DPB5000
DPB4000
High Voltage Differential Probe

Instruction Manual

EN01B

SIGLENT TECHNOLOGIES CO., LTD.

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Contents

Preface

First of all, thank you for purchasing our products, this instruction manual is the description about the function, usage, operation attention points, etc. Before use, please read the instructions carefully and use correctly.

Manual annotation will use the following symbols to distinguish.

This symbol means it is harmful to the product and human body; you must strictly follow the instruction manual to operate.

Warning In the case of wrong operation, the user risk injury. The content under this mark records the relevant matters needing attention to avoid such dangers.

Notice The user may suffer minor injuries and material damage with the wrong operation. To avoid such situation, the matters under this mark need attention.

Note This symbolizes important note about how to use the product.

To the safely use the product, you must abide by the following safety precautions strictly. The violation against the manual is likely to damage the protective function of the product. In addition, the company is not responsible for any safety problem caused by the violation of matters needing attention in operation.

- Please be careful to get an electric shock, pay attention to the highest input voltage.
- Do not operate in wet/damp or combustible conditions.
- Make sure to close the circuit under test before access to the probe.
- Turn off the circuit after the measurement, and then remove the probe.
- While BNC lines connect to the oscilloscope or other devices, ensure the BNC terminal grounding.
- Please check the probe skin if there is any breakage, stop using it if happen.
- Select the product standard adapter power supply.

DPB5000 Series High Voltage Differential Probe

DPB5000 Series Summary

Model	Maximum Input Differential Voltage	Bandwidth	Attenuation Rate
DPB5150	±1500 V	70 MHz	50X/500X
DPB5150A	±1500 V	100 MHz	50X/500X
DPB5700	±7000 V	70 MHz	100X/1000X
DPB5700A	±7000 V	100 MHz	100X/1000X

Overview

DPB5000 series high voltage differential probes are designed for the measurement of high voltage differential signal, to meet the demand for floating measurement. The bandwidth can be as high as 100MHz, meeting the demand for majority of measurement systems. There are a variety of ranges to choose from, and their differential voltage measurement range can meet with the demand for majority of tested circuits; users may go into test mode to adjust the offset voltage, and meanwhile to adjust automatically to prevent probes being disordered after years' of use; the electronic touch buttons give them longer working life; with function of 5MHz bandwidth limit selection, whose frequency bandwidth fits for the FETs switching frequency measurement in most switching power supplies, and they can filter out higher frequency noise and interference; with sound & light alarming function, which can also be closed manually, is more humanized designed; with USB power supply connector, easier and more flexible for use; the probes are equipped with standard BNC input connectors, can be used with any manufacturer oscilloscope (oscilloscope input impedance should set to 1MΩ; when 50Ω is selected, the attenuation multiply attenuates double.) to test waveform of the tested circuits; automatic save function, to prevent users re-operating in case of power supply drops. The probes have good capability of common mode noise suppression, can be widely used in the research and development, debugging or overhauling work for switching power supply, frequency converter, electronic ballast, frequency conversion electronic appliances and other electric power equipment.

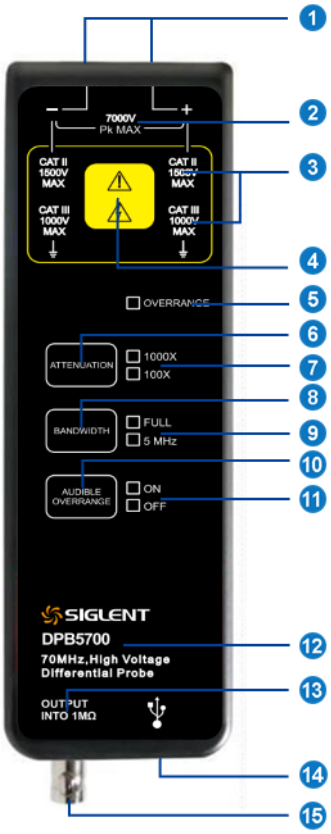
Application

- Floating voltage measurement
- Frequency converter
- Switching power supplies designs
- Welding, plating power supplies
- Induction heating, electromagnetic oven
- Motor driven design
- Electronic ballast design
- CRT displayer design
- Inverter, UPS power supplies
- Frequency conversion electrical appliances
- Power conversion and related design
- Electrical engineering experiment
- Low voltage appliances experiment
- Power electronics and electric drive experiments

