

UNI-T

UT-PD2500/1500 Active Differential Probe

2.5GHz | 150ps | 10:1 | $\pm 4\text{V}$ | 200k Ω | 1pF



User Manual REV2.0

2025.09

Foreword

Thank you for choosing this UNI-T instrument. For safe and proper use this instrument, please read this manual carefully, especially the safety instructions section.

After reading this manual, it is recommended to keep the manual in a convenient location, preferably near the device, for future reference.

Safety Instructions

This chapter contains information and warnings that must be observed. Ensure that the instrument is operated under the safe conditions. In addition to the safety precautions indicated in this chapter, you must also follow accepted safety procedures.

Safety Precautions	
Warning	Please follow these guidelines to avoid possible electric shock and risk to personal safety.
	Users must adhere to the following conventional safety precautions in operation, service, and maintenance of this device. UNI-T will not be liable for any personal safety and property loss caused by the user's failure following the safety precautions. This device is designed for professional users and responsible organizations for measurement purposes.
	Do not use this device in any manner not specified by the manufacturer. This device is intended for indoor use only, unless otherwise stated in the product manual.
Safety Statements	
Warning	“Warning” indicates the presence of a hazard. It warns users to pay attention to a certain operation process, operation method or similar. Personal injury or death may occur if the rules in the “Warning” statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the “Warning” statement.
Caution	“Caution” indicates the presence of a hazard. It warns users to pay attention to a certain operation process, operation method or similar. Product damage or loss of important data may occur if the rules in the “Caution” statement are not properly executed or observed. Do

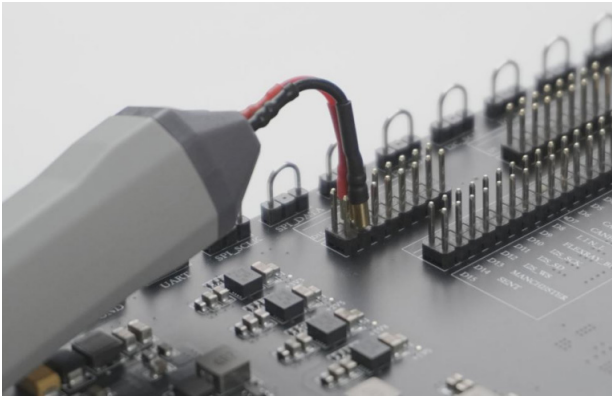
		not proceed to the next step until you fully understand and meet the conditions stated in the “Caution” statement.
Note		“Note” indicates important information. It reminds users to pay attention to procedures, methods, and conditions, etc. The contents of “Note” should be highlighted if necessary.
Safety Signs		
		Danger It indicates danger of electric shock, which may cause personal injury or death.
		Warning It indicates that there are factors you should be cautious of to prevent personal injury or product damage.
		Caution It indicates danger, which may cause damage to this device or other equipment if you fail to follow a certain procedure or condition. If the “Caution” sign is present, all conditions must be met before you proceed to operation.
		Note It indicates potential problems, which may cause failure of this device if you fail to follow a certain procedure or condition. If the “Note” sign is present, all conditions must be met before this device will function properly.
	Certification	CE indicates a registered trademark of EU.
	Waste	Do not place equipment and accessories in the trash. Items must be properly disposed of in accordance with local regulations.
	EEUP	This environment-friendly use period (EFUP) mark indicates that dangerous or toxic substances will not leak or cause damage within this indicated time period. The environmentally friendly use period of this product is 40 years, during which it can be used safely. Upon expiration of this period, it should enter the recycling system.
Safety Requirements		
Warning		
Anti-static protection		Static electricity can cause damage to the instrument and should be tested in an anti-static zone whenever possible. Before connecting the cable to the instrument, its inner and outer conductors should be briefly grounded to release static electricity. This equipment has a protection level of 4kV in contact discharge and 8kV in air discharge.
Working environment		This device is intended for indoor use in a clean and dry environment with an ambient temperature range of 0°C - 40°C. The appliance must not be operated in explosive, dusty, or humid air.

