

UT- M14 Power Amplifier

User's Manual

Preface

Thank you for purchasing this brand new UNI-T product. In order to use this product safely and correctly, please read this manual thoroughly, especially the safety instructions.

After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

Copyright Information

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Warranty Service

UNI-T warrants that the product will be free from defects for three years. If the product is re-sold, the warranty period will be from the date of the original purchase from an authorized UNI-T distributor. Probes, other accessories, and fuses are not included in this warranty.

If the product is proved to be defective within the warranty period, UNI-T reserves the rights to either repair the defective product without charging of parts and labor, or exchange the defected product to a working equivalent product. Replacement parts and products may be brand new, or perform at the same specifications as brand new products. All replacement parts, modules, and products become the property of UNI-T.

The "customer" refers to the individual or entity that is declared in the guarantee. In order to obtain the warranty service, "customer" must inform the defects within the applicable warranty period to UNI-T, and to perform appropriate arrangements for the warranty service. The customer shall be responsible for packing and shipping the defective products to the designated maintenance center of UNI-T, pay the shipping cost, and provide a copy of the purchase receipt of the original purchaser. If the product is shipped domestically to the location of the UNI-T service center, UNI-T shall pay the return

shipping fee. If the product is sent to any other location, the customer shall be responsible for all shipping, duties, taxes, and any other expenses.

Guarantee Limit

This warranty shall not apply to any defects or damages caused by accidental, machine parts' wear and tear, improper use, and improper or lack of maintenance. UNI-T under the provisions of this warranty has no obligation to provide the following services:

- a) Any repair damage caused by the installation, repair, or maintenance of the product by non UNI-T service representatives.
- b) Any repair damage caused by improper use or connection to an incompatible device.
- c) Any damage or malfunction caused by the use of a power source which does not conform to the requirements of this manual.
- d) Any maintenance on altered or integrated products (if such alteration or integration leads to an increase in time or difficulty of product maintenance).

This warranty is written by UNI-T for this product, and it is used to substitute any other express or implied warranties. UNI-T and its distributors do not offer any implied warranties for merchant ability or applicability purposes.

For violation of this guarantee, regardless of whether UNI-T and its distributors are informed that any indirect, special, incidental, or consequential damage may occur, UNI-T and its distributors shall not be responsible for any of the damages.

1. Safety Precautions

1.1 Safety Term and Symbol

Safety term in this manual.

Warning: Warning statement, it indicates the condition and action that may cause danger to personnel safety.

Caution: Note statement, it indicates the condition and action that may cause damage to product and other property.












Product term in this manual.

Danger: It indicates the condition and action that may cause danger to personnel safety immediately.

Warning: It indicates the condition and action that may cause danger to personnel safety.

Caution: It indicates the condition and action that may cause damage to product and other property.

Symbol on Product

	AC Alternating current of device.		Measurement Grounding
	Grounding Frame and chassis grounding terminal.		Power Supply
	High Voltage		Caution
	Protective Grounding		CE is a registered trademark of EU.
	CSA is a registered trademark of CSA International.		
	C-tick is a registered trademark of Spectrum Management Agency of Australia. It represents the product is compliance with the provisions of the Australian EMC Framework established under the provisions of the Wireless Communications Act 1992.		
	It indicates that the product contains one or more of the six hazardous substances exceeding the maximum concentration value (MCV) and the 40-year EPUP. 1SM1-A indicates that the product belongs to "Industrial Science and Medical Group 1 Class A" (International Specialized Committee on Radio Interference (CISPER) 11, article 4).		

ICES/NMB-001: It indicates that the product is compliance with Industrial, Scientific and Medical Radio Frequency Generators (ICES-001).

1.2 Safety Requirement

Please follow the following safety requirement to avoid possible electric shock and risk to personal safety.

- In order to prevent electric shock or fire, please use the specialized power cord and power adapter that approved by the local and state standards.
- The product is grounded through the protective grounding cable in the power cord. To avoid electric shock, please check whether the power socket is connected to the ground. Before connecting any input or output end of this product except the power cord, ensure that the protective grounding end of this product is securely connected to the grounding end of the power cord.
- In order to avoid personal injury and damage to the product and its connected device, the product can only be used in the specified range. Only qualified personnel can execute the maintenance procedure.
- In order to prevent electric shock or fire, please note all the rated value and mark on the product. Before using the product, please read this product user's manual for further information on rated value.
- Do not use the input voltage over than the rated value of the product.
- Before using the product, please check whether the accessories is damaged. If it damaged, replace it.
- Only use the accessories that configured with the product.
- Do not plug the metal object to the input/output end of the product.
- If the product is suspected to be damaged, let qualified personnel to inspect it.
- Do not operating the product when the chassis is opened.
- Do not operate in humid environment.
- Do not operate in flammable and explosive environment.
- Keep the product surface clean and dry.