Probe and Accessories Introduction

Probe Introduction

The main body of the DPB5700 probe is introduced as an example, voltage, range, and bandwidth will vary with different product models.



1. High voltage differential input ports: Standard red and black socket. Red is positive and black is negative. When connected in reverse, the output will be reversed; Use together with standard red

black input cables.

2. Maximum measurable differential voltage.
3. Maximum input voltage to earth.
4. High voltage danger, pay attention to safety.
5. Overload indicator.
6. Attenuation rate switch button: Different attenuation indicates different measurement range. such as
   - DPB5150A: 500X indicates the maximum test voltage is 1500 V; 50X indicates maximum test voltage is 150 V.
   - DPB5700A: 1000X indicates maximum test voltage is 7000 V; 100X indicates maximum test voltage is 700 V.

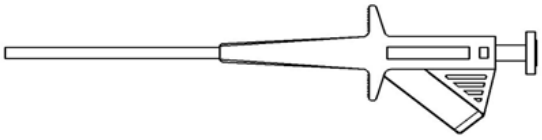
   Oscilloscope attenuation factor should be set accordingly based on the probe attenuation selection.
7. Attenuation rate indicator.
8. Bandwidth switch button: The series products have bandwidth selection function; the default is full bandwidth (FULL) of the product. When testing low frequency signal, you can choose 5MHz bandwidth limit to prevent being interfered by high frequency signal.
9. Bandwidth indicator.
10. Audible overrange button: When test range exceeds probe range, audible and visual alarm will start; the function is to control buzzer alarm on or off, ON is to open audible alarm and OFF closes the alarm.
11. Audible overrange ON/OFF indicator.
12. Probe model information.
13. Load requirement description.
14. Power interface: Standard USB type B interface, supply power with standard USB adapter; can be supplied by oscilloscope, easy to use; also can be supplied by portable power source, convenient for outdoor test.
15. BNC output interface: Standard BNC input connectors, can be connected to any manufacturer oscilloscope. Oscilloscope input impedance should set to 1 MΩ; if set to 50 Ω, the output attenuation is a half of the practical value.

Factory setting: The default factory setting is high attenuation ratio, FULL bandwidth, audible alarm is on. The product has automatic memory, automatically save the state before power off.

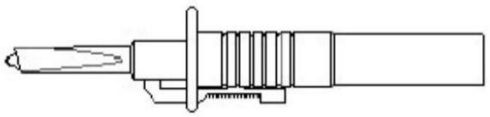
Accessories Introduction

Alligator clips (CK-261, red and black)

Alligator clips (CK-262, red and black)

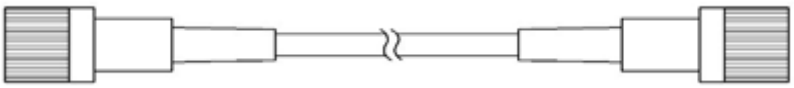


Pincer clips (CK-281, red and black)



Hook clips (CK-284, red and black)

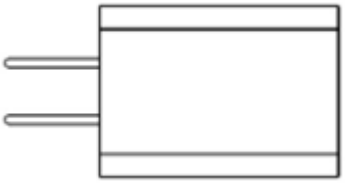
Input differential lead (CK-28, red and black)



Coaxial output line (CK-310)

Coaxial output line (CK-320)

USB line (CK-315, AM-BM, 1.5 m)



Power adapter (CK-605, USB 5 V/1 A)

Product standard accessories description:

