RIGOL

Performance Verification Guide

DS6000 Series Digital Oscilloscope

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RIGOL Technologies, Inc.

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If you have any problem or requirement when using our products or this manual, please contact **RIGOL**.

E-mail: service@rigol.com

Website: www.rigol.com

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 use the instrument only specified by this manual.

Use Proper Power Cord.

Only the 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, it is essential to connect the earth terminal of the power cord to the Protective Earth terminal before connecting any inputs or outputs.

Connect the Probe Correctly.

If a probe is used, do not connect the ground lead to high voltage since it has isobaric electric potential as the ground.

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.

Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might be exposed to the danger of electrical shock.

Do Not Operate Without Covers.

Do not operate the instrument with covers or panels removed.

Do Not Insert Anything Into the Holes of Fan.

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.

Do Not Operate With Suspected Failures.

If you suspect damage occurs 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.

Keep Well Ventilation.

Inadequate ventilation may cause an increase of instrument temperature which would cause damage to the instrument. So please keep the instrument well ventilated and inspect the intake and fan regularly.

Do Not Operate in Wet Conditions.

In order to avoid short circuiting to the interior of the device or electric shock, please do not operate the instrument in a humid environment.

Do Not Operate in an Explosive Atmosphere.

In order to avoid damage to the device or personal injuries, it is important to operate the device away from an explosive atmosphere.

Keep Product Surfaces Clean and Dry.

To avoid the influence of dust and/or moisture in the air, please keep the surface of the device clean and dry.

Electrostatic Prevention.

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.

Proper Use of Battery.

If a battery is supplied, it must not be exposed to high temperature or in contact with fire. Keep it out of the reach of children. Improper change of battery (note: lithium battery) may cause explosion. Use **RIGOL** specified battery only.

Handling Safety.

Please handle with care during transportation to avoid damage to buttons, knob interfaces and other parts on the panels.

Safety Terms and Symbols

Terms Used in this Manual. These terms may appear in this manual:

WARNING

Warning statements indicate conditions or practices that could result in injury or loss of life.

CAUTION

Caution statements indicate conditions or practices that could result in damage to this product or other property.

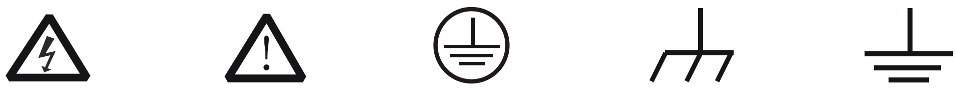
Terms Used on the Product. These terms may appear on the product:

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.

Symbols Used on the Product. These symbols may appear on the product:



Hazardous Voltage	Safety Warning	Protective Earth Terminal	Chassis Ground	Test Ground

Allgemeine Sicherheits Informationen

Überprüfen Sie diefolgenden Sicherheitshinweise sorgfältigumPersonenschädenoderSchäden am Gerätundan damit verbundenen weiteren Gerätenzu vermeiden. Zur Vermeidung vonGefahren, nutzen Sie bitte das Gerät nur so, wiein diesem Handbuchangegeben.

Um Feuer oder Verletzungen zu vermeiden, verwenden Sie ein ordnungsgemäßes Netzkabel.

Verwenden Sie für dieses Gerät nur das für ihr Land zugelassene und genehmigte Netzkabel.

Erden des Gerätes.

Das Gerät ist durch den Schutzleiter im Netzkabel geerdet. Um Gefahren durch elektrischen Schlag zu vermeiden, ist es unerlässlich, die Erdung durchzuführen. Erst dann dürfen weitere Ein- oder Ausgänge verbunden werden.

Anschluss einesTastkopfes.

Die Erdungsklemmen der Sonden sindauf dem gleichen Spannungspegel des Instruments geerdet. SchließenSie die Erdungsklemmen an keine hohe Spannung an.

Beachten Sie alle Anschlüsse.

Zur Vermeidung von Feuer oder Stromschlag, beachten Sie alle Bemerkungen und Markierungen auf dem Instrument. Befolgen Sie die Bedienungsanleitung für weitere Informationen, bevor Sie weitere Anschlüsse an das Instrument legen.

Verwenden Sie einen geeigneten Überspannungsschutz.

Stellen Sie sicher, daß keinerlei Überspannung (wie z.B. durch Gewitter verursacht) das Gerät erreichen kann. Andernfallsbestehtfür den Anwender die GefahreinesStromschlages.

Nicht ohne Abdeckung einschalten.

Betreiben Sie das Gerät nicht mit entfernten Gehäuse-Abdeckungen.

