



Acoustic Transmit and Receive System: Underwater and NDT Diagnostic Ultrasonics

BII8080 series portable transmit and receive systems are bandpass system and designed optimally for underwater acoustic and NDT ultrasound applications. It integrates a power amplifier, an impedance matching network, a T/R Switch, a digitally programmable gain preamp, and a bandpass filter into a portable water-proof case or a metal enclosure to drive underwater and NDT transducers in wideband frequency range around f_s (transducer's resonance frequency). With a laptop computer (DSP board or microcontroller) and a DAQ (Data Acquisition Module), BII8080 series functions as a portable underwater acoustic system and/or NDT pulsing system.

Typical Applications

Underwater Acoustic System, NDT, Diagnostic Ultrasound, Studies of Materials	Artificial Acoustic Target, Echo-Repeater Target, Active-Acoustic Target
Underwater Communication, Pinger, Transponder, Telephone, Diver Recall System	Echo sounding, Object Detection, Navigation
Chirp/FM Sonar, Imaging Sonar, Sub-bottom Profiling, Sea-floor Mapping	Distance Measurement, Water Depth, Bottom Contour
Maintenance/Inspection of Underwater Structure/Structural Health Monitoring	Bioacoustics, Fishery Acoustics/Sonar, Underwater Sound Stimulus

Related Products: [BII8030](#) Underwater Acoustic Transmitter

[Transducer](#) Broadband, High Power, Omni & Highly Directional...

Specification

Transceiver	BII8081	BII8082	BII8083
Frequency Range:	0.6 to 100 kHz	10 to 350 kHz	0.1 to 10 MHz.
DC Power Supply:	+8 to +58 VDC. 14.2 A.	+8 to +35 VDC. 7.1 A.	+10 to +35 VDC. 7.1A.
	DC Supply Current of Pulsing Signals: When a device works with pulsing signals (pulse width ≤ 0.1 ms) such as SINE pulse or voltage spikes, the DC current from DC power supply is much less than the rating. $Current = Rated\ DC\ Current * \sqrt{D}$. D: Duty Cycle of the pulsing signal = Pulse Width / Period. For example: Driving BII8083 with SINE pulse whose D = 1%, DC current from DC power supply = $7.1A * \sqrt{0.01} = 0.71A$.		
Maximum Supply Voltage:	+60 VDC	+36 VDC	+36 VDC
Suggested DC Supply:	Warning: DC Supply voltage greater than the maximum DC supply voltage listed in the table above will damage the devices. Fully charged 12V Car or Marine Battery are from 12.6 to 14.4 VDC. Ensure that voltage of battery pack is less than maximum DC supply voltage.		
Quiescent Current:	104 mA	65 mA	35 mA
Power Supply Connector:	Dual Binding Post Terminal (Red and Black): Red Terminal: +VDC Power Supply. Black Terminal: Common of Power supply and Grounding.		Sheathed Banana Jack Red Terminal: +VDC Supply Black Terminal: Common
Grounding:	Black Terminal must be grounded firmly for safety.		Grounding Stud on Enclosure
Console and Wiring:	Front Panel and Wiring.	Front Panel and Wiring.	Front Panel and Wiring.
Transducer Case:	No transducer case in default. Available upon request. Portable, Waterproof, Light Weight, Durable, Highly Chemical Resistant.		
Console Case:	Portable, Waterproof, Light Weight, Durable, Highly Chemical Resistant.		
Accessories:	A mating connector for the cable of buyer's transducer.		DC Power Supply Cable: Two 0.6m cables with Banana Plug.
	A mating connector with 1 m cables for Gain Control.		One Grounding Cable, #10-24 nut and #10 washer included.
Case:	Portable, Waterproof, Light Weight, Durable, Highly Chemical Resistant		Aluminum Enclosure
Size LxWxD:	11"x10"x7", or 0.28x0.26x0.18 m	11"x10"x7", or 0.28x0.26x0.18 m	180.5x110.3x75 mm
Weight:	3.8 kg	3.0 kg	2.5kg

