RIGOL

Performance Verification Guide

DS1000Z-E Series
Digital Oscilloscope

Aug. 2019
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Safety Requirement

General Safety Summary

Please review the following safety precautions carefully before putting the instrument into operation so as to avoid any personal injury or damage to the instrument and any product connected to it. To prevent potential hazards, please follow the instructions specified in this manual to use the instrument properly.

Use Proper Power Cord.
Only the exclusive power cord designed for the instrument and authorized for use within the local country could be used.

Ground the Instrument.
The instrument is grounded through the Protective Earth lead of the power cord. To avoid electric shock, connect the earth terminal of the power cord to the Protective Earth terminal before connecting any input or output terminals.

Connect the Probe Correctly.
If a probe is used, the probe ground lead must be connected to earth ground. Do not connect the ground lead to high voltage. Improper way of connection could result in dangerous voltages being present on the connectors, controls or other surfaces of the oscilloscope and probes, which will cause potential hazards for operators.

Observe All Terminal Ratings.
To avoid fire or shock hazard, observe all ratings and markers on the instrument and check your manual for more information about ratings before connecting the instrument.

Use Proper Overvoltage Protection.
Ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the operator might be exposed to the danger of an electric shock.

Do Not Operate Without Covers.
Do not operate the instrument with covers or panels removed.

Do Not Insert Objects Into the Air Outlet.
Do not insert anything into the holes of the fan to avoid damaging the instrument.

Use Proper Fuse.
Please use the specified fuses.

Avoid Circuit or Wire Exposure.
Do not touch exposed junctions and components when the unit is powered on.

Do Not Operate With Suspected Failures.
If you suspect that any damage may occur to the instrument, have it inspected by **RIGOL** authorized personnel before further operations. Any maintenance, adjustment or replacement especially to circuits or accessories must be performed by **RIGOL** authorized personnel.

Provide Adequate Ventilation.
Inadequate ventilation may cause an increase of temperature in the instrument, which would cause damage to the instrument. So please keep the instrument well ventilated and inspect the air outlet and the fan regularly.

Do Not Operate in Wet Conditions.
To avoid short circuit inside the instrument or electric shock, never operate the instrument in a humid environment.

Do Not Operate in an Explosive Atmosphere.
To avoid personal injuries or damage to the instrument, never operate the instrument in an explosive atmosphere.

Keep Product Surfaces Clean and Dry.
To avoid dust or moisture from affecting the performance of the instrument, keep the surfaces of the instrument clean and dry.

Prevent Electrostatic Impact.
Operate the instrument in an electrostatic discharge protective environment to avoid damage induced by static discharges. Always ground both the internal and external conductors of cables to release static before making connections.

Use the Battery Properly.
Do not expose the battery (if available) to high temperature or fire. Keep it out of the reach of children. Improper change of a battery (lithium battery) may cause an explosion. Use the **RIGOL** specified battery only.

Handle with Caution.
Please handle with care during transportation to avoid damage to keys, knobs, interfaces, and other parts on the panels.

Safety Notices and Symbols

Safety Notices in this Manual:

WARNING

Indicates a potentially hazardous situation or practice which, if not avoided, will result in serious injury or death.

CAUTION

Indicates a potentially hazardous situation or practice which, if not avoided, could result in damage to the product or loss of important data.

Safety Terms on the Product:

DANGER It calls attention to an operation, if not correctly performed, could result in injury or hazard immediately.

WARNING It calls attention to an operation, if not correctly performed, could result in potential injury or hazard.

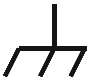
CAUTION It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

Safety Symbols on the Product:

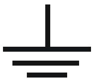
Hazardous Voltage

Safety Warning

Protective Earth Terminal



Chassis Ground



Test Ground

Document Overview

This manual is used to guide users to correctly test the performance specifications of **RIGOL** DS1000Z-E series digital oscilloscope. For the operation methods used in the test procedures, please refer to the corresponding User's Guide.

Main Topics of this Manual:

Chapter 1 Overview
This chapter introduces the preparations before performing the performance verification tests and the notices.

Chapter 2 Performance Verification Test
This chapter introduces the limit, test devices required as well as the test method and procedures of each performance specification.

Appendix Test Record Form
The appendix provides a test record form for users to record the test results and judge whether each performance specification can meet the requirement.

Format Conventions in this Manual:

1. **Key**
   The front panel keys are denoted by the format of "Key Name (Bold) + Text Box". For example, **Utility** denotes the "Utility" key.

