

RIGOL

User's Guide

RP7150 Active Probe

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RIGOL Technologies, Inc.

Guaranty and Declaration

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WARNING indicates potential hazard may happen.

CAUTION indicates damage to the instrument or other devices connected to the instrument may happen.

Symbols on the Product. The following symbols may appear on the product:



High Voltage



Refer to Manual



Protective Earth Terminal



Chassis Ground Terminal



Test Ground Terminal

Document Overview

This document is used to guide users to get a quick understanding of the RP7150 active probe as well as its using method. Besides, this document gives service information relating to general care and cleaning.

Main topics:

- **RP7150 Active Probe Overview**
This chapter gives a brief introduction of the probe, including general inspection, probe dimensions, accessories and options etc.
- **To Use RP7150 Active Probe**
This chapter introduces how to use the probe, including how to connect to the oscilloscope, how to use the probe head, how to replace probe accessories, how to adjust the offset voltage, how to calibrate the probe etc.
- **General Care and Cleaning**
- **Warranty**
- **Specifications**

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RP7150 Active Probe Overview

This chapter guides users to quickly get familiar with the RP7150 active probe.

Main topics:

- Probe Introduction
- General Inspection
- Probe Dimensions
- Accessories and Options
- Active Probe Amplifier
- Probe Head

Probe Introduction

RP7150, with more than 1.5GHz bandwidth, is an active probe solution for high frequency application. It can be used to measure differential and single-ended signals with better common mode rejection. RP7150 uses plug-on socket probe head and supports 4 types of interchangeable probe heads to optimize the performance and usability. Besides, its replaceable probe tip prolongs the service life of the probe and the probe tip spacing can be precisely adjusted to fit different test point spacing.

RP7150 is compatible with the auto-identification port of **RIGOL** DS6000 series oscilloscope and can be recognized and configured automatically by this port. Its snap-in BNC connector enables easier connection with the oscilloscope.

RP7150 provides multiple replaceable components and various accessories and options which make it applicable to be used in different tests and measurements.

General Inspection

1. **Inspect the shipping container for damage.**

If your shipping container appears to be damaged, keep the shipping container or cushioning material until you have inspected the contents of the shipment for completeness and have checked the probe electrically and mechanically.

If your probe has damaged during shipping, please contact your shipper and carrier for compensation. **RIGOL** will provide no free repair or replacement.

2. **Inspect the probe.**

If there is any mechanical damage or defect, or if the probe does not pass electrical and mechanical tests, please contact your **RIGOL** sales representative.

3. **Check the Accessories.**

Please check the accessories according to **Accessories and Options** in this guide. If the accessories are incomplete or damaged, please contact your **RIGOL** sales representative.

Probe Dimensions

Figure 1 shows the dimensions of the main parts of RP7150 active probe.

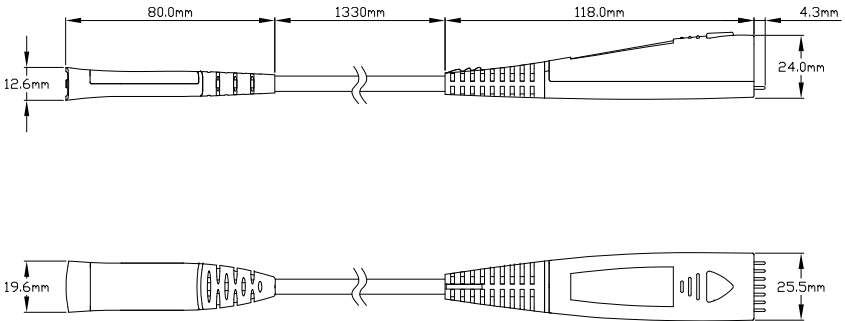


Figure 1 Probe Dimensions

Accessories and Options

Table 1 and table 2 list the standard accessories and options of the RP7150 active probe kit respectively. All the components listed below can be ordered from **RIGOL**.

