RIGOL

DG800 Pro Series

Function/Arbitrary Waveform Generator

Performance Verification

Mar. 2024

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1 Safety Requirement

1.1 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 the BNC Output Connectors Properly.**

  The front-panel and BNC output connectors only allow signal output but unable to support signal input.

- **Use Proper Power Cord.**

  Only the exclusive power cord designed for the instrument and authorized for use within the destination country could be used.

- **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 objects into the air outlet, as doing so may cause damage to the instrument.

- **Avoid Circuit or Wire Exposure.**

  Do not touch exposed junctions and components when the instrument 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.**

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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 Instrument 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.

WARNING

Equipment meeting Class A requirements may not offer adequate protection to broadcast services within residential environment.

1.2 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.

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Safety Notices 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**

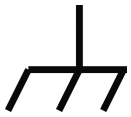
  It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

Safety Symbols on the Product:

Hazardous Voltage

Safety Warning

Protective Earth Terminal



Chassis Ground

Test Ground

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2 Document Overview

This manual is designed to guide you to properly test the performance specifications of RIGOL DG800 Pro Series Function/Arbitrary Waveform Generator. For the operation methods mentioned in the test procedures, refer to User Guide of this product.

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Format Conventions in this Manual

1. **Key**

   The front panel key is denoted by the menu key icon. For example, Default indicates the "Default" key.

2. **Menu**

   The menu item is denoted by the format of "Menu Name (Bold) + Character Shading" in the manual. For example, **Setup** indicates the "Setup" sub-menu under the "Utility" function menu.

3. **Operation Procedures**

   The next step of the operation is denoted by ">" in the manual. For example, > **Utility** indicates first clicking or tapping and then clicking or tapping **Utility**.

Content Conventions in this Manual

DG800 Pro Series Function/Arbitrary Waveform Generator includes the following models. Unless otherwise specified, this manual takes the two-channel model DG852 Pro as an example to illustrate the methods for the performance verification test of DG800 Pro series.

Model	No. of Channels	Sample Rate	Max. Output Frequency
DG821 Pro	1	625 MSa/s	25 MHz
DG822 Pro	2	625 MSa/s	25 MHz
DG852 Pro	2	625 MSa/s	50 MHz

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3 Overview

3.1 Test Preparations

Before the test, please make sure that the instrument is within the calibration period (1 year recommended) and has been operating for at least 20 minutes at a specified operating temperature (23℃±5℃).

3.2 Recommended Test Equipment

Use the test equipment listed in the following table to verify the performance of DG800 Pro. If the exact instrument model is not available, it is recommended to select the substitute equipment that can meet the following "Specification".

Table 3.1 Recommended Test Equipment

Equipment	Specification	Recommended Model
Frequency Counter	>10 MHz Accuracy: 0.1 ppm	Agilent 53131A
Digital Multimeter	6½ digits	RIGOL DM3068
Power Meter	-30 dBm to +20 dBm Accuracy: ±0.02 dB Resolution: 0.01 dB	Agilent E4416A
Spectrum Analyzer	Min. resolution bandwidth: 10 Hz	RIGOL DSA875
Oscilloscope	Bandwidth: ≥500 MHz Rise/Fall time measurement function Overshoot measurement function	RIGOL DHO4804
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

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Equipment	Specification	Recommended Model
Power Sensor Cable	Used to connect the power meter and power sensor	-
Adaptor	N (f)-BNC (m)	-
Adaptor	BNC (f)-N (m)	-

3.3 Test Considerations

For better performance, all procedures should comply with the following recommendations:

1. Before making the performance verification test, please make sure that the instrument has been operating for at least 20 minutes at a specified operating temperature (23℃±5℃).
2. Each test should be performed at the specified operating temperature (23℃±5℃).
3. Please reset the instrument to the factory setting before or after executing any of the tests.

3.4 Test Result Record

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

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.

3.5 Specifications

The specification of each test item is provided in this manual. For other technical parameters, refer to *DG800 Pro Data Sheet* (download it from RIGOL website: www.rigol.com).

TIP

All the specifications are valid only when the instrument has been operating for more than 20 minutes within the specified operating temperature range (23℃±5℃).

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4 Performance Verification Test

This chapter takes the CH1 of the two-channel model DG852 Pro as an example to illustrate the performance verification test methods of DG800 Pro series. The testing methods are also applicable to CH2.