Do not operate in a humid environment	Avoid the risk of short circuits or electric shock in the internal circuits of the instrument, and do not operate the instrument in a humid environment.
Do not operate in a flammable or explosive environment	To avoid damage to the instrument or personal injury, do not operate the instrument in a flammable or explosive environment.
Caution	
Abnormality	If this device may be faulty, please contact the authorized maintenance personnel of UNI-T for testing. Any maintenance, adjustment or parts replacement must be done by the relevant personnel of UNI-T.
handling safety	In order to avoid the instrument slipping down during handling, resulting in damage to the buttons, interfaces and other components on the instrument, please pay attention to the safety of handling.
Maintain proper ventilation	Poor ventilation can cause the temperature of the instrument to rise, which may further lead to damage to the instrument. Good ventilation should be maintained during use.
Keep clean and dry	Avoid dust or moisture in the air affecting the performance of the instrument, and keep the surface of the product clean and dry.
Note	
Calibration	The recommended calibration period is one year. Calibration should only be conducted by qualified personnel.

Probe Overview

UT-PD2500 and UT-PD1500 are high-frequency active differential probe equipped with essential features for modern high-speed signal analysis. Active differential probes are widely used in high-speed applications such as digital circuit analysis, bus analysis, and signal integrity analysis.

UT-PD2500 and UT-PD1500 enable precise and rapid signal acquisition, improving measurement accuracy and engineering efficiency.



UT-PD2500 connects to MSO7000X and features a flexible front-end connector for connecting to the DUT.

Excellent

Electrical Properties:

- Accurately measure high-speed serial signals:
UT-PD2500 bandwidth: 2.5GHz
UT-PD1500 bandwidth: 1.5GHz
- High signal fidelity :
UT-PD2500 rise time $\leq 150\text{ps}$
UT-PD1500 rise time $\leq 245\text{ps}$
- Input dynamic range: $\pm 4\text{V}$
- Input common-mode range: $\pm 15\text{V}$

Functions

- Probe Front Light On/Off Button
- Control the oscilloscope to run/stop
- Clear the current displayed waveform and measurement values of the oscilloscope
- Control the oscilloscope to perform a forced trigger
- Automatically sense the attenuation multiple
- Automatic impedance matching
- Identify the probe model and serial number

Widely Used

- Used for the design, verification, and debugging of high-speed serial buses.
 - I2C, SPI
 - CAN, CAN-FD, LIN
 - Serial ATA
 - Ethernet (GbE)
 - USB2.0
 - FireWire (1394b)
- Signal integrity, jitter analysis, and eye diagram
- High-speed serial bus consistency analysis

Compatibility

- UNI-T Oscilloscope Series
 - MSO7000X series
 - MSO8000HD series
 - UPO7000L series
 - MSO5000HD series
 - MSO3000HD series
 - MSO3000X series

Quick Start Guide

General Inspection

It is recommended to inspect the instrument by following the steps below before using UT-PD2500 and UT-PD1500 active differential probe.

(1) Check for damage 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.

(2) Check accessories

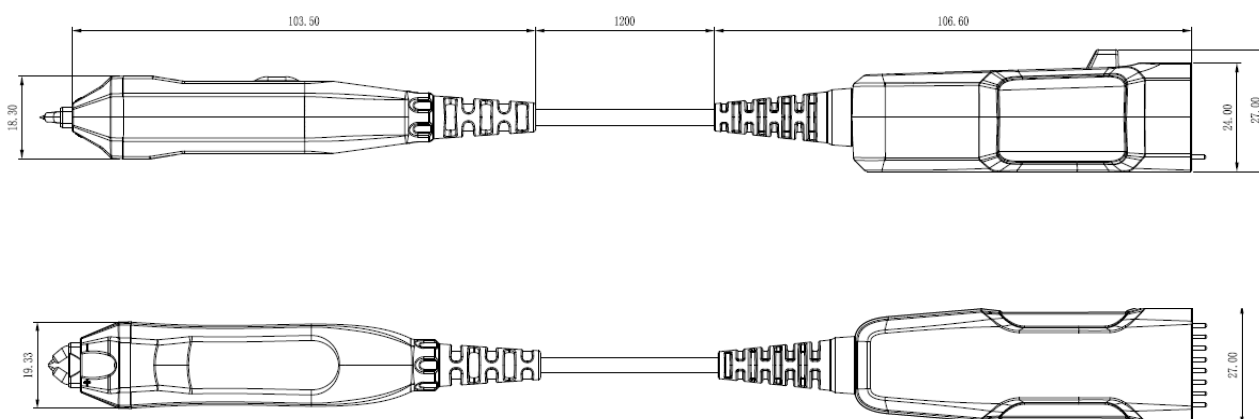
The details of the supplied accessories are described in UT-PD2500 active differential probe supplied accessories section in this manual. Please refer to this section for the list of accessories. If any accessories are missing or damaged, contact UNI-T or the local distributors of this product.