Table 1 RP7150 Active Probe Kit & Standard Accessories

Name	Ordering NO.	Qty
RP7150 Active Probe Kit	RP7150	1
Active Probe Amplifier	RP7-0100	1
Hand-held Differential Probe Head	RP7-0101	1
Hand-held Single-ended Probe Head	RP7-0102	1
Solder-in Differential Probe Head	RP7-0201	1
Solder-in Single-ended Probe Head	RP7-0203	1
0Ω Lead Resistor	RP7-0301	8
91Ω Lead Resistor	RP7-0303	8
91Ω Probe Tip	RP7-0403	8
Single-ended Ground Strip	RP7-0501	2
Marker Rings (Yellow/Pink/Light Blue/Dark Blue)	RP-0203	8
User's Guide	RP7-0601	1
Probe Bag	RP7-0602	1
Storage Box	RP7-0603	1

Table 2 Options of RP7150 Active Probe

Name	Ordering NO.
150Ω Lead Resistor	RP7-0304
150Ω Probe Tip	RP7-0404

Note: Accessories listed here are only for your reference. For actual configuration, refer to the products you received.

Active Probe Amplifier

The active probe amplifier (Figure 2), with more than 1.5GHz bandwidth, is a main component of the active probe. One end of the active probe amplifier can be connected to the DS6000 series oscilloscope and the other end can be connected to the desired probe head.

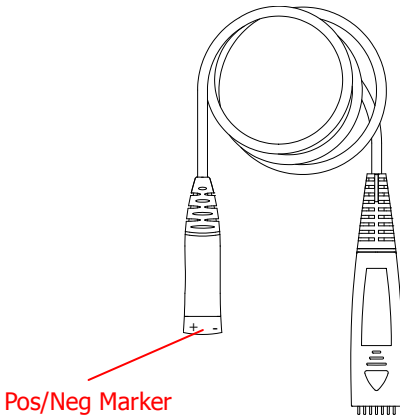


Figure 2 Active Probe Amplifier

When connecting a **probe head** to an **active probe amplifier**, push it straight in. When connecting them, pay attention to their polarities. If the polarity is reversed, the performance of the active probe would reduce and the active probe might even be permanently damaged.



CAUTION

There are Pos/Neg markers on the active probe amplifier and probe head of the active probe. Pay attention to their polarities when using them.

Probe Head

RP7150 supports **hand-held probe head** and **solder-in probe head**.

1. Hand-held Probe Head

Hand-held probe head includes two types: **hand-held differential probe head** and **hand-held single-ended probe head**.

Like using common passive probes, you can use this kind of probe head to easily measure signals. Besides, the spacing between the probe tips can be easily adjusted to fulfill your various measurement requirements.

For hand-held differential probe head, the spacing between the probe tips is controlled by the roller on the probe head. As shown in Figure 3, turning the roller forwards or backwards can precisely adjust the spacing between the two probe tips.

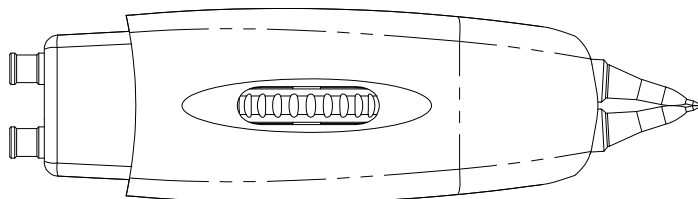


Figure 3 Hand-held Differential Probe Head

For hand-held single-ended probe head, rotating the single-ended ground strip adjusts the spacing between the single-ended ground strip and probe tip, as shown in Figure 4.

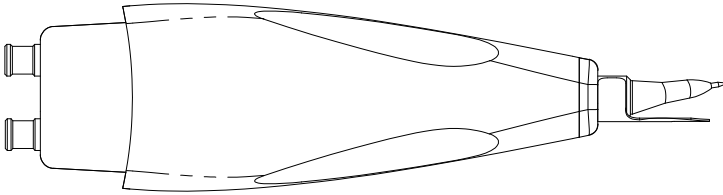


Figure 4 Hand-held Single-ended Probe Head

Wherein, as shown in Figure 5 and Figure 6, probe tip and single-ended ground strip are standard accessories and are both replaceable. If any of them is damaged during use, you can easily replace it with a new one (refer to **To Replace Probe Accessories**).



