RIGOL

Performance Verification Guide

DG1000 Series Dual-channel Function / Arbitrary Waveform Generator

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RIGOL Technologies, Inc.

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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 injuries or damages 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 by 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 power cord to the Protective Earth terminal before any inputs or outputs.

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.

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 expose to danger of electrical shock.

Do Not Operate Without Covers.

Do not operate the instrument with covers or panels removed.

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 qualified service 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 increasing of temperature or damages to the device. So please keep 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 in a humid environment.

Do Not Operate in an Explosive Atmosphere.

In order to avoid damages 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 air, please keep the surface of device clean and dry.

Electrostatic Prevention.

Operate in an electrostatic discharge protective area environment to avoid damages induced by static discharges. Always ground both the internal and external conductors of the cable to release static before connecting.

Handling Safety

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

Safety Terms and Symbols

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

DANGER	indicates an injury or hazard may immediately happen.
WARNING	indicates an injury or hazard may be accessible potentially.
CAUTION	indicates a potential damage to the instrument or other property might occur.

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

Hazardous Voltage

Please Refer to Manuals

Protective Earth Terminal

Chassis Ground

Test Ground

Document Overview

This manual guides users to correctly test the performance of **RIGOL** DG1000 series dual-channel function/arbitrary waveform generator. For the operation method of the instrument, please refer to the corresponding User's Guide.

Main topics in this manual:

Chapter 1 Overview

This chapter introduces the preparations and precautions of the performance verification test.

Chapter 2 Performance Verification Test

This chapter introduces the limit, test method and procedures of each performance.

Appendix Test Record Form

In the appendix, a test record form is provided for recording the test results so as to determine whether each performance fulfills the requirement.

Format Conventions in this Manual:

Front Panel Key: denoted by "Text Box + Button Name (Bold)", for example, **Utility**.
Menu Softkey: denoted by "Character Shading + Menu Word (Bold)", for example, **I/O**.
Operation Step: denoted by an arrow "→", for example, **Utility** → **I/O**.

Content Conventions in this Manual:

In this manual, DG1022 is taken as an example to illustrate the performance verification test method. The introductions in this manual are applicable to all the models of the DG1000 series.

Model	Channels	Max. Frequency	Sample Rate
DG1022	2	20 MHz	100 MSa/s
DG1022A	2	25 MHz	100 MSa/s

Contents

Chapter 1 Overview

Test Preparations

Make sure the instrument has been warmed up for at least 30 minutes under the specified operational temperature (18℃ to 28℃) before performing the test.

Recommended Test Devices

The test devices used in this manual are listed in Table 1-1. You can also use other test devices that fulfill the performance requirements for the performance verification tests.

Table 1-1 Recommended Test Devices

Device	Performance Requirement	Recommended
Frequency Counter	>10 MHz Accuracy: 0.1 ppm	Agilent 53131A
Digital Multimeter	$6^1/_2$ digit	**RIGOL** DM3068
Power Meter	-30 dBm to +20 dBm Accuracy: ±0.02 dB Resolution: 0.01 dB	Agilent E4416A
Spectrum Analyzer	Minimum resolution bandwidth is 10 Hz	**RIGOL** DSA1000A
Oscilloscope	Rise/fall time measurement function	**RIGOL** DS4000 Series
Cable	BNC (m)-BNC (m)	--
Cable	BNC (m)-Dual banana plug (m)	--
50 Ω Load	50 Ω/1 W	--
Power Sensor	-35 dBm to +20 dBm	Agilent N8482A
Power Sensor Cable	Used to connect the power meter and power sensor	--
Connector	N (f)-BNC (m)	--
Connector	BNC (f)-N (m)	--

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 specifications of each test item are provided in chapter 2. For other specifications, refer to DG1000 User's Guide or DG1000 Data Sheet (can be downloaded from www.rigol.com).

Tip:

All the specifications are only valid when the instrument has been warmed up for more than 30 minutes under the specified operational temperature (18℃ to 28℃).

Chapter 2 Performance Verification Test

Taking DG1022 as an example, this chapter introduces the method of performance verification test for DG1000 series dual-channel function/arbitrary waveform generator.