2. **Menu**
   The menu items are denoted by the format of "Menu Word (Bold) + Character Shading". For example, **System** denotes the "System" menu item under **Utility**.

3. **Operation Step**
   The next step of operation is denoted by an arrow "→". For example, **Utility** → **System** denotes pressing **Utility** on the front panel and then pressing **System**.

4. **Knob**

Label	Knob
HORIZONTAL ◎ **SCALE**	Horizontal Scale Knob
HORIZONTAL ◎ **POSITION**	Horizontal Position Knob
VERTICAL ◎ **SCALE**	Vertical Scale Knob
VERTICAL ◎ **POSITION**	Vertical Position Knob
TRIGGER ◎ **LEVEL**	Trigger Level Knob

Content Conventions in this Manual:

DS1000Z-E series digital oscilloscope includes the following models. Unless otherwise noted, this manual takes DS1202Z-E for example to illustrate the performance verification test methods of DS1000Z-E series.

Model	Analog Bandwidth	Number of Analog Channels
DS1202Z-E	200 MHz	2

Contents

Chapter 1 Overview

Test Preparations

The following preparations should be done before the test:
1. Self-test
2. Warm-up (make sure that the instrument has been running for at least 30 minutes)
3. Self-calibration

Self-test

When the oscilloscope is in power-on state, press the power key at the lower left corner of the front panel to start the oscilloscope. During the start-up, the instrument performs a series of self-test items. The welcome screen is displayed after the self-test is finished.

If the oscilloscope cannot start normally, refer to "Troubleshooting" section in *DS1000Z-E User Guide* to locate the problem and resolve it. Do not perform self-calibration or performance tests until the instrument passes the self-test.

Self-calibration

Make sure that the oscilloscope has been warmed up or running for more than 30 minutes before performing self-calibration.

1. Disconnect the connections of all the channels.
2. Press **Utility** → **Self-Cal**; press **Start** to execute self-calibration.
3. The self-calibration lasts for about 30 minutes. After the self-calibration is finished, the corresponding prompt message is displayed. At this point, please restart the instrument.
4. Press **Acquire** → **Mode** and use to select "Average"; press **Averages** and use to set it to 16.
5. Set the probe attenuation ratio of each channel to "1X" (press **CH1** (or **CH2**) → **Probe**).
6. Set the vertical scale of each channel to 2 mV/div and view the offset of the waveform of each channel. If the offset is greater than 0.5 div, check whether there are interference signals around you and whether the power source is well grounded. If yes, perform self-calibration again.

Test Result Record

Record and keep the test result of each test. In the Appendix of this manual, a test result record form which lists all the test items and their corresponding performance limits as well as spaces for users to record the test results, is provided.

Tip:
It is recommended that users photocopy the test record form before each test and record the test results in the copy so that the form can be used repeatedly.

Specifications

The specification of each test item is provided in chapter 2. For other specifications, refer to *DS1000Z-E Data Sheet* (available to download from **RIGOL** official website (www.rigol.com)).

Tip:
All the specifications are only valid when the oscilloscope has been warmed up for more than 30 minutes.

Chapter 2 Performance Verification Test

This chapter introduces the performance verification test methods and procedures of DS1000Z-E series digital oscilloscope by taking DS1202Z-E as an example. Fluke 9500B is used in this manual for the tests. You can also use other devices that fulfill the "Specification" in Table 2-1.

Table 2-1 Test Devices Required

Device	Specification	Recommended Model
Oscilloscope Calibrator	DC output voltage range: 1 MΩ: 1 mV to 200 V 50 Ω: 1 mV to 5 V Fast edge signal rise time: ≤ 150 ps	Fluke 9500B
50 Ω Impedance Adapter	BNC (M)-BNC (F) cable	--

Note:

1. Make sure that the oscilloscope passes the self-test and self-calibration is performed before executing the performance verification tests.
2. Make sure that the oscilloscope has been warmed up for at least 30 minutes before executing any of the following tests.
3. Please reset the instrument to the factory setting before or after executing any of the following tests.