Betreiben Sie das Gerät nicht geöffnet.

Der Betrieb mit offenen oder entfernten Gehäuseteilen ist nicht zulässig. Nichts in entsprechende Öffnungen stecken (Lüfter z.B.)

Passende Sicherung verwenden.

Setzen Sie nur die spezifikationsgemäßen Sicherungen ein.

Vermeiden Sie ungeschützte Verbindungen.

Berühren Sie keine unisolierten Verbindungen oder Baugruppen, während das Gerät in Betrieb ist.

Betreiben Sie das Gerät nicht im Fehlerfall.

Wenn Sie am Gerät einen Defekt vermuten, sorgen Sie dafür, bevor Sie das Gerät wieder betreiben, dass eine Untersuchung durch **RIGOL** autorisiertem Personal durchgeführt wird. Jedwede Wartung, Einstellarbeiten oder Austausch von Teilen am Gerät, sowie am Zubehör dürfen nur von **RIGOL** autorisiertem Personal durchgeführt werden.

Belüftung sicherstellen.

Unzureichende Belüftung kann zu Temperaturanstiegen und somit zu thermischen Schäden am Gerät führen. Stellen Sie deswegen die Belüftung sicher und kontrollieren regelmäßig Lüfter und Belüftungsöffnungen.

Nicht in feuchter Umgebung betreiben.

Zur Vermeidung von Kurzschluß im Geräteinneren und Stromschlag betreiben Sie das Gerät bitte niemals in feuchter Umgebung.

Nicht in explosiver Atmosphäre betreiben.

Zur Vermeidung von Personen- und Sachschäden ist es unumgänglich, das Gerät ausschließlich fernab jedweder explosiven Atmosphäre zu betreiben.

Geräteoberflächen sauber und trocken halten.

Um den Einfluß von Staub und Feuchtigkeit aus der Luft auszuschließen, halten Sie bitte die Geräteoberflächen sauber und trocken.

Schutz gegen elektrostatische Entladung (ESD).

Sorgen Sie für eine elektrostatisch geschützte Umgebung, um somit Schäden und Funktionsstörungen durch ESD zu vermeiden. Erden Sie vor dem Anschluß immer Innen- und Außenleiter der Verbindungsleitung, um statische Aufladung zu entladen.

Die richtige Verwendung desAkku.

Wenneine Batterieverwendet wird, vermeiden Sie hohe Temperaturen bzw. Feuer ausgesetzt werden. Bewahren Sie es außerhalbder Reichweitevon Kindern auf. UnsachgemäßeÄnderung derBatterie (Anmerkung: Lithium-Batterie) kann zu einer Explosion führen. VerwendenSie nur von **RIGOL** angegebenenAkkus.

Sicherer Transport.

Transportieren Sie das Gerät sorgfältig (Verpackung!), um Schäden an Bedienelementen, Anschlüssen und anderen Teilen zu vermeiden.

Sicherheits Begriffe und Symbole

Begriffe in diesem Guide. Diese Begriffe können in diesem Handbuch auftauchen:

WARNING

Die Kennzeichnung WARNING beschreibt Gefahrenquellen die leibliche Schäden oder den Tod von Personen zur Folge haben können.

CAUTION

Die Kennzeichnung Caution (Vorsicht) beschreibt Gefahrenquellen die Schäden am Gerät hervorrufen können.

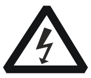
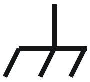
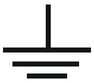
Begriffe auf dem Produkt. Diese Bedingungen können auf dem Produkt erscheinen:

DANGER weist auf eine Verletzung oder Gefährdung hin, die sofort geschehen kann.

WARNING weist auf eine Verletzung oder Gefährdung hin, die möglicherweise nicht sofort geschehen.

CAUTION weist auf eine Verletzung oder Gefährdung hin und bedeutet, dass eine mögliche Beschädigung des Instruments oder anderer Gegenstände auftreten kann.

Symbole auf dem Produkt. Diese Symbole können auf dem Produkt erscheinen:

				
Gefährliche Spannung	**Sicherheits-Hinweis**	**Schutz-erde**	**Gehäusemasse**	**Erde**

Contents

Document Overview

This manual guides users to correctly test the performance of **RIGOL** DS6000 series digital oscilloscope.

Main topics in 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 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:

Front Panel Key: denoted by "Text Box + Button Name (Bold)", for example, **UTIL**.
Menu Softkey: denoted by "Character Shading + Menu Word (Bold)", for example, **Self-Cal**.
Operation Step: denoted by an arrow "→", for example, **UTIL** → **Self-Cal**.