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

Transmitting Sounds

Signal Type:	Pulsed SINE, Chirp, PSK, FSK, Pulse, Square Waveform, etc.		
Transmit Frequency f_s :	Specify f_s when ordering. f_s is the center frequency of the bandpass. please refer to graphs of f_{min}, f_1, f_2, and f_s. Generally, f_s is resonance frequency of a transducer whose TVR is maximum at f_s .		
Operating Frequency:	Minimum Operating Frequency f_{min} can be determined from graphs of f_{min}, f_1, f_2, and f_s. Warning: Operating the device at frequency lower than f_{min} may damage the device.		
Quality Factor Q:	Q = 1. Fixed, set at BII factories. Note: BII8080 series devices are bandpass system.		
-3dB Bandwidth:	$-3dB\ bandwidth\ BW = f_s/Q = f_s = f_2 - f_1$. Lower Half-power Frequency $f_1 = 0.618 f_s$. Upper Half-power Frequency $f_2 = 1.618 f_s$.		
Damping Factor:	$\zeta = 0.5$ when devices drive 50 Ω or 100 Ω load at f_s .		
Input Impedance:	20 k Ω 7 pF	1 k Ω 6 pF	1 k Ω 7 pF, or 50 Ω 7 pF
Signal Level:	2 Vpp Maximum		
Voltage Gain:	47 dB	45 dB	40 dB

