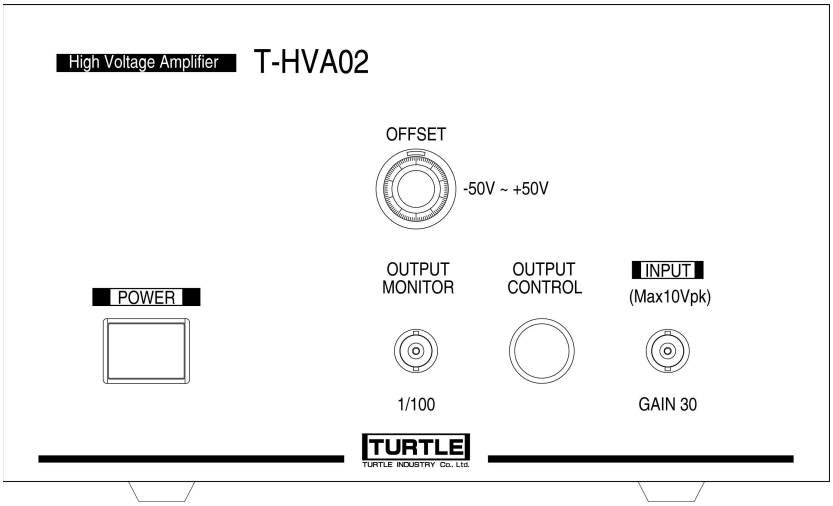
TURTLE INDUSTRY Co., Ltd.

T-HVA02

High-speed High-voltage 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.

 Warning	Any failure to observe this warning or mishandling the product could result in death or severe injury.
 Caution	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.

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 result in physical injury.

If any smoke or abnormal odors get generated ensure to immediately cease use of the product. Remove the power supply cable and consult our Service Support Section.

1. Introduction

Thank you very much for purchasing the High-speed High-voltage Amplifier T-HVA02 made by Turtle Industry Co., Ltd.
The document describes use of the product, including its special features, how to use it, handling instructions, and other information related to the product.
To use the product correctly you will need to be familiar with electric circuits because of the special nature of the product. Any wrong usage or mishandling could result in not only damage to the product but also lead to a serious accident. Please ensure you have thoroughly read and understood this document in ensuring correct use of the product.

1.1 Product Outline

This product is a high-speed direct current amplifier with an output voltage of 600 Vpp. It has a slew rate of 400V/μs and thus an excellent response to large amplitudes. The maximum output current is 100 mA, thus incorporating a sufficient margin for the product to be used for various purposes.
The offset adjustment is equipped with a fine-tuning dial function, thus supporting an output offset of ±50 V.