Content Conventions in this Manual:

DS6000 series digital oscilloscope includes the following models. In this manual, DS6104 is taken as an example to illustrate the performance verification test methods. Unless otherwise noted, the introductions in this manual are applicable to other models.

Model	DS6104	DS6102	DS6064	DS6062
Analog Bandwidth	1 GHz	1 GHz	600 MHz	600 MHz
Number of Channels	4	2	4	2
Max Real-time Sample Rate	5 GSa/s			
Standard Memory Depth	140 Mpts			
Waveform Capture Rate	Up to 180 000 wfs/s			

Chapter 1 Overview

Test Preparations

The following preparations should be done before the test.

1. Self-test: perform self-test to make sure that the oscilloscope can work normally;
2. Warm-up: warm the oscilloscope up for at least 30 minutes;
3. Self-calibration: calibrate the oscilloscope.

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 and users can hear the sound of relay switching. The welcome screen is displayed after the self-test is finished. Users can view the self-test results by pressing **UTIL** → **System** → **SelfTestInfo**.

If the self-test fails, make sure that the problems are found and resolved and do not perform calibration and 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. Then, follow the steps to calibrate the oscilloscope.

1. Connect the **[Trig Out/Calibration]** connector at the rear panel of the oscilloscope to the four analog input channels and the external trigger input channel at the front panel respectively using a one-to-five BNC (M) cable.
2. Press **UTIL** → **Self-Cal** at the front panel to enter the self-calibration interface.
3. Press **Start** and the oscilloscope will start to execute the self-calibration.
4. It takes about 20 minutes (15 minutes for dual-channel models) to finish the calibration. Restart the oscilloscope when "Calibration finished, please restart the oscilloscope!" is displayed.
5. Press **ACQ** → **Acquisition** to select "Average"; then, press **Averages** and use to set the number of averages to 16.
6. Disconnect the input signals of all the channels. 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 1 div, you should 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 *DS6000 User's Guide* or *DS6000 Data Sheet* (can be downloaded from 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 DS6000 series digital oscilloscope by taking DS6104 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

Test Plan	Device	Specification	Recommended Model
Plan 1	Oscilloscope Calibrator	DC output voltage range: 1 MΩ: 1 mV to 200 V 50 MΩ: 1 mV to 200 V The rise time of fast edge signal: ≤ 150 ps	Fluke 9500B
Plan 2	Digital Multimeter	The resistance measurement accuracy is higher than ±0.1% of reading	**RIGOL** DM3058/3068
	Test Cable	BNC (M) to Dual-banana plug cable	--
	Function/Arbitrary Waveform Generator	Frequency accuracy: ±1 ppm	**RIGOL** DG4162
	Dual-BNC Cable	BNC (M)-BNC (M) cable	--

Note:

1. Make sure that the oscilloscope passes the self-test and self-calibration is performed before executing 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	
Specification	1 MΩ: 0.99 MΩ to 1.01 MΩ
	50 Ω: 49.25 Ω to 50.75 Ω

Test Connection Diagram

Figure 2-1 Impedance Test Connection Diagram

Test Procedures

1. Impedance test of CH1-CH4 when the input impedance is 1 MΩ

1) Connect the active signal terminal of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.
2) Configure the oscilloscope:
   a) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   b) Press **CH1** → **Input** to set the input impedance of CH1 to 1 MΩ.
   c) Rotate **VERTICAL** **SCALE** to set the vertical scale of CH1 to 200 mV/div.
3) Enable 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; then, read and record the resistance measured.
5) Turn off CH1. Measure the resistances of CH2, CH3 and CH4 respectively using the method above and record the measurement results.

2. Impedance test of CH1-CH4 when the input impedance is 50 Ω

1) Connect the active signal terminal of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.
2) Configure the oscilloscope:
   a) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   b) Press **CH1** → **Input** to set the input impedance of CH1 to 50 Ω.

c) Rotate **VERTICAL** **SCALE** to set the vertical scale of CH1 to 200 mV/div.

3) Enable Fluke 9500B; set its impedance to 50 Ω 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; then, read and record the resistance measurement value.
5) Turn off CH1. Measure the resistances of CH2, CH3 and CH4 respectively using the method above and record the measurement results.