(3) Machine inspection

If the instrument appears to be damaged, malfunctions, or has failed the functionality test, please contact UNI-T or local distributors of this product.

If the instrument 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.

Probe Dimensions



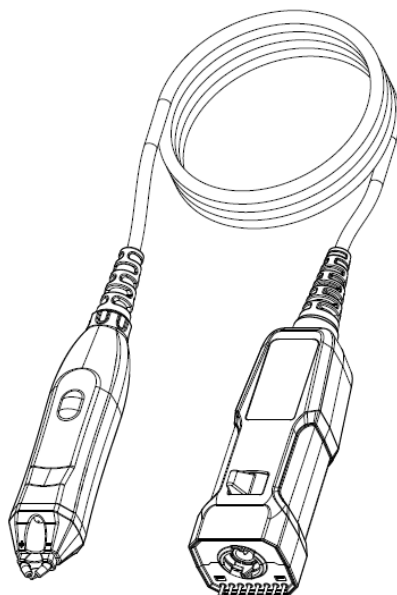
Accessories

This section lists the UT-PD2500 and UT-PD1500 probe kit and their accessories. All listed accessories are available for purchase from UNI-T or authorized distributors.

Accessory (Standard)	
UT-PD-F01	Socket-type extension wires (red), quantity × 5, suitable for 2.45mm header pins Bandwidth: 1GHz (UT-PD1500), 1.5GHz (UT-PD2500)
UT-PD-F02	Socket-type extension wires (black), quantity × 5, compatible with 2.45mm male header pins Bandwidth: 1GHz (UT-PD1500), 1.5GHz (UT-PD2500)
UT-PD-F03	Weld-in type extension wires, quantity × 5 Bandwidth: 1GHz (UT-PD1500), 1.5GHz (UT-PD2500)
UT-PD-F05	Adjustable curved needle, quantity × 5, adjustable spacing between two needle tips is 0.3mm to 12.0mm Bandwidth: 100MHz
UT-PD-F06	Double-pointed needle, quantity × 5. The adjustable distance between the two needle tips ranges from 1.2mm to 11.0mm. Bandwidth: 100MHz
UT-PD-F07	Impedance straight needle, quantity × 3, spacing between two needles is 6.3mm Bandwidth: 1.5GHz (UT-PD1500), 2.5GHz (UT-PD2500)
UT-PD-F08	Impedance curved needle, quantity × 3, The adjustable distance between the two needle tips ranges from 0.5mm to 12.0mm. Bandwidth: 1.5GHz (UT-PD1500), 2.5GHz (UT-PD2500)
UT-PD-F09	Tinned copper wire, quantity × 1
UT-PF01	Probe box, quantity × 2
UT-PF02	Accessories box, quantity × 1
UT-PF03	Labeling ring, quantity × 8

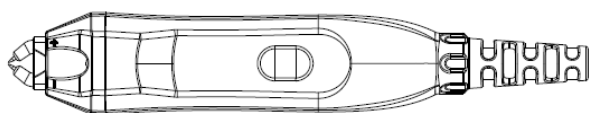
Probe

The rear end of the probe can be connected to MSO7000X, MSO8000HD, and UPO7000L series oscilloscopes, with power supplied through the oscilloscope channels. The front end can be flexibly inserted into the measurement points according to the user's needs.

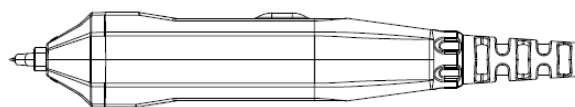


Probe front-end button control

The probe features differential signal tips with fixed spacing. When viewed from the front (with the button facing upward), the probe tip on the right side is the positive signal tip, and the one on the left side is the negative signal tip. The design includes a front-end probe headlight and oscilloscope control buttons, making it convenient to control the oscilloscope during measurements.