Mode	DPB5150	DPB5150A	DPB5700	DPB5700A
Alligator clip (CK-261)	CATIII 1000V CATIV 600V	CATIII 1000V CATIV 600V	--	--
Alligator clip (CK-262)	--	--	CATIII 1000V CATIV 600V	CATIII 1000V CATIV 600V
Pincer clip (CK-281)	CATIII 1000V	CATIII 1000V	CATIII 1000V	CATIII 1000V
Hook clip (CK-284)	CATIII 1000V	CATIII 1000V	CATIII 1000V	CATIII 1000V
High voltage input differential lead (CK-28)	10A CATIII 1000V	10A CATIII 1000V	10A CATIII 1000V	10A CATIII 1000V
Coaxial output line (CK-310)	Double-ended BNC connector coaxial line, 1 m (standard)			
Coaxial output line (CK-320)	Double-ended BNC connector coaxial line, 2 m (non-standard, purchased individually)			
USB line (CK-315)	AM-BM, 1.5 m			
Power adapter (CK-605)	USB 5 V/1 A			

NOTE: The above "--" refers to non-standard accessory of this model.

Electronic Specifications

Mode		DPB5150	DPB5150A	DPB5700	DPB5700A
Bandwidth (-3 dB)		DC-70 MHz	DC-100 MHz	DC-70 MHz	DC-100 MHz
Rise time		≤5 ns	≤3.5 ns	≤5 ns	≤3.5 ns
Accuracy		Typical accuracy ±1% (≤full scale 80%) ±2% (>full scale 80%)			
Attenuation ratio		50X/500X		100X/1000X	
Maximum differential test voltage (DC + Peak AC)		50X: ±150 V		100X: ±700 V	
		500X: ±1500 V		1000X: ±7000 V	
Maximum input voltage to earth		600V CATIII 1000V CATII		1000V CATIII 1500V CATII	
Common mode voltage (DC + Peak AC)		±1500 V		±7000 V	
Input impedance	Single-ended to ground	5 MΩ	5 MΩ	20 MΩ	20 MΩ
	Between inputs	10 MΩ	10 MΩ	40 MΩ	40 MΩ
Input capacitance	Single-ended to ground	<4 pF	<4 pF	<5 pF	<5 pF
	Between inputs	<2 pF	<2 pF	<2.5 pF	<2.5 pF
CMRR	DC	>80 dB	>80 dB	>80 dB	>80 dB
	100 kHz	>60 dB	>60 dB	>60 dB	>60 dB
	1 MHz	>50 dB	>50 dB	>50 dB	>50 dB
Noise (Vrms)		50X: <50 mV		100X: <220 mV	
		500X: <300 mV		1000X: <1.2 V	
Delay	Probe	50X: 9 ns	50X: 8.5 ns	100X: 9.3 ns	100X: 8.9 ns
		500X: 7.5 ns	500X: 7.5 ns	1000X: 7.2 ns	1000X: 6.6 ns
	BNC line (1 m)	5 ns		5 ns	
Bandwidth limit (5 MHz)		≥-3 dB@5 MHz		≥-3 dB@5 MHz	
Differential overvoltage detection level		50X: ≥150 V		100X: ≥700 V	
		500X: ≥1500 V		1000X: ≥7000 V	
Overload indicator (red light)		Yes			
Overload alarm		Yes (Can shut up manually)			
Automatic save		Yes			
Offset setting function		Yes (Set in test mode)			
Terminate load		1 MΩ			
Power supply		USB 5 V/1 A adapter			

Mechanical Specifications

Mode		DPB5150	DPB5150A	DPB5700	DPB5700A
Differential input lead (CK-28)		28 cm			
Output lead	CK-310	1 m			
	CK-320	2 m			
Alligator clip (CK-261)		85*40*17 mm			
Alligator clip (CK-262)		106*43*16 mm			
Pincer clip (CK-281)		152*50*13 mm			
Hook clip (CK-284)		121*23*23 mm			
Probe body dimensions		195*58*25 mm			
Probe body weight		248 g		256g	

Environment Characteristics

Mode	DPB5150	DPB5150A	DPB5700	DPB5700A
Operating temperature	0℃ ~ 50℃			
Storage temperature	-30℃ ~ 70℃			
Operating humidity	≤85%RH			
Storage humidity	≤90%RH			
Operating altitude	3000 m			
Storage altitude	12000 m			

Note: Direct sunlight, radiators, and other heat sources should be taken into account when assessing the ambient temperature.