Impedance Test

Specification

Input Impedance	
Analog Channel	1 MΩ: 0.99 MΩ to 1.01 MΩ

Test Connection Diagram

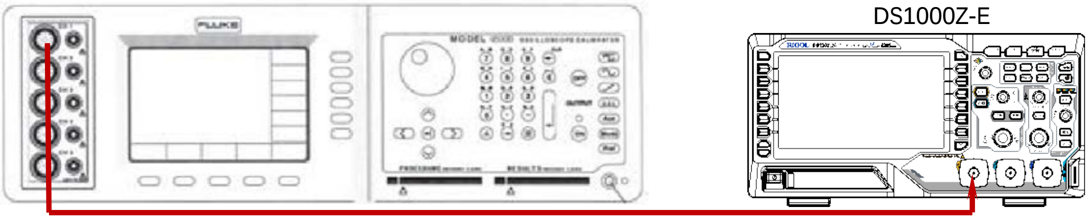


Figure 2-1 Impedance Test Connection Diagram

Test Procedures

1. Connect the active head of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.

2. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) on the front panel to turn on CH1.
   2) Press **CH1** → **Probe** to set the probe attenuation ratio to "1X".
   3) Rotate **VERTICAL** **SCALE** to set the vertical scale of CH1 to 100 mV/div.

3. Turn on Fluke 9500B; set its impedance to 1 MΩ and select the resistance measurement function. Read and record the resistance measured.

4. Rotate **VERTICAL** **SCALE** to adjust the vertical scale of CH1 of the oscilloscope to 500 mV/div; read and record the resistance measured.

5. Turn off CH1. Measure the resistance of CH2 using the method above and record the measurement results.

Test Record Form

Channel	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	100 mV/div		0.99 MΩ to 1.01 MΩ	
	500 mV/div			
CH2	100 mV/div			
	500 mV/div			

DC Gain Accuracy Test

Specification

DC Gain Accuracy	
Specification	< 10 mV: ±4% × Full Scale[1] ≥ 10 mV: ±3% × Full Scale[1]

Note[1]: Full Scale = 8 × Current Vertical Scale

Test Connection Diagram

Figure 2-2 DC Gain Accuracy Test Connection Diagram

Test Procedures

1. Connect the active head of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.

2. Turn on Fluke 9500B and set its impedance to 1 MΩ.

3. Output a DC signal with +3 mV_{DC} voltage (Vout1) via Fluke 9500B.

4. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) on the front panel to turn on CH1.
   2) Press **CH1** → **Probe** to set the probe attenuation ratio to "1X".
   3) Rotate **VERTICAL** **SCALE** to set the vertical scale to 1 mV/div.
   4) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 100 us/div.
   5) Press **VERTICAL** **POSITION** to set the vertical position to 0.
   6) Press **Acquire** → **Mode** and use to select "Average" acquisition mode; press **Averages** and use to set the number of averages to 32.
   7) Adjust the trigger level to avoid that the signals are being triggered by mistake.

5. Press **MENU** → **Vavg** at the left side of the screen of the oscilloscope to turn on the average measurement function. Read and record Vavg1.

6. Adjust Fluke 9500B to make it output a DC signal with -3 mV_{DC} voltage (Vout2).

7. Press **MENU** → **Vavg** at the left side of the screen of the oscilloscope to turn on the average measurement function. Read and record Vavg2.

8. Calculate the relative error of this vertical scale: **|(Vavg1 - Vavg2) - (Vout1 - Vout2)|/Full Scale × 100%**.

9. Keep the other settings of the oscilloscope unchanged:
   1) Set the vertical scale to 2 mV/div, 5 mV/div, 10 mV/div, 20 mV/div, 50 mV/div, 100 mV/div,

200 mV/div, 500 mV/div, 1 V/div, 2 V/div, 5 V/div and 10 V/div respectively.

2) Adjust the output voltage of Fluke 9500B to 3 × the current vertical scale and -3 × the current vertical scale respectively.
3) Repeat steps 3 to 7 and record the test results.
4) Calculate the relative error of each vertical scale: **|(Vavg1 - Vavg2) - (Vout1 - Vout2)|/ Full Scale × 100%**.

