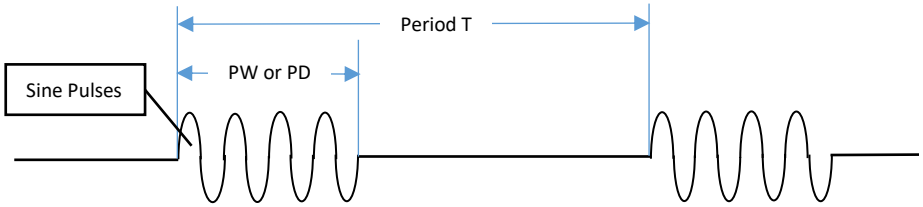
Pulsed/Burst SINE for Acoustic Systems

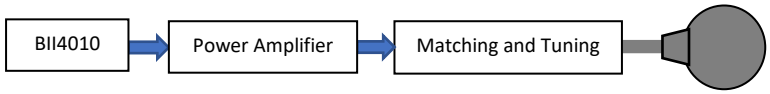
BII4010 series signal generators are embedded and standalone components/modules which generate SINE pulses for Pulsing-Echo acoustic systems (SONAR, NDT, Diagnostic ultrasound…), HIFU, and underwater communication system, and feature low power, high accuracy, and long-term stability.
The generators work with power amplifiers and impedance matching units to drive the transducer in high power application. Besides, BII4010 can also be used to drive transducers directly for low power application in laboratory or pilot study in field.

Pulsed/Burst SINE (SINE Pulse, Rectangle Modulated): Pulsed SINE $s(t) = A*\sin(2\pi f_0 t)$, if $0 \le t \le PW$.
$s(t) = 0$, if $PW < t \le T$.

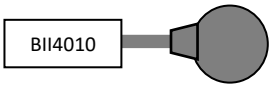


PW: Pulse Width or PD: Pulse Duration.
PRR: Pulse Repetition Rate
Pulse Signal Period T =1/ PRR.
Duty Cycle D = PW/T = PW * PRR.
Bandwidth Δf_{-3dB} of SINE Pulses ≈ 0.89/T = 0.89 * PRR.

High Power Application (DC Power Supply: not shown.)



Low Power Application (DC Power Supply: not shown.)



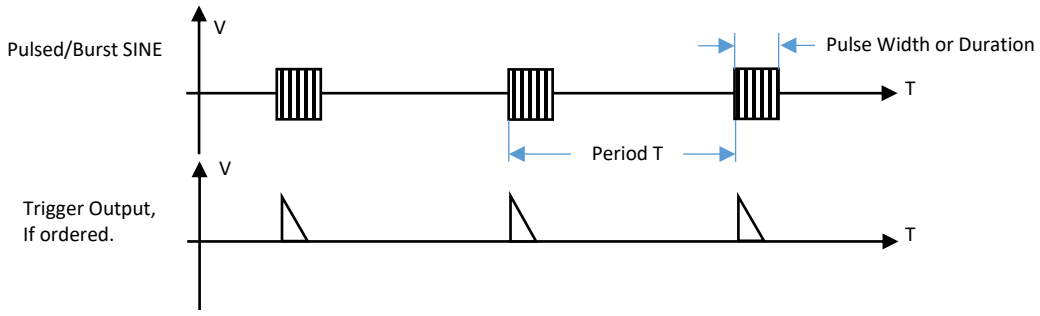
Typical Application	
Active SONAR System, Seafloor Mapping, Echo Sounding Communication/Positioning/Beacon/Transponder/Pinger/Locator Artificial Acoustic Target, Phantom Echo Generation Ultrasonic Instrumentation, HIFU System, NDT, Diagnostic ultrasound	Sub-Bottom Investigation/Assessment/Profiler Sediment Profiling, Sediment Penetrating Detection Buried Objects Search, Pipeline/Cable Survey Navigation/Fishery Acoustics/Physical Oceanography
Features	
High Accuracy and Stability High Output Current: 250 mA	Pulsed/Burst SINE: Higher Order Harmonics ≤ -40 dB Pulse Width/Period: nS to Hours