3. Impedance test of the [EXT TRIG] channel

1) Disconnect the connections of the four input channels.
2) Connect the external trigger channel **[EXT TRIG]** of the oscilloscope with the active signal terminal of Fluke 9500B.
3) Press **UTIL** → **Ext impedance** to set the input impedance of the external trigger channel to 1 MΩ.
4) Enable Fluke 9500B; set its impedance to 1 MΩ and select the resistance measurement function. Read and record the resistance measured.
5) Press **UTIL** → **Ext impedance** to set the input impedance of the external trigger channel to 50 Ω.
6) Set the impedance of Fluke 9500B to 50 Ω. Read and record the resistance measured.

Test Record Form

CH1-CH4 (1MΩ Input Impedance)

Channel	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	200 mV/div		0.99 MΩ to 1.01 MΩ	
	500 mV/div			
CH2	200 mV/div			
	500 mV/div			
CH3	200 mV/div			
	500 mV/div			
CH4	200 mV/div			
	500 mV/div			

CH1-CH4 (50 Ω Input Impedance)

Channel	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	200 mV/div		49.25 Ω to 50.75 Ω	
	500 mV/div			
CH2	200 mV/div			
	500 mV/div			
CH3	200 mV/div			
	500 mV/div			
CH4	200 mV/div			
	500 mV/div			

External Trigger Channel

Channel	Input Impedance	Test Result	Limit	Pass/Fail
EXT TRIG	1 MΩ		0.99 MΩ to 1.01 MΩ	
	50 Ω		49.25 Ω to 50.75 Ω	

DC Gain Accuracy Test

Specification

DC Gain Accuracy	
Specification	±2% × Full Scale[1]

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

Test Connection Diagram

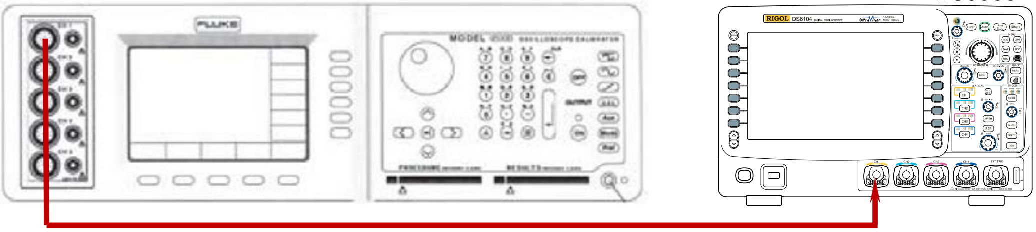


Figure 2-2 DC Gain Accuracy Test Connection Diagram

Test Procedures

1. DC gain accuracy test when the input impedance is 50 Ω

1) Connect the active signal terminal of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.
2) Enable Fluke 9500B and set its impedance to 50 Ω.
3) Output a DC signal with +6 mV_{DC} voltage (Vout1) via Fluke 9500B.
4) Configure the oscilloscope:
   a) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   b) Press **CH1** → **Probe** → **Ratio** to set the probe attenuation ratio to "1X".
   c) Press **CH1** → **Input** to set the input impedance of CH1 to 50 Ω.
   d) Rotate **VERTICAL** **SCALE** to set the vertical scale to 2 mV/div.
   e) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 2 ms.
   f) Press **VERTICAL** **POSITION** to set the vertical position to 0.
   g) Press **ACQ** → **Acquisition** and use to select "Average". Then, press **Averages** and use to set the number of averages to 32.
5) Press **MENU** → **Vavg** at the left side of the screen of the oscilloscope to enable the average measurement function. Read and record Vavg1.
6) Adjust Fluke 9500B to make it output a DC signal with -6 mV_{DC} voltage (Vout2).
7) Press **MENU** → **Vavg** at the left side of the screen of the oscilloscope to enable 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:
    a) Set the vertical scale to 5 mV/div, 10 mV/div, 20 mV/div, 50 mV/div, 100 mV/div, 200 mV/div, 500 mV/div and 1 V/div respectively.
    b) Adjust the output voltage of Fluke 9500B to 3 × the current vertical scale and -3 × the current vertical scale respectively.
    c) Repeat steps 3) to 7) and record the test results.
    d) 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, CH3 and CH4 respectively using the method above and record the test results.

2. DC gain accuracy test when the input impedance is 1 MΩ

1) Connect the active signal terminal of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.
2) Set the impedance of Fluke 9500B to 1 MΩ.
3) Output a DC signal with +6 mV_{DC} voltage (Vout1) via Fluke 9500B.
4) Configure the oscilloscope:
    a) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
    b) Press **CH1** → **Probe** → **Ratio** to set the probe attenuation ratio to "1X".
    c) Press **CH1** → **Input** to set the input impedance of CH1 to 1 MΩ.
    d) Repeat d) to g) in step 4) in **DC gain accuracy test when the input impedance is 50 Ω**.
5) Test the relative error of each scale of CH1 (add the tests of 2 V/div and 5 V/div) according to steps 5) to 9) in **DC gain accuracy test when the input impedance is 50 Ω** and record the test results.
6) Turn off CH1. Test the relative error of each scale of CH2, CH3 and CH4 respectively using the method above and record the test results.