Figure 5 Probe Tip

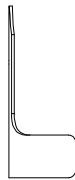


Figure 6 Single-ended Ground Strip

2. Solder-in Probe Head

Solder-in probe head includes two types: **solder-in differential probe head** and **solder-in single-ended probe head** as shown

in Figure 7 and Figure 8. Wherein, solder-in differential probe head is suitable for measurement of high-density IC pin signals.

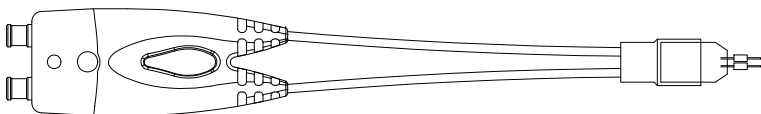


Figure 7 Solder-in Differential Probe Head

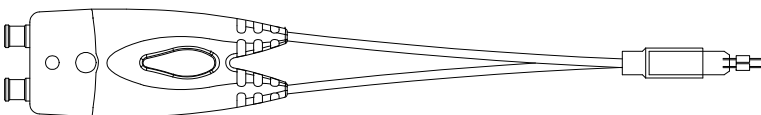


Figure 8 Solder-in Single-ended Probe Head

When using the solder-in probe head for measurement, please use auxiliary device to fix the probe head. Do not use your hand to fix the probe head, or else, the lead resistor soldered onto the probe head might break or fall off, what's more, the hand-held position might also affect the probe performance.

Wherein, the lead resistor (as shown in Figure 9) of the solder-in probe head is a standard accessory. If the resistor is damaged during use, replace it with an appropriate resistor (refer to **To Replace the Lead Resist**).

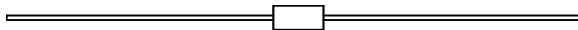


Figure 9 Lead Resistor

To Use RP7150 Active Probe

During the use of RP7150 active probe, correct operations can ensure the probe performance, prolong the service life of the probe and ensure the effectiveness of the signal measurement result. This chapter introduces in detail the using method of the RP7150 active probe.

Main Topics:

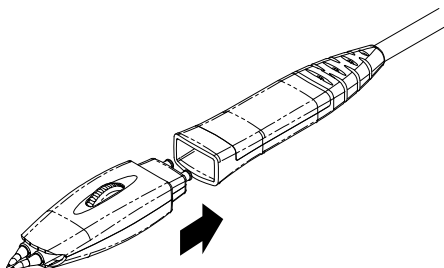
- To Connect to the Oscilloscope
- To Use the Probe Head
- To Replace Probe Accessories
- To Adjust Offset Voltage
- To Calibrate the Probe
- To Replace the Lead Resistor

To Connect to the Oscilloscope

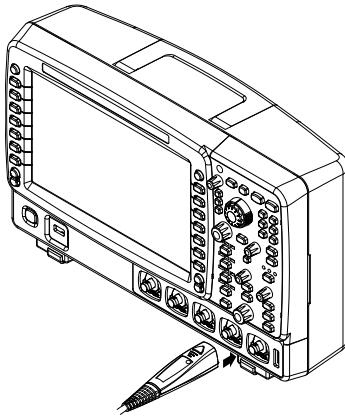
After RP7150 is connected correctly to a **RIGOL** DS6000 series oscilloscope, the oscilloscope recognizes the probe automatically and provides both power and offset voltage to the probe. You can adjust the offset voltage (refer to **To Adjust Offset Voltage**) and calibrate the probe (refer to **To Calibrate the Probe**) by operating the front panel menu of the oscilloscope.