Front View



Side View

Using UT-PD2500/1500 Probe

Correct use of the UT-PD2500 and UT-PD1500 active differential probe ensure optimal performance, extends its service life, and maintains measurement accuracy. This section provides detailed instructions on proper usage, including the following.

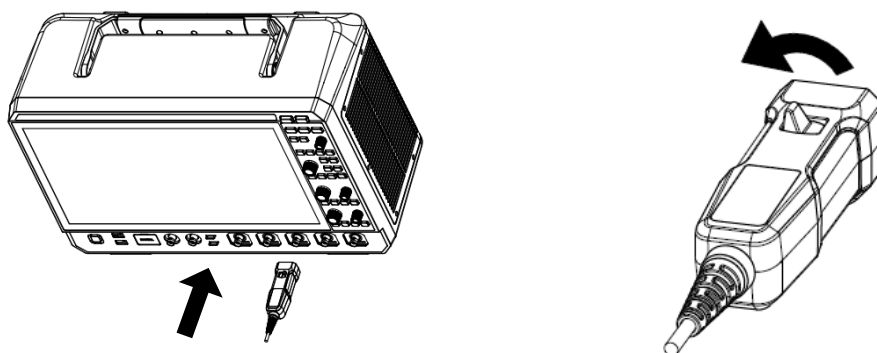
- Connecting the oscilloscope
- Using the probe's front end for signal measurement
- Replacing probe accessories
- Probe button control function
- Calibrating the probe

Connecting the oscilloscope

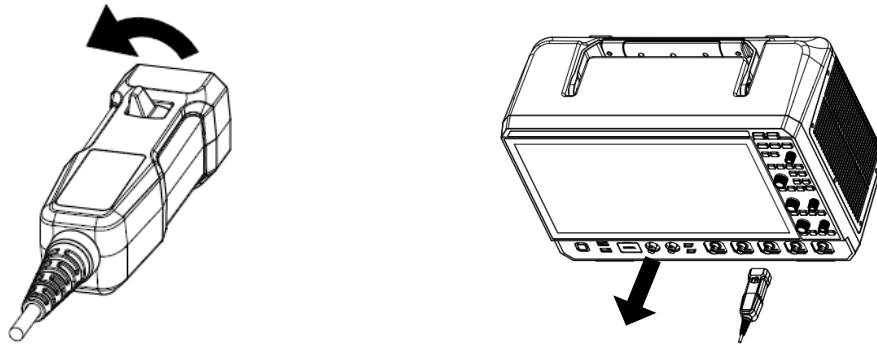
Once active differential probe is properly connected to a oscilloscopes, such as MSO8000HD, MSO7000X, and UPO7000L series, the oscilloscope will automatically recognize the probe and supply power to the probe through its channels.

At this stage, users can adjust the offset voltage, calibrate the probe, and perform other operations using the oscilloscope's front panel menu. The following demonstration operations will take the MSO7000X series oscilloscope as an example.

- (1) Turn the locking buckle at the main unit end of the active probe to the leftmost position, insert it into the channel, and then wait for the locking buckle to bounce back and lock automatically.



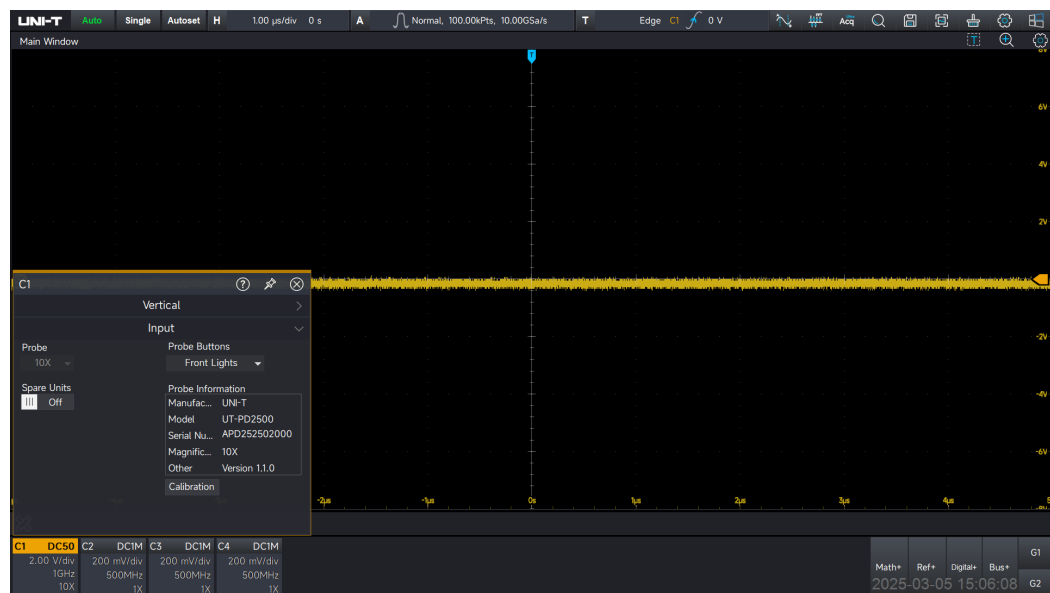
- (2) When it is necessary to disconnect the probe from the oscilloscope, first turn the locking buckle of the probe counter - directionally to the leftmost position. After pulling the probe main unit out of the oscilloscope, simply release the locking buckle.