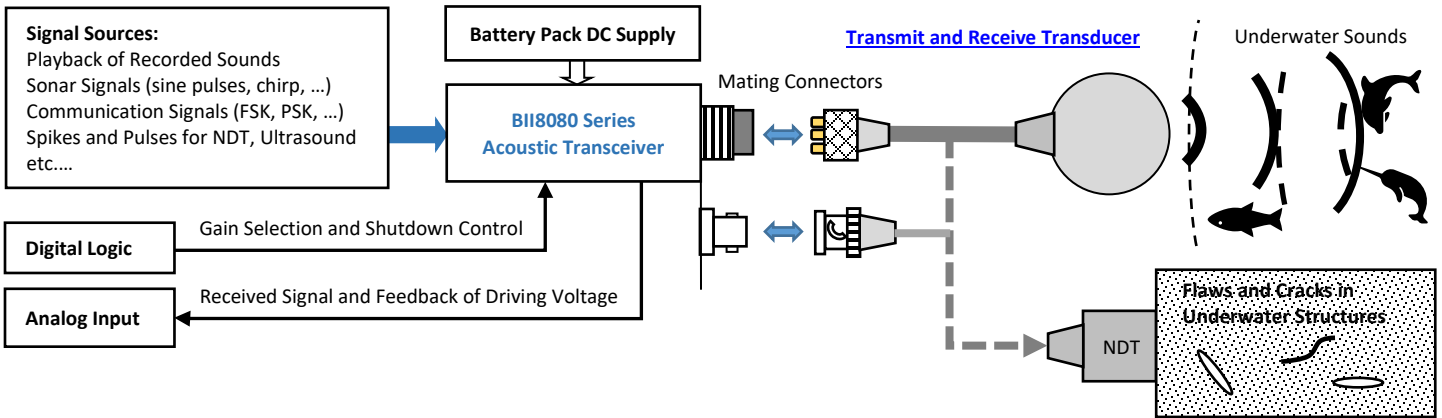
Input Signal Connector:	Female BNC, "Transmit". To signal generator.		
Signal Generator:	Not included. Laboratory Signal/Function Generator; Playback of Digital Recorder; Computerized DAQ System; Embedded DAC System. BII Sonar Signal Generator .		
Shutdown:	Shutdown (SD) is used to shut down the device and enable the device to operate normally. Shutdown Control Voltage: Digital Signal, TTL/CMOS compatible. Digital 0 or LOW: Shutdown. Digital 1 or HIGH: Active, working normally.		N/A
	Logic Low or "0": 0 to +0.8 VDC. Logic High or "1": +3.5 VDC to Vs. Warning: Control voltage greater than Vs will damage the device.	Logic Low or "0": 0 to +0.4 VDC. Logic High or "1": +3.5 to +5 VDC. Warning: Control voltage greater than +20VDC or lower than -20VDC will damage the device.	N/A
Connector:	Female BNC, "SHUTDOWN". To a Digital Output of a DAQ device.		
Drive Voltage Feedback:	Voltage Feedback (VF) output is used to monitor driving voltage applied to the transducer. Output at VF terminals = Driving Voltage of Transducer * Feedback Gain. Feedback Gain = 0.001 to 0.01 which is customized according to a specific transducer.		
	Connector: Female BNC, "DRIVE VOLTAGE FEEDBACK". To an Analog Input of a DAQ device.		
Transducers:	Original, 100Ω, or 50Ω.	Original or 50Ω.	50Ω.
	"Original" means transducers without built-in impedance matching network, "50Ω" means transducers with built-in impedance matching networks which transform transducer impedances to 50Ω. "100Ω" means transducers with built-in impedance matching networks which transform transducer impedances to 100Ω.		
	Not Included, Order Separately. Refer to System Block Diagram .		
	TVR and FFVS variation of a transducer with built-in Impedance Matching Network: 1. When $R_{IM} < 1/G$, TVR increases, FFVS decreases. Generally, this is true for low frequency transducers. 2. When $R_{IM} > 1/G$, TVR decreases, FFVS increases. Generally, this is true for high frequency transducers. R _{IM} : Impedance-Matched Resistance at fs such as 50Ω or 100Ω at fs. G: Transducer Conductance at Operating Frequency.		
	Ordering Tips: 1. In low frequency range $R_{IM} < 1/G$, use transducers without built-in Impedance Matching Network to avoid FFVS decreasing. 2. In high frequency range $R_{IM} > 1/G$, use transducers with built-in Impedance Matching Network to increase FFVS. Please refer to datasheets of BII transducers for conductance G at fs or G-B graph around fs.		
Transducer Connector:	97 Series Standard Cylindrical Connector, MIL-5015 style, Socket. "TRANSDUCER". To Transducer.	BNC Jack, "TRANSDUCER". To Transducer.	
RMS Power Capability:	415W@+58VDC	133W@+35VDC	118W@+32VDC
	315W@+48VDC	78W @+24VDC	78W @+24VDC
Pulse Power: Voltage Spikes/Single Pulse	N/A	N/A	235W@+32VDC 155W@+24VDC
Receiving Sounds			
Bandpass Filtering:	Built-in, 40dB/decade.		
-3dB Bandwidth:	Specify -3dB cut-off frequencies When Ordering.		
Dynamic Range:	86 dB		
Signal Type:	Waveform, AC Coupled, Single Ended.		
Signal Connector:	Female BNC, "RECEIVE". To an Analog Input of a DAQ device.		
Receiving Gain Selection			
Signal Type:	TTL/CMOS Compatible (Digital Output), or Manual Setting. Logic Low 0: 0 to +0.8 VDC from digital outputs, or Gain Selection Wire is short to Digital COM. Logic High 1: +2.4 VDC to +Vs from digital outputs, or Gain Selection Wire Opens. Vs: Power Supply Voltage.		
Gain Selection Connector:	97 Series Standard Cylindrical Connector, MIL-5015 style, Pin. "GAIN SELECTION".	BNC Jack, "GAIN SELECTION".	
To Digital Outputs of DAQ devices, Microcontrollers, Embedded Computers, etc.			
Wires:	Red or White Wire: A1. Black Wire: A0. Shield: Digital Common.	Red or White Wire: A1. Black Wire: A0. Shield: Digital Common.	Coax Conductor: A0. Coax Shield: Digital Common.
	Connect the Black wire to the shield: A0 = 0 or Logic Low. Disconnect the Black wire from the shield: A0 = 1 or Logic High. Connect the Red or White wire to the shield: A1 = 0 or Logic Low. Disconnect the Red or White wire from the shield: A1 = 1 or Logic High.		Connect conductor to shield: A0=0. Open conductor and shield: A0=1.
Selection Digitally:	a 1-bit or 2-bit digital word to the gain selection inputs. Shield is connected to Digital COMMON.		
Truth Table:	A1 A0 Gain(dB)	A1 A0 Gain(dB)	A0 Gain(dB)
	0 0 0	0 0 0	0 20
	0 1 20	0 1 20	1 50
	1 0 40	1 0 40	N/A
	1 1 60	1 1 60	N/A

How to order:

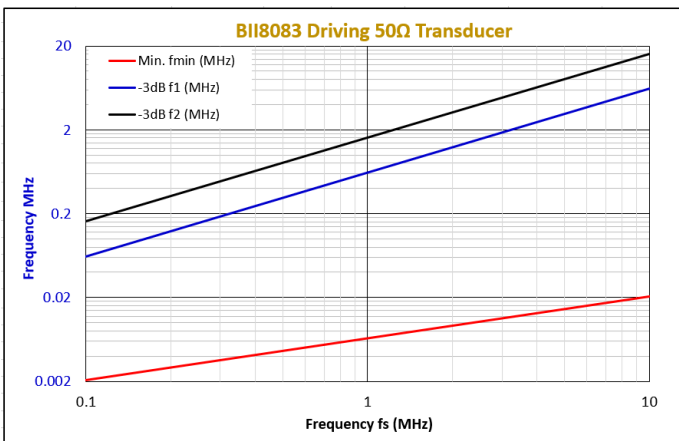
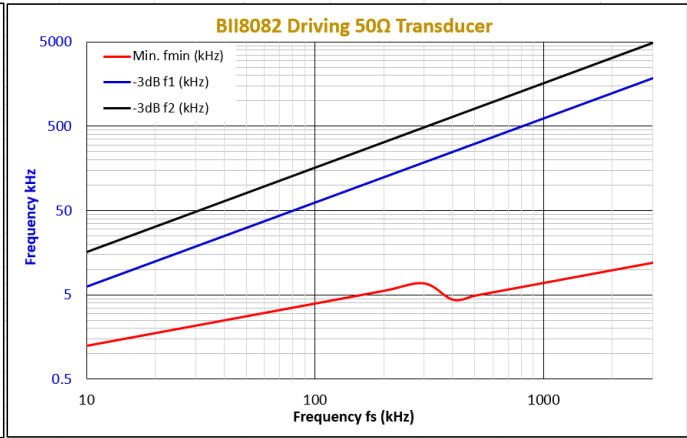
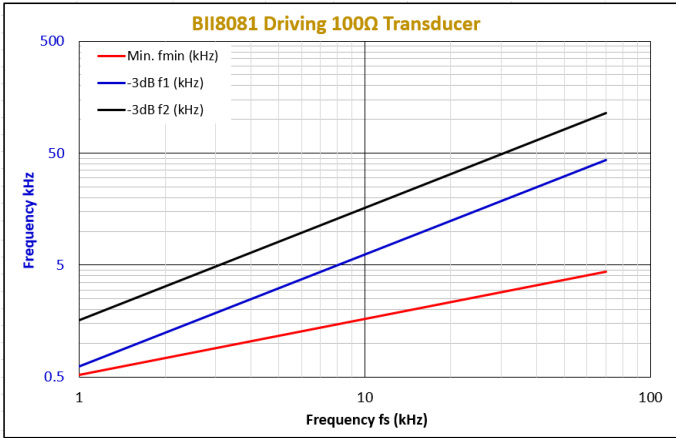
T/R System Part Number	-fs	-Z _{TX} /θ or G/B	-Bandwidth of Receiving around fs
BII8081, BII8082, BII8083.	Operating Frequency, in kHz. Generally, fs is resonant frequency of a transducer.	Complex impedance of a transducer. Impedance Z _{TX} in Ω, Phase θ in °, or Admittance G and B in S, mS or μS.	-3dB Bandwidth of Receiving around fs, in kHz or MHz.
Example of Part Number	Description		
BII8082-120kHz-100Ω/-60°-50kHz	BII8082, Operating Frequency fs: 120kHz; Transducer Impedance: 100Ω with Phase Angle -60°; -3dB Receiving Bandwidth: 50kHz with center frequency fs.		
BII8083-1MHz-50Ω-0.2MHz	BII8083, Operating Frequency fs: 1MHz; Transducer Impedance: 50Ω; -3dB Receiving Bandwidth: 0.2MHz with center frequency fs.		

System Block Diagram

BII8080 Series Drive "Original", 50Ω, or 100Ω Transducers.



Minimum Operating Frequency f_{min} , -3dB Band Pass Frequency f_1 and f_2 , and Operating Frequency f_s .



How to determine f_{min} , f_1 , f_2 with f_s to drive transducers?