Operating Steps

1. You should estimate the tested voltage amplitude before testing, please do not use if exceeds the voltage range, because probably the probe will be damaged.
2. Connect the input lead and output lead to the probe; and then connect the probe to oscilloscope or other instruments.
3. Connect the power adapter to voltage probe, the power indicator light turns on green. Please select proper range based on the tested voltage; when the tested voltage exceeds range, the overload indicator light is on with alarming sound, which can be manually turned off.
4. Please set proper attenuation rate for the oscilloscope or other instruments according to the probe range; and adjust the oscilloscope sensitivity based on the tested voltage.
5. Connect the probe clips based on needs, start after connecting to the circuits to be tested. When testing, the probe body should keep away from high voltage pulse circuits to reduce interference to the probe.
6. Turn off the probe power after the testing is completed, first disconnect the two inputs from the tested points, and then unplug the BNC plug from the oscilloscope.

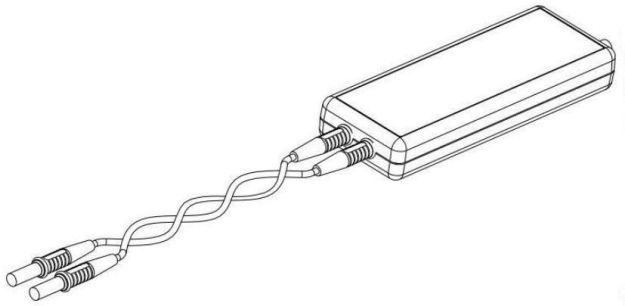
Test Mode (Offset Setting)

Users may enter the test mode to adjust offset based on needs; the probes may be disordered after years' of use. The adjustment method is as follows if not in zero:

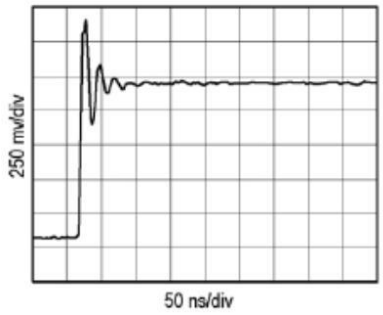
1. Please press these two keys [ATTENUATION] [BANDWIDTH], and make short circuits for input terminals.
2. Turn power on to start, entering test mode, and the overload indicator light is on, release the two keys.
3. Go into the high attenuation factor offset adjustments under the state, press the key [ATTENUATION] offset increase; press [BANDWIDTH], offset decrease.
4. After the adjustment, press key [AUDIBLE OVERRANGE] to switch to low attenuation ratio offset adjustment, press key [ATTENUATION], offset increases; press [BANDWIDTH], offset decreases.
5. After the above step, press key [AUDIBLE OVERRANGE] to exit the test mode, offset adjustment is completed and the overload indicator light off, entering into normal operation mode.

Precautions During Measurement

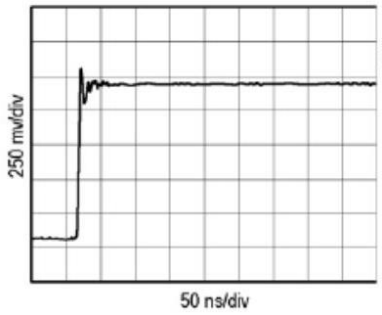
1. Please try to wind the input leads when testing, which is better for eliminating noise, to improve the ability of high frequency response. The winding method is shown below:



2. It is better not to extend input lead when testing; Otherwise, it may introduce more noise. If extra extension lead is necessary, please ensure the extension leads are at same length, and the input frequency is under 5 MHz, errors may exist if exceeds 5 MHz output.



