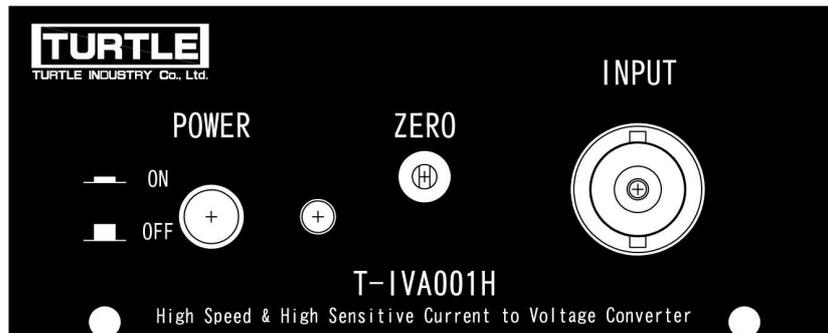


# T-IVA001HZ

Ultra-high Sensitive and High-speed Galvanometer Amplifier

## Operating Instruction Manual



## Warnings and Cautions (Ensure to Read Before Use)

This operating instructions manual describes how to prevent any physical injury or damage to property and ensures safe use of the product.

The indications and labels used in this document have the following meanings. Please ensure you have carefully read and understand the content before reading the main text.

 <b>Warning</b>	Any failure to observe this warning or mishandling the product could result in death or severe injury.
 <b>Caution</b>	Any failure to observe this caution or mishandling the product could result in physical injury or damage to property.

- (1) The specifications of the product and content of this operating instructions manual are both subject to change without prior notice.
- (2) No individual parts or all of the product or this operating instructions manual can be reprinted without prior permission.
- (3) This operating instructions manual was created to be thorough but if anything is unclear or requires correction please contact the Service Support Section of Turtle Industry.
- (4) We will bear no responsibility for any claims for losses or lost earnings allegedly due to operation of the product, notwithstanding the above.
- (5) The product was not intended to be incorporated in or to control any facilities or equipment that could involve human lives or that require a high level of reliability. We will bear absolutely no responsibility for any fatal accidents or damage to property that occur because the product was used in any such facilities or equipment.
- (6) If the product and software fall under the category of being strategic goods (or services) according to the provisions of the Foreign Exchange and Foreign Trade Control Law an export permit issued by the Japanese government will be required in exporting the product abroad.

©2012 Turtle Industry Co., Ltd. All rights reserved.

Copying or modifying this document is prohibited without prior permission from Turtle Industry Co., Ltd.

Any names of companies or products used in this document are the trademark or registered trademark of the company concerned.

## Warnings and Cautions on Use



### Warning

Ensure to cut off all the power supply of any equipment before connecting or removing it. Failure to do so could pose the hazard of an electric shock depending on the equipment used.



### Caution

Ensure to observe the indicated range of voltage and current in the specifications with the terminals. Failure to do so could result in overheating and fire or electricity leaking.

Do not use the product anywhere it could be exposed to water or chemicals. Failure to do so could result in fire or other type of disaster.

Do not use the product anywhere inflammable gases could be present. Failure to do so could result in fire or explosion.

Do not install the product anywhere unstable or it could fall over and cause physical injury.

If any smoke or abnormal odor is generated immediately cease use of the product. Remove the USB cable and consult our Service Support Section.

1. Introduction.....	4
1.1 Product Outline .....	4
1.2 Product Structure .....	4
2. Names of Each Part .....	5
2.1 Front.....	5
2.2 Rear .....	5
3. Description of Each Part.....	6
3.1 Current Input Terminal (INPUT).....	6
3.2 Voltage Output Terminal (OUTPUT).....	6
3.3 Zero Adjustment (ZERO) .....	7
3.4 Setting Switch .....	7
3.4.1 Gain Setting .....	7
3.4.2 Filter Setting .....	7
3.5 Power Supply Input Terminal (DC 5V).....	8
4. Other.....	9
4.1 Limited Warranty.....	9
4.2 Contact Information .....	9
5. Specifications.....	11
5.1 Summary of Specifications .....	11
5.2 Outline of Dimensions.....	12

## 1. Introduction

Thank you very much for purchasing the Ultra-high Sensitive High-speed Galvanometer Amplifier T-IVA001HZ made by Turtle Industry Co., Ltd.