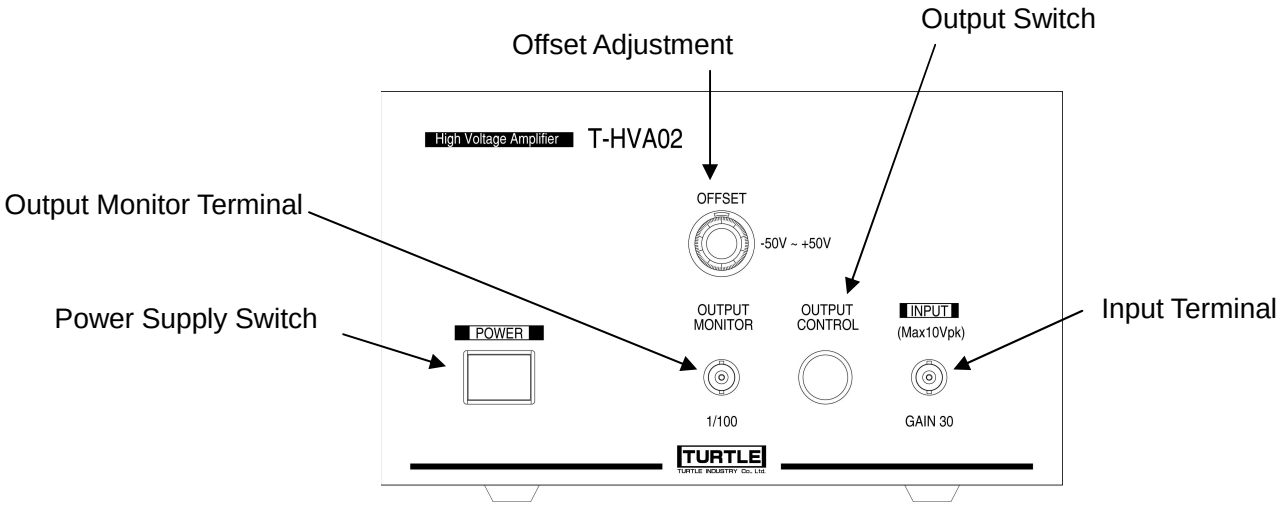
1.2 Product Structure

The product package contains:
(1) Main Body of T-HVA02
(2) Operating Instructions Manual
(3) AC Cable

* If any of the above is missing ensure to contact our Service Support Section. (Refer to page 11 for contact information.)

2. Names of Each Part

2.1 Front



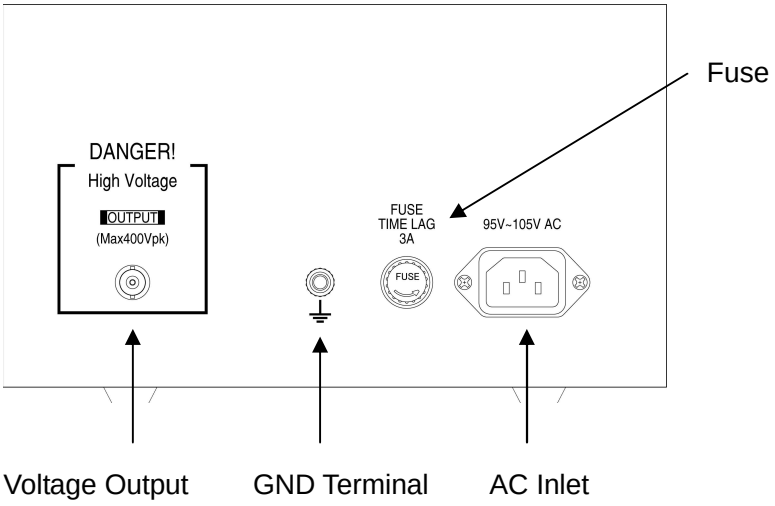
Power Supply Switch	A push button switch used to supply power to the amplifier. When turned on the switch will light up in green.
Input Terminal	Used to input signals. The input signals will be output after the voltage has been amplified thirty times. Ensure that a total of the output voltage from the input signals and any signals due to the offset adjustment do not exceed the range of ±300 V.
Output Switch	A push button switch used to switch the output signals on and off. Lighting up red means signals are being output. Even when the output has been set to off the built-in high-voltage amplifier is still running, thus allowing it to be monitored through the output monitor. [Caution] Even when the output is off about 1μA is being leaked. Even when the output is off a capacitance of about 50 pF is present between the output of the built-in amplifier and the output terminal.

Offset Adjustment	Direct current voltage within the range of approx. ±50 V can be added to the output voltage.
Output Monitor Terminal	A monitor terminal for the output terminal. About 1/100 voltage of the output voltage will be output. The effective bandwidth is less than 1 MHz.

Caution

To prevent the equipment from being damaged due to a sudden voltage surge ensure to set the output switch to off before supplying any power.

2.2 Rear



Output Terminal	This is where signals are output with converted and amplified voltage. High voltage is output here, thus making touching the terminal in the center very dangerous. Before connecting ensure sure to cut off the power supply.
GND Terminal	Connects to the internal signal GND. The internal signal GND, the earth terminal for the AC inlet, and the case are all common. To avoid any hazardous situations ensure to ground it using a GND terminal or AC connection.
Fuse	The fuse. If the fuse blows ensure to replace it with a 3A time-delay (resistant to rush current) type fuse. When replacing remove the AC input for greater safety.
AC Inlet	Use with the accompanying AC cable to connect to an AC100V power supply. Ensure to ground it for greater safety. If it cannot be grounded at an outlet make an earth connection using a GND terminal.

Warning

To avoid any hazardous situations make the connection after ensuring there is no chance of a human body coming in contact with the high voltage side of the voltage output (central terminal of BNC).

Warning

To avoid any hazardous situations ensure to ground it using a GND terminal or AC inlet earth terminal.