Please connect the probe to the oscilloscope following the steps below:

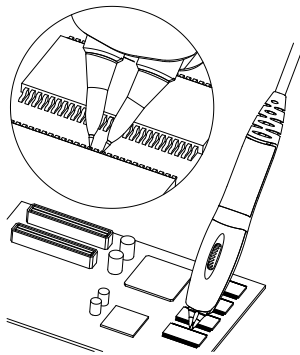
1. Connect the probe head (in the figure, taking a hand-held differential probe head for example) with the active probe amplifier. During the connection, pay attention to their polarities.



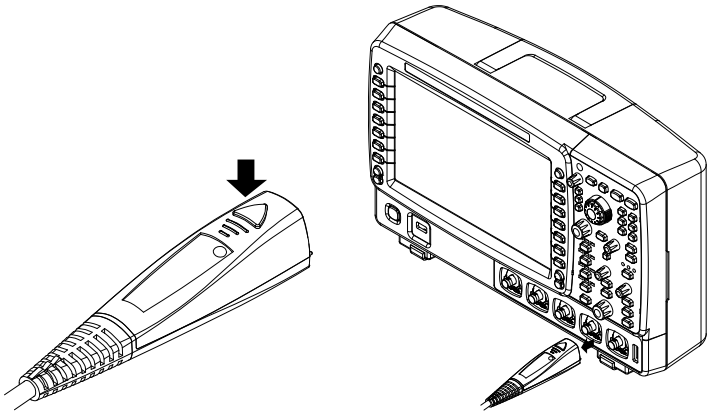
2. Connect the other end of the active probe amplifier to the channel input or external trigger input connector of the oscilloscope and make sure the connection is tight.



- 3. Use any probe auxiliary device to connect the probe to the circuit to be tested.



- 4. To disconnect the probe from the oscilloscope, press the button on the probe (as shown in the left figure below), pull the connector straight out of the oscilloscope (as shown in the right figure below) and then release the button.

**CAUTION**

Do not twist the probe on the BNC connector of the oscilloscope, or else, the probe might be damaged.

To Use the Probe Head

Known from **Probe Head**, RP7150 can be connected with 4 kinds of probe heads. You can easily change the probe head by using the method introduced in **To Replace Probe Accessories**. This chapter introduces how to use the four kinds of probe heads respectively.

1. Hand-held Differential Probe Head

As mentioned above, the hand-held differential probe head provides an effective bandwidth of more than 1.5GHz. Besides, the spacing between the two probe tips can be precisely adjusted by turning the roller and the replaceable probe tips prolong the service life of the probe.

The hand-held differential probe head can be used to measure differential and single-ended signals. During the measurement, you can turn the roller on the probe head to adjust the spacing between the probe tips so as to fit measurements with different spacing requirements.

The structure of the hand-held differential probe head is as shown in Figure 10.

- ① Turning the roller to adjust the spacing (0mm to 5.5mm) between the two probe tips.
- ② Hand-held differential probe head (RP7-0101).
- ③ 91Ω probe tip (RP7-0403).

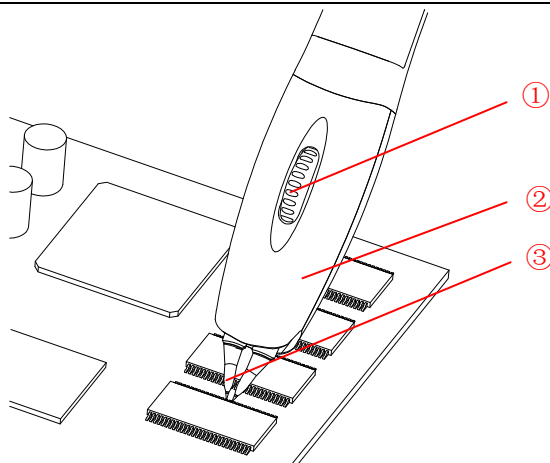


Figure 10 Hand-held Differential Probe Head



CAUTION

There are Pos/Neg markers on the active probe amplifier and probe head of RP7150. Pay attention to their polarities when using them.