Test items include:

- Frequency Accuracy Test
- AC Amplitude Accuracy Test
- DC Offset Accuracy Test
- AC Amplitude Flatness Test
- Harmonic Distortion Test
- Rise/Fall Time Test

Note:

1) Make sure that the instrument has been warmed up for at least 30 minutes before executing any of the following tests.
2) Any of the following tests must be done under the specified operational temperature (18℃ to 28℃).
3) Please reset the instrument to factory setting before or after executing any of the following tests.

Frequency Accuracy Test

Specification:

Frequency Characteristics	
Accuracy	Within 90 days: ±50 ppm Within 1 year: ±100 ppm
Note: ppm denotes one part per million. For example, if the setting frequency is 1 MHz, the actual output frequency is between 0.999950 MHz (-50 ppm) and 1.000050 MHz (+50 ppm) within 90 days from the last calibration, the frequency accuracy of the instrument is guaranteed and the test passes; the actual output frequency is between 0.999900 MHz (-100 ppm) and 1.000100 MHz (+100 ppm) within 1 year from the last calibration, the frequency accuracy of the instrument is guaranteed and the test passes**.**	

Test Device:

1. Frequency Counter

Test Procedures:

1. Connect CH1 of DG1000 with the signal input terminal of the frequency counter using the dual-BNC cable as shown in the figure below.

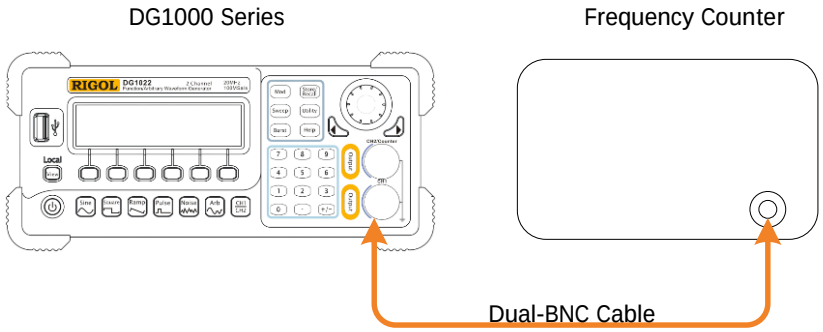

Figure 2-1 Connect DG1000 and the Frequency Counter

2. Set the output impedance of the frequency counter to 1 MΩ.
3. Press **Utility** → **System** → **Setting** → **Default** → **Yes** to restore DG1000 to factory setting.
4. Configure DG1000 to output a sine waveform with 1 MHz frequency and 1 Vpp amplitude. Press **Output** to enable CH1.

5. Record the current reading of the frequency counter.
6. Configure DG1000 to output a square and pulse waveform with 1 MHz frequency and 1 Vpp amplitude respectively. Record the current readings of the frequency counter.
7. Test the frequency accuracy of CH2 according to the steps above and record the test results.

Test Record Form:

Channel: CH1

Waveform	Setting	Measurement Value	Limit calculated from specification[1]	Pass /Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		Within 90 days: 0.999950 MHz to 1.000050 MHz Within 1 year: 0.999900 MHz to 1.000100 MHz		
Square					
Pulse					

Channel: CH2

Waveform	Setting	Measurement Value	Limit calculated from specification[1]	Pass /Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		Within 90 days: 0.999950 MHz to 1.000050 MHz Within 1 year: 0.999900 MHz to 1.000100 MHz		
Square					
Pulse					

Note[1]: Within 90 days from last calibration: ±50 ppm; within 1 year from last calibration: ±100 ppm; 18℃ to 28℃.

AC Amplitude Accuracy Test

Specification:

Output Characteristics	
Amplitude (into 50 Ω)	
Accuracy	Typical (1 kHz sine) ±(2% of setting value+2 mVpp)

Test Devices:

1. Digital Multimeter
2. 50 Ω Load

Test Procedures:

1. Connect the 50Ω load to CH1 of DG1000; connect the 50 Ω load and the voltage input terminals of the digital multimeter using the BNC-Dual banana plug cable as shown in the figure below.