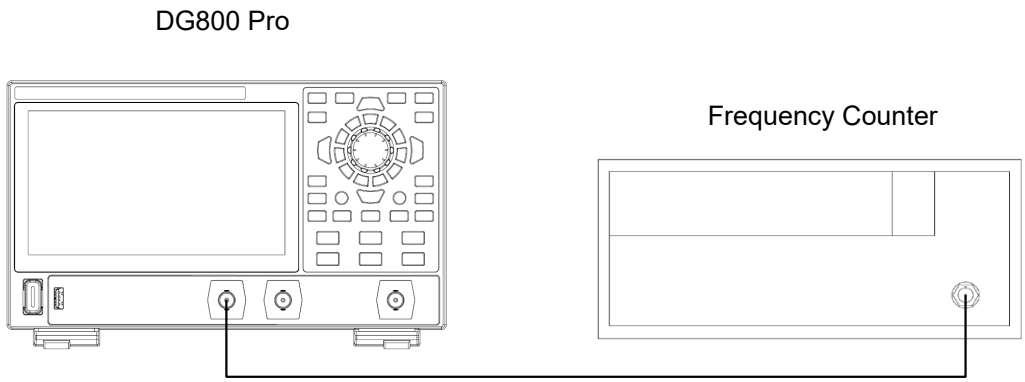
4.1 Frequency Accuracy Test

4.1.1 Specification

Frequency Accuracy	
Specification	±10^{-6} of the setting value (except Arb and Sequence), 0℃ to 40℃ ±10^{-6} of the setting value ±1 μHz (Arb and Sequence), 0℃ to 40℃

4.1.2 Test Procedures

1. As shown in the figure below, use the dual BNC cable to connect the output terminal of DG800 Pro to the signal input terminal of the frequency counter. This case takes CH1 as an example. The test method also applies to CH2.



2. Set the input impedance of the frequency counter to 1 MΩ.
3. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.
4. Set up the DG800 Pro series:
   a. Set CH1 to output a Sine wave with 1 MHz frequency and 1 Vpp amplitude.
   b. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.

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5. Record the current reading on the frequency counter and verify that the reading is between 0.999999 MHz and 1.000001 MHz.
6. Set DG800 Pro to output Square, Ramp, Pulse, and Harmonics respectively (1 MHz frequency, 1 Vpp amplitude). Record the reading on the counter respectively and verify that the reading is within 0.999999 MHz and 1.000001 MHz.
7. (Two-channel models only) Repeat the steps above to test the frequency accuracy for CH2 and record the test results.

4.1.3 Test Record Form

Channel: CH1

Waveform	Setting	Measured Value	Limit[1]	Pass/Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		0.999999 MHz to 1.000001 MHz		
Square			0.999999 MHz to 1.000001 MHz		
Ramp			0.999999 MHz to 1.000001 MHz		
Pulse			0.999999 MHz to 1.000001 MHz		
Harmonic			0.999999 MHz to 1.000001 MHz		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Waveform	Setting	Measured Value	Limit[1]	Pass/Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		0.999999 MHz to 1.000001 MHz		
Square			0.999999 MHz to 1.000001 MHz		
Ramp			0.999999 MHz to 1.000001 MHz		
Pulse			0.999999 MHz to 1.000001 MHz		
Harmonic			0.999999 MHz to 1.000001 MHz		

Note[1]: $\pm 10^{-6}$ of the setting value (except Arb and Sequence), 0℃ to 40℃

4.2 AC Amplitude Accuracy Test

4.2.1 Specification

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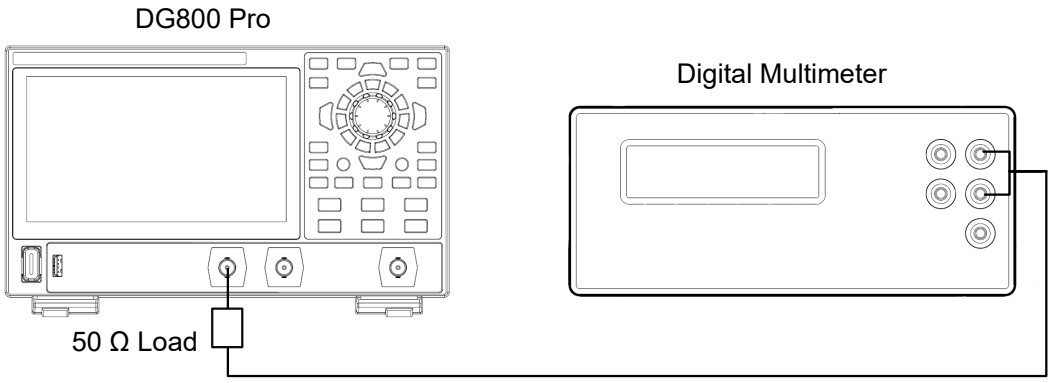
AC Amplitude Accuracy[1]	
Specification	±(1% of the setting value + 2 mVpp)(into 50 Ω) ±(1% of the setting value + 5 mVpp)(into HighZ)

Note[1]: 1 kHz Sine, amplitude > 1 mVpp, 0 V offset, unit: Vpp.