Note: Do not rotate the probe on oscilloscope's BNC connector; otherwise, the probe may be damaged.

(3) Probe recognition

Once probe is connected, the oscilloscope will automatically detect the probe information, including the manufacturer, model, serial number, and attenuation ratio. Click the oscilloscope's vertical channel to access the vertical channel control menu.



(4) Automatically adjust probe multiple

Probe has a fixed attenuation ratio of 10X. Once the probe is connected to the oscilloscope, the probe's attenuation ratio on the oscilloscope is automatically set to 10X and cannot be adjusted.

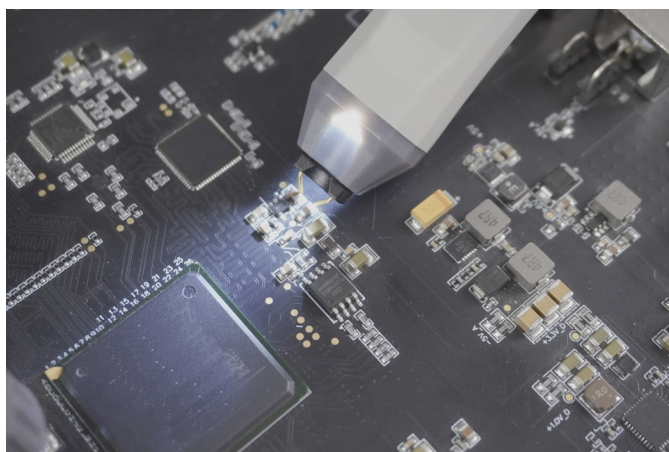
(5) Automatically set impedance

Probe has a fixed output impedance of 50Ω. Once the probe is connected to the oscilloscope, the oscilloscope's impedance setting is automatically fixed at 50Ω and cannot be changed.

Using the probe's front end for signal measurement

The front end of the handheld active differential probe provides an effective bandwidth of up to 2.5GHz. The probe tip and ground tip are replaceable, and the probe can be used with various flexible accessories, extending its service life.

Using the front end of the handheld active differential probe, users can conveniently measure differential signals.



Probe Tip Connect to DUT

Using probe accessories

Active differential probe comes with various test accessories suitable for different scenarios. When using these accessories, it may be necessary to replace the standard probe tip.

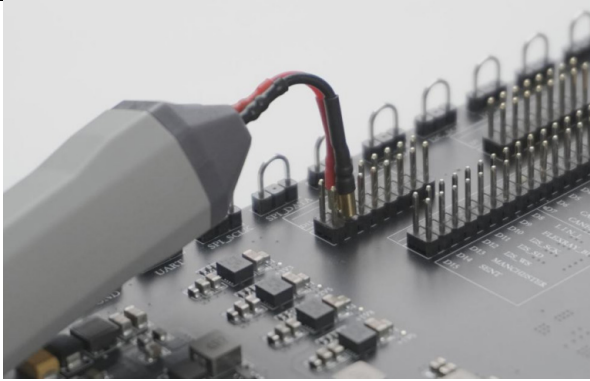
1. Replace the probe accessory

Carefully replace the probe tip, handle the replacement process cautiously to avoid damaging the connection and compromising the probe's performance.