Test Record Form

50 Ω Input Impedance

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH1	2 mV/div				≤ 2%	
	5 mV/div					
	10 mV/div					
	20 mV/div					
	50 mV/div					
	100 mV/div					
	200 mV/div					
	500 mV/div					
	1 V/div					
CH2	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					
CH3	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					
CH4	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					

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.

1 MΩ Input Impedance

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH1	2 mV/div				≤ 2%	
	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					
CH2	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					

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.

(Continue) 1 MΩ Input Impedance

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH3	2 mV/div				≤ 2%	
	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					
CH4	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					

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]	-3 dB to 1 dB

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

Test Connection Diagram

Figure 2-3 Bandwidth Test Connection Diagram

Test Procedures

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

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

3. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   2) Press **CH1** → **Probe** → **Ratio** to set the probe attenuation ratio to "1X".
   3) Press **CH1** → **Input** to set the input impedance of CH1 to 50 Ω.
   4) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 500 ns.
   5) Rotate **VERTICAL** **SCALE** to set the vertical scale to 200 mV/div.
   6) Press **HORIZONTAL** **POSITION** and **VERTICAL** **POSITION** to set the horizontal position and vertical position to 0 respectively.
   7) Press **TRIGGER** **LEVEL** to set the trigger level to 0 V.

4. Output a sine signal with 1 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.

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

6. Output a sine signal with 1 GHz frequency (the setting value is different for different model of oscilloscope under test; please refer to Table 2-2) and 1.2 Vpp amplitude via Fluke 9500B.

Table 2-2 Setting Value of the Oscilloscope under Test

Model	Full Bandwidth	Horizontal Time Base
DS606X	600 MHz	1 ns
DS610X	1 GHz	500 ps

7. Rotate **HORIZONTAL** **SCALE** of the oscilloscope to set the horizontal time base to 500 ps (the setting value is different for different model of oscilloscope under test; please refer to Table 2-2).

8. Press **MENU** → **Vrms** at the left side of the screen of the oscilloscope to enable 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 signal with 1 MHz frequency and 3 Vpp amplitude via Fluke 9500B.

12. Repeat step 5.

13. Output a sine signal with 1 GHz frequency (the setting value is different for different model of oscilloscope under test; please refer to Table 2-2) and 3 Vpp amplitude via Fluke 9500B.

14. Repeat steps 7 to 9.

15. Turn off CH1. Test CH2, CH3 and CH4 respectively using the above test steps and record the test results.

Test Record Form

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vrms1	Vrms2	Amplitude Loss[1]		
CH1	200 mV/div				-3 dB to 1 dB	
	500 mV/div					
CH2	200 mV/div					
	500 mV/div					
CH3	200 mV/div					
	500 mV/div					
CH4	200 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 and 250 MHz bandwidth limit function of the oscilloscope respectively by testing the amplitude losses of the oscilloscope under test at the bandwidth limits.

Specification

Bandwidth Limit	
Amplitude Loss[1]	-3 dB to 1 dB

Note[1]: Amplitude Loss (dB) = 20 × lg (Vrmsn/Vrms1). Wherein, Vrmsn represents Vrms2 or Vrms3; Vrms1 is the measurement result of the amplitude effective value at 1 MHz; Vrms2 is the measurement result of the amplitude effective value at the bandwidth limit; Vrms3 is the measurement result of the amplitude effective value when the frequency is greater than the bandwidth limit.

Test Connection Diagram

Figure 2-4 Bandwidth Limit Test Connection Diagram

Test Procedures

1. 20 MHz Bandwidth Limit Test

1) Connect the active signal terminal of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.
2) Enable Fluke 9500B and set its impedance to 50 Ω.
3) Configure the oscilloscope:
   a) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   b) Press **CH1** → **Probe** → **Ratio** to set the probe attenuation ratio to “1X”.
   c) Press **CH1** → **Input** to set the input impedance to 50 Ω.
   d) Rotate **VERTICAL** **SCALE** to set the vertical scale to 200 mV/div.
   e) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 500 ns.
   f) Press **HORIZONTAL** **POSITION** and **VERTICAL** **POSITION** respectively to set the horizontal position and vertical position to 0.
   g) Press **TRIGGER** **LEVEL** to set the trigger level to 0 V.