4.2.2 Test Procedures

1. Connect the 50 Ω load to the output terminal of DG800 Pro. This case takes CH1 as example. The test method also applies to CH2. Then use the BNC-dual banana plug cable to connect the 50 Ω load and the voltage input terminal of the digital multimeter.



2. Select the AC voltage (ACV) measurement function for the multimeter and set the range to "2 V".
3. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.
4. Set up the DG800 Pro series:
   a. Set the output impedance of CH1 to 50 Ω (in CH1 setup interface, click or tap the **Channel** tab and select "Load" in the drop-down menu of **Imped**).
   b. Set CH1 to output a Sine wave with 1 kHz frequency, 0 Vdc offset, and 20 mVpp amplitude.
   c. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.
5. Record the reading on the multimeter and verify that the reading is within the range specified in the "Limits of Amplitude Output Value (Vrms)".
6. Keep other settings unchanged for DG800 Pro and adjust the output waveform amplitude of CH1 to 100 mVpp, 500 mVpp, 1 Vpp, 5 Vpp, and 10 Vpp respectively. When the amplitude of the output waveform is set to 100 mVpp or 500 mVpp, keep the 2 V range for the multimeter; when the amplitude of the output waveform is set to 1 Vpp, 5 Vpp, or 10 Vpp, set the range to 20 V. Record the

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reading on the multimeter and verify that the reading is within the range specified in the "Limits of Amplitude Output Value (Vrms)".

Amplitude Setting (Vpp)	Permissible Error[1] (Vpp)	Limits of Amplitude Output Value (Vpp)	Limits of Amplitude Output Value (Vrms)[2]
20 mVpp	±2.2 mV	17.8 mVpp to 22.2 mVpp	6.3 mVrms to 7.8 mVrms
100 mVpp	±3 mV	97 mVpp to 103 mVpp	34.3 mVrms to 36.4 mVrms
500 mVpp	±7 mV	493 mVpp to 507 mVpp	174.3 mVrms to 179.3 mVrms
1 Vpp	±12 mV	0.988 Vpp to 1.012 Vpp	349.3 mVrms to 357.8 mVrms
5 Vpp	±52 mV	4.948 Vpp to 5.052 Vpp	1.7494 Vrms to 1.7862 Vrms
10 Vpp	±102 mV	9.898 Vpp to 10.102 Vpp	3.4995 Vrms to 3.5716 Vrms

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

Note[2]: "Limits of Amplitude Output Value (Vrms)" is calculated from "Limits of Amplitude Output Value (Vpp)". The conversion relationship between Vrms and Vpp: $Vpp = 2\sqrt{2}\ Vrms$.

7. (Two-channel models only) Repeat the steps above to test the AC amplitude accuracy for CH2 and record the test results.

4.2.3 Test Record Form

Channel: CH1

Amplitude Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz		6.3 mVrms to 7.8 mVrms		
100 mVpp	Offset: 0 Vdc		34.3 mVrms to 36.4 mVrms		
500 mVpp	Impedance: 50 Ω		174.3 mVrms to 179.3 mVrms		

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Amplitude Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
1 Vpp			349.3 mVrms to 357.8 mVrms		
5 Vpp			1.7494 mVrms to 1.7862 mVrms		
10 Vpp			3.4995 mVrms to 3.5716 mVrms		

Channel: CH2 (only for DG822 Pro/DG852 Pro)

Amplitude Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz Offset: 0 Vdc Impedance: 50 Ω		6.3 mVrms to 7.8 mVrms		
100 mVpp			34.3 mVrms to 36.4 mVrms		
500 mVpp			174.3 mVrms to 179.3 mVrms		
1 Vpp			349.3 mVrms to 357.8 mVrms		
5 Vpp			1.7494 mVrms to 1.7862 mVrms		
10 Vpp			3.4995 mVrms to 3.5716 mVrms		

Note[1]: 1 kHz Sine, amplitude > 1 mVpp, 0 V offset, unit: Vpp. ±(1% of the setting value + 2 mVpp).

4.3 DC Offset Accuracy Test

4.3.1 Specification

DC Offset Accuracy	
Specification	±(1% of |setting value| + 2 mVdc + 0.5% of amplitude (Vpp)) (into 50 Ω) ±(1% of |setting value| + 5 mVdc + 1% of amplitude (Vpp)) (into HighZ)