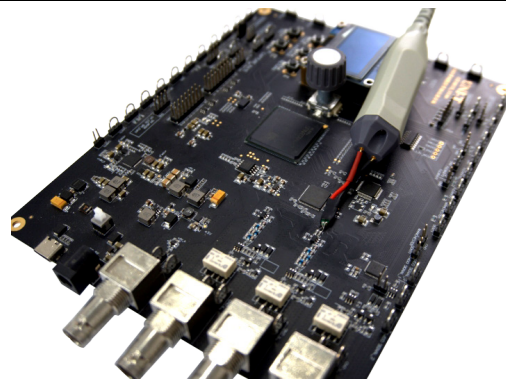
2. Replacement Method

- Disconnect the active probe from the oscilloscope.
- Insert the new probe tip vertically into the front end of the active differential probe.

The extension lead connects to the probe's front end as shown in the following figure.



Extension Lead



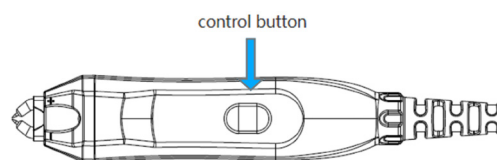
Welded Extension Lead

Probe button control function

The front end of probe features buttons for controlling both the oscilloscope and the probe's headlight. Using these probe buttons during testing can improve testing efficiency.

Probe control buttons include the following functions: probe headlight control, oscilloscope run/stop, clear display, forced trigger, and no operation.

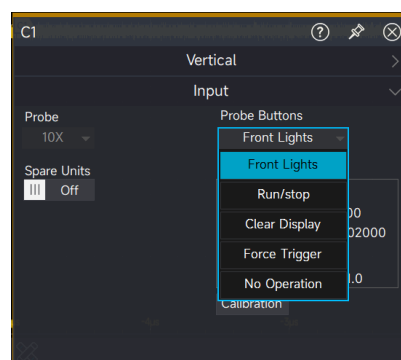
These functions are compatible with oscilloscopes in MSO7000X, UPO7000L, and MSO8000HD series. The following demonstrates the operation using the interface of the MSO7000X series oscilloscope.



Probe Headlight Control

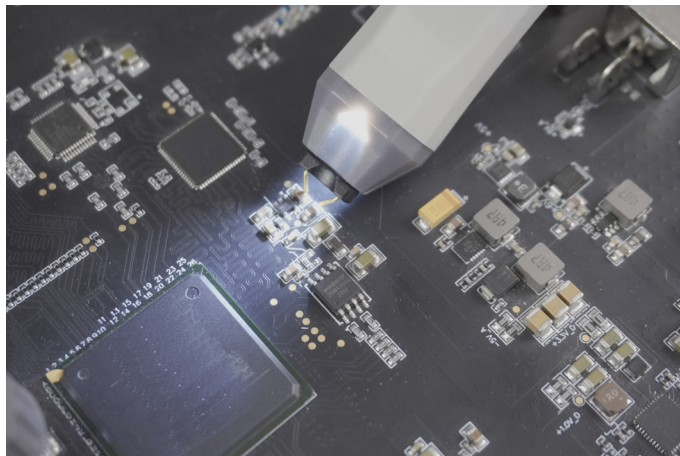
After connecting probe to MSO7000X oscilloscope, access the oscilloscope's vertical channel settings. Navigate to **Input Settings > Probe Button** and select **Headlight**. This allows users to configure the probe button to toggle the headlight on or off.

In low-light testing scenarios, the probe's headlight can provide illumination to ensure reliable connection between the probe and the DUT.



The following diagram illustrates how to control the headlight:

When the headlight is on, press the probe button to turn it off. When the headlight is off, press the probe button to turn it on.



Run/Stop

After connecting probe to MSO7000X oscilloscope, access the oscilloscope's vertical channel settings. Navigate to **Input Settings > Probe Button** and select **Run/Stop**. This allows users to configure the probe button to toggle the oscilloscope between run and stop states.

During testing, this feature helps users flexibly capture key signals by quickly starting or stopping the oscilloscope.

- When the oscilloscope is running, press the probe button to stop it.
- When the oscilloscope is stopped, press the probe button to start it.

Clear Display

After connecting probe to MSO7000X oscilloscope, access the oscilloscope's vertical channel settings. Navigate to **Input Settings > Probe Button** and select **Clear Display**. This configures the probe button to control the oscilloscope's clear display function.

