GETTING INSTRUMENTS, INC.

WWW.GETTINGINSTRUMENTS.COM • SAN DIEGO, CA • 619-855-1246

DIGITAL STIMULUS ISOLATION UNIT

MODEL 4D
INSTRUCTION MANUAL

GETTING INSTRUMENTS, INC.

Phone: (619) 855-1246

Revised 3/03

CONTENTS

I. WARRANTY

The model **BJN10-9V1 Stimulus Isolator** is hereby warranted to the original purchaser only:

1. Against defects in materials for a period of one (1) year from the date of invoice; and

2. Against defects in workmanship for a period of one (1) year from the date of invoice.

Subject to the provisions of this Warranty, **GETTING INSTRUMENTS, INC**., shall repair or replace, at its option, all **4D** Stimulus Isolation Amplifiers which fail to operate properly due to defects in materials or workmanship during the terms of this Warranty at no cost to the purchaser. This Warranty applies only to those **4D** Stimulus Isolation Amplifiers which are not altered in any way and which are used in an ordinary and proper manner, as reasonably determined by **GETTING INSTRUMENTS, INC.**

In the event the **4D Stimulus Isolation Amplifier** should, within the period of this Warranty, fail to operate properly due to defect, the purchaser shall return the Amplifier, postage prepaid, to **GETTING INSTRUMENTS, INC**., with a note describing product failure. Failure to return the Amplifier within sixty (60) days of product failure shall constitute a waiver of all rights under this Warranty.

THIS WARRANTY IS IN LIEU OF ANY AND ALL OTHER EXPRESSED OR IMPLIED WARRANTIES OF GETTING INSTRUMENTS, INC., INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. GETTING INSTRUMENTS, INC. DOES NOT ASSUME, NOR DOES IT AUTHORIZE ANY PERSON TO ASSUME, ON ITS BEHALF, ANY OTHER OBLIGATION OR LIABILITY.

Dated: 1/99

II. INTRODUCTION AND SPECIFICATIONS

BEFORE USING THE **4D** STIMULUS ISOLATION AMPLIFIER, READ THIS INSTRUCTION MANUAL.

INITIAL INSTALLATION: The **4D SIU** comes fully adjusted and ready to use. Before powering the unit on, install the batteries. Instructions for opening the battery cover are on the back panel of the SIU. Always set the polarity switch to the **OFF** position before powering the unit on or off to prevent power spikes from reaching the electrode.

Description

The MODEL BJN10-9V1 Stimulus Isolation Amplifier (SIU) is a low-noise optical isolation amplifier designed to optically isolate electrical stimulating currents. Its output is gated by a digital TTL level input. It is stand alone or rack mounted, and is powered by ten internal 9V alkaline batteries.

The unit operates with ZERO leakage current, ZERO power on spikes (maintains short circuit across electrode when off), excellent low level stimulation (linear down to zero), high compliance (72VDC), battery load test function, excellent step response and settings for biphasic opertation.

See *http://www.gettinginstruments.com/manuals* for recent versions of Getting Instrument's manuals.

SPECIFICATIONS

Digital Stimulus Isolation Amplifier Specifications	
Input voltage range	Digital input TTL and CMOS compliant. 0 - 5V
Gain	Adjustable in the ranges; 0-0.1mA (0-0.5V), 0-1mA (0-5V), 0-10mA (0-50V)
Output	Double-ended, isolated from ground. Current or voltage source.
Output Compliance	72 VDC
Step response	<10 μS (output range = 5mA and load = 1Kohm). Note; rise time is a function of load and output current level.
Leakage current	ZERO
Quiescent current	ZERO
Isolation	2500 Volts (optical)
Dimensions	7.25" (W) x 2.5" (H) x 6.25" (L)
Other features	Low battery indicator with load test. Rack mount option lets you mount two SIU's on a 3.5" rack panel.

III. CONTROLS

Inputs:
- Digital input is TTL and CMOS compatible.

Output:
- Output is either a current source or a voltage source (set by a toggle switch). Therefore unit operates as a Voltage Controlled Current Source or a Voltage Controlled Voltage Source. The output polarity can be set to allow biphasic operation in the digital mode (see appendix for exact I/O characteristics). The output connector is BNC and the mode (current or voltage), along with the polarity (+ or -) is selectable with a toggle switch on the front panel.

Range:
- Output ranges are 0-0.1mA, 0-1mA or 0-10mA when the unit is operating as a current source and 0.5V, 5V, or 50V when the unit is operating as a voltage source. The output is scaled with the 10-turn Magnitude pot on the front panel. The value of the pot reflects the value of the output current when a digital pulse is applied. For example, when the range is 0-1mA and the pot is set at 6 turns the output current will be 0.6mA during the time that the digital input is at a "high" logic level. The range is set from the toggle switch on the front panel.
- There are corresponding voltage ranges on the range switch. These range settings are used when the output mode is voltage (when the mode toggle switch near the output is set to VOL). Using the same example as above; when range is 0-5V, an input sine wave whose peak to peak voltage ranges from 0-6V will produce an output voltage sine wave of 0-6V (0.6 x 5V range).

Magnitude:
- The Magnitude knob scales the output amplitude between the minimum and maximum value of the range setting when the unit is set to digital input mode. The knobs scale reads from 0 to 10. For example, if the magnitude knob is set to 5.0, the output mode set to current, the range set to 0-0.1mA, then a 5V TTL “on” signal at the input will produce a 0.05 mA output.