4) Press **CH1** → **BW Limit** and use ↺ to select "20 M" bandwidth limit.
5) Output a sine signal with 1 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.
6) Press **MENU** →**Vrms** at the left side of the screen of the oscilloscope to enable the effective value measurement function. Read and record Vrms1.
7) Output a sine signal with 20 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.
8) Rotate **HORIZONTAL** **SCALE** of the oscilloscope to set the horizontal time base to 20 ns.
9) Press **MENU** →**Vrms** at the left side of the screen of the oscilloscope to enable 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) Output a sine signal with 40 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.
12) Rotate **HORIZONTAL** **SCALE** of the oscilloscope to set the horizontal time base to 10 ns.
13) Press **MENU** →**Vrms** at the left side of the screen of the oscilloscope to enable the effective value measurement function. Read and record Vrms3.
14) Calculate the amplitude loss: **Amplitude Loss A2 (dB) = 20 × lg (Vrms3/Vrms1)**. At this point, the amplitude loss should be lower than -3 dB.
15) Keep the other settings of the oscilloscope in step 3) unchanged and set the vertical scale to 500 mV/div.
16) Output a sine signal with 1 MHz frequency and 3 Vpp amplitude via Fluke 9500B.
17) Repeat step 6).
18) Output a sine signal with 20 MHz frequency and 3 Vpp amplitude via Fluke 9500B.
19) Repeat steps 8) to 10).
20) Output a sine signal with 40 MHz frequency and 3 Vpp amplitude via Fluke 9500B.
21) Repeat steps 12) to 14).
22) Turn off CH1. Test CH2, CH3 and CH4 respectively using the above test method and record the test results.

2. 250 MHz Bandwidth Limit Test

1) Connect the active signal terminal of Fluke 9500B to CH1 of the oscilloscope, as shown in the figure above.
2) Enable Fluke 9500B and set its impedance to 50 Ω.
3) Configure the oscilloscope:
   a) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   b) Press **CH1** → **Probe** → **Ratio** to set the probe attenuation ratio to "1X".
   c) Press **CH1** → **Input** to set the input impedance to 50 Ω.
   d) Rotate **VERTICAL** **SCALE** to set the vertical scale to 200 mV/div.
   e) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 500 ns.
   f) Press **HORIZONTAL** **POSITION** and **VERTICAL** **POSITION** respectively to set the horizontal position and vertical position to 0.
   g) Press **TRIGGER** **LEVEL** to set the trigger level to 0 V.
4) Press **CH1** → **BW Limit** and use ↺ to select "250 M" bandwidth limit.

5) Output a sine waveform with 1 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.
6) Press **MENU** →**Vrms** at the left side of the screen of the oscilloscope to enable the effective value measurement function. Read and record Vrms1.
7) Output a sine waveform with 250 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.
8) Rotate **HORIZONTAL** **SCALE** of the oscilloscope to set the horizontal time base to 2 ns.
9) Press **MENU** →**Vrms** at the left side of the screen of the oscilloscope to enable 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) Output a sine waveform with 500 MHz frequency and 1.2 Vpp amplitude via Fluke 9500B.
12) Rotate **HORIZONTAL** **SCALE** of the oscilloscope to set the horizontal time base to 1 ns.
13) Press **MENU** →**Vrms** at the left side of the screen of the oscilloscope to enable the effective value measurement function. Read and record Vrms3.
14) Calculate the amplitude loss: **Amplitude Loss A2 (dB) = 20 × lg (Vrms3/Vrms1)**. At this point, the amplitude loss should be lower than -3 dB.
15) Keep the other settings of the oscilloscope in step 3) unchanged and set the vertical scale to 500 mV/div.
16) Output a sine waveform with 1 MHz frequency and 3 Vpp amplitude via Fluke 9500B.
17) Repeat step 6).
18) Output a sine waveform with 250 MHz frequency and 3 Vpp amplitude via Fluke 9500B.
19) Repeat steps 8) to 10).
20) Output a sine waveform with 500 MHz frequency and 3 Vpp amplitude via Fluke 9500B.
21) Repeat steps 12) to 14).
22) Turn off CH1. Test CH2, CH3 and CH4 respectively using the above test method and record the test results.