The document describes what you will need to know to use the product, including its special features, how to use it, handling instructions, and other related information.

To ensure correct use of the product you will need to be familiar with electronic circuits because of its inherent nature. Any wrong usage or mishandling could not only result in damage to the product but also lead to a serious accident. Please ensure to thoroughly read and understand this document in thereby enabling correct use of the product.

### 1.1 Product Outline

A highly sensitive current-to-voltage conversion amplifier suited to detecting ultra-low current signals. The product supports the capture of picoampere class ultra-low current with a very fast response to rise time and from direct current through to the fastest of 200 $\mu$  a second. The product runs on a single power supply of 5V and is easy to handle.

### 1.2 Product Structure

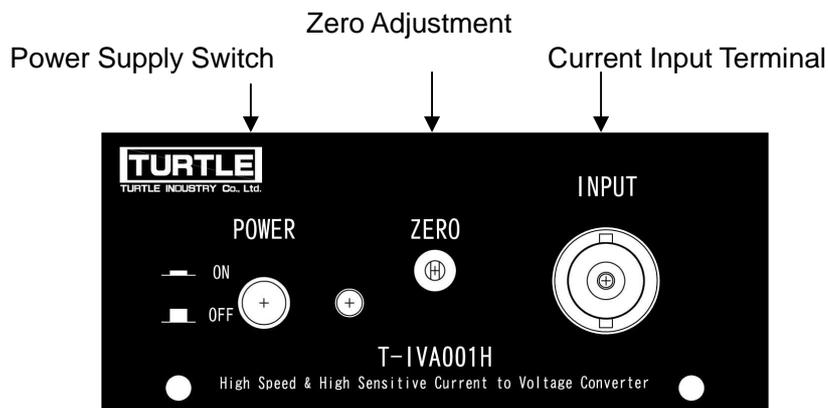
The product packaging contains:

- (1) Main T-IVA001HZ body
- (2) Dedicated AC/DC adaptor
- (3) Operating instructions manual
- (4) Case feet (set of 4)
- (5) Driver for making adjustments

\* If anything is missing please ensure to contact our Service Support Section. (Refer to page 9 for contact information.)

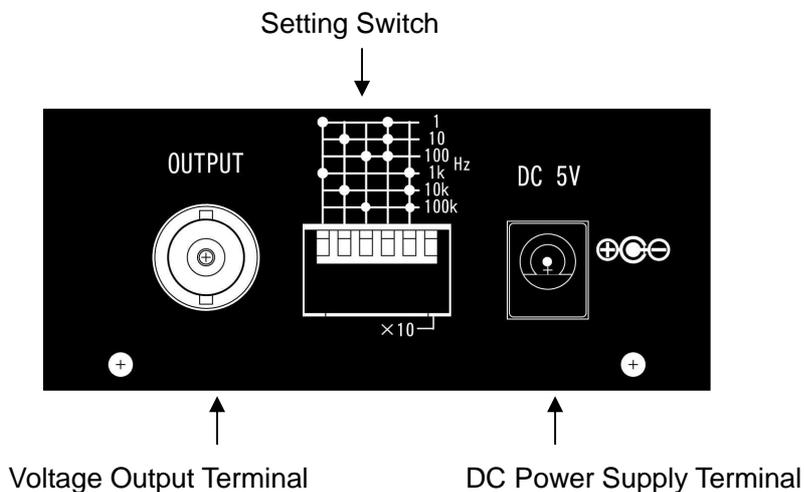
## 2. Names of Each Part

### 2.1 Front



Power Supply Switch	Used to switch the power supply to the amplifier on and off.
Zero Adjustment	The offset adjustment volume.
Current Input Terminal	The input terminal for current signals.