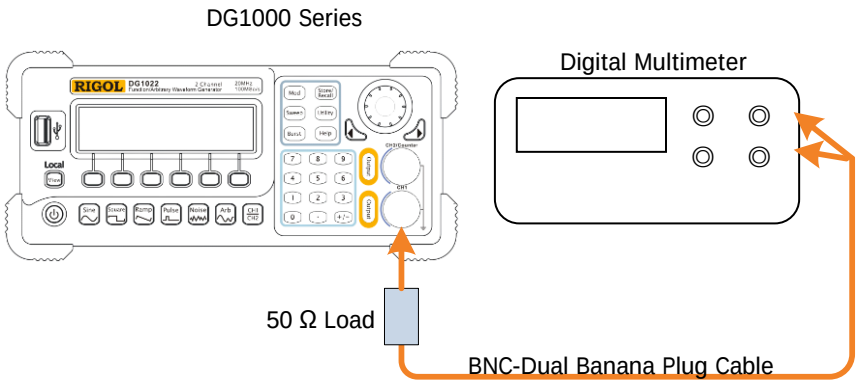

Figure 2-2 Connect DG1000 and the Digital Multimeter via the 50Ω Load

2. Select AC voltage (ACV) measurement function for digital multimeter and set the range to “Auto”.
3. Press **Utility** → **System** → **Setting** → **Default** → **Yes** to restore DG1000 to factory setting.
4. Configure DG1000:
   a) Set the output impedance of CH1 to 50 Ω (press **Utility** → **CH1**→ **Load**).
   b) Output a sine waveform with 1 kHz frequency, 0 V_{DC} offset and 20 mVpp

amplitude.

c) Press **Output** to enable CH1.

5. Record the reading of the multimeter and check whether the reading exceeds the range listed in "Limit of Output Amplitude (Vrms)" in Table 2-1.
6. Keep other settings of DG1000 unchanged, set the output amplitude to 100 mVpp, 500 mVpp, 1 Vpp, 5 Vpp and 10 Vpp respectively, record the readings of the multimeter and check whether the readings exceed the ranges listed in "Limit of Output Amplitude (Vrms)" in the table below.

Table 2-1 Limits of AC Amplitude Accuracy Test

Setting Amplitude (Vpp)	Permitted Error[1] (Vpp)	Limit of Output Amplitude (Vpp)	Limit of Output Amplitude (Vrms) [2]
20 mVpp	±2.4 mVpp	17.6~22.4 mVpp	6.2~7.9 mVrms
100 mVpp	±4 mVpp	96~104 mVpp	33.9~36.8 mVrms
500 mVpp	±12 mVpp	488~512 mVpp	172.6~181.0 mVrms
1 Vpp	±22 mVpp	0.978~1.022 Vpp	345.8~361.4 mVrms
5 Vpp (only for CH1)	±102 mVpp	4.898~5.102 Vpp	1.732~1.804 Vrms
10 Vpp (only for CH1)	±202 mVpp	9.798~10.202 Vpp	3.464~3.607 Vrms
3 Vpp (only for CH2) [3]	±62 mVpp	2.938~3.062 Vpp	1.0388~1.0827 Vrms

Note[1]: "Permitted Error" is calculated from the specification "±(2% of setting value+2 mVpp)".

Note[2]: "Limit of Output Amplitude (Vrms)" is calculated from "Limit of Output Amplitude (Vpp)".

The conversion relation between Vrms and Vpp is $1\mathrm{Vpp} = 2\sqrt{2}Vrms$.

Note[3]: The maximum output amplitude of CH2 is 3 Vpp (the impedance is 50 Ω).

7. Repeat the above steps to test the AC amplitude accuracy of CH2 and record the test results (pay attention to the difference in step 6: set the output amplitude to 100 mVpp, 500 mVpp, 1 Vpp and 3 Vpp respectively).

