

Random &  
Sinusoidal  
Jitter Injector

# RJI12G

## Main Unit Operation Manual

Rev 1.0

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# Introduction

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Thank you very much for purchasing our product. This manual contains the procedures to be followed to operate the product, the checkpoints and precautions to be observed, and so on. Improper handling may result in malfunction. Before using this product, please read through these instructions to ensure that you will operate this product correctly. After reading through the manual, keep it in a safe place for future reference.

## Safety Instruction



### Warning

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In order to avoid improper handling that may result in a safety hazard, please be sure to read this manual thoroughly before using this product to learn the proper method of operation.

Do not use this product where there is a danger of ignition or explosions.

This product is for indoor use ONLY.

Static electricity gives critical damage to the product. Do not short static electricity to signal line and ground line.

Do not connect GND to voltage supply.

Do not remove the cover.

In the unlikely event that trouble or malfunction should occur, disconnect this product's power cable, and contact your dealer or an ARTEK sales representative.

This product contains some high-voltage parts. If you touch them, you may receive an electronic shock and burn yourself, so do not attempt to disassemble, repair, or remodel this product.

Do not spill liquid or drop inflammable objects or metal parts into it. Usage under such conditions may result in fire, electrical shock, or malfunction.

All copyright pertaining to this manual are the property of Artek, Inc.

This manual may not be copied in whole or in part without written permission.

The contents of this manual are subject to change without prior notice due to improvements.

The manufacture will not be liable for any damage or trouble caused by the faulty connection or operation of this product.

## **Accessories**

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AC power cord (1)

USB control cord (1)

Operation Manual (1)

Control Software Operation Manual (1)

Control Software CD (1)

# 1. General

The random & Sinusoidal Jitter Injector RJ12G is designed for receiver jitter tolerance testing. Reproductive jitter injection system provides quantitative testing environment.

## 1-1 Features

- Supports up to 12.5Gbps Bit Rate
- Random & Sinusoidal Jitter generator integrated
- 3 band range for random jitter
- 2 band sinusoidal jitter
- External Jitter available
- De-Emphasis & Pre-Shoot Control (2 Taps)
- Duty Cycle Distortion Control (DCD)
- Skew Control
- USB Remote Control
- Optional Bypass Mode

## 1-2 Functions & Characteristics

### Jitter Source

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The jitter source is selectable from the following three items.

- Internal Random & Sinusoidal Jitter Generator
- External Jitter Source (User is to feed jitter via External Jitter input connector)
- Off

## Jitter Type, Level and Bandwidth

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The jitter Type, Level and Bandwidth are adjusted independently

- Random Jitter

Level Range: 0.5ps – 10ps-rms at 0.1ps

Bandwidth Range: 10kHz – 1.5MHz

1.5MHz – 100MHz

1.5MHz – 1GMHz

- Sinusoidal Jitter

Level Range: 0 – 440ps p-p at 0.1ps Resolution

Frequency Range 1: 10kHz – 100MHz at 1kHz Resolution

Frequency Range 2: 10KHz – 400MHz at 1KHz Resolution

## Output Swing Level

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The output swing level is adjusted between 200mVpp – 2.5Vpp (Differential w/o emphasis) at 10mV resolution.

## De-emphasis & Pre-shoot

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The amount of de-emphasis and pre-shoot of 2tap is adjusted in the range of 0.0 – 6.0dB at 0.1dB resolution. You need to select the consistent data rate with the input data (It reflects to the time-width of emphasis.)

When De-emphasis is on, a peak of 1UI will be added to its leading edge and be subtracted from its trailing edge.

When Pre-shoot is on, a peak of 1UI will be added to its trailing edge and be subtracted from its leading edge.

## Duty Cycle Distortion (DCD) Control

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You can adjust the duty cycle in the range of +/- 8ps.

## **Skew**

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You can adjust the phase between intra-pair of differential signals (between + and -) in the range of 120psec at resolution of 1ps.

## **Bypass Mode (Optional)**

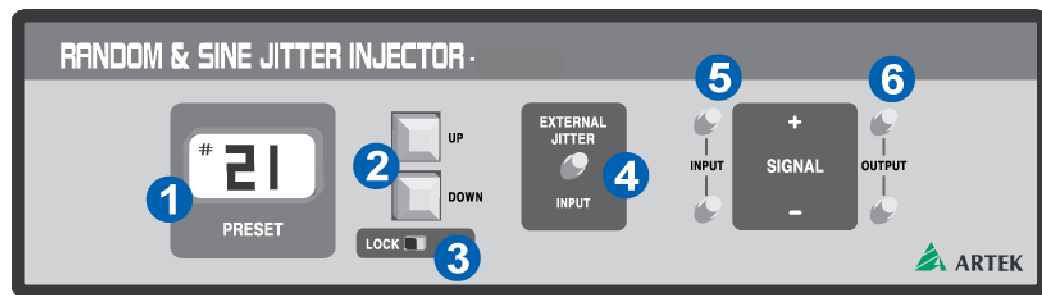
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Bypass mode can be added optionally. Bypass mode enables direct DC-coupling, from input to output bypassing jitter circuitry. Any signal conditionings and jitter operations are NOT available.