3. Description of Each Part

3.1 Input Terminal (INPUT)

The terminal is used to input the signals to be amplified. The input signals here will be amplified 30 times and then output at the output terminal. A BNC connector is used here.
Ensure that a total of 30 times the input voltage that passes through the terminal and the amount of the offset adjustment does not exceed ±300 V.

* The INPUT shield and OUTPUT shield sides have common potentiality (electrically connected).
* The INPUT shield side and case have common potentiality (electrically connected).
* The input resistance at the input terminal is approx. 1 MΩ.

3.2 Output Terminal (OUTPUT)

The terminal is used to output the amplified voltage. The centerline is of high voltage, thus making it very dangerous. When routing the output signal cables ensure to eliminate any possibility of the human body easily coming in contact with the centerline.
The operating output voltage is from -300V to +300V.

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

3.3 Output Switch (OUTPUT CONTROL)

This switch is used to enable or disable any voltage being output to the output terminal. Pushing the switch will light up the button in red and enable output. If it does not light up the output is off.

Even when the output is off ensure to keep the following in mind:

a) About 1μA of current will be leaking.
b) The internal amplifier and output terminal are connected with a capacitance of about 50 pF. Depending on the frequency of the signals and the load some signal voltage may get generated at the output. Even when the output is off ensure to never touch the output central signal line.

Warning To avoid hazardous situation ensure to never touch the output terminal while power is being supplied, even if the output switch is turned off.

3.4 Offset Adjustment (OFFSET)

A direct current voltage from -50 V to +50 V can be added to the output voltage.

A potentiometer with 10 rotations gets utilized here. It can be adjusted toward being positive by turning it clockwise and toward negative by turning it counterclockwise. Ensure that the total of 30 times the input voltage passing through the terminal and the amount of the offset adjustment does not exceed ±300 V.

3.5 Output Monitor Terminal (OUTPUT MONITOR)

The monitor terminal for the output amplifier, which monitors the output terminal of the internal amplifier and hence will be output when the output switch is set to off.

3.6 GND Terminal (GND)

The signal GND, the case, and the earthing wire of the AC cable are all common. Ground it using the earth wire of the AC cable or this terminal.

3.7 Fuse (FUSE)

Use an AC125V (or more) - 3A time delay fuse (resistant to rush current).

Size: φ6.3 x 30 mm

3.8 AC Inlet (95-105V AC)

Supply AC100 V (50/60 Hz) power using the accompanying AC cable.

4. Important Notes on Use

- The internal amplifier has an overheating protection circuit. Once the temperature of the output IC exceeds the threshold value the output will be turned off. If the protection has been activated ensure to turn off the power supply and review the load on the product or ambient temperature.

  * The overheat protection will not recover until the power supply has been cut off.

- Also has an overcurrent protection circuit. The protection circuit will be active while the rated output current is flowing. If the protection does get activated ensure to review the load on the product and signals.

- Switching the output switch from off to on while the output level is high may activate the overcurrent protection circuit and the output may not therefore be correct. Ensure to turn the output switch on first and then increase the signal voltage.

5. Other

5.1 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.

5.2 Contact Information

If you have any problems with the equipment or any questions please contact us at the following.
We will investigate the problem and then get back to you.

When making an inquiry ensure to provide as much information as possible, including the operating environment.

Turtle Industry Co., Ltd.