Test Record Form:

Channel: CH1

Setting Amplitude	Setting	Measurement Value	Limit calculated from specification[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz Offset: 0 V_{DC} Impedance: 50 Ω		6.2~7.9 mVrms		
100 mVpp			33.9~36.8 mVrms		
500 mVpp			172.6~181.0 mVrms		
1 Vpp			345.8~361.4 mVrms		
5 Vpp			1.732~1.804 Vrms		
10 Vpp			3.464~3.607 Vrms		

Channel: CH2

Setting Amplitude	Setting	Measurement Value	Limit calculated from specification[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz Offset: 0 V_{DC} Impedance: 50 Ω		6.2~7.9 mVrms		
100 mVpp			33.9~36.8 mVrms		
500 mVpp			172.6~181.0 mVrms		
1 Vpp			345.8~361.4 mVrms		
3 Vpp			1.0388~1.0827 Vrms		

Note[1]: Typical (1 kHz sine) ±(2% of setting value+2 mVpp)

DC Offset Accuracy Test

Specification:

Output Characteristics	
DC Offset	
Accuracy	±(2% of |Offset Setting|+2mV)

Test Devices:

1. Digital Multimeter
2. 50 Ω Load

Test Procedures:

1. Connect the 50Ω load to CH1 of DG1000; connect the 50 Ω load and the voltage input terminals of the digital multimeter using the BNC-Dual banana plug cable as shown in Figure 2-2.
2. Select DC voltage (DCV) measurement function for digital multimeter and set the range to 20 V scale.
3. Press **Utility** → **System** → **Setting** → **Default** → **Yes** to restore DG1000 to factory setting.
4. Configure DG1000:
   a) Set the output impedance of CH1 to 50 Ω (press **Utility** → **CH1**→ **Load**);
   b) Output a sine waveform with 1 kHz frequency, 1 Vpp amplitude and 1 V_{DC} offset;
   c) Press **Output** to enable CH1.
5. Record the reading of the multimeter and check if the reading exceeds the range listed in the “Limit of Offset” in Table 2-2.
6. Keep other settings of DG1000 unchanged, set the offset to -2.5 V_{DC}, -1 V_{DC}, 1 V_{DC} and 2.5 V_{DC} respectively, record the readings of the multimeter and check whether the readings exceed the ranges listed in “Limit of Offset” in Table 2-2.

Table 2-2 Limits of DC Offset Accuracy Test

Setting Offset	Permitted Error [1]	Limit of Offset [2]
-2.5 V_{DC}	±0.052 V_{DC}	-2.552~-2.448 V_{DC}
-1 V_{DC}	±0.022 V_{DC}	-1.022~-0.978 V_{DC}
1 V_{DC}	±0.022 V_{DC}	0.978~1.022 V_{DC}
2.5 V_{DC}	±0.052 V_{DC}	2.448~2.552 V_{DC}

Note[1]: "Permitted Error" is calculated from the specification "±(2% |Setting Offset|+2 mV)".

Note[2]: Limit of Offset = Setting Offset ± Permitted Error

7. Repeat the above steps to test the DC offset accuracy of CH2 and record the test results (pay attention to the difference in step 6: set the offset to -1 V_{DC}, -500 mV_{DC}, 500 mV_{DC} and 1 mV_{DC} respectively).

Test Record Form:

Channel: CH1

Setting Offset	Setting	Measurement Value	Limit of Offset [1]	Pass/Fail	
-2.5 V_{DC}	Frequency: 1 kHz Amplitude: 1 Vpp Impedance: 50 Ω		-2.552~-2.448 V_{DC}		
-1 V_{DC}			-1.022~-0.978 V_{DC}		
1 V_{DC}			0.978~1.022 V_{DC}		
2.5 V_{DC}			2.448~2.552 V_{DC}		

Channel: CH2

Setting Offset	Setting	Measurement Value	Limit of Offset [1]	Pass/Fail	
-1 V_{DC}	Frequency: 1 kHz Amplitude: 1 Vpp Impedance: 50 Ω		-1.022~-0.978 V_{DC}		
-500 mV_{DC}			-0.512~-0.488 V_{DC}		
500 mV_{DC}			0.488~0.512 V_{DC}		
1 V_{DC}			0.978~1.022 V_{DC}		

Note[1]: Limit of Offset = Setting Offset ± Permitted Error

AC Amplitude Flatness Test

Specification:

Output Characteristics	
Flatness (relative to 1 kHz Sine wave, 5 Vpp, 50 Ω)	Typical (CH1) <100 kHz ±0.1 dB 100 kHz ~ 5 MHz ±0.15 dB 5 MHz ~ 20 MHz/25 MHz ±0.3 dB