During testing, users can control the oscilloscope to clear the measured value and refresh the sampling trace.

Forced Trigger

After connecting probe to MSO7000X oscilloscope, access the oscilloscope's vertical channel settings. Navigate to **Input Settings > Probe Button** and select **Forced Trigger**. This configures the probe button to active the oscilloscope's forced trigger function.

During testing, if the single trigger or normal trigger mode fails to capture a waveform, press the forced trigger button to force the acquisition of the waveform trace.

No Operation

After connecting probe to MSO7000X oscilloscope, access the oscilloscope's vertical channel settings. Navigate to **Input Settings > Probe Button** and select **No Operation**. This setting disables the probe button, meaning it will have no assigned function.

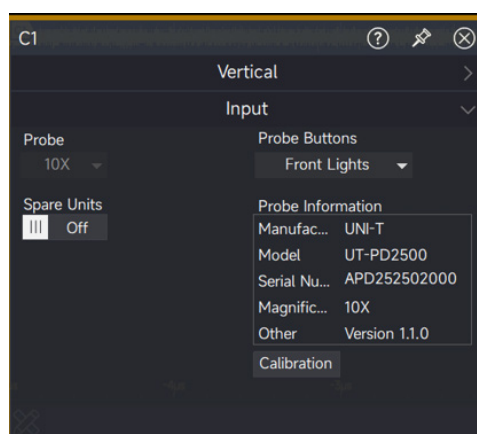
Calibrating the probe

Before using UT-PD2500/1500 probe, perform calibration to adjust its zero offset effectively. This ensures the integrity of the measured signal.

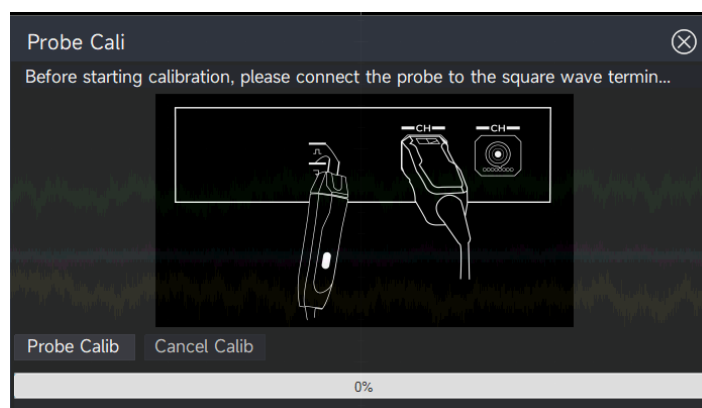
1. Connecting the oscilloscope

Refer to the first section, *Connecting the Oscilloscope*. After completing the connection, preheat the probe for 15 minutes to ensure it reaches a stable operating state.

2. Access the oscilloscope's channel menu, then select **Input > Auto Calibration** to calibrate the probe.



3. Before calibration, insert the probe into the oscilloscope channel as instructed. Connect the probe tip to the square-wave terminal, then click Calibrate.



4. Wait for the calibration to complete. The calibration time depends on the probe's zero offset and takes approximately 40 seconds. If this is the first time calibrating the probe, the process may take longer.

When calibration is complete, the oscilloscope will display either "Probe Calibration Completed" or "Probe Calibration Failed" based on the results. If "Probe Calibration Failed" appears, retry the calibration steps. If calibration fails multiple times, contact a UNI-T distributor for assistance.

Maintenance and Cleaning

(1) General Maintenance

Keep the probe and its accessories away from the direct sunlight.

Caution: Avoid contact with sprays, liquids, or solvents to prevent probe damage.

(2) Cleaning

Check the probe frequently according to the operating condition. Follow these steps to clean the external surface of the probe:

Use a soft cloth to remove dust from the probe.

Disconnect the power supply and clean the probe with mild detergent or water.

Do not use abrasive or chemical cleaners, as they may damage the probe.