~ Support Service Section,

Technical Division, Technical Department ~

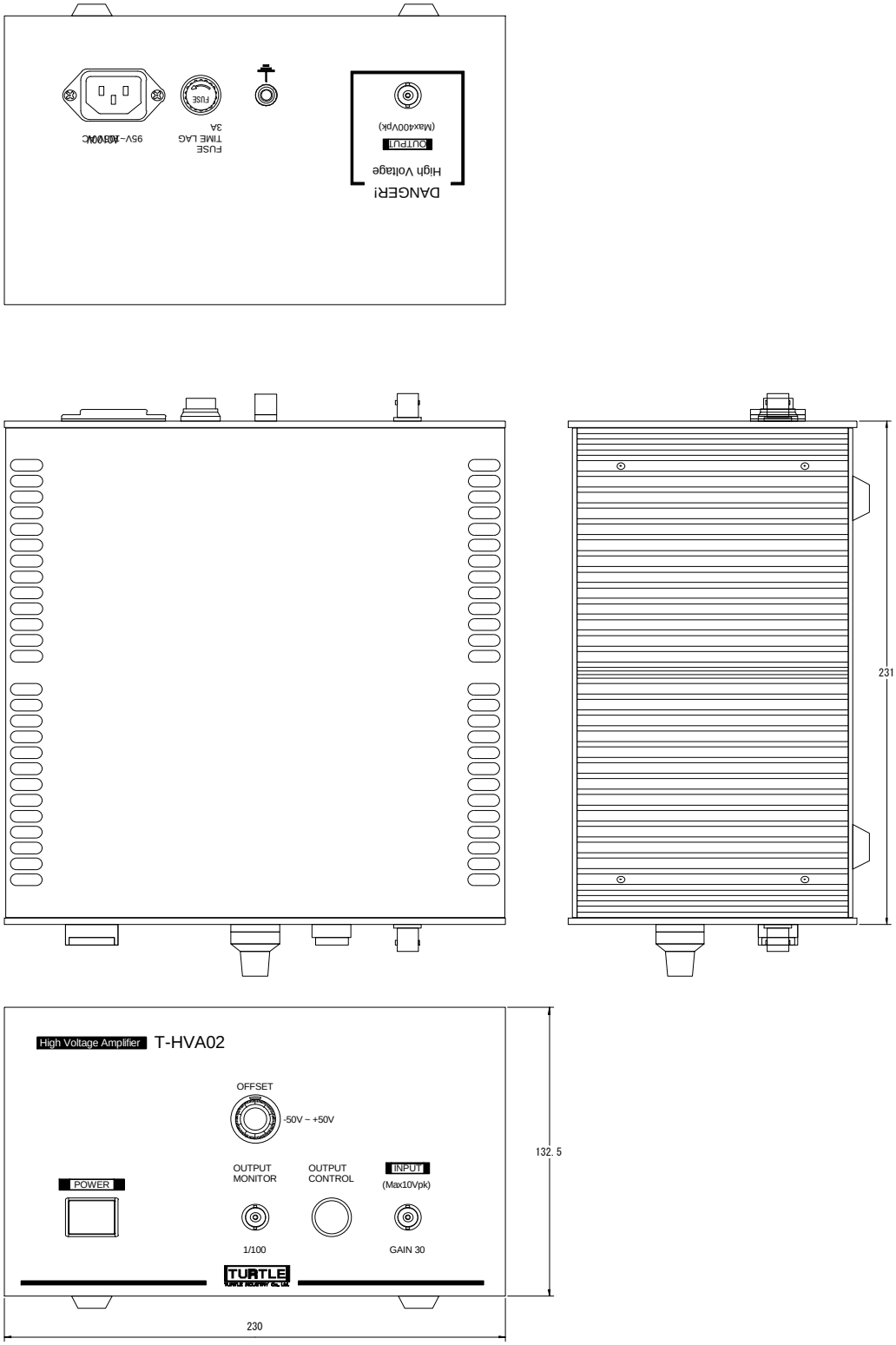
Email	tokyo@turtle-ind.co.jp
FAX	+81-29-843-2024
Address	1-12-4, Nishineminami, Tsuchiura-shi, Ibaraki, Japan, 300-0842

6. Specifications

6.1 Summary of Specifications

Maximum Output Voltage	±300 Vpk
Maximum Output Current	±100 mA
Output Resistance	18 Ω (standard), 35 Ω (maximum)
Monitor Output	1/100 of Output Voltage
Slew Rate	400 V/μs or more
Minimum Load Resistance	2 kΩ (resistance load)
Input Resistance	1 MΩ
Gain	30 times (29.5 dB, fixed) ±3%
Output Offset Adjustment	approx. ±50 V
Small Signal Frequency Property	DC ~ 2 MHz (±3 dB, no load of 15 Vpp)
Power Supply Voltage	AC100 V ± 5 V
Consumed Current	approx. 250 mA (AC100 V, output 0 V)
Fuse	3A time-delay type
Operating Temperature Range	5 ~ 35 C
Dimensions	132.5 (H) x 230 (W) x 231 (D) mm (protrusion not included)
Weight	approx. 6 kg (accessories such as AC cable not included)

6.2 Outline of Dimensions



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