2. Hand-held Single-ended Probe Head

As mentioned above, the hand-held single-ended probe head provides an effective bandwidth of more than 1.5GHz. Besides, the spacing between the single-ended ground strip and probe tip can be adjusted by rotating the ground strip and the replaceable probe tip and single-ended ground strip prolong the service life of the probe.

The hand-held single-ended probe head can be used to measure single-ended signal. During the measurement, the single-ended ground strip must be grounded. Pay attention to their polarities when connecting the probe head and active probe amplifier.

The structure of the hand-held single-ended probe head is as shown in Figure 11.

- ① Hand-held single-ended probe head (RP7-0102).
- ② 91Ω probe tip (RP7-0403).
- ③ Single-ended ground strip (RP7-0501): rotating the ground strip adjusts the spacing (0mm to 5mm) between the ground strip and probe tip.

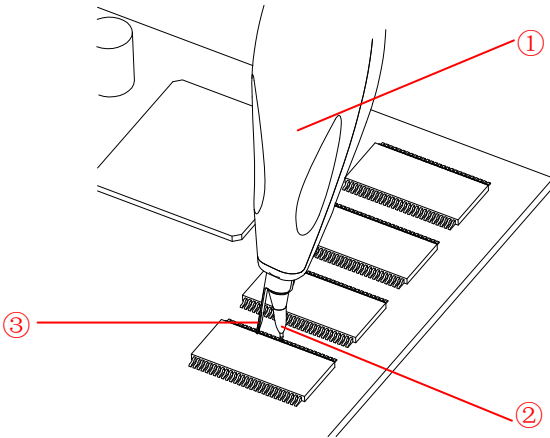


Figure 11 Hand-held Single-ended Probe Head



CAUTION

Ground the ground strip when using the hand-held single-ended probe.

3. Solder-in Differential Probe Head

As mentioned above, the solder-in differential probe head provides an effective bandwidth of more than 1.5GHz and its replaceable lead resistors enhance the usability of the probe and prolong its service life.

The structure of the solder-in differential probe head is as shown in Figure 12.

- ① Solder-in differential probe head (RP7-0201).
- ② 91Ω lead resistor (RP7-0303) (Full Bandwidth).

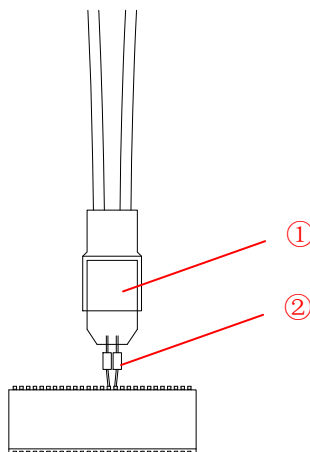


Figure 12 Solder-in Differential Probe Head

Full bandwidth solder-in differential probe head (with 91Ω full bandwidth lead resistors) can not be used due to its dimensions when the points to be tested are widely spaced. At this point, non-full bandwidth solder-in differential probe head (with 150Ω

non-full bandwidth lead resistors) can be used.

The structure of non-full bandwidth solder-in differential probe head is as shown in Figure 13.

- ① Solder-in differential probe head (RP7-0201).
- ② 150Ω lead resistor (RP7-0304) (Non-full Bandwidth) (Option).

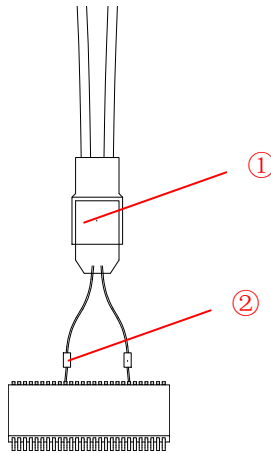


Figure 13 Non-full Bandwidth Solder-in Differential Probe Head



CAUTION

Non-full bandwidth solder-in differential probe head can be used for measurement when the points to be tested are widely spaced.

4. Solder-in Single-ended Probe Head

As mentioned above, the solder-in single-ended probe head

provides an effective bandwidth of more than 1.5GHz and its replaceable lead resistors enhance the usability of the probe and prolong its service life.