Test Devices:

1. Digital Multimeter
2. 50 Ω Load
3. Power Meter
4. Power Sensor

Test Procedures:

1. Connect the 50 Ω load to CH1 of DG1000; connect the 50 Ω load and the voltage input terminals of the digital multimeter using the BNC-Dual banana plug cable as shown in Figure 2-2.
2. Press **Utility** → **System** → **Setting** → **Default** → **Yes** to restore DG1000 to factory setting.
3. Configure DG1000:
   a) Set the output impedance of CH1 to 50 Ω (press **Utility** → **CH1**→ **Load**);
   b) Output a sine waveform with 1 kHz frequency and 5 Vpp amplitude;
   c) Press **Output** to enable CH1.
4. Select the AC voltage (ACV) measurement function for the multimeter. Enable the dBm operation function and set the reference resistance to 50 Ω. Read the measurement value and use it as the reference power (P_{ref}). (Tip: you can also calculate the reference power using the formula 10 x Log10 [(Reading^2 / Rref) / 1 mW according to the measurement value of the multimeter).
5. Calibrate the power meter:
   a) Connect the power sensor with the input terminal and **[POWER REF]** terminal of the power meter respectively.
   b) Press **Zero/Cal** →**Zero**; after the zeroing finishes, press **Cal**; after the calibration finishes, enable **power reference** and observe whether the measurement value of the power meter is a 0 dBm, 50 MHz signal.

c) Disable **power reference**.

d) Disconnect the power sensor and the **[POWER REF]** terminal of the power meter.

6. Disconnect DG1000 and the multimeter. Connect the power sensor with CH1 of DG1000 as shown in the figure below.

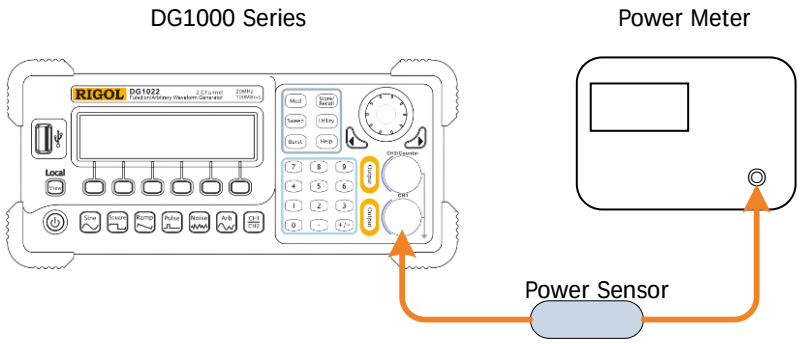

Figure 2-3 Connect DG1000 and the Power Meter

7. Keep other settings of DG1000 unchanged and set the output frequency to 50 kHz. Set the frequency factor of the power meter to 50 kHz, record the measurement value of the power meter and check whether the result of "measurement value - P_{ref}" is in the range from -0.1 dB to +0.1 dB.
8. Keep other settings of DG1000 unchanged and set the output frequency to 1 MHz. Set the frequency factor of the power meter to 1 MHz, record the measurement value of the power meter and check whether the result of "measurement value - P_{ref}" is in the range from -0.15 dB to +0.15 dB.
9. Keep other settings of DG1000 unchanged and set the output frequency to 10 MHz and 20 MHz (25 MHz for DG1022A) respectively. Set the frequency factor of the power meter accordingly, record the measurement values of the power meter and check whether the results of "measurement value - P_{ref}" are in the range from -0.3 dB to +0.3 dB.