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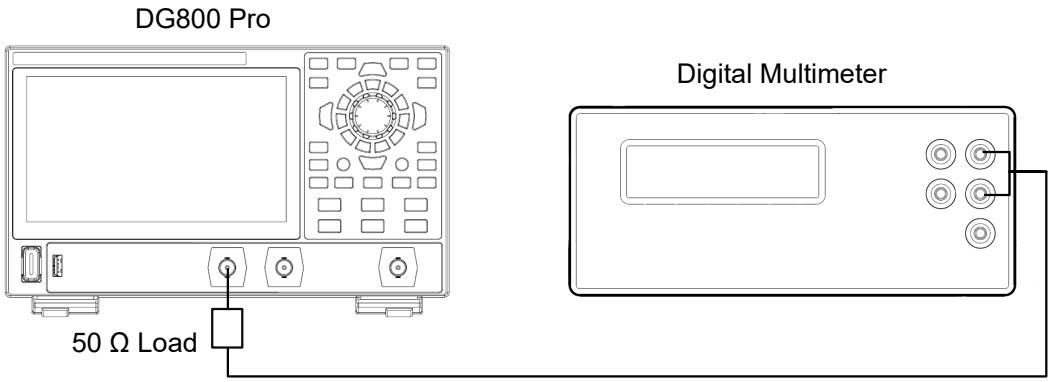
4.3.2 Test Procedures

1. Connect the 50 Ω load to the output terminal of DG800 Pro. This case takes CH1 as example. The test method also applies to CH2. Then use the BNC-dual banana plug cable to connect the 50 Ω load and the voltage input terminal of the digital multimeter.



2. Select the DC voltage (DCV) measurement function for the multimeter and set the range to 20 V.
3. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.
4. Set up the DG800 Pro series:
   a. Set the output impedance of CH1 to 50 Ω (in CH1 setup interface, click or tap the **Channel** tab and select "Load" in the drop-down menu of **Imped**).
   b. Set CH1 to output a Sine wave with 1 kHz frequency, 5 Vpp amplitude, and 0 Vdc offset.
   c. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.
5. Record the reading on the multimeter and verify that the reading is within the range specified in the "Offset Limit" of the table below.
6. Keep the other settings unchanged and adjust the output waveform offset of CH1 to -2.5 Vdc, -1 Vdc, -500 mVdc, 500 mVdc, 1 Vdc, and 2.5 Vdc respectively. Record the reading on the multimeter and verify that the reading is within the "Offset Limit" specified in the table below.

Offset Setting	Amplitude Setting	Permissible Error[1]	Offset Limit
-2.5 Vdc	5 Vpp	±0.052 Vdc	-2.552 Vdc to -2.448 Vdc
-1 Vdc		±0.037 Vdc	-1.037 Vdc to -0.963 Vdc
-500 mVdc		±0.032 Vdc	-0.532 Vdc to -0.468 Vdc

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Offset Setting	Amplitude Setting	Permissible Error[1]	Offset Limit
0 Vdc		±0.027 Vdc	-0.027 Vdc to +0.027 Vdc
+500 mVdc		±0.032 Vdc	0.468 Vdc to 0.532 Vdc
+1 Vdc		±0.037 Vdc	0.963 Vdc to 1.037 Vdc
+2.5 Vdc		±0.052 Vdc	2.448 Vdc to 2.552 Vdc

Note[1]: "Permissible Error" is calculated from the specification "±(1% of |the setting value| + 2 mV + 0.5% of the amplitude (Vpp))".

7. (Two-channel models only) Repeat the steps above to verify the DC offset accuracy for CH2 and record the test result.

4.3.3 Test Record Form

Channel: CH1

Offset Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
-2.5 Vdc	Frequency: 1 kHz Amplitude: 5 Vpp Impedance: 50 Ω		-2.552 Vdc to -2.448 Vdc		
-1 Vdc			-1.037 Vdc to -0.963 Vdc		
-500 mVdc			-0.532 Vdc to -0.468 Vdc		
0 Vdc			-0.027 Vdc to +0.027 Vdc		
500 mVdc			0.468 Vdc to 0.532 Vdc		
1 Vdc			0.963 Vdc to 1.037 Vdc		
2.5 Vdc			2.448 Vdc to 2.552 Vdc		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Offset Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
-2.5 Vdc	Frequency: 1 kHz Amplitude: 5 Vpp Impedance: 50 Ω		-2.552 Vdc to -2.448 Vdc		
-1 Vdc			-1.037 Vdc to -0.963 Vdc		
-500 mVdc			-0.532 Vdc to -0.468 Vdc		
0 Vdc			-0.027 Vdc to +0.027 Vdc		

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Offset Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
500 mVdc			0.468 Vdc to 0.532 Vdc		
1 Vdc			0.963 Vdc to 1.037 Vdc		
2.5 Vdc			2.448 Vdc to 2.552 Vdc		

Note[1]: the offset limit value is calculated from the offset setting value ± permissible error. The permissible error is calculated from the specification "±(1% of |the setting value| + 2 mVdc + 0.5% of the amplitude (Vpp))".