Test Record Form

20 MHz Bandwidth Limit Test

Channel	Vertical Scale	Test Result			Calculation Result		Limit	Pass/Fail
		Vrms1	Vrms2	Vrms3				
CH1	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH2	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH3	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH4	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	

Note[1]: Amplitude Loss A1 (dB) = 20 × lg (Vrms2/Vrms1).

Note[2]: Amplitude Loss A2 (dB) = 20 × lg (Vrms3/Vrms1).

250 MHz Bandwidth Limit Test

Channel	Vertical Scale	Test Result			Calculation Result		Limit	Pass/ Fail
		Vrms1	Vrms2	Vrms3				
CH1	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH2	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH3	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH4	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	

Note[1]: Amplitude Loss A1 (dB) = 20 × lg (Vrms2/Vrms1).

Note[2]: Amplitude Loss A2 (dB) = 20 × lg (Vrms3/Vrms1).

Time Base Accuracy Test

Specification

Time Base Accuracy[1]	
Specification	≤ ±(4 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 ±2 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

Fluke 9500B

DS6000

Figure 2-5 Time Base Accuracy Test Connection Diagram

Test Procedures

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

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

3. Output a sine waveform with 10 MHz frequency and 1 Vpp amplitude via Fluke 9500B.

4. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   2) Press **CH1** → **Probe** → **Ratio** to set the probe attenuation ratio to “1X”.
   3) Press **CH1** → **Input** to set the input impedance to 50 Ω.
   4) Rotate **VERTICAL** **SCALE** to set the vertical scale to 200 mV/div.
   5) Rotate **VERTICAL** **POSITION** to set the vertical position to 0.
   6) Rotate **HORIZONTAL** **POSITION** to set the horizontal position to 1 ms.
   Tip: To quickly set the horizontal position to 1 ms, you can first rotate **HORIZONTAL**

SCALE to set the horizontal time base to 50 ms.

7) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 5 ns.

5. Observe the screen of the oscilloscope. Press **CURS** → **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 2 ns, the time base accuracy is 2 ns/1 ms = 2 ppm.

7. Calculate the limit of the time base accuracy using the formula "±(4 ppm + 2 ppm/year × Number of years that the instrument has been used)".

Test Record Form

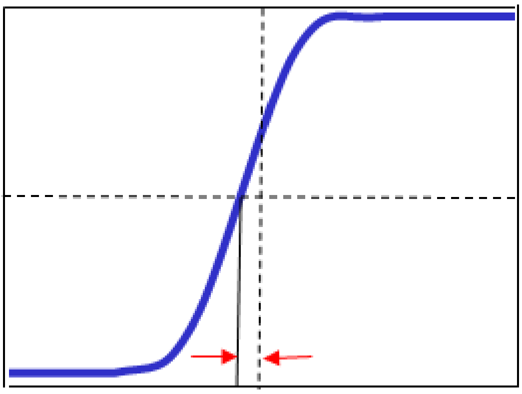
Channel	Test Result ΔT	Calculation Result[1]	Limit	Pass/Fail
CH1			±(4 ppm + 2 ppm/year × Number of years that the instrument has been used[2])	

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	±0.5 div × Minimum Time Base Scale[1]

Note[1]: For different models of oscilloscopes under test, the minimum time base scales are different. For DS610X, the minimum time base scale is 500 ps/div; for DS606X, the minimum time base scale is 1 ns/div.

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, as shown in the figure above.

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

3. Output a fast edge signal with 150 ps rise time and 1.2 Vpp amplitude via Fluke 9500B.

4. Configure the oscilloscope:
   1) Press **CH1** in the vertical control area (VERTICAL) at the front panel to enable CH1.
   2) Press **CH1** → **Probe** → **Ratio** to set the probe attenuation ratio to “1X”.
   3) Press **CH1** → **Input** to set the input impedance to 50 Ω.
   4) Press **ACQ** → **Sampling** to select “Real Time”.
   5) Rotate **VERTICAL** **SCALE** to set the vertical scale to 200 mV/div.
   6) Rotate **HORIZONTAL** **SCALE** to set the horizontal time base to 500 ps (the setting value is different for different model of oscilloscope under test; please refer to Table 2-3).

   Table 2-3 Horizontal Time Base Setting Value for the Oscilloscope under Test

Model	Horizontal Time Base
DS610X	500 ps/div
DS606X	1 ns/div

   7) Rotate **VERTICAL** **POSITION** and **HORIZONTAL** **POSITION** respectively to set the vertical position and horizontal position to appropriate values.
   8) Rotate **TRIGGER** **LEVEL** to adjust the trigger level to the middle of the screen.