Specification

SINE Pulse Generator	BII4013	BII4014
	Dry Uses ONLY	Underwater, ≤ 300m.
Status:	ACTIVE	ACTIVE
	ACTIVE: Product device recommended for new designs. **LIFEBUY**: BII has announced that the device will be discontinued, and a lifetime-buy period is in effect. **OBSOLETE**: BII has discontinued the production of the device.	
Signal:	Sine Pulses or Pulsed (Burst) SINE Signals	
Signal Frequency:	0.5 kHz to 10 MHz, Bespoke.	
Pulse Width or Duration (PW):	20 nS to 100 S, Bespoke.	
	PW ≤ Pulse Period T/2 or PW ≤ 1/(2*PRR), that is, Duty Cycle D ≤ 50%.	
Pulse Repetition Rate (PRR):	PRR: ≥ 0.000035 pps (Pulses Per Second), or **Pulse Period T**: 1.024 ms to 8 hrs, Bespoke.	
	1. Pulse Period T = 1/PRR. 2. Duty Cycle D = PW/T = PW * PRR. 3. Bandwidth Δf_{-3dB} of SINE Pulse ≈ 0.89/T = 0.89 * PRR.	
Frequency Accuracy	500 Hz to 10 kHz: ±0.8% typical; ±1.5% Maximum, @25 °C. 10 kHz to 4 MHz: ±0.25% typical; ±0.5% Maximum, @25 °C. 4 MHz to 10 MHz: ±0.5% typical; ±2.0% Maximum, @25 °C.	
Frequency Stability	±0.005%/°C, ref @ 25 °C	
Aging/Long-Term Stability	500 Hz to 10 kHz: ±45 ppm/√kHr, @25 °C. 10 kHz to 10 MHz: ±150 ppm/√kHr, @25 °C.	
Trigger Output:	1. Default: No Trigger Output. 2. Built-in Trigger Output. Appending **-TGO** to part number when ordering. Rise Edge Pulse Signal. Logic 0 or Low: 0 to +0.12VDC, Logic 1 or High: +2.6V to +3.3VDC. Trigger load: ≥ 1MΩ. Trigger signal can ONLY drive short cable (≤1 m) to keep steep rise and fall edges in MHz range.	
	In many SONAR and NDT system, "Trigger Output" of BII4010 is NOT necessary. Emitting SINE Pulses from T/R Switch Module can be used as trigger signals which provide accurate timing of echoes by avoiding delays caused by power amplifiers and impedance matching networks.	

Analog Output Level V_{omax}:	1. 2Vpp. 2. 5 Vpp. 3. 10Vpp. 4. 20Vpp at f <= 1 MHz.	
Output Type:	Single-ended	
Maximum Output Current:	I_{omax} = 250 mA for SINE Pulse: 20 nS ≤ PW ≤ 10 mS, D ≤ 10%. I_{omax} = 250 mA for SINE Pulse: 10 mS < PW ≤ 100 mS, D ≤ 1%. I_{omax} = 50 mA for SINE Pulse: 0.1 S < PW ≤ 1 S, D ≤ 10%. I_{omax} = 25 mA for SINE Pulse: PW > 1 S. D ≤ 100%.	
Minimum load:	$R_{min} = (V_{omax}/2)/I_{omax}$.	
Cable Drive Capability:	100 m	
Supply Voltage:	+6 to +32 VDC	
Suggested DC Supply:	1.2 V to 12.6 V Batteries (AA, AAA, C, and D, 9V, Coin Cell, Marine and Automobile). Fixed DC Linear Power Supply, Not Included. DO NOT use variable power supply whose maximum supply voltage is higher than the above rated voltage. DO NOT use switching mode DC power supply.	
Quiescent Supply Current:	4 mA	
Operating Temperature:	-10 to 70 °C or 14 to 158 °F	
Storage Temperature:	0 to 70 °C or 32 to 158 °F	
Housing:	Metal Housing with four mounting holes	Plastic Housing with Underwater Mateable Connectors
Output Signal Connector:	BNC Jack (BNC)	Four Pin Underwater Mateable Connector: 0.3m Cable + MCOM4M + OMBMC + MCDLS-F
Trigger Connector:	BNC Jack (BNC)	
Power Supply:	Power Connector Jack on Housing. Power Supply Cable: DC-PPBP-24	
Size:	LxWxH = 95x59x47 mm (available) or 77x50.6x43 mm (not available now).	Φ60mm x 50mm.
Weight:	180 grams	260 grams
Accessories:	By default, BII does NOT supply accessory cables.	
	A1: Bespoke length RG58, RG174, or RG178 Coax with BNC Male to BNC Male.	Bespoke Cable with mating underwater connectors. Contact BII for customization.