10. Turn off CH1. Test the relative error of each scale of CH2 using the method above and record the test results.

Test Record Form

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH1	1 mV/div				≤ 4%	
	2 mV/div					
	5 mV/div					
	10 mV/div				≤ 3%	
	20 mV/div					
	50 mV/div					
	100 mV/div					
	200 mV/div					
	500 mV/div					
	1 V/div					
	2 V/div					
	5 V/div					
	10 V/div					
CH2	1 mV/div				≤ 4%	
	2 mV/div					
	5 mV/div					
	10 mV/div				≤ 3%	
	20 mV/div					
	50 mV/div					
	100 mV/div					
	200 mV/div					
	500 mV/div					
	1 V/div					
	2 V/div					
	5 V/div					
	10 V/div					

Note[1]: The calculation formula is |(Vavg1 - Vavg2) - (Vout1 - Vout2)|/Full Scale × 100%; wherein, Vout1 and Vout2 are 3 × the current vertical scale and -3 × the current vertical scale respectively.

Bandwidth Test

The bandwidth test verifies the bandwidth performance of the oscilloscope by testing the amplitude loss of the oscilloscope under test at full bandwidth.

Specification

Bandwidth		
Amplitude Loss[1]	200 MHz	-3 dB, all-channel mode

Note[1]: Amplitude Loss (dB) = 20 × lg (Vrms2/Vrms1); wherein, Vrms1 is the measurement result of amplitude effective value at 1MHz and Vrms2 is the measurement result of amplitude effective value at full bandwidth.

Test Connection Diagram

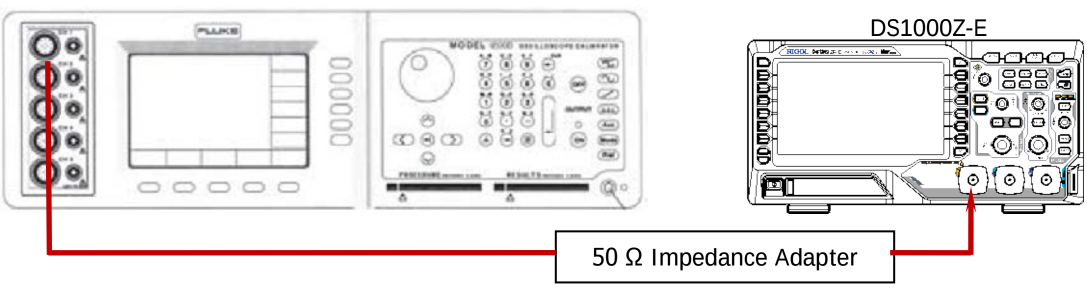


Figure 2-3 Bandwidth Test Connection Diagram

Test Procedures

1. Connect the active head of Fluke 9500B to CH1 of the oscilloscope via a 50 Ω impedance adapter, as shown in the figure above.

2. Turn on Fluke 9500B and set its impedance to 50 Ω.

3. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) on the front panel to turn on CH1.
   2) Press **CH1** → **Probe** to set the probe attenuation ratio to "1X".
   3) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 500 ns/div.
   4) Rotate **VERTICAL** **SCALE** to set the vertical scale to 100 mV/div.
   5) Press **HORIZONTAL** **POSITION** and **VERTICAL** **POSITION** respectively to set the horizontal position and vertical position to 0.
   6) Press **TRIGGER** **LEVEL** to set the trigger level to 0 V.

4. Output a Sine with 1 MHz frequency and 600 mVpp amplitude via Fluke 9500B.

5. Press **MENU** → **Vrms** at the left side of the screen of the oscilloscope to turn on the effective value measurement function. Read and record Vrms1.

6. Output a Sine with 200 MHz frequency and 600 mVpp amplitude via Fluke 9500B.

7. Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 2 ns/div.

8. Press **MENU** → **Vrms** at the left side of the screen of the oscilloscope to turn on the effective value measurement function. Read and record Vrms2.

9. Calculate the amplitude loss: **Amplitude Loss (dB) = 20 × lg (Vrms2/Vrms1)**.

10. Keep the other settings of the oscilloscope in Step 3 unchanged and set the vertical scale to 500 mV/div.

11. Output a Sine with 1 MHz frequency and 3 Vpp amplitude via Fluke 9500B.

12. Repeat Step 5.

13. Output a Sine with 200 MHz frequency and 3 Vpp amplitude via Fluke 9500B.

14. Repeat Step 7-9.

15. Turn off CH1. Test CH2 using the method above and record the test results.

Test Record Form

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vrms1	Vrms2	Amplitude Loss[1]		
CH1	100 mV/div				-3 dB to 3 dB	
	500 mV/div					
CH2	100 mV/div					
	500 mV/div					

Note[1]: Amplitude Loss (dB) = 20 × lg (Vrms2/Vrms1).