5. Observe the screen of the oscilloscope. Press **CURS** → **Mode** →“Manual” to enable the manual cursor function. Measure the zero point offset using manual cursor measurement and record the measurement result.

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

7. Output a fast edge signal with 150 ps rise time and 3 Vpp amplitude via Fluke 9500B.

8. Measure the zero point offset according to the above method and record the test result.

9. Turn off CH1. Test CH2, CH3 and CH4 respectively 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		≤ 0.5 div × Minimum Time Base Scale[1]	
	3 Vpp	500 mV/div			
CH2	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			
CH3	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			
CH4	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			

Note[1]: For different models of oscilloscopes, the minimum time base scales are different. For DS610X, the minimum time base scale is 500 ps/div; for DS606X, the minimum time base scale is 1 ns/div.

Appendix Test Record Form

RIGOL DS6000 Series Digital Oscilloscope Performance Verification Test Record Form

Model: _______________ Tested by: _______________ Test Date: _______________

Impedance Test

CH1-CH4 (1 MΩ Input Impedance)

Channel	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	200 mV/div		0.99 MΩ to 1.01 MΩ	
	500 mV/div			
CH2	200 mV/div			
	500 mV/div			
CH3	200 mV/div			
	500 mV/div			
CH4	200 mV/div			
	500 mV/div			

CH1-CH4 (50 Ω Input Impedance)

Channel	Vertical Scale	Test Result	Limit	Pass/Fail
CH1	200 mV/div		49.25 Ω to 50.75 Ω	
	500 mV/div			
CH2	200 mV/div			
	500 mV/div			
CH3	200 mV/div			
	500 mV/div			
CH4	200 mV/div			
	500 mV/div			

External Trigger Channel

Channel	Vertical Scale	Test Result	Limit	Pass/Fail
EXT TRIG	1 MΩ		0.99 MΩ to 1.01 MΩ	
	50 Ω		49.25 Ω to 50.75 Ω	

DC Gain Accuracy Test

50 Ω Input Impedance

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH1	2 mV/div				≤ 2%	
	5 mV/div					
	10 mV/div					
	20 mV/div					
	50 mV/div					
	100 mV/div					
	200 mV/div					
	500 mV/div					
	1 V/div					
CH2	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					
CH3	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					
CH4	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					

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.

1 MΩ Input Impedance

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH1	2 mV/div				≤ 2%	
	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					
CH2	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					
CH3	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					

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.

(Continue) 1 MΩ Input Impedance Test Record Form

Channel	Vertical Scale	Test Result			Limit	Pass/Fail
		Vavg1	Vavg2	Calculation Result[1]		
CH4	2 mV/div				≤ 2%	
	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					

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	200 mV/div				-3 dB to 1 dB	
	500 mV/div					
CH2	200 mV/div					
	500 mV/div					
CH3	200 mV/div					
	500 mV/div					
CH4	200 mV/div					
	500 mV/div					

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

Bandwidth Limit Test

20 MHz Bandwidth Limit Test

Channel	Vertical Scale	Test Result			Calculation Result		Limit	Pass/ Fail
		Vrms1	Vrms2	Vrms3				
CH1	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH2	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH3	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH4	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	

Note[1]: Amplitude Loss A1 (dB) = 20 × lg (Vrms2/Vrms1).

Note[2]: Amplitude Loss A2 (dB) = 20 × lg (Vrms3/Vrms1).

250 MHz Bandwidth Limit Test

Channel	Vertical Scale	Test Result			Calculation Result		Limit	Pass/ Fail
		Vrms1	Vrms2	Vrms3				
CH1	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH2	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH3	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
CH4	200 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	
	500 mV/div				Amplitude Loss A1[1]		-3 dB to 1 dB	
					Amplitude Loss A2[2]		≤-3 dB	

Note[1]: Amplitude Loss A1 (dB) = 20 × lg (Vrms2/Vrms1).

Note[2]: Amplitude Loss A2 (dB) = 20 × lg (Vrms3/Vrms1).

Time Base Accuracy Test

Channel	Test Result ΔT	Calculation Result[1]	Limit	Pass/Fail
CH1			±(4 ppm + 2 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		≤ 0.5 div × Minimum Time Base Scale[1]	
	3 Vpp	500 mV/div			
CH2	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			
CH3	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			
CH4	1.2 Vpp	200 mV/div			
	3 Vpp	500 mV/div			

Note[1]: For different models of oscilloscopes, the minimum time base scales are different. For DS610X, the minimum time base scale is 500 ps/div; for DS606X, the minimum time base scale is 1 ns/div.