Output Waveform:



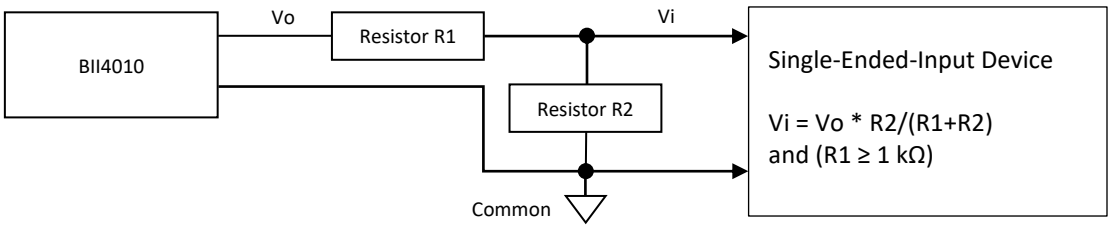
How to order:

PW: pulse width/duration. **PRR**: pulse repetition rate (**pps**: pulses per second). These parameters are factory-set and calibrated at 25°C, not adjustable/trimmable.

BII4013, BII4014.	**-Trigger Output**	**-frequency**	**-PW**	**-PRR**	**-Vo**
Pulsed SINE Generator	1. Default: None. 2. Bespoke **TGO**: Trigger Output	in Hz, kHz, MHz.	in nS, µS, mS, or S.	in PPS.	Bespoke Analog Output Voltage Level, in Vpp. 2Vpp, 5Vpp, 10Vpp, 20Vpp.

BII4013-37.5kHz-0.2mS-0.5PPS-5Vpp:	BII4013, SINE Pulse, f=37.5kHz; Pulse Width PW= 0.2mS, Pulse Repetition PRR=0.5PPS, Output Voltage 5Vpp.
BII4013-1MHz-10µS-10PPS-2Vpp:	BII4013, SINE Pulse, f=1MHz; Pulse Width PW= 10µS, Pulse Repetition PRR=10PPS, Output Voltage 2Vpp.
BII4013-TGO-1MHz-10µS-10PPS-2Vpp:	BII4013, SINE Pulse with Trigger Output, f=1MHz; Pulse Width PW= 10µS, Pulse Repetition PRR=10PPS, Output Voltage 2Vpp.

Attenuation Output Signal: If the output voltage level of the device is higher than the input level of the power amplifier, specify bespoke output voltage level when ordering, or use resistors to attenuate the signal voltage level.



BII4013 Signals and Wiring of Panel-Mount Connectors

Signal Output	**Trigger Output, if ordered.**	**Power Supply**	
Single Ended Signal (SE)	**Single Ended Signal (SE)**	**Single DC Supply**	
BNC Jack	**BNC Jack**	**Power Jack**	**Power Plug + Cable + 4mm Banana Plugs**
Center: Signal. Shield: Common.	Center: Signal. Shield: Common.	Center Contact: +VDC. Shell: Common.	Red Banana Plug or Red Wire Lead: +VDC. Black Banana Plug or Black Wire Lead: Common. Cable Shield, if any: Shielding.
Metal Case is for shielding and grounding.			

BII4014 Wiring

Connectors:	**Wire Leads**	**Underwater Connector (Male), MCBH4M.**
+VDC	Red	Pin 3
Common	Black	Pin 1
Output Signal	White	Pin 2
Trigger Signal if ordered.	Blue, Green, or Yellow	Pin 4

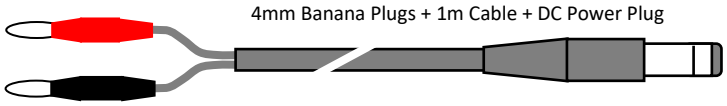
Accessories:

DC Supply Cable

Red Banana Plug or Red Wire Lead: +VDC.	**Black Banana Plug or Black Wire Lead:** Common.	**Cable Shield, if any**: Shielding.

Part Number: DC-PPBP-24.

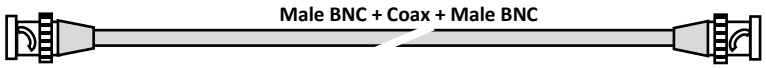
To Terminals of DC Supply:
a. One Red 4mm Banana Plug.
b. One Black 4mm Banana Plug.