For example, for device BII8083-1MHz-50Ω:

1. $f_s = 1$ MHz.
2. Refer to graph of **BII8083 driving 50Ω Transducer**.
3. Locate $f_s = 1$ MHz on Horizontal Axis.
4. Find the values of f_{min} , f_1 , and f_2 respectively from Vertical axis.
 $f_{min} = 0.006$ MHz, $f_1 = 0.618$ MHz, $f_2 = 1.618$ MHz.

f_{min} : Minimum Operating Frequency.

f_s is resonance frequency of transducer and center frequency of bandwidth.

Lower Half-power Frequency $f_1 = 0.618 f_s$.

Upper Half-power Frequency $f_2 = 1.618 f_s$.

Warning:

Operating the device at frequency lower than f_{min} may damage the device.

Transducer Connector Assembly

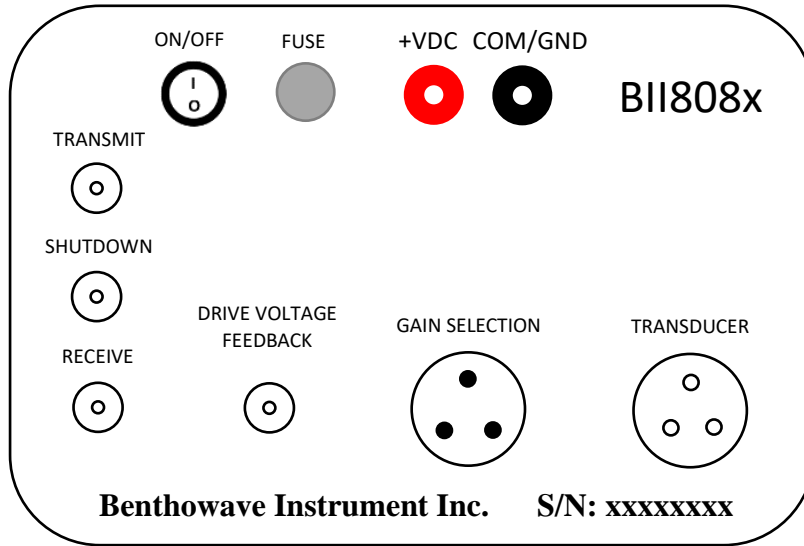
If buyer orders a free hanging, flange mount or flush mount transducer, BII assembles the connector on transducer cable. Buyer does not need to do any assembly. If buyer orders a thru-hole mount, bolt-fastening mount or end-face mount transducer, BII ships the transducer with wire leads and the mating connector to buyer. After installing the transducer on the mounting wall, buyer shall assemble the connector with transducer cable and solder the wire leads to the connector pins. Note: the size of the mating connector is bigger than mounting hole size of the transducer.

Wirings	3-Contact Mating Connector	Wire Leads of Transducer with Shielded Cable	Wire Leads of Transducer with Coax Cable
Signal	Pin C	Red or White Wire	Coax Conductor
Signal Common	Pin B	Black Wire	Coax Shield
Shielding and Grounding	Pin A	Shield	Coax Shield

Manufacturing Status

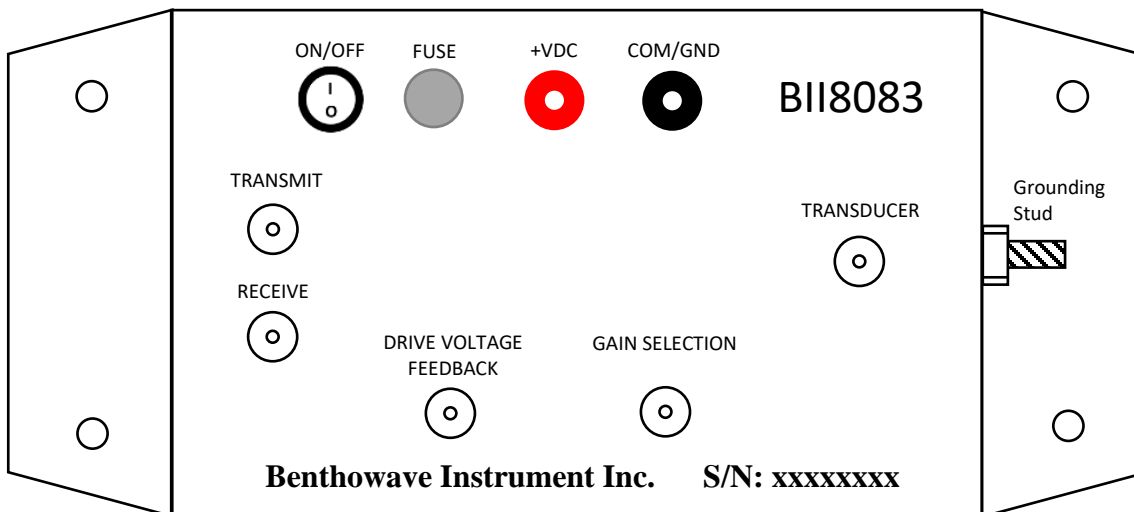
ACTIVE: Product device recommended for new designs. **LIFEBUY:** BII has announced that the device will be discontinued, and a lifetime-buy period is in effect. **OBSELETE:** BII has discontinued the production of the device.