2. Quick Start

2.1 Introduction

UT- M14 power amplifier is an optional accessory of UTG series function/arbitrary waveform generator that made by UNI-T. The full power bandwidth can be up to 2MHz. The maximum output power is 10W. Output slew rate is greater than 160V/ μ s. The product can connect to the function/arbitrary waveform generator to use.

2.2 Characteristic

- Independent key operation, it can flexible to set the gain (x1 or x10), the polarity (in-phase or reverse phase), the output switch of power amplifier without the computer.
- High input impedance of 50 k Ω .
- Completed output protective circuit (output overcurrent protection, output overvoltage protection, inner temperature abnormal protection) to ensure the

- stable, reliable and safe operation for the instrument.
- Small size for easy carry and operating.

2.3 General Inspecting

Please inspecting the product before using.

a. Check for Damages caused by Transport

If the packaging carton or the foam plastic cushions are severely damaged, please contact the UNI-T distributor of this product immediately.

If the equipment is damaged due to shipping, please keep the packaging and notify both the transportation department and UNI-T distributors, UNI-T will arrange maintenance or replacement.

b. Check Attachment

Please check appendix for the list of accessories (refer to “Appendix B Accessory List”). If any of the accessories are missing or damaged, please contact UNI-T or local distributors of this product.

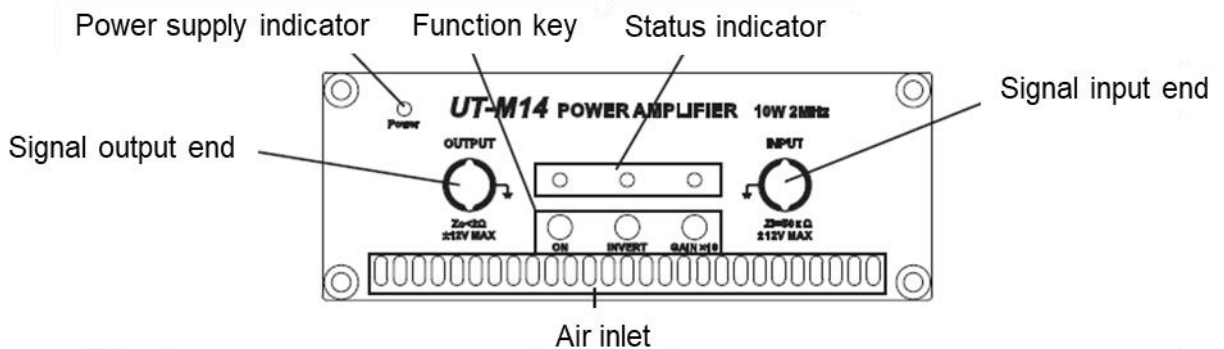
c. Machine Inspection

If the instrument appears to be damaged, not working properly, or has failed the functionality test, please contact UNI-T or local distributors of this product.

2.4 Panel and Key

UT- M14 power amplifier provides concise, intuitive and easily operating front/rear panel as shown in the following figure.

Front Panel



2.4.1 Status Indicator

Status indicator uses “ON” and “Blinking” to indicate the different operating mode of the power amplifier. The name of green status indicator is the same as the key name at below.

GAIN x 10: Press GAIN x 10 key, the indicator will steady illuminated, it indicates voltage gain of the power amplifier enlarges to 10 times; press this key again, the indicator will be extinguished, it indicates voltage gain of the power amplifier enlarges to 1 times.

INVERT: Press INVERT key, the indicator will steady illuminated, it indicates the power amplifier outputs a reverse phase 180° signal from the input signal; Press this key again, the indicator will be extinguished, it indicates the power amplifier outputs an in-phase signal that is the same as the input signal.