### 2.2 Rear



Voltage Output Terminal	Used to output converted and amplified voltage signals.
Setting Switch	Used to set the filter and range of the amplifier.
DC Power Supply Terminal	Used to connect the accompanying AC/DC adaptor to the power supply.

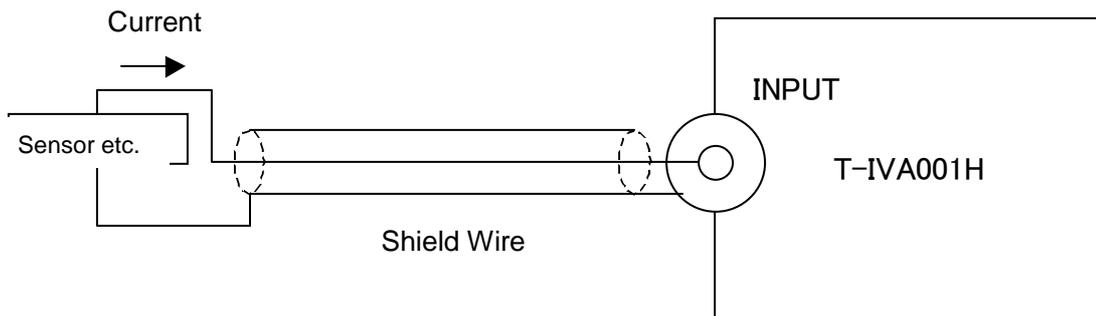
### 3. Description of Each Part

#### 3.1 Current Input Terminal (INPUT)

The terminal used to input the current signals to be detected.

A BNC connector is used here. Connect it so that the current will be input from the center of the coaxial cable and returned to the external conductor (shield).

- The amplifier detects ultra-low current and therefore the utmost care needs to be taken that no noise gets mixed into the input cable connection.
- The supported input current is  $\pm 100\text{nA}$ . Ensure to connect it so that no input of over the current value occurs.
- The supported input voltage is  $\pm 5\text{V}$ . Ensure to connect it so that no input over the voltage values occurs.



- \* The DC power supply terminal (DC 5V) and current input terminal (INPUT) are isolated.  
(The insulation withstanding voltage is not, however, guaranteed.)
- \* The INPUT shield and OUTPUT shield have common potentiality (electrically connected).
- \* The INPUT shield and case have common potentiality (electrically connected).

#### 3.2 Voltage Output Terminal (OUTPUT)

The terminal will output the voltage after being converted and amplified. Connect it with, for example, an instrument used to measure the input voltage.

- \* The OUTPUT shield and INPUT shield have common potentiality (electrically connected).
- \* The OUTPUT shield and case have common potentiality (electrically connected).

### 3.3 Zero Adjustment (ZERO)

Zero adjustments can be made as necessary using the accompanying driver. The adjustable range is  $\pm 2\text{pA}$  of the input.

(Adjusting to Zero)

- (1) Remove the input connection.
- (2) Shield the input terminal by covering it with a metal lid or aluminum foil in thus providing an electrical shield.

\* Ensure, however, that the centerline of the input terminal is open (connected to nothing).

- (3) Turn the zero adjustment volume while monitoring that the voltage at the output terminal approaches to zero.

\* Adjusting the potentiometer too quickly or turning it in the same direction for too long could damage it. Ensure to turn it gently and slowly.

### 3.4 Setting Switch

Used to set the internal filter and amplification factor.

\* Before switching ensure to cut off the power supply.

#### 3.4.1 Gain Setting

10 Giga [V/A] Range	Turn the 6 <sup>th</sup> setting switch off (upwards).
100 Giga [V/A] Range	Turn the 6 <sup>th</sup> setting switch on (downwards).

#### 3.4.2 Filter Setting

Ensure to set to one of the following filter options. Any other setting than in the table below will result in the amplifier not working properly.