4.4 AC Flatness Test

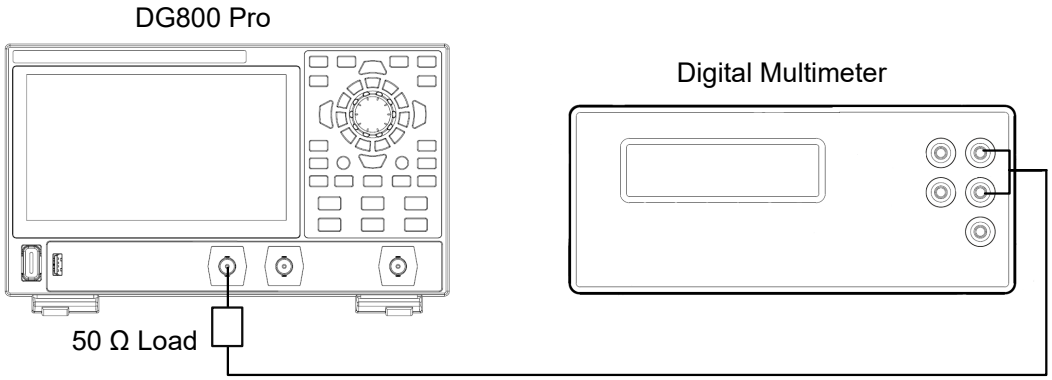
4.4.1 Specification

AC Flatness	
Flatness	Typical (relative to 1 kHz Sine, 0 dBm) <10 MHz: ±0.1 dB ≥10 MHz: ±0.2 dB

4.4.2 Test Procedures

Test Procedures

1. Connect the 50 Ω load to the output terminal of DG800 Pro. This case takes CH1 as example. The test method also applies to CH2. Then use the BNC-dual banana plug cable to connect the 50 Ω load and the voltage input terminal of the digital multimeter.



2. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.

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3. Set up the DG800 Pro series:

   a. Set the output impedance of CH1 to 50 Ω (in CH1 setup interface, click or tap the **Channel** tab and select "Load" in the drop-down menu of **Imped**).

   b. Set CH1 to output a Sine wave with 1 kHz frequency and 0 dBm amplitude.

   c. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.

4. Select the AC voltage measurement function for the multimeter and enable the dBm operation. Set the reference resistance to 50 Ω and read the measured value as the reference power value (P_{ref}).

TIP

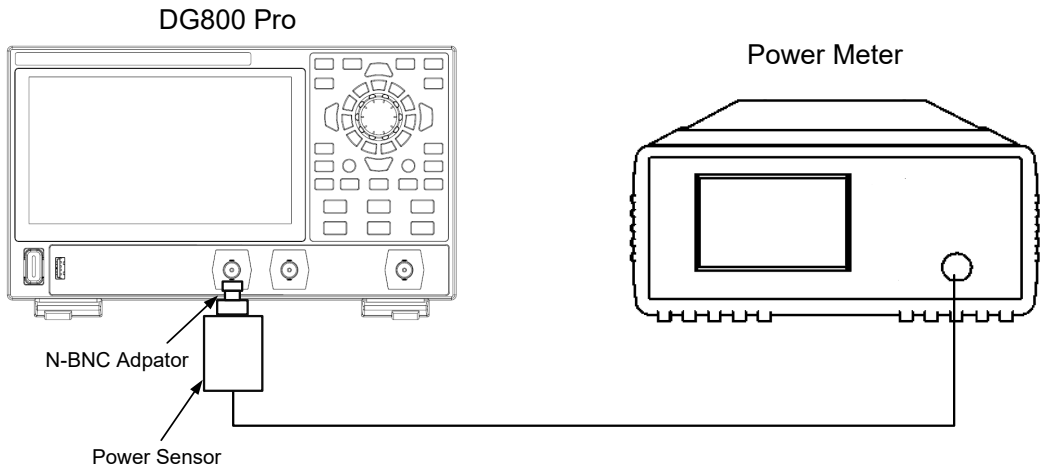
In this step, if the dBm operation is not enabled, you can also use the measured value ($V_{Reading}$) on the multimeter and the formula "dBm = 10 x lg[($V_{Reading}^2$/R_{ref})/1 mW]" to calculate the reference power value; wherein, R_{ref} is the load impedance.

5. Calibrate the power meter:

   a. Connect the power sensor to the input terminal and the **[POWER REF]** terminal of the power meter respectively.

   b. Open the Zero/Cal menu and then click or tap **Zero+Cal** to perform the calibration. After the calibration is complete, observe whether the measured value of the power meter is 0 dBm, 50 MHz.

6. Disconnect DG800 Pro and the multimeter. Use the N-BNC adaptor to connect the power sensor to the output terminal of DG800 Pro. This case takes CH1 as an example. The test method also applies to CH2. Use the power meter cable to connect the power sensor output terminal to the power meter input terminal, as shown in the figure below.