Test Record Form:

Channel: CH1

Reference Power Value P_{ref}						
Setting Frequency	**Setting**	**Amplitude Measurement Value**	**Calculation Result[1]**	**specification**	**Pass /Fail**	
50 kHz	Amplitude: 5 Vpp			±0.1 dB		
1 MHz				±0.15 dB		
10 MHz				±0.3 dB		
20 MHz (DG1022) 25 MHz (DG1022A)						

Note[1]: Calculation Result=Amplitude Measurement Value**-** P_{ref}

Harmonic Distortion Test

Specification:

Sine Wave Spectrum Purity				
Harmonic Distortion	**CH1**		**CH2**	
	≤1 Vpp	>1 Vpp	≤1 Vpp	>1 Vpp
DC~1 MHz	<-45 dBc	<-45 dBc	<-45 dBc	<-45 dBc
1 MHz~5 MHz	<-45 dBc	<-40 dBc	<-45 dBc	<-40 dBc
5 MHz~20 MHz (DG1022) 5 MHz~25 MHz (DG1022A)	<-45 dBc	<-35 dBc	<-45 dBc	<-35 dBc

Test Device:

1. Spectrum Analyzer

Test Procedures:

1. Connect the CH1 output terminal of DG1000 with the RF input terminal of the spectrum analyzer using dual-BNC cable and N-BNC adaptor as shown in the figure below.

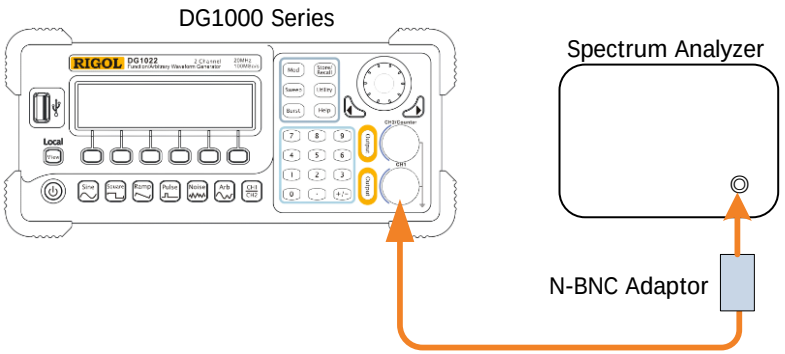

Figure 2-4 Connect DG1000 and the Spectrum Analyzer

2. Press **Utility** → **System** → **Setting** → **Default** → **Yes** to restore DG1000 to factory setting.
3. Configure DG1000:
   a) Set the output impedance of CH1 to 50 Ω (press **Utility** → **CH1**→ **Load**);

b) Output a sine waveform with 500 kHz frequency, 1 Vpp amplitude and 0 V_{DC} offset;
c) Press **Output** to enable CH1.

4. Set the spectrum analyzer:
   a) Set the input attenuation to 30 dB;
   b) Set the start frequency to 0 Hz and the stop frequency to 2 MHz;
   c) Set the reference level to 20 dBm;
   d) Set RBW to 1 kHz.
5. Enable the peak table function of the spectrum analyzer. Set proper peak measurement parameter to display the measurement results of the fundamental waveform and second harmonic in the peak table. Record the measurement Values.
6. Keep other settings of DG1000 unchanged, set the output frequency to 2 MHz, 10 MHz and 20 MHz (25 MHz for DG1022A) respectively and adjust the start frequency and stop frequency of the spectrum analyzer accordingly. Repeat step 5.
7. Keep other settings of DG1000 unchanged, set the output amplitude to 2 Vpp, repeat steps 3 through 6 and record the test results.
8. Repeat the steps above to test the harmonic distortion of CH2 and record the test results.

Test Record Form:

Channel: CH1

DG1000 Setting		Measurement Value	Calculation Result[1]	specification	Pass /Fail[2]	
Amplitude	Frequency					
1 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-45 dBc		
		2:				
2 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-40 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-35 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-35 dBc		
		2:				

Note[1]: Calculation Result=The Measurement Value of Second Harmonic—The Measurement Value of Fundamental Wave

Note[2]: If the calculation result is greater than the specification, the test fails.

Channel: CH2

DG1000 Setting		Measurement Value	Calculation Result[1]	specification	Pass /Fail[2]	
Amplitude	**Frequency**					
1 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-45 dBc		
		2:				
2 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-40 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-35 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-35 dBc		
		2:				

Note[1]: Calculation Result=The Measurement Value of Second Harmonic—The Measurement Value of Fundamental Wave

Note[2]: If the calculation result is greater than the specification, the test fails.

