	Cable + In-line MIL-5015 (Pin)
Analog Output	Signal: Center Contact	Output Signal: Socket C	Signal: Pin C
Analog Common	Grounded Common: Body	Common: Socket B	Common: Pin B
		Grounding: Socket A	Grounding: Pin A
DC Power Supply:	Red Sheathed Banana Jack: +VDC. Black Sheathed Banana Jack: Common of the DC Power Supply.		
DC Supply Switch:	Turn ON and Turn OFF DC Supply. "I" -> ON; "O" -> OFF.		
Fuse:	BII5067MIL, 15A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4".		
	BII5068MIL, 8A, 250VAC, Slow-Blow, 3AB, 3AG, 1/4" x 1-1/4".		
Accessories Included:	1. Two DC supply cables, Part Number: DCBP18. 2. One Grounding Cable, Part Number: GWL18.		
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.			

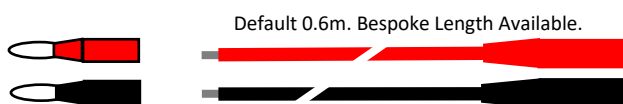
#### How to Order

BII5067MIL, BII5068MIL	- <a href="#">Adaptor Accessory</a>
Example of Part Number:	Description
BII5067MIL	BII5067MIL, Linear Power Amplifier.
BII5068MIL	BII5068MIL, Linear Power Amplifier.
BII5067MIL-MIL-UMC	BII5067MIL, Linear Power Amplifier with Adaptor Accessory: MIL-UMC.
BII5068MIL-MIL-SUMC	BII5068MIL, Linear Power Amplifier with Adaptor Accessory: MIL-SUMC.

#### DC Supply Cable Pair: Part Number DCBP18.

##### To Terminals of DC Supply:

- Default: Wire Lead
- One Red 4mm Banana Plug.
- One Black 4mm Banana Plug.



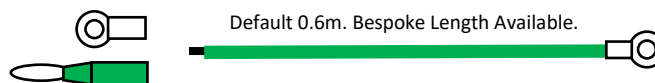
Sheathed Banana Plug.  
To sheathed Banana Jack of Power Amplifier.

Two 0.6m DC supply cables. Red and Black. One end of the cable is wire-lead, another end is Sheathed Banana Plug. One pair banana plugs (Red and Black) are included. Depending on output terminals of buyer's DC Supply, buyer assembles Banana Plugs, or other type of connectors to DC supply cable at buyer's cost.

#### Grounding Cable and Terminals

##### Terminal to buyer's Grounding Terminal:

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



#10 Ring Terminal  
#10-24 nut and #10 washer included.

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

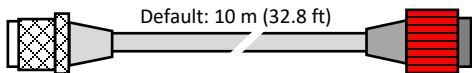
One 0.6m AWG 18 Green Wire with #10 Ring Terminal and Wire Lead. One #10 Ring Terminal and one 4mm Banana Plug (Green) are included.

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

## Adaptor Accessory:

**(1) MIL-UMC,** MIL-5015 (3 Pins) to UMC25 (Underwater Connector, 2 Sockets, Locking Sleeve: DLSA-F, Size:  $\Phi 35.5 \times 33.5 \text{ mm}$ )

MIL-5015  
3 Pin



Default: 10 m (32.8 ft)

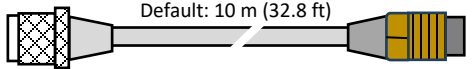
Underwater Connector, 2 Sockets.  
Contact 2: Signal.  
Contact 1: Common.



Transducer with 2-Pin Underwater Connector and DLSA-M Locking Sleeve.

**(2) MIL-SUMC,** MIL-5015 (3 Pins) to Small UMC25 (Underwater Connector, 2 Sockets, Thread Locking, Size:  $\Phi 22 \times 28 \text{ mm}$ )

MIL-5015  
3 Pin



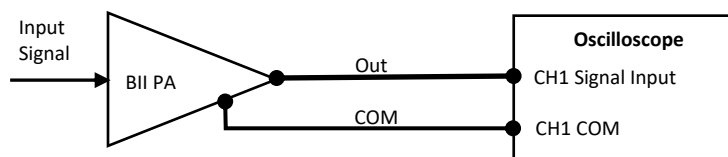
Default: 10 m (32.8 ft)

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



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

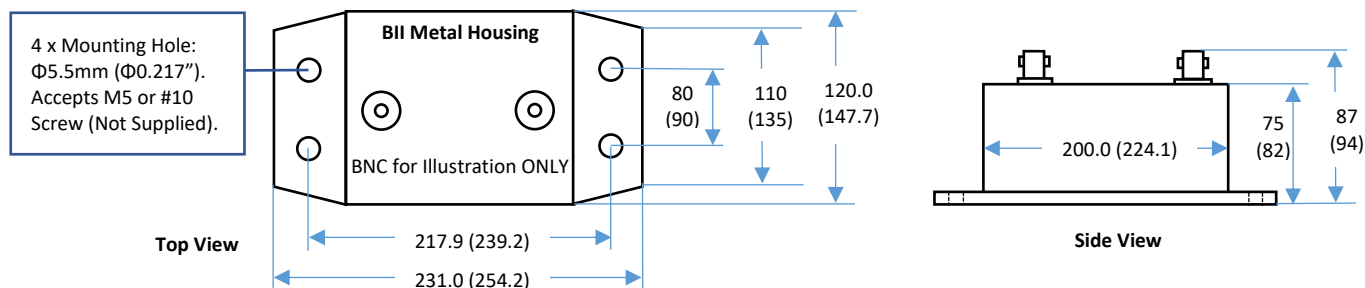
## Measure Single Ended Output of BII Power Amplifiers



### Warning:

1. Outputs of the power amplifier is high voltage, choose suitable oscilloscope probe with correct attenuation and voltage rating.
2. for operating safety, ensure proper grounding, and shut down power supply of the device before handling the cables, wiring and hookup, etc.

**BII5067MIL (Sizes are in bracket), BII5068MIL Metal Housings, Outline Dimensions (mm), Illustration only, the scale is not 1:1.**



## Customer's Question: What if the connector of my transducer/projector is NOT MIL-5015 Connector with Pins?

BII Answers: Buyer may order a MIL-5015 Connector (Pins) from BII to replace original transducer connector or use it as a component of the connector adaptor. MIL-5015 Connector has solder contacts. Buyer may also order the connector from local electronic distributors in buyer's country. For example, if you have a transducer with Underwater connector (pin), you may make a connector adaptor from MIL-5015 (pin) to Underwater connector (Socket). BII may make this connector adaptor as accessory of the device. Please discuss with BII for customizations.