7. Keep other settings unchanged for DG800 Pro and adjust the output frequency to 1 MHz. Set the frequency factor to 1 MHz for the power meter. Record the

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measured value and verify that the "Measured Value-P_{ref}" is between -0.1 dB and +0.1 dB.

8. Keep other settings unchanged for DG800 Pro and adjust the output frequency to 10 MHz. Set the frequency factor to 10 MHz for the power meter. Record the measured value and verify that the "Measured Value-P_{ref}" is between -0.2 dB and +0.2 dB.
9. Keep other settings unchanged for DG800 Pro and adjust the output frequency to 25 MHz. Set the frequency factor to 25 MHz for the power meter. Record the measured value and verify that the "Measured Value-P_{ref}" is between -0.2 dB and +0.2 dB.
10. Keep other settings unchanged for DG800 Pro and adjust the output frequency to 50 MHz (DG852 Pro only). Set the frequency factor to 50 MHz for the power meter. Record the measured value and verify that the "Measured Value-P_{ref}" is between -0.2 dB and +0.2 dB.
11. (Two-channel models only) Repeat the steps above to verify the AC flatness for CH2 and record the test result.

4.4.3 Test Record Form

Output Channel: CH1

P_{ref}= _____

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
1 MHz	Amplitude: 0 dBm Impedance: 50 Ω			±0.1 dB		
10 MHz				±0.2 dB		
25 MHz				±0.2 dB		
50 MHz (for DG852 Pro only)				±0.2 dB		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

P_{ref}= _____

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
1 MHz	Amplitude: 0 dBm Impedance: 50 Ω			±0.1 dB		
10 MHz				±0.2 dB		
25 MHz				±0.2 dB		

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Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
50 MHz (for DG852 Pro only)				±0.2 dB		

Note: Calculation Result = Amplitude Measured Value - P_{ref}.

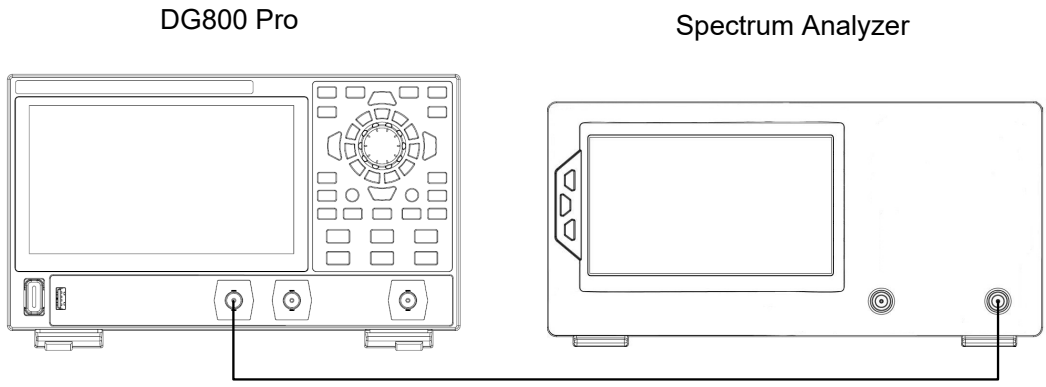
4.5 Harmonic Distortion Test

4.5.1 Specification

Sine Wave Spectral Purity	
Harmonic Distortion	Typical (0 dBm) 10 Hz to <10 MHz: <-55 dBc ≥10 MHz: <-50 dBc

4.5.2 Test Procedures

1. As shown in the figure below, use the dual BNC cable and the BNC-N adaptor to connect the output terminal of DG800 Pro to the RF input terminal of the spectrum analyzer. This case takes CH1 as an example. The test method also applies to CH2.



2. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.
3. Set up the DG800 Pro series:
   a. Set the output impedance of CH1 to 50 Ω (in CH1 setup interface, click or tap the **Channel** tab and select "Load" in the drop-down menu of **Imped**).
   b. Set CH1 to output a Sine wave with 1 MHz frequency, 0 dBm amplitude, and 0 Vdc offset.

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c. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.