The structure of the solder-in single-ended probe head is as shown in Figure 14.

- ① Solder-in single-ended probe head (RP7-0203).
- ② 91 Ω lead resistor (RP7-0303) (Full Bandwidth).

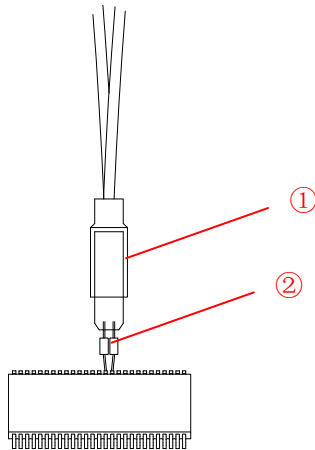


Figure 14 Solder-in Single-ended Probe Head

Full bandwidth solder-in single-ended probe head (with 91 Ω full bandwidth lead resistors) can not be used due to its dimensions when the points to be tested are widely spaced. At this point, non-full bandwidth solder-in single-ended probe head (with 150 Ω non-full bandwidth lead resistors) can be used.

The structure of non-full bandwidth solder-in single-ended probe head is as shown in Figure 15.

- ① Solder-in single-ended probe head (RP7-0203).
- ② 150Ω lead resistor (RP7-0304) (Non-full Bandwidth) (Option).

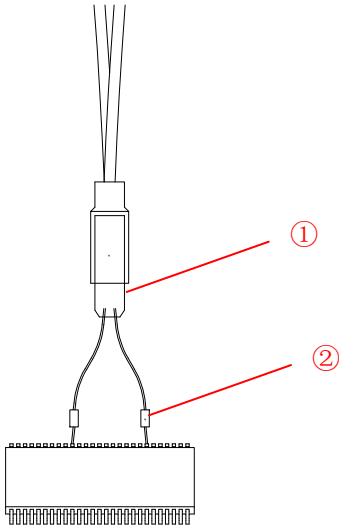


Figure 15 Non-full Bandwidth Solder-in Single-ended Probe Head



CAUTION

Non-full bandwidth solder-in single-ended probe head can be used for measurement when the points to be tested are widely spaced.

To Replace Probe Accessories

1. To Replace the Probe Head

Take care not to damage the connecting part to avoid affecting the probe performance when replacing the probe head.

Replacing Method:

- ① Disconnect the current probe head from the active probe amplifier. Requirement: pull it out straightly; bending or twisting the probe head might damage the connecting part.
- ② Push the new probe head into the active probe amplifier straightly and pay attention to their polarities.

2. To Replace the Probe Head Accessories

The probe head accessories include probe tip, single-ended ground strip and lead resistor.

Install the probe tip correctly and firmly when replacing it; make sure the single-ended ground strip is firmly connected to the copper pipe to ensure the probe performance when replacing it; make sure the resistor has correct resistance and dimensions when replacing it (referring to **To Replace the Lead Resistor**).

To Adjust Offset Voltage

RIGOL DS6000 series oscilloscope can provide offset voltage to the RP7150 active probe. The offset voltage adjusts the measured signal which exceeds the input dynamic range of the probe within an appropriate range to ensure the measured signal's integrity.

The offset voltage ranges from -12 V to +12 V. You can adjust the offset voltage by operating the front panel menu of the oscilloscope and the operation method is as shown below.

- 1.** Connect the RP7150 active probe to the channel input terminal (such as CH1) of the DS6000 oscilloscope, referring to **To Connect to the Oscilloscope**.
- 2.** Open the probe offset voltage control menu of the DS6000 oscilloscope (front panel operation: **CH1 → Probe → Bias Voltage**) and rotate the knob to adjust the value.

To Calibrate the Probe

Before using, please calibrate the RP7150 active probe following the steps below.