## 2. Connections & Start Up

This section explains how you start up RJ12G as stand-alone operation. Refer to Remote Control Reference manual for USB operation.

### 2-1 Front Panel Switches and Connectors



1	LCD Display	4	External Jitter Input
2	Operation Button	5	Data Signal Input
3	Lock Switch	6	Data Signal Output

### 2-2 Connections

- Connect the power code at the rear panel.
- Connect the differential input data cables from your data source to RJ12G's Input SMA connectors (5). Make sure D+ goes to the upper connector and D- goes to the lower one.
- Connect the differential output data cable from RJ12G's Output SMA connectors (6) to your receiver. Make sure D+ goes to the upper connector and D- goes to the lower one.
- If necessary, connect your own jitter source to the RJ12G's external jitter SMA connector (4). Input voltage level translates to jitter amount as 1ps/mV.



## 2-3 Start Up and Turn OFF

### Turning ON

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- On the rear panel, Power ON the unit first
- Connect the USB Cable when remote control
- Start the Control Software

### Turning OFF

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- Close the Control Software
- Or Disconnect the USB Cable
- Power OFF the unit on the rear panel

In case the unit responds incorrectly, restart the turning on process.

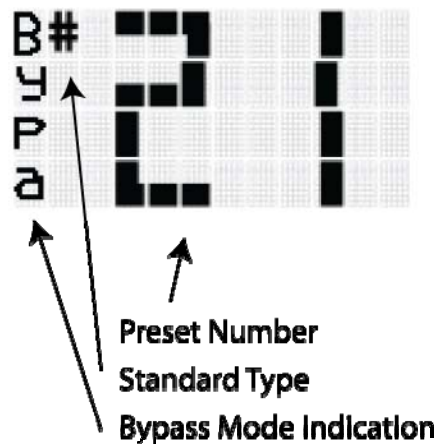
## 3. Operations

This section explains how to select the presets by stand-alone operation. Full-control including preset programming requires USB remote Control.

### 3-1 Preset Selection

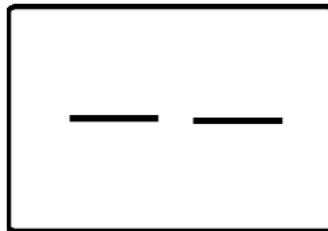
Only the preset selection is available in stand-alone operation.

#### LCD Display



- First Column is to display Bypass mode
- Second Column is to indicates Standard Type of Preset
- Number is the Preset number

When parameters changed by remote Operation, the LCD display shows like below.



## Switches

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- Unlock operation by sliding the lock switch (3) to left position for operation.
- Press & Hold both UP and DOWN buttons (2) simultaneously to go to the Standard-type Selection.
- Press & Hold both UP and DOWN buttons again to go back to previous menu.
- Use UP & DOWN buttons to select preset number.

Press UP and DOWN buttons simultaneously goes to Standard type selection.