Output Mode Switch:
- Output mode can be a Current or a Voltage. See "Output" and "Range" for more details.

Output Polarity:
- Output Polarity can be positive, negative or off (polarity of current or voltage out). In the 'off' position the output is shorted to prevent charge build up in the electrode and can also be used to prevent "power-on" spikes at the output when the unit's ON/OFF power is cycled. e.g. turn Output Polarity switch to OFF position, then power unit on,

then set Output Polarity to desired polarity. This will prevent spikes at output which can damage cells. Being able to set the output polarity allows for biphasic operation in the digital mode (see appendix for exact I/O characteristics).

Battery Test:

- Pushing the battery test switch simulates a load on the batteries and the LED will light indicating good batteries. If the the LED doesn't light you need to change the batteries. Typical battery life is over one year. See http://www.gettinginstruments.com/BatteryLife.html for detailed analysis of battery life.

Power:

- **Always set the polarity switch to *OFF* before powering the unit on or off.** The unit is powered by 9 Volt alkaline batteries. A battery test button on the front panel tells you when to change the battery. Press button, if LED turns on the batteries are good, if not replace. Battery replacement instructions are on rear of SIU. Hint: with unit facing you, removal seems to be easier if you rotate the batteries clockwise out of the sockets. You will need to start from the right.

- Duracel batteries are not recommended because very large variances in their physical dimensions may cause problems with their fit in the battery carrier. We recommend Energizer Alkaline or Panasonic Alkaline. Here's the ordering information if you would like to order batteries from Digi-Key corporation. You can order in packages of 12 and the price is reduced.

  Digi-Key Corporation
  Phone: 800-344-4539 or 218-681-6674
  Web: www.digikey.com
  Part number is P145-ND

  Digikey also sells an inexpensive battery tester. The part number is CEC-2-ND.

Available Options:

- IN and OUT BNC's on the rear panel.

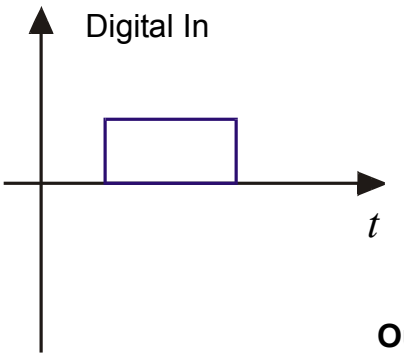
Appendix A

I/O characteristics (transfer functions) Digital Stimulus Isolation Unit

Note 1; outputs in the transfer function can be a current or a voltage depending on the output mode switch (CUR/VOL). When “Full Range” is referenced this corresponds to the current or the voltage the Range switch is set too. e.g. Range = 1mA/5V and Mode-switch = CUR the output "full range" is 1mA. If the Mode-switch = VOL the ourput full range is 5V.

Note 2; multiple isolation units can be stacked in parallel to obtain functional operation in multiple quadrants. i.e. the transfer functions can be added.

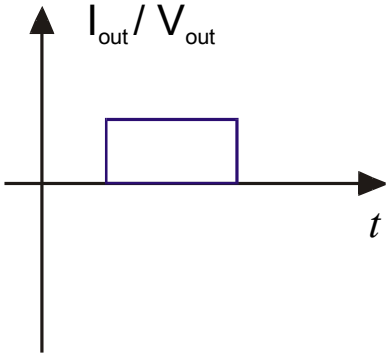
D-SIU I/O Characteristic (Digital Mode)



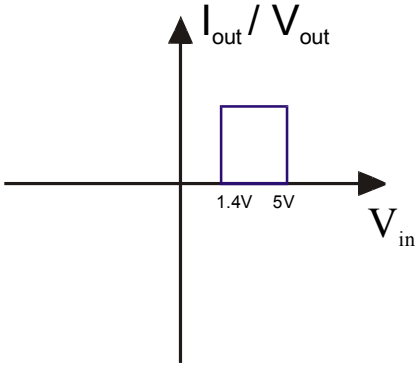
Output Scaling Factor = (# turns on mag. pot / 10) x Full Range

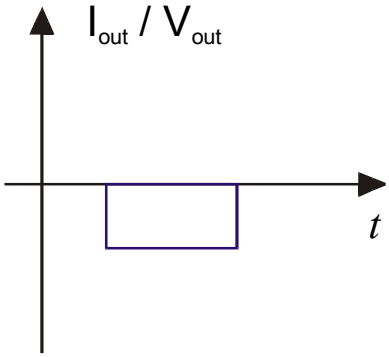
Polarity Setting

Transfer functions

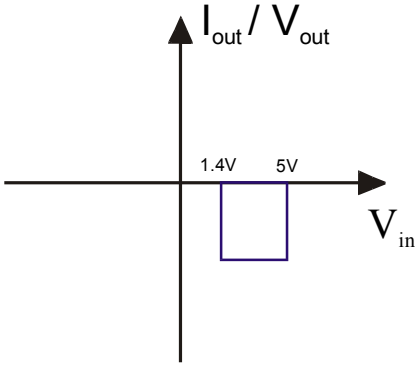


+ OUT





- OUT



Input is Logic high (5V) or low (0V) and is TTL or CMOS compatible.

The actual amplitude of the output is governed by the 10-Turn Magnitude potentiometer on the front panel where 10-turns corresponds to full range on Range knob. Output is linear down to zero.