Bandwidth Limit Test

The bandwidth limit test verifies the 20 MHz bandwidth limit function of the oscilloscope by testing the amplitude loss of the oscilloscope under test at the bandwidth limit.

Table 2-2 Bandwidth Limit

Input Impedance of the Oscilloscope	Available Bandwidth Limit
1 MΩ	20 MHz

Specification

Bandwidth Limit	
Amplitude Loss[1]	-3 dB, all-channel mode

Note[1]: Amplitude Loss (dB) = 20 × lg (Vrms2/Vrms1). Wherein, Vrms1 is the measurement result of amplitude effective value at 1 MHz; Vrms2 is the measurement result of amplitude effective value at the bandwidth limit.

Test Connection Diagram

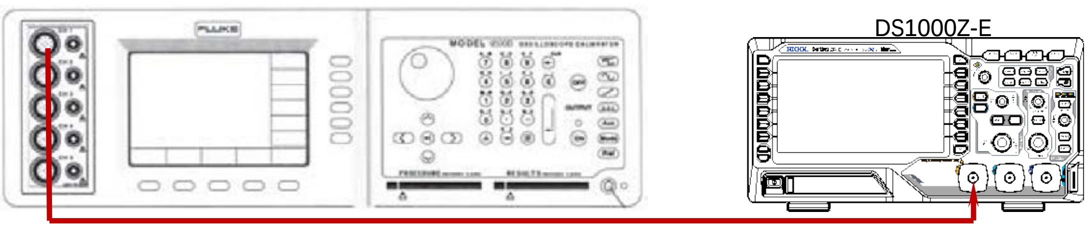


Figure 2-4 Bandwidth Limit Test Connection Diagram

Test Procedures

1. Connect the active head of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.

2. Turn on Fluke 9500B and set its impedance to 1 MΩ.

3. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) on the front panel to turn on CH1.
   2) Press **CH1** → **Probe** to set the probe attenuation ratio to "1X".
   3) Rotate **VERTICAL** **SCALE** to set the vertical scale to 100 mV/div.
   4) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 500 ns/div.
   5) Press **HORIZONTAL** **POSITION** and **VERTICAL** **POSITION** respectively to set the horizontal position and vertical position to 0.
   6) Press **TRIGGER** **LEVEL** to set the trigger level to 0 V.

4. Output a Sine with 1 MHz frequency and 600 mVpp amplitude via Fluke 9500B.

5. Press **MENU** → **Vrms** at the left side of the screen of the oscilloscope to turn on the effective value measurement function. Read and record Vrms1.

6. Press **CH1** → **BW Limit** to set the bandwidth limit to "20 M".

7. Output a Sine with 20 MHz frequency and 600 mVpp amplitude via Fluke 9500B.

8. Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 50 ns/div.

9. Press **MENU** → **Vrms** at the left side of the screen of the oscilloscope to turn on the effective value measurement function. Read and record Vrms2.

10. Calculate the amplitude loss: **Amplitude Loss A1 (dB) = 20 × lg (Vrms2/Vrms1)** and compare the result with the specification. At this point, the amplitude loss should be within the specification range.

11. Keep the other settings of the oscilloscope in Step 3 unchanged and set the vertical scale to 500 mV/div.

12. Output a Sine with 1 MHz frequency and 3 Vpp amplitude via Fluke 9500B.

13. Repeat Step 5.

14. Output a Sine with 20 MHz frequency and 3 Vpp amplitude via Fluke 9500B.

15. Repeat Step 8-10.

16. Turn off CH1. Test CH2 using the method above.

Test Record Form

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vrms1	Vrms2	Amplitude Loss[1]		
CH1	100 mV/div				-3 dB to 3 dB	
	500 mV/div					
CH2	100 mV/div					
	500 mV/div					

Note [1]: Amplitude Loss (dB) = 20 × lg (Vrms2/Vrms1).

Time Base Accuracy Test

Specification

Time Base Accuracy[1]	
Specification	≤ ±(25 ppm + Clock Drift[2] ×Number of years that the instrument has been used[3])

Note[1]: Typical.
Note[2]: Clock drift is lower than or equal to ±5 ppm/year.
Note[3]: For the number of years that the instrument has been used, please calculate according to the date in the verification certificate provided when the instrument leaves factory.