With extender leads



Without extender leads

Performance Verification

The below operation is for performance verification of the electric specification, requirement for test equipment is shown below:

Equipment	Minimum Requirements	Usages
Oscilloscope	Bandwidth ≥100 MHz; Accuracy ≤1.5%, e.g. Tektronix MSO/DSO4000	Display probe output
Standard signal generator; calibrator	Amplitude accuracy ≤0.75%; rise time ≤3 ns e.g. FLUKE/WAVETEK 9100	Test bandwidth; AC accuracy; Common mode rejection ration
Digital multimeter	Accuracy of not less than 6 and a half e.g. KEITHLEY 2000	Test the DC accuracy

Insulation pincer clips	Supplied in the accessories	Testing clips
BNC adapter 1	BNC-male-to-female-dual show as Figure 1	Test adapter
BNC adapter 2	BNC-male-to-dual binding post show as Figure 2	Test adapter
BNC adapter 3	BNC-female-to-dual binding post show as Figure 3	Test adapter
Load terminal	BNC-male-to 50Ω load show as Figure 4	Signal source load

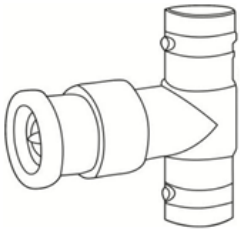


Figure 1 BNC-male-to-female-dual

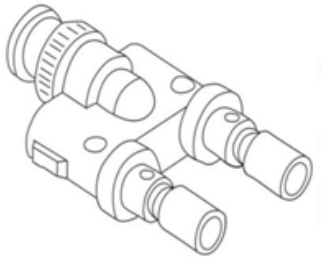


Figure 2 BNC-male-to-dual binding post

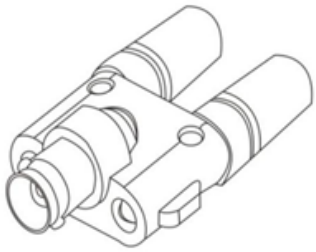


Figure 3 BNC-female-to-dual binding post

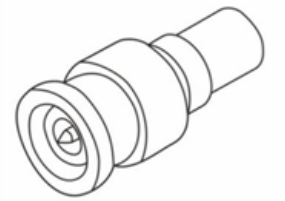


Figure 4 BNC-male-to 50Ω load

Setup

1) Connect power adapter to voltage probe, which turns on green light, to ensure accuracy, test the probe index after 20 minutes.
2) Uncover the red black plastic cover of the BNC-male-to-dual binding post.

DC accuracy

1) Connect the probe output to the BNC-female-to-dual binding post; plug the two input terminals of the digital multimeter into the binding post hole.
2) Connect the probe input to insulation pincer clips, and then connect the calibrator output and the generator close, connect the red clip to the positive pole, black clip to negative pole.
3) Set the probe attenuation factor in the first gear.
4) Follow the chart below to set output values for the signal source.
5) Enable the signal output, observe and record the output voltage for the attenuation.

6) Turn off the signal source output.
7) Switch the probe attenuation factor to the second gear.
8) Repeat step 4~6, and calculate whether is within the accuracy ranges.

Mode	Attenuation Ratio	Source Output Voltage	Expected Output Voltage of the Probe	Actual Output Voltage of the Probe
DPB5150 (A)	50X	5 V	100 mV±2 mV	
	500X	50 V	100 mV±2 mV	
DPB5700 (A)	100X	10 V	100 mV±2 mV	
	1000X	100 V	100 mV±2 mV	

Rise time

1) Configure the fast rise output of the generator for a 50Ω load. Attach a 50Ω terminator to the generator fast-rise output and attach the modified BNC adapter to the terminator. Attach the differential probe input leads (without attachment accessories) by sliding the banana plug of the leads onto the binding posts metal sleeves on the modified BNC adapter.
2) Connect the probe output to the oscilloscope, set attenuation factor in the first gear.
3) Refer to the below stable to set standard signal generator.
4) Enable signal source output and record the rise time.
5) Turn off signal source output.
6) Switch the probe attenuation factor to the second gear.
7) Repeat step 3~5, and calculate whether is in the range.