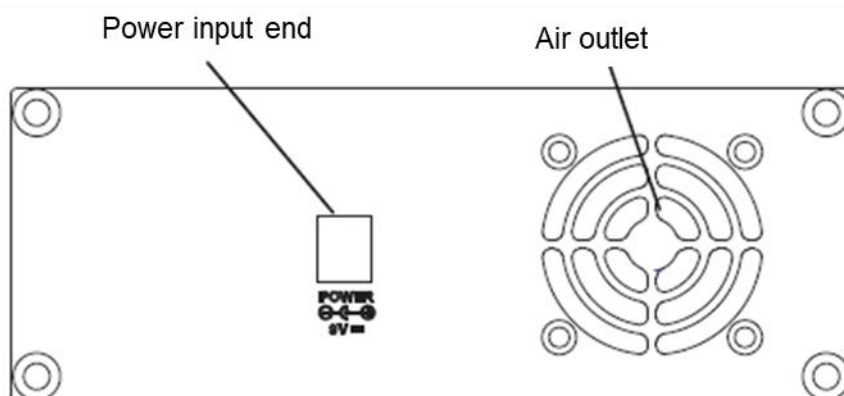
ON: Press ON key, the indicator will steady illuminated, it indicates channel output of the power amplifier is enabled; press ON key, the indicator will be extinguished, it indicates channel output of the power amplifier is disabled; If the indicator is blinking, it indicates the channel output overcurrent protection or output overvoltage protection

POWER: If POWER indicator is steady illuminated, it indicates the power is connected; if the indicator is blinking, it indicates the interior temperature of power amplifier is high, so the channel output cannot be open. It should wait the interior temperature decrease to the normal range, and the indicator will turn to steady illuminated. Then then channel output can be open.

2.4.2 Notice for Input / Output

If input impedance of the instrument is $Z_i = 50\text{ k}\Omega$, then input range is $-12\text{V}\sim +12\text{V}$ when voltage gain is $\times 1$; input range is $-1.25\text{V}\sim +1.25\text{V}$ when voltage gain is $\times 10$. If input signal is over the specified range, it may cause damage to the instrument and dangerous. If output impedance of the instrument is $Z_o < 2\Omega$, then the output range is $-12\text{V}\sim +12\text{V}$; the actual output voltage can up to $\pm 12.5\text{V}$, so the total harmonic distortion of wave will increased.

Rear Panel



2.4.3 Power Input End

Please use the power adapter provided in the attachment to connect the power input end. The power supply is $9\text{V}/4000\text{mA}$ DC signal. Do not use other output adapters to power UT-M14. Otherwise, the performance of the device may be

degraded or permanently damaged.

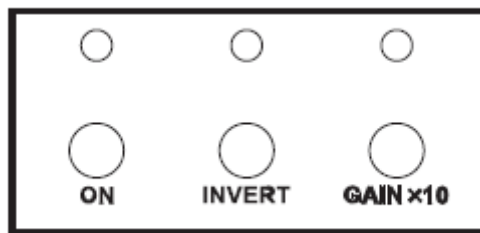
2.4.4 Air Outlet

After powering on UT-M14, please make sure that no objects blocking or obstructing the air inlet or air outlet to prevent it from working properly.

3. Operation Guide

3.1 Basic Operation

UT-M14 has three function keys, which correspond to the 3 status parameters of the power amplifier, and the power amplifier performs the function by pressing the corresponding function key as shown in the following figure.



Description of Function Key

Function Key	Function Setting	Description
ON (Channel output switch)	Turn on/off	Turn on/off channel output. If the indicator is illuminated, it indicates the channel output is enabled.
INVERT (Output polarity)	In-phase output Reverse output	Set the polarity of output signal. If the indicator is illuminated, it indicates the power amplifier outputs a reverse phase 180° signal from the input signal; If the indicator is extinguished, it indicates the power amplifier outputs an in-phase signal that is the same as the input signal.
GAIN x 10 (Gain Setting)	x 1, x 10	Set the output gain. If the indicator is illuminated, it indicates x 10; if the indicator is extinguished, it indicates x 1.

3.2 Application Scenario

UT-M14 power amplifier can enlarge and output the various wave from function/arbitrary waveform generator. In general, connect the input port of the power amplifier to output port of function/arbitrary waveform generator, and then use the high output performance (broadband, high power) to drive the power load.

Power amplifier may be used in the following scenario.

- Evaluating the performance of power component
- B-H curve measurement of magnetic substance
- As a drive of piezoelectric component
- Power amplifying of the audio signal

In addition, UT-M14 can apply to research and development of other technical field and drive amplifier for experiment.

4. Troubleshooting

The following is a list of faults that may occur during the use of the UT-M14 and how to troubleshoot them. If you encounter any of these problems, please follow the appropriate steps to handle it. If the problem cannot be handle, please contact UNI-T distributor or local office.

Protective Circuit

When the output current or the interior temperature is too high, the instrument will automatically enabled the protection function (cut-off channel output, status indicator is blinking) to avoid damage to the instrument.