Switch Selection Table

	1st	2nd	3rd	4th	5th
1Hz	ON	OFF	OFF	ON	OFF
10Hz	OFF	ON	OFF	ON	OFF
100Hz	OFF	OFF	ON	ON	OFF
1kHz	ON	OFF	OFF	OFF	ON
10kHz	OFF	ON	OFF	OFF	ON

ON: Turn the switch downwards. OFF: Turn the switch upwards.

\* The supported band of the amplifier is up to 2 kHz. The filter can be set to 100 kHz, but will have no effect. 10 kHz will provide the fastest response.

### 3.5 Power Supply Input Terminal (DC 5V)

Used to connect the accompanying AC/DC adaptor.

The power supply input terminal and ground for the signal processing circuit are isolated. However, the insulation withstanding voltage is not guaranteed.

## 4. Other

### 4.1 Limited Warranty

The Turtle Industry (Turtle-Ind) warrants each product of its manufacture to be free from defects in material and workmanship subject to the following terms and conditions. The warranty is effective for half a year after the shipment by Turtle-Ind to the original purchaser.

The obligation of Turtle-Ind under the warranty is limited to servicing or adjusting any product returned to the head office of Turtle-Ind for this purpose and to replacing any defective part thereof. Such product must be returned by the original purchaser, transportation charges prepaid, with sufficient and detailed proof in writing of the defect. If the fault has been caused by misuse or abnormal conditions of operation, repairs must be paid for. Prior to repair, in this instance, a quotation will be submitted. Service or shipping information will be notified depending on the difficulty encountered. Model and serial numbers must be supplied by user. Batteries are specifically excluded under warranty.

Turtle-Ind shall not be liable for any injury to persons or property or for expenses incurred by the use of any Turtle-Ind product.

### 4.2 Contact Information

<p>If you have any operating problems or questions please contact us at the following. We will investigate the cause of problem before then getting back to you.</p>
--

When making any inquiries please provide as detailed information as possible, including the operating environment.

Turtle Industry Co., Ltd.

~ Service Support Section,

Technical Division, Technical Department ~

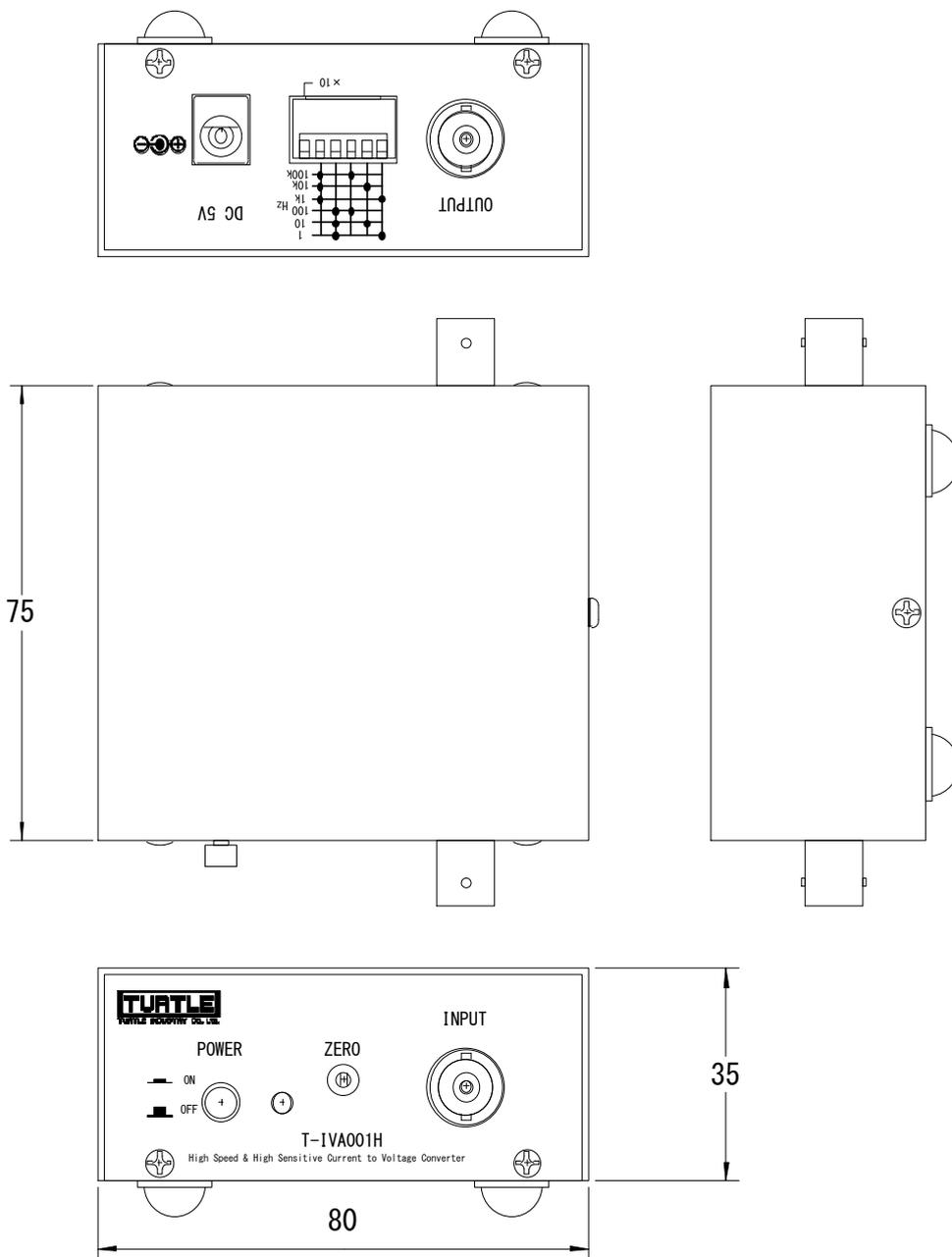
E-mail	tokyo@turtle-ind.co.jp
FAX	+81-29-843-2024
Address	1-12-4, Nishineminami, Tsuchiura-shi, Ibaraki, Japan, 300-0842