Rise/Fall Time Test

Specification:

Signal Characteristics	
Square	
Rise/Fall Time	< 20 ns (10% ~ 90%, typical, 1 kHz, 1 V_{PP})

Test Device:

1. Oscilloscope

Test Procedures:

1. Connect CH1 of DG1000 with the signal input terminal of oscilloscope using dual-BNC cable as shown in the figure below.

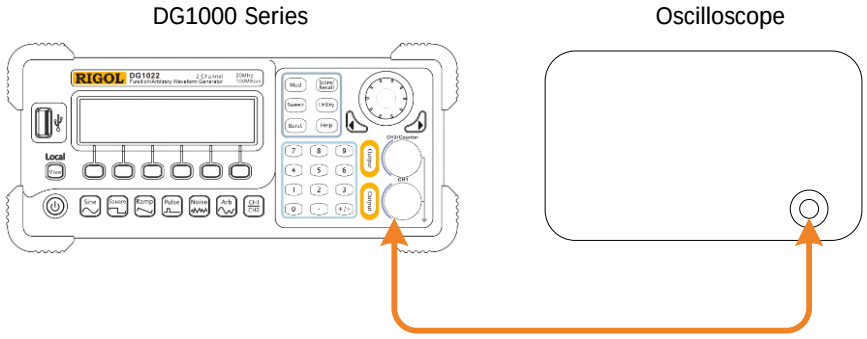

Figure 2-5 Connect DG1000 and the Oscilloscope

2. Press **Utility** → **System** → **Setting** → **Default** → **Yes** to restore DG1000 to factory setting.
3. Configure DG1000 to output a square waveform with 1 kHz frequency and 1 Vpp amplitude. Press **Output** to enable CH1.
4. Set the oscilloscope:
   a) Set the vertical scale to 200 mV/div;
   b) Set the horizontal time base to 20 ns;
   c) Set the trigger type to edge trigger and the trigger edge to rising edge. Adjust the trigger level to make the oscilloscope trigger stably.
5. Enable the rise time measurement function of the oscilloscope, record the

measurement value of the oscilloscope and check whether it is within the specification range.

6. Keep other settings unchanged and set the trigger edge of the oscilloscope to falling edge. Adjust the trigger level to make the oscilloscope trigger stably.
7. Enable the fall time measurement function of the oscilloscope, record the measurement value of the oscilloscope and check whether it is within the specification range.
8. Repeat the above steps to test the rise/fall time of CH2 and record the test results.

Test Record Form:

Channel: CH1

Waveform	Setting	Measurement Value		Specification	Pass /Fail	
Square	Frequency: 1 kHz Amplitude: 1 Vpp	Rise Time		Typical (1 Vpp, 10% ~ 90%) < 20 ns		
		Fall Time				

Channel: CH2

Waveform	Setting	Measurement Value		Specification	Pass /Fail	
Square	Frequency: 1 kHz Amplitude: 1 Vpp	Rise Time		Typical (1 Vpp, 10% ~ 90%) < 20 ns		
		Fall Time				

Appendix Test Record Form

RIGOL DG1000 Series Dual-channel Function/Arbitrary Waveform Generator
Performance Verification Test Record Form

Model: _____ Tested by:_____ Test Date:_____

Frequency Accuracy Test

Channel: CH1

Waveform	Setting	Measurement Value	Limit calculated from specification[1]	Pass /Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		Within 90 days: 0.999950 MHz to 1.000050 MHz Within 1 year: 0.999900 MHz to 1.000100 MHz		
Square					
Pulse					

Channel: CH2

Waveform	Setting	Measurement Value	Limit calculated from specification[1]	Pass /Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		Within 90 days: 0.999950 MHz to 1.000050 MHz Within 1 year: 0.999900 MHz to 1.000100 MHz		
Square					
Pulse					

Note[1]: Within 90 days from last calibration: ±50 ppm; within 1 year from last calibration: ±100 ppm; 18℃ to 28℃.