Overcurrent/Overvoltage Protection

Cut-off channel output (output relay will be cut-off), ON indicator is blinking.

Over Temperature Protection

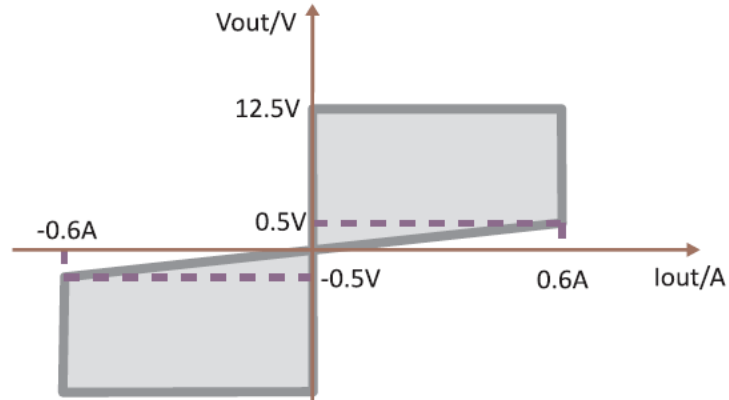
Cut-off channel output (output relay will be cut-off), POWER indicator is blinking.

If the protective circuit function is enabled, please check whether the load exceeds the maximum output value of UT-M14 and whether the operating temperature of the instrument is out of range; if it exceeds the maximum operating range of the power amplifier, it should reduce the load and eliminate overvoltage at the output or wait the interior temperature decrease to the normal range, and then the channel output of the power amplifier can be opened. Otherwise the channel output of the power amplifier cannot be opened.

5. Safety Operating Curve

Before using UT-M14, please read the curve and ensure UT-M14 is operating in the safety range (shadow area) to avoid the performance of the device may be degraded or damaged.

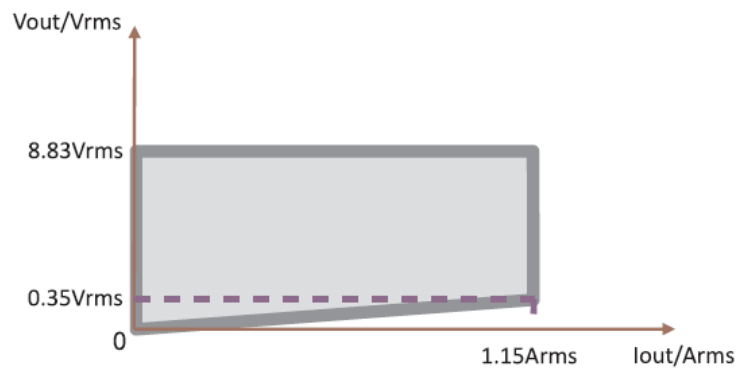
5.1 DC Operating Area



直流工作区域 (25°C, Freq ≤ 50Hz)

DC operating area (25°C, Freq ≤ 50Hz)

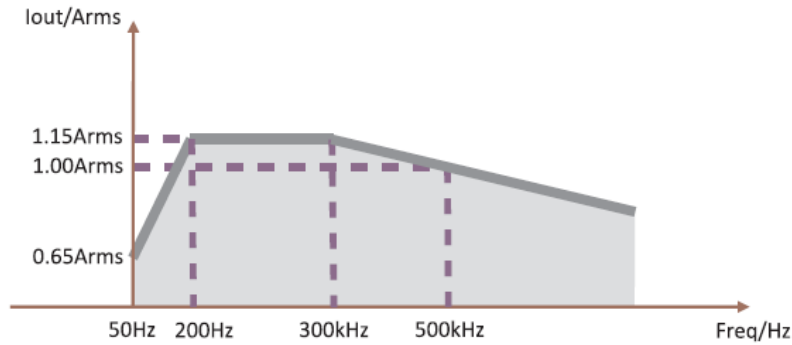
5.2 AC Operating Area



交流工作区域 (25°C, Sine, Freq=100kHz)

AC operating area (25°C, Sine, Freq ≤ 100Hz)