## 5. Specifications

### 5.1 Summary of Specifications

Number of Channels	1
Current/Voltage Conversion Rate	2 ranges of 10G [V/A] and 100G [V/A] (G is an auxiliary unit, giga)
Maximum Input Current	500pA (10G range) 50pA (100G range)
Conversion Rate Accuracy	Within $\pm 1\%$
Frequency Property	Rise response of 200 $\mu$ a second or less (more than 90%, output 5V rise) DC ~ approx. 2 KHz (within $\pm 3$ dB, $\pm 2.5$ Vp sine wave)
Band Filter (LPF)	Select from 1Hz/10Hz/100Hz/1KHz/10KHz/(100KHz), all -6dB/oct
Noise (Converted values of output noise voltage into input current)	100G [V/A] Filter 10KHz: approx. 2pArms (output noise 200mVrms) 1Hz: approx. 10fArms(output noise 1mVrms) 10G [V/A] Filter 10KHz: approx. 2pArms (output noise of 20mVrms) 1Hz: approx. 40fArms (output noise of 0.4mVrms)
Maximum Output Voltage	$\pm 5$ Vp
Maximum Output Current	$\pm 10$ mA
Offset Adjustment	Adjustable via the front panel (adjustable range of $\pm 2$ pA or more)
Offset Temperature Drift	20fA/C
Output Resistance	50 $\Omega$
Power Supply Input	DC 5V $\pm$ 5% (supplied with the accompanying AC100V input adaptor)
Consumed Current	approx. 90mA (5V)
Operating Temperature	5C ~ 45C
Maximum Recommended Operating Temperature	25C
Dimensions	80 (w) x 35 (h) x 75 (d) mm (protrusions such as connectors not included)
Weight	approx. 240g (AC/DC adaptors and connection cables not included)

5.2 Outline of Dimensions



**Operating Instruction Manual for  
T-IVA001HZ**

Date of Issue: June 2012, Fourth Edition

Issued by: Turtle Industry Co., Ltd.

Edited by: Turtle Industry Co., Ltd.

c2012 Turtle Industry Co., Ltd