Test Connection Diagram

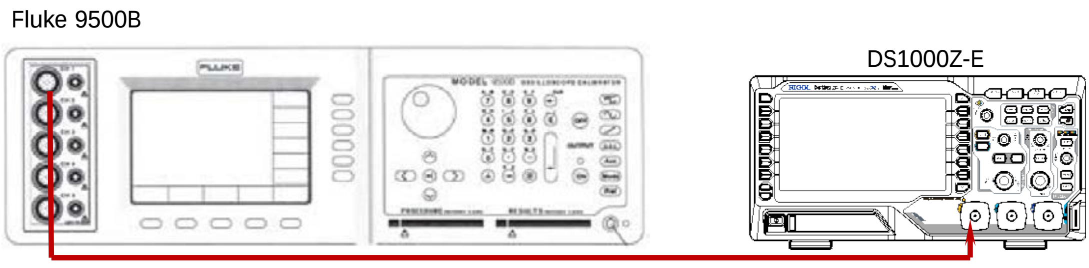


Figure 2-5 Time Base Accuracy Test Connection Diagram

Test Procedures

1. Connect the active head of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.

2. Turn on Fluke 9500B and set its impedance to 1 MΩ.

3. Output a Sine with 10 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.

4. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) on the front panel to turn on CH1.
   2) Press **CH1** → **Probe** to set the probe attenuation ratio to "1X".
   3) Rotate **VERTICAL** **SCALE** to set the vertical scale to 200 mV/div.
   4) Press **VERTICAL** **POSITION** to set the vertical position to 0.
   5) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 10 ns/div.
   6) Rotate **HORIZONTAL** **POSITION** to set the horizontal position to 1 ms.

5. Observe the screen of the oscilloscope. Press **Cursor** → **Mode** → "Manual" to turn on the manual cursor function. Measure the offset (ΔT) of the middle point of the signal (namely the crossing point of the rising edge of the current signal and the trigger level line) relative to the screen center using manual cursor measurement and record the measurement result.

6. Calculate the time base accuracy; namely the ratio of ΔT to the horizontal position of the oscilloscope. For example, if the offset measured is 1 ns, the time base accuracy is 1 ns/1 ms=1 ppm.

7. Calculate the time base accuracy limit using the formula "±(25 ppm + 5 ppm/year × number of years that the instrument has been used).

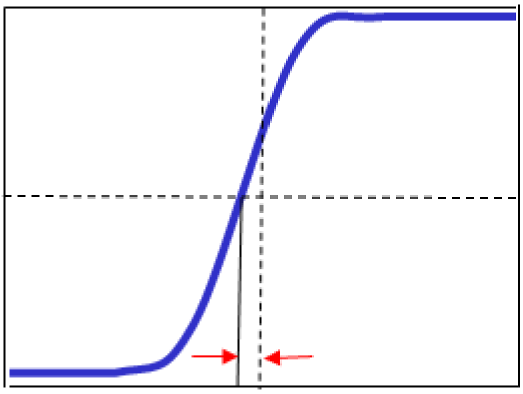
Test Record Form

Channel	Test Result ΔT	Calculation Result[1]	Limit	Pass/Fail
CH1			±(25 ppm + 5 ppm/year × number of years that the instrument has been used[2])	

Note[1]: Calculation Result = Test Result ΔT/1 ms.
Note[2]: For the number of years that the instrument has been used, please calculate according to the date in the verification certificate provided when the instrument leaves factory.

Zero Point Offset Test

Zero point offset is defined as the offset of the crossing point of the waveform and trigger level line relative to the trigger position, as shown in the figure below.



Specification

Zero Point Offset	
Specification	2.5 ns

Test Connection Diagram

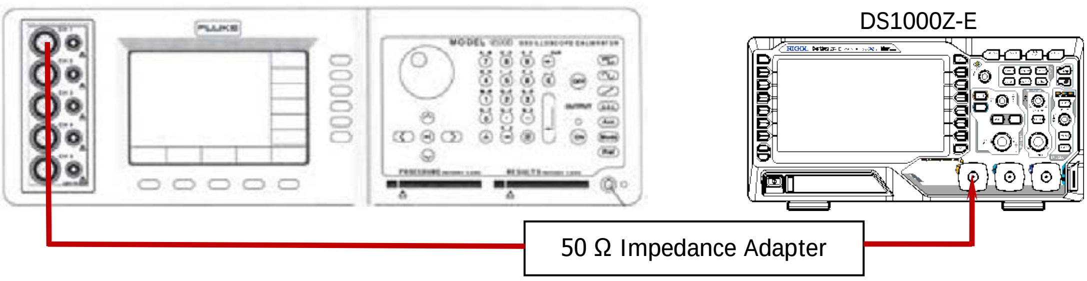


Figure 2-6 Zero Point Offset Test Connection Diagram

Test Procedures

1. Connect the active signal terminal of Fluke 9500B to CH1 of the oscilloscope via a 50 Ω impedance adapter, as shown in the figure above.