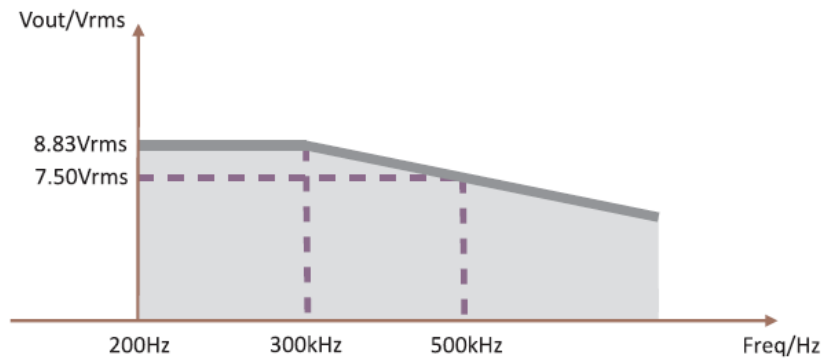
5.3 Relation of Output Current and Operating Frequency



输出电流与工作频率的关系 (25°C, Sine, $R_L=7.5\Omega$)

Relation of output current and operating frequency (25°C, Sine, $R_L=7.5\Omega$)

5.4 Relation of Output Voltage and Operating Frequency



输出电压与工作频率的关系 (25°C, Sine, $R_L=7.5\Omega$)

Relation of output voltage and operating frequency (25°C, Sine, $R_L=7.5\Omega$)

6. Contact Us

If the use of this product has caused any inconvenience, if you in mainland China you can contact UNI-T company directly.

Service support: 8am to 5.30pm (UTC+8), Monday to Friday or via email. Our email address is infosh@uni-trend.com.cn

For product support outside mainland China, please contact your local UNI-T distributor or sales center.

Many UNI-T products have the option of extending the warranty and calibration period, please contact your local UNI-T dealer or sales center.

To obtain the address list of our service centers, please visit our website at URL: <http://www.uni-trend.com>

Appendix A Technical Index

Signal Input	
Input Impedance	50 kΩ
External Input	± 12 V _{max} (Gain x1)
	± 1.25 V _{max} (Gain x10)
Amplifier Index	
Operating Mode	Constant voltage
Gain	Switching x1, x10 (DC gain error < ±5% ±30 mV)
Polarity Switching	In-phase / Reverse phase
Sine Output Power RMS (RL=7.5 Ω)	Maximum 10W (Typical value, input sine wave, 100 kHz, x10)
Output Voltage	12.5 V _{peak} (Input sine wave, 100 kHz)
Output Current	1.65 V _{peak} (Input sine wave, 100 kHz)
Output Impedance	< 2 Ω
Full Power Bandwidth	DC ~ 2 MHz
Output Slew Rate	≥ 160 V/μs (Typical value)
Overshoot	< 5%
Other	
Power Supply	DC 9V/4000mA
Output Protection	Output current protection, interior temperature abnormal protection
Operating Temperature	0 °C ~ +40 °C
Size (Width x Height x Depth)	145mm x 54mm x 215mm
Net Weight	970g ± 20g

Note 1: The instrument needs to operate continuously at 0 °C ~ +40 °C for more than 30 minutes. The above specifications are at 25°C. All specifications shown are guaranteed except for those marked "typical".
UT-M14 operating temperature is 0 °C ~ +40 °C, it is recommended to reduce the output power and the operating frequency of the UT-M14 when the ambient temperature is above 40 °C.

Note 2: Full power bandwidth refers to the maximum frequency of the amplifier outputs the maximum amplitude of distortion-free AC signal:

$$\text{Full power bandwidth } FPB = \frac{SR}{2 \pi V_{o \max}}$$

SR (Slew Rate): When input a large step signal into the power amplifier, the output slope of the signal is found to saturate into a fixed constant at a certain point, which is called the Slew Rate of the power amplifier.

V_{omax}: The power amplifier can output the maximum amplitude of distortion-free AC signal.

Appendix B Accessory List

International standard power cable -----	1
9 V/4000 mA power adapter -----	1
BNC cable (1 meter) -----	1
User's Manual -----	1

Appendix C Maintenance and Cleaning

General Maintenance

Keep the instrument away from the direct sunlight.

Keep sprays, liquids and solvents away from the instrument or probe to avoid damaging the instrument or probe.

Cleaning

Check the instrument frequently according to the operating condition.

Disconnect the power supply at first, and then wipe the instrument with a damp but not dripping soft cloth (use a soft detergent or water to wipe the dust outside the instrument. Do not use chemicals or cleaning agent that contain potent substances such as benzene, toluene, xylene and acetone.)

When cleaning the LCD screen, please pay attention and protect the transparent LCD screen.

Do not allow any corrosive liquid to get on the instrument to avoid damaging it.

Warning

Please confirm that the instrument is completely dry before use, to avoid electrical shorts or even personal injury caused by moisture.

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