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

Technical Specifications

Technical Specifications	UT-PD2500	UT-PD1500
Probe Bandwidth (-3dB)	2.5GHz	1.5GHz
Rise Time	≤150ps	≤245ps
Input Capacitance	≤1pF	
Input Resistance	200kΩ ±2% (differential)	
Output Impedance	50Ω	
DC Attenuation Ratio	10:1±5%	
Input Dynamic Range	8Vpp (±4V DC or peak AC)	
Input Common-mode Range	±15V (DC to 100Hz) ±2.5V (>100Hz)	
Offset Range	±4V	
Offset Accuracy ^{☆1}	Before calibration: <3% of the current range After calibration: <1% of the current range	
Maximum Input Voltage ^{☆2}	±30V (DC + peak AC)	
Flatness (Typical)	DC-500MHz:0.8dB 500MHz-2GHz:1dB	DC-500MHz:0.8dB 500MHz-1GHz:1dB
Common-mode Rejection Ratio	> 40dB@1MHz > 40dB@30MHz > 30dB@1GHz	
Probe Noise (Equivalent to input end)	7mVrms	
Maximum Slew Rate	30V/ns (differential) 15V/ns (single-ended)	
Zero Offset Error (Equivalent to input end) ^{☆1}	Before calibration: <30mV After calibration: <5mV	
Transmission Delay (Typical)	7.5ns	
Electronic Static Discharge	>8kV, HBM	

☆1: This indicator is met after the probe is preheated for 15 minutes.

☆2: The maximum input voltage refers to the maximum withstand voltage at the probe input end, not the voltage that the probe can measure normally.

General Specifications

Weight	<95g
Wire Length	1.2meters
Dimensions	103.50(mm)x19.33(mm)x18.30(mm)
Compatible Oscilloscopes	MSO8000HD Series
	MSO7000X Series
	UPO7000L Series
	MSO5000HD Series
	MSO3000HD Series
	MSO3000X Series

Environmental Requirements

Operating Temperature	0°C to 40°C
Non-operating Temperature	-40°C to 70°C
Operating Humidity	95% RH @40°C
Non-operating Humidity	95% RH @65°C
Operating Altitude	4,600meters
Non-operating Altitude	15,300meters

Limited Warranty and Liability

UNI-T guarantees that the Instrument product is free from any defect in material and workmanship within three years from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination, or improper handling. If you need a warranty service within the warranty period, please contact your seller directly. UNI-T will not be responsible for any special, indirect, incidental, or subsequent damage or loss caused by using this device. For the probes and accessories, the warranty period is one year. Visit instrument.uni-trend.com for full warranty information.



Learn more at: www.instruments.uni-trend.com



Register your product to confirm your ownership. You will also get product notifications, update alerts, exclusive offers and all the latest information you need to know.

UNI-T is the licensed trademark of UNI-TREND TECHNOLOGY (CHINA) CO., Ltd.

UNI-T products are protected under patent laws in China and internationally, covering both granted and pending patents. Licensed software products are the properties of UNI-Trend and its subsidiaries or suppliers, all rights reserved. This manual contains information that replaces all earlier published versions. The product information in this document subject to update without notice. For more information on UNI-T Test & Measure Instrument products, applications, or service, please contact UNI-T instrument for support, the support center is available on www.uni-trend.com ->instruments.uni-trend.com
<https://instruments.uni-trend.com/ContactForm/>

Headquarter

UNI-TREND TECHNOLOGY (CHINA)
CO., Ltd.

Address: No.6, Industrial North 1st
Road, Songshan Lake Park, Dongguan
City, Guangdong Province, China
Tel: (86-769) 8572 3888

Europe

UNI-TREND TECHNOLOGY EU
GmbH

Address: Affinger Str. 12
86167 Augsburg Germany
Tel: +49 (0) 821 8879980

North America

UNI-TREND TECHNOLOGY US
INC.

Address: 3171 Mercer Ave STE 104,
Bellingham, WA 98225
Tel: +1-888-668-8648

说明书菲林做货要求：

序号	项目	内容	
1	尺寸	外尺寸: (148x210) ±1mm.	
2	材质	封面封底 128G 双铜 内页 60g 书纸	
3	颜色	黑色，双面印刷	
4	外观要求	印刷完整清晰,版面整洁.无分层.残损.毛边等缺陷	
5	装订方式	骑马订装	
6	表面处理	无	
7	其它		
版本		REV.0	
DWH 设计		MODEL 机型：UT-PD2500/1500 系列	Part NO. 110401113320X
CHK 审核			
APPRO 批准		UNI-T®	优利德科技(中国)股份有限公司 NI-TREND TECHNOLOGY (CHINA) CO.,LTD