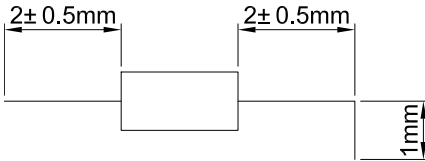
1. Connect the RP7150 active probe to the channel input terminal (such as CH1) of the DS6000 oscilloscope, referring to **To Connect to the Oscilloscope**.
2. Open the probe calibration control menu of the DS6000 oscilloscope (front panel operation: **CH1** → **Probe** → **ProbeCal** → **Start**) and the oscilloscope starts to calibrate the probe.

Note: Relative specifications of the RP7150 active probe depend on the calibration operation. After the calibration is finished, the DC gain, offset voltage zero and offset gain will be calibrated.

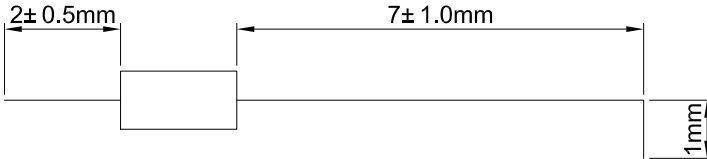
To Replace the Lead Resistor

Replace the lead resistors of the solder-in probe head if they become damaged or break off due to use. The probe head lead resistors should be replaced according to the requirements to ensure the performance of the active probe.

- Full Bandwidth Lead Resistor: 91Ω (RP7-0303)



- Non-full Bandwidth Lead Resistor: 150Ω (RP7-0304)



General Care and Cleaning

General Care:

Do not place the probe and its accessories in places where they will be exposed to sun light for long periods of time.



CAUTION

Keep the probe and its accessories away from any corrosive liquid.

Cleaning:

Clean the probe and its accessories regularly according to their operation conditions using the method below.

1. Disconnect the probe from the oscilloscope or voltage source.
2. Remove the loose dust on the exterior of the probe and its accessories using a lint-free cloth (with mild detergent or water).



WARNING

Make sure the probe is completely dry before using it to avoid short circuit and personal injuries.

Warranty

RIGOL warrants that its products mainframe and accessories will be free from defects in materials and workmanship within the warranty period.

If a product is proven to be defective within the respective period, **RIGOL** guarantees the free replacement or repair of products which are approved defective. For detailed warranty description, please refer to **RIGOL** official website or the warranty card. To get repair service or a complete copy of the warranty description, please contact with your nearest **RIGOL** sales and service office.

RIGOL does not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose. **RIGOL** will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

Specifications

Technical Specifications

Bandwidth	>1.5GHz
Rise Time	<265ps
Input Capacitance	<2pF
Input Resistance	50kΩ±2% Differential 25kΩ±2% Single-ended
Input Dynamic Range	±7V
Input Common mode Range	±6.75V DC to 100Hz ±1.25V >100Hz
Common Mode Rejection Ratio	>45dB@1MHz
DC Attenuation	10:1 ±3%
Zero Offset Error	<30mV before calibration <5mV after calibration
Offset Voltage Range	±12V
Offset Accuracy	<3% of setting before calibration <1% of setting after calibration
Input Noise	55mVpp
Propagation Delay	6ns
Max Input Voltage	30V Peak CAT I ^[1]
Electrostatic Protection	>8kV

General Characteristics

Environmental Conditions	Operating	Non-operating
Temperature	+5°C to +40°C	-40°C to +70°C
Humidity	0 RH to 80%RH	0 RH to 90%RH
Altitude	4600m	15300m
Power Consumption	1.2W	N/A
Weights	147g ± 10g ^[2]	530g ± 50g ^[3]
Wire Length	1.4m	

Note:

[1] CAT I and CAT II Definitions

Installation Category (Overvoltage Category) I: signal level, special equipment or parts of equipment, telecommunication, electronic, etc., with smaller transient voltages than installation category (Overvoltage Category) II.

Installation Category (Overvoltage Category) II: local level, appliance, portable equipment etc., with smaller transient voltages than installation category (Overvoltage Category) III.

[2] The weight of the probe with the hand-held differential probe head.

[3] The weight of the RP7150 Active Probe Kit with the probe bag.