AC Amplitude Accuracy Test

Channel: CH1

Setting Amplitude	Setting	Measurement Value	Limit calculated from specification[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz Offset: 0 V_{DC} Impedance: 50 Ω		6.2~7.9 mVrms		
100 mVpp			33.9~36.8 mVrms		
500 mVpp			172.6~181.0 mVrms		
1 Vpp			345.8~361.4 mVrms		
5 Vpp			1.732~1.804 Vrms		
10 Vpp			3.464~3.607 Vrms		

Channel: CH2

Setting Amplitude	Setting	Measurement Value	Limit calculated from specification[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz Offset: 0 V_{DC} Impedance: 50 Ω		6.2~7.9 mVrms		
100 mVpp			33.9~36.8 mVrms		
500 mVpp			172.6~181.0 mVrms		
1 Vpp			345.8~361.4 mVrms		
3 Vpp			1.0388~1.0827 Vrms		

Note[1]: Typical (1 kHz sine) ±(2% of setting value+2 mVpp)

DC Offset Accuracy Test

Channel: CH1

Setting Offset	Setting	Measurement Value	Limit of Offset [1]	Pass/Fail	
-2.5 V_{DC}	Frequency: 1 kHz Amplitude: 1 Vpp Impedance: 50 Ω		-2.552~-2.448 V_{DC}		
-1 V_{DC}			-1.022~-0.978 V_{DC}		
1 V_{DC}			0.978~1.022 V_{DC}		
2.5 V_{DC}			2.448~2.552 V_{DC}		

Channel: CH2

Setting Offset	Setting	Measurement Value	Limit of Offset [1]	Pass/Fail	
-1 V_{DC}	Frequency: 1 kHz Amplitude: 1 Vpp Impedance: 50 Ω		-1.022~-0.978 V_{DC}		
-500 mV_{DC}			-0.512~-0.488 V_{DC}		
500 mV_{DC}			0.488~0.512 V_{DC}		
1 V_{DC}			0.978~1.022 V_{DC}		

Note[2]: Limit of Offset = Setting Offset ± Permitted Error

AC Amplitude Flatness Test

Channel: CH1

Reference Power (P_{ref})						
Setting Frequency	**Setting**	**Amplitude Measurement Value**	**Calculation Result[1]**	**specification**	**Pass /Fail**	
50 kHz	Amplitude: 5 Vpp			±0.1 dB		
1 MHz				±0.15 dB		
10 MHz				±0.3 dB		
20 MHz (DG1022) 25 MHz (DG1022A)						

Note[1]: Calculation Result=Amplitude Measurement Value- P_{ref}

Harmonic Distortion Test

Channel: CH1

DG1000 Setting		Measurement Value	Calculation Result[1]	specification	Pass /Fail[2]	
Amplitude	Frequency					
1 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-45 dBc		
		2:				
2 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-40 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-35 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-35 dBc		
		2:				

Note[1]: Calculation Result=The Measurement Value of Second Harmonic—The Measurement Value of Fundamental Wave

Note[2]: If the calculation result is greater than the specification, the test fails.

Channel: CH2

DG1000 Setting		Measurement	Calculation	specification	Pass	
Amplitude	**Frequency**	**Value**	**Result[1]**		**/Fail[2]**	
1 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-45 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-45 dBc		
		2:				
2 Vpp	500 kHz	1(fundamental wave):		<-45 dBc		
		2:				
	2 MHz	1(fundamental wave):		<-40 dBc		
		2:				
	10 MHz	1(fundamental wave):		<-35 dBc		
		2:				
	20 MHz (DG1022) 25 MHz (DG1022A)	1(fundamental wave):		<-35 dBc		
		2:				

Note[1]: Calculation Result=The Measurement Value of Second Harmonic－The Measurement Value of Fundamental Wave

Note[2]: If the calculation result is greater than the specification, the test fails.

Rise/Fall Time Test

Channel: CH1

Waveform	Setting	Measurement Value		Specification	Pass /Fail	
Square	Frequency: 1 kHz Amplitude: 1 Vpp	Rise Time		Typical (1 Vpp, 10% ~ 90%) < 20 ns		
		Fall Time				

Channel: CH2

Waveform	Setting	Measurement Value		Specification	Pass /Fail	
Square	Frequency: 1 kHz Amplitude: 1 Vpp	Rise Time		Typical (1 Vpp, 10% ~ 90%) < 20 ns		
		Fall Time				