Mode	Attenuation Ratio	Setting of the Source Voltage and Frequency	Expected Rise Time of the Probe	Actual Rise Time of the Probe
DPB5150	50X	20 Vp-p, 70 MHz	≤5 ns	
	500X	20 Vp-p, 70 MHz	≤5 ns	
DPB5150A	50X	20 Vp-p, 100 MHz	≤3.5 ns	
	500X	20 Vp-p, 100 MHz	≤3.5 ns	
DPB5700	100X	20 Vp-p, 70 MHz	≤5 ns	
	1000X	20 Vp-p, 70 MHz	≤5 ns	
DPB5700A	100X	20 Vp-p, 100 MHz	≤3.5 ns	
	1000X	20 Vp-p, 100 MHz	≤3.5 ns	

DC common mode rejection ration (CMRR)

1) Set DPB5000 probes at low attenuation ration, respectively (50X, 100X).
2) Set 500 V DC voltage for signal source and turn off the voltage output.
3) Connect the two probe inputs to 500 V voltage.
4) Connects the probe output to BNC-female- to-dual binding post (as shown in Figure 3), and plug into the two inputs of the digital multimeter.
5) Enable signal source output, respectively record voltage output values; check with the following chart to calculate whether is within the ranges.
6) Turn off the calibrator after completion of the test.

Mode	Attenuation Ratio	Probe expected output voltage	Probe practical output voltage
DPB5150 (A)	50X	≤1 mV	
DPB5700 (A)	100X	≤1 mV	

Note

High voltage 500 V is used during the testing, please pay attention to personal safety; to reduce voltage fluctuation, be sure to make the calibrator output 500 V high voltages after the completion of all connections.

DPB4080 High Voltage Differential Probe

DPB4080 Summary

Model	Maximum Input Differential Voltage	Bandwidth	Attenuation Rate
DPB4080	800 V	50 MHz	10X/100X

Overview

The PDB4080 differential probe provides a safety means for measuring differential voltage to all models of oscilloscopes. It can convert the high differential voltage (≤800Vpeak) into a low voltage (≤8V) and display on the oscilloscope. Its bandwidth is up to 50MHz, which is ideal for big power testing, development and maintain.

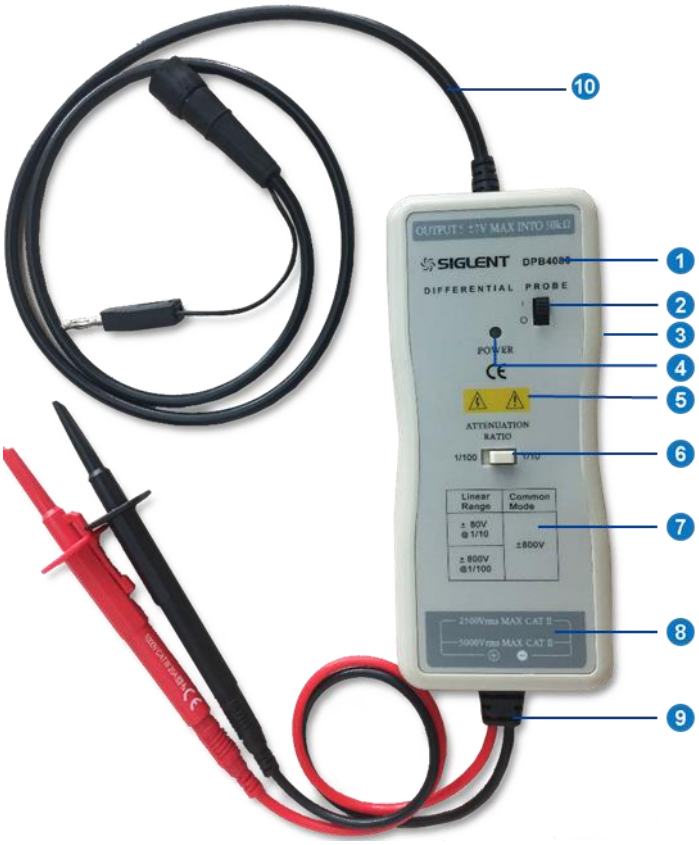
The DPB4080 is designed to operate with the 1MΩ impedance oscilloscopes. When combine with the 50Ω load, the attenuation will be 2 times.