2. Turn on Fluke 9500B and set its impedance to 50 Ω.

3. Output a fast edge signal with 500 ps rise time and 1.2 V amplitude via Fluke 9500B.

4. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) on the front panel to turn on CH1.
   2) Press **CH1** → **Probe** to set the probe attenuation ratio to "1X".
   3) Rotate **VERTICAL** **SCALE** to set the vertical scale to 200 mV/div.
   4) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 5 ns/div.
   5) Rotate **HORIZONTAL** **POSITION** and **VERTICAL** **POSITION** respectively to

adjust the horizontal position and vertical position properly.

6) Rotate **TRIGGER** **LEVEL** to adjust the trigger level to the middle of the screen.

5. Observe the screen of the oscilloscope. Press **Cursor** → **Mode** → "Manual" to turn on the manual cursor function. Measure the zero point offset using manual cursor measurement and record the measurement result.

6. Output a fast edge signal with 500 ps rise time and 3 V amplitude via Fluke 9500B.

7. Keep the other settings of the oscilloscope unchanged and set the vertical scale to 500 mV/div.

8. Repeat Step 5; measure the zero point offset and record the measurement result.

9. Turn off CH1. Test CH2 according to the method above and record the test results.

Test Record Form

Channel	Fast Edge Signal Amplitude	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	1.2 Vpp	200 mV/div		≤ 2.5 ns	
	3 Vpp	500 mV/div			
CH2	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			

Appendix Test Record Form

RIGOL DS1000Z-E Series Digital Oscilloscope
Performance Verification Test Record Form

Model:_______________ Tested by:_______________ Test Date:______________

Impedance Test

Channel	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	100 mV/div		0.99 MΩ to 1.01 MΩ	
	500 mV/div			
CH2	100 mV/div			
	500 mV/div			

DC Gain Accuracy Test

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH1	1 mV/div				≤ 4%	
	2 mV/div					
	5 mV/div					
	10 mV/div				≤ 3%	
	20 mV/div					
	50 mV/div					
	100 mV/div					
	200 mV/div					
	500 mV/div					
	1 V/div					
	2 V/div					
	5 V/div					
	10 V/div					
CH2	1 mV/div				≤ 4%	
	2 mV/div					
	5 mV/div					
	10 mV/div				≤ 3%	
	20 mV/div					
	50 mV/div					
	100 mV/div					
	200 mV/div					
	500 mV/div					
	1 V/div					
	2 V/div					
	5 V/div					
	10 V/div					

Note[1]: The calculation formula is |(Vavg1 - Vavg2) - (Vout1 - Vout2)|/Full Scale × 100%; wherein, Vout1 and Vout2 are 3 × the current vertical scale and -3 × the current vertical scale respectively.

Bandwidth Test

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vrms1	Vrms2	Amplitude Loss[1]		
CH1	100 mV/div				-3 dB to 3 dB	
	500 mV/div					
CH2	100 mV/div					
	500 mV/div					

Note[1]: Amplitude Loss (dB) = 20 × lg (Vrms2/Vrms1).

Bandwidth Limit Test

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vrms1	Vrms2	Amplitude Loss[1]		
CH1	100 mV/div				-3 dB to 3 dB	
	500 mV/div					
CH2	100 mV/div					
	500 mV/div					

Note[1]: Amplitude Loss (dB) = 20 × lg (Vrms2/Vrms1).

Time Base Accuracy Test

Channel	Test Result ΔT	Calculation Result[1]	Limit	Pass/Fail
CH1			±(25 ppm + 5 ppm/year × number of years that the instrument has been used[2])	

Note[1]: Calculation Result = Test Result ΔT/1 ms.
Note[2]: For the number of years that the instrument has been used, please calculate according to the date in the verification certificate provided when the instrument leaves factory.

Zero Point Offset Test

Channel	Fast Edge Signal Amplitude	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	1.2 Vpp	200 mV/div		≤ 2.5 ns	
	3 Vpp	500 mV/div			
CH2	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			