BII8081 and BII8082 Front Panel and Wiring. Manufacturing Status: ACTIVE.



Power Supply:	Dual Binging Posts. Red: +DC Power Supply. Black: +DC Power Supply Common and Grounding. Warning: Black post must be grounded firmly for operating safety.
Power Supply Switch:	ON and OFF. Manual Control. "I" -> ON; "O" -> OFF.
Fuse Holder:	Fuse, 15A (BII8081) or 8A (BII8082), 250VDC, 3AB, 3AG, 1/4" x 1-1/4".
Transmit:	BNC Jack to Signal Generator, BNC Center Contact: Signal; BNC Shield: Signal Common.
Shutdown:	BNC Jack to Shutdown Control Signal (TTL/CMOS Compatible), BNC Center Contact: Digital Signal; BNC Shield: Digital Common.
Receive:	BNC Jack to Analog Input of DAQ, BNC Center Contact: Received Signal; BNC Shield: Common.
Drive Voltage Feedback:	BNC Jack to Analog Input of DAQ, BNC Center Contact: Feedback Voltage Signal; BNC Shield: Common.
Gain Selection:	Circular Connector MIL-5015 Style, Pin, to Digital Outputs of the DAQ, or Manual Gain Selection. Red or White Wire: A1. Black Wire: A0. Shield: Digital Common.
Transducer:	Circular Connector (Receptacle) MIL-5015 Style, Driving Signal to Transducer. Pin A: Shielding and Grounding. Pin B: Signal Common. Pin C: Signal.

BII8083 Front Panel and Wiring. Manufacturing Status: ACTIVE.



Power Supply:	Sheathed Banana Jack. Red: +DC Power Supply. Black: +DC Power Supply Common.
Power Supply Switch:	ON and OFF. Manual Control. "I" -> ON; "O" -> OFF.
Fuse Holder:	Fuse, 8A BII8083, 250VDC, 3AB, 3AG, 1/4" x 1-1/4".
Transmit:	BNC Jack to Signal Generator, BNC Center Contact: Signal; BNC Shield: Signal Common.
Receive:	BNC Jack to Analog Input of DAQ, BNC Center Contact: Received Signal; BNC Shield: Common.
Drive Voltage Feedback:	BNC Jack to Analog Input of DAQ, BNC Center Contact: Feedback Voltage Signal; BNC Shield: Common.

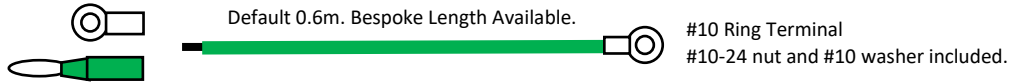
Gain Selection:	BNC Jack , to Digital Output of DAQ, or Manual Gain Selection. BNC Socket: A0. BNC Shield: Digital Common.
Transducer:	BNC Jack . Driving Signal to Transducer. BNC Socket: Signal. BNC Shield: Common and Grounding.
Grounding Stud:	#10-24 screw . Two #10 washers and two #10-24 nuts are included

BII8083 Accessories:

DC Power Supply Cables: Two 0.6m Cables with Banana Plug.
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 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



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