DPB4080 is recommend to use with our own manufactured PL-10 to expand the measuring with the electricity meter to observe more accurate measurement. The accuracy of oscilloscope is 1% and the electricity meter is about 10%.

Application

- Floating voltage measurement
- Switching power supplies designs
- Inverter, UPS power supplies
- Frequency converter
- Electronic ballast design
- Induction heating, electromagnetic oven
- Electrical engineering experiment
- Power electronics and electric drive experiments

Probe Introduction



1. Probe model information
2. Power switch
3. 6 V adapter connector
4. Power indicator (red light) / overvoltage warning light (yellow light)
5. High voltage danger, pay attention to safety
6. Attenuation switch
7. Probe liner range and common mode voltage
8. Maximum input voltage to earth
9. Banana cable input, red is positive, black is negative
10. BNC output cable

Electronic Specifications

Mode		DPB4080	
Bandwidth (-3 dB)		DC-50 MHz	
Rise time		≤7 ns	
Accuracy		±1%	
Attenuation ratio		10X/100X	
Maximum differential test voltage (DC + Peak AC)		10X	±80 V
		100X	±800 V
Maximum input voltage to earth		5 kVrms	
Common mode voltage (DC + Peak AC)		±800 V	
Input impedance	Single-ended to ground	2 MΩ	
	Between inputs	4 MΩ	
Input capacitance	Single-ended to ground	<2.5 pF	
	Between inputs	<1.3 pF	
CMRR	60 Hz	>80 dB	
	100 Hz	>60 dB	
	100 kHz	>50 dB	
Overload indicator (red light)		Null	
Terminal load requirement		1 MΩ	
Power adapter		6 V DC power	

Mechanical Specifications

Item	Data
Probe body dimensions	165*69*26 mm
Probe body weight	500 g

Environment Characteristics

Mode	DPB4080
Operating temperature	0℃ ~ 50℃
Storage temperature	-30℃ ~ 70℃
Operating humidity	10%RH ~ 85%RH
Storage humidity	10%RH ~ 90%RH

1. Electrical safety to IEC 1010-1

   Dual insulation

   Installation category Ⅲ

   Degree of Pollution 2

   Related voltage or max line-earth: 6500 V RMS

   CE: EN50081-1 and 50082-1

2. Use indoors.

Operating Steps

Connect the probe to the oscilloscope with the BP-250 BNC TO BNC cable.

Adjust the vertical zero adjustment of the oscilloscope if necessary.

Select the attenuation ration and the vertical deviation of the oscilloscope in accordance with the conversion table below.

Note: The power must be on

Attenuation Rate	X100	X10
Input voltage (DC+AC Peak)	±800 V	±80 V

Attention: The real vertical deviation is equal to the attenuation ration multiplied by the range of vertical deviation selected on the oscilloscope. It will be double in the case of a 50Ω load.

Care and Maintenance

1. Keep the probe clean and dry.
2. Please wipe with soft dry cloth when clean needed, must not use chemicals to clean.
3. Please put the probe in the package provided, and put it in cool, clean and dry places.
4. When transporting, please put the probe in the packing box provided to prevent shock.
5. Do not forcefully pull the input and output lead to prevent bending, twisted and folding.

Warranty

Please follow the instruction of the Warranty Card.

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