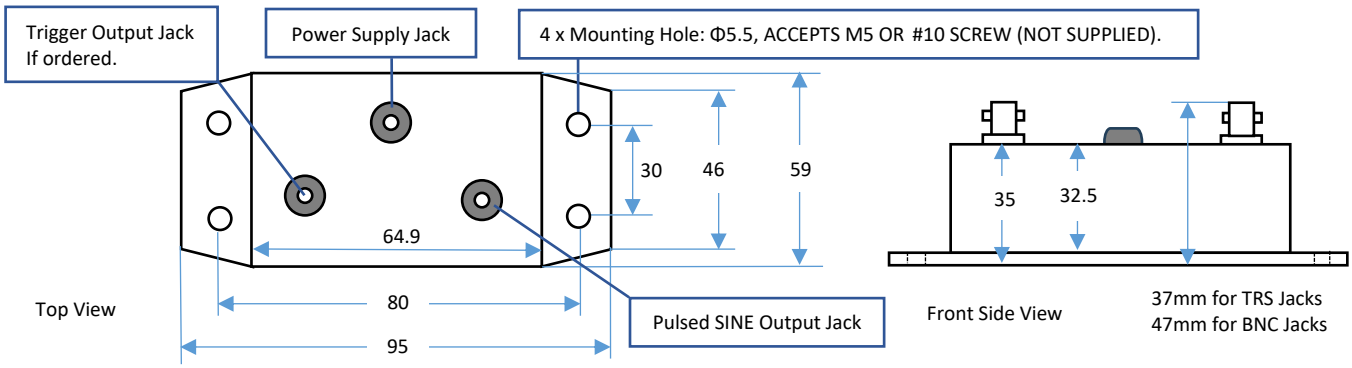
DC Power Plug.
To DC Power Jack of the Device.

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.

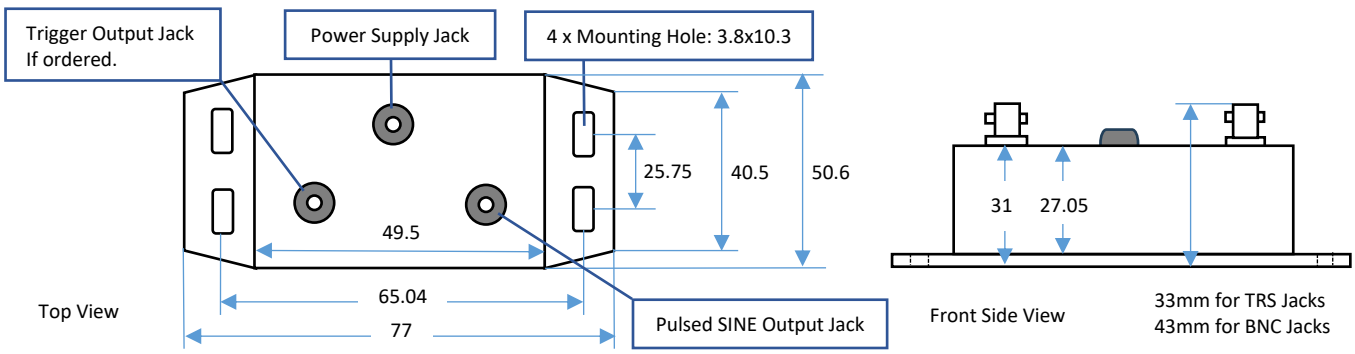
A1: Bespoke length RG58, RG174, or RG178 Coax with BNC Male to BNC Male. Default: 0.6m.



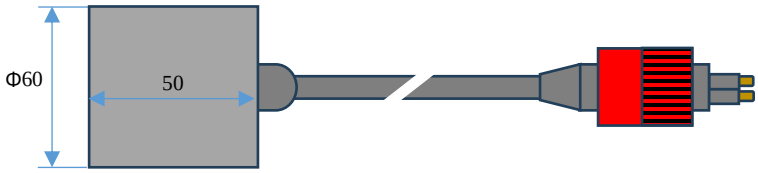
BII4013 Metal Housing (available): The connectors can be customized on side walls. Please specify in detail when ordering if you need custom-fit connector positions.



BII4013 Metal Housing Option 2 (not available now):



BII4014 Outline (unit: mm).



0.3m Cable + MCOM4M + OMBMC + MCDLS-F.

Recommended Connector installed on buyer's submersibles: MCBH4F