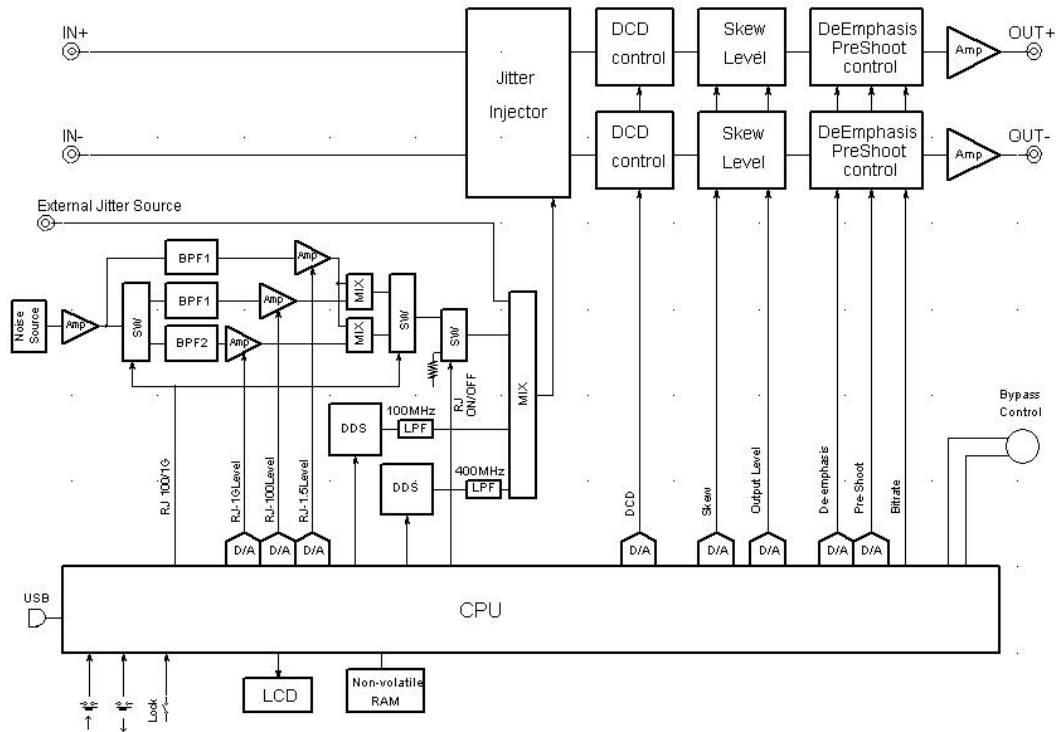


- #: User Definition
- U: USB 3.0
- S: SATA Gen 1, 2, 3
- P: PCI Express Gen 1, 2, 3

## 4. Specifications

Input Bit Rate	up to 12.5Gbps
Input Impedance	Single-end 50 ohm
Maximum Input V	 DC +/- 4V + AC 2Vpp
Operational Input Voltage Range	100mVpp - 1.0Vpp (single end)
	200mVpp - 2Vpp (differential)
Return Loss	Input: < -8dB
	Output: < -15dB
Output Level	200mVpp - 2.5Vpp , Differential (+/-), 50 ohm, AC coupling
	10mV resolution
Intrinsic Jitter	Less than 2ps-rms (typical, excluding ISI jitter)
	20psec pp (typical, Tj including ISI jitter)
Random Jitter	Amount: 0.5 – 10.0ps-rms @ 0.1psec step (< 440ps)
	Bandwidth Range 1: 10kHz - 1.5MHz, Bandwidth Range 2: 1.5MHz - 100MHz or 1.5MHz – 1GHz
	flatness: +/- 3dB Crest factor: 14
Sinusoidal Jitter	Amount: 0 - 440ps pp
	Frequency 1: 10kHz - 100MHz @ 1KHz resolution
	Frequency 2: 10KHz – 400MHz @ 1KHz resolution
External Jitter	1ps/mV, 50 ohm term., 10KHz – 500MHz (+/-3dB)
Jitter Precision	+/- 10% +/- 5ps
De-Emphasis & Pre-shoot Control	0 - 6 dB adjustable
	2 taps at leading edge and at trailing edge
Duty Cycle Distortion	+/- 8ps at 1ps resolution
Intra-pair Skew Control	+/- 120ps @ 1ps resolution
Bypass Mode (Option)	DC Coupling, bypassing jitter injection circuitry
	Series Resistance: < 5 ohm (single end)
	Insulation Resistance: > 1Mohm
	Response Time: <100ms
Control	PC control via USB interface
	Front Panel for Preset selection only
Power	AC 100 - 220V 50/60Hz, 25VA
Dimensions	370(w) x 99(h) x 230(d) mm
Temperature & Humidity	Spec guarantee: 25 +/- 5 C, <75%Rh
	Operational: 0 - 40C, <85%
	Storage: -10 - 60C, <85%

## Block Diagram



## 5. Warrantees

- Artek is warranted from date of purchase against defects of materials or in workmanship for a period of 1 year.
- This warranty is extended only to the original purchase. A purchase receipt or other proof of date of original purchase will be required in order to exercise your rights under this warranty.
- If the product fails to function properly, return the product, prepaid and this warranty only covers failures due to defects in materials or workshop which occur during normal use.
- It does not cover damage which occurs in shipment; applications and used for which this product was not intended; failures or problems which are caused by products or equipment not supplied by ARTEK; accidents, misuse, abuse, neglect, misapplication, fire, water, lightning, or other acts of nature; incorrect electrical line voltage, fluctuations or surges; damage caused by improper or faulty installation; improper connection with any peripheral; product alteration or modification; improper or unauthorized repair; cosmetic damage or exterior finish; product with altered serial numbers; failure to follow operating instructions, customer adjustments, maintenance and environment instructions that are covered and prescribed in the instruction book.

### Cautions

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- Terminate the other line even when you use one line of the differential signal.
- Avoid all possible shocks and vibrations.
- It may take approximately one second until it becomes stable once you change the setting parameters.
- Retain the power voltage within the acceptance range for precise jitter generation.
- Bit error may happen when external jitter fed with exceeded level.
- Minimum protection circuitries are applied for highest performance. Avoid feeding over voltage signals.
- The magnitude of random jitter generator is expressed here by RMS at normal distribution.
- Analog information as well as DC value is not to be processed even Jitter –off . You should switch to by-pass mode for DC values.

## Customer Support

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Please contact with our customer support center.

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