4. Set up the spectrum analyzer:
   a. Set the input attenuation to 20 dB and the reference level to 10 dBm.
   b. Set the start frequency to 0 Hz and the stop frequency to 5 MHz.
   c. Set the resolution bandwidth to 1 kHz.
5. Enable the peak table[1] function of the spectrum analyzer and record the measured values of the fundamental wave and the second harmonic. Verify that the harmonic distortion is less than -55 dBc through calculation[2].
6. Keep other settings unchanged for DG800 Pro and adjust the output frequency to 10 MHz.
7. Set up the spectrum analyzer:
   a. Set the input attenuation to 20 dB and the reference level to 10 dBm.
   b. Set the start frequency to 5 MHz and the stop frequency to 30 MHz.
   c. Set the resolution bandwidth to 1 kHz.
8. Record the measured values of the fundamental wave and the second harmonic in the peak table. Verify that the harmonic distortion is less than -50 dBc through calculation[2].
9. Keep other settings unchanged for DG800 Pro and adjust the output frequency to 25 MHz.
10. Set up the spectrum analyzer:
    a. Set the input attenuation to 20 dB and the reference level to 10 dBm.
    b. Set the start frequency to 10 MHz and the stop frequency to 70 MHz.
    c. Set the resolution bandwidth to 3 kHz.
11. Record the measured values of the fundamental wave and the second harmonic in the peak table. Verify that the harmonic distortion is less than -40 dBc through calculation[2].
12. Keep other settings unchanged for DG800 Pro and adjust the output frequency to 50 MHz (for DG852 Pro only).
13. Set up the spectrum analyzer:
    a. Set the input attenuation to 20 dB and the reference level to 10 dBm.
    b. Set the start frequency to 40 MHz and the stop frequency to 120 MHz.

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c. Set the resolution bandwidth to 3 kHz.

14. Record the measured values of the fundamental wave and the second harmonic. Verify that the harmonic distortion is less than -50 dBc through calculation[2].

15. (Two-channel models only) Repeat the steps above to test the harmonic distortion for CH2 and record the test result.

NOTE

[1]: The Second Harmonic Distortion = Measured Value of the Second Harmonic - Measured Value of the Fundamental Wave; For example, if the measured value of the fundamental wave is -10 dBm and the measured value of the second harmonic is -72 dBm, the second harmonic distortion = (-72) – (-10) = -62 dBc.

4.5.3 Test Record Form

Channel: CH1

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail[2]	
1 MHz	Waveform: Sine Amplitude: 0 dBm Offset: 0 Vdc	1 (Fundamental Wave):		<-55 dBc		
		2:				
10 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				
25 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				
50 MHz (for DG852 Pro only)		1 (Fundamental Wave):		<-50 dBc		
		2:				

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Channel: CH2 (for DG822 Pro/DG852 Pro only)

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail[2]	
1 MHz	Waveform: Sine Amplitude: 0 dBm Offset: 0 Vdc	1 (Fundamental Wave):		<-55 dBc		
		2:				
10 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				
25 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				
50 MHz (for DG852 Pro only)		1 (Fundamental Wave):		<-50 dBc		
		2:				

Note[1]: Calculation Result = Measured Value for the n^{th} Harmonic—Measured Value for the Fundamental Wave

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

4.6 Spurious Signal Test

4.6.1 Specification

Sine Wave Spurious Signal (nonharmonic)	
Specification	Typical (1 Vpp) 10 Hz to <10 MHz: <-65 dBc ≥10 MHz: <-60 dBc

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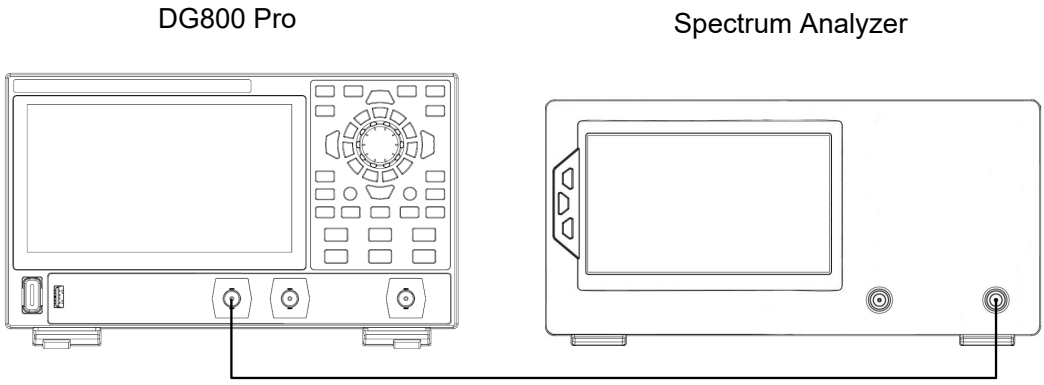
4.6.2 Test Procedures

Test Procedures

1. As shown in the figure below, use the dual BNC cable and the BNC-N adaptor to connect the output terminal of DG800 Pro to the RF input terminal of the spectrum analyzer. This case takes CH1 as an example. The test method also applies to CH2.



2. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.
3. Set up the DG800 Pro series:
   a. Set the output impedance of CH1 to 50 Ω (in CH1 setup interface, click or tap the **Channel** tab and select "Load" in the drop-down menu of **Imped**).
   b. Set CH1 to output a Sine wave with 1 MHz frequency, 1 Vpp amplitude, and 0 Vdc offset.
   c. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.
4. Set up the spectrum analyzer:
   a. Set the reference level to 10 dBm and the input attenuation to 20 dB.
   b. Set the start frequency to 0 Hz and the stop frequency to 10 MHz.
   c. Set the resolution bandwidth to 1 kHz.
   d. Set the peak shift to 3 dB.
   e. Set the sweep mode to Single.
   f. Press the front panel Peak key to find the maximum peak.
5. Measure the maximum spurious signal (except the harmonics) using the cursor measurement and record the test result A. Calculate the nonharmonic spurious signal (A - 4 dBm) and compare it with the specification.

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6. Keep the other settings unchanged and change the output frequency of DG800 Pro and the stop frequency of the spectrum analyzer according to the table below. Record the max. spurious signal for each output frequency and calculate the measurement result. Compare the result with the specification.

DG800 Pro Output Frequency	Spectrum Analyzer Stop Frequency
10 MHz	100 MHz
25 MHz	120 MHz
50 MHz (for DG852 Pro only)	150 MHz

7. (Two-channel models only) Repeat the steps above to test the spurious signal for CH2 and record the test result.

4.6.3 Test Record Form

Channel: CH1

Output Frequency	Start Frequency	Stop Frequency	A	A - 4 dB	Limit	Pass/Fail	
1 MHz	0 Hz	10 MHz			<-65 dBc		
10 MHz	0 Hz	100 MHz			<-60 dBc		
25 MHz	0 Hz	120 MHz			<-60 dBc		
50 MHz (for DG852 Pro only)	0 Hz	150 MHz			<-60 dBc		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Output Frequency	Start Frequency	Stop Frequency	A	A - 4 dB	Limit	Pass/Fail	
1 MHz	0 Hz	10 MHz			<-65 dBc		
10 MHz	0 Hz	100 MHz			<-60 dBc		
25 MHz	0 Hz	120 MHz			<-60 dBc		
50 MHz (for DG852 Pro only)	0 Hz	150 MHz			<-60 dBc		

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4.7 Rise/Fall Time Test

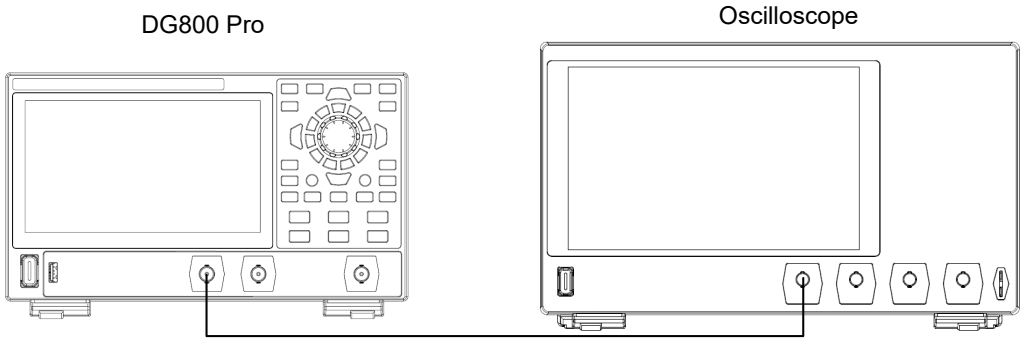
4.7.1 Specification

Square Rise/Fall Time	
Specification	Typical (≤2 Vpp amplitude, 50 Ω load), ≤3 ns

4.7.2 Test Procedures

Test Procedures

1. As shown in the figure below, use the dual BNC cable to connect the output terminal of DG800 Pro to the signal input terminal of the oscilloscope. This case takes CH1 as an example. The test method also applies to CH2.



2. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.
3. Set up the DG800 Pro series:
   a. Set the output impedance of CH1 to 50 Ω (in CH1 setup interface, click or tap the **Channel** tab and select "Load" in the drop-down menu of **Imped**).
   b. Set the CH1 to output a Square wave with 1 MHz frequency, 0 dBm amplitude, and 0 Vdc offset.
   c. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.
4. Set up the oscilloscope:
   a. Set the vertical scale to 200 mV/div.
   b. Set the horizontal timebase to 1 ns.
   c. Adjust the trigger level.
   d. Set the input impedance to 50 Ω.

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e. Enable the rise time and fall time measurement functions.

5. Set the edge type to rising edge for the oscilloscope. Record the measured value of the rise time and verify that the value is within the specified range.
6. Set the edge type to falling edge for the oscilloscope. Record the measured value of the fall time and verify that the value is within the specified range.
7. (Two-channel models only) Repeat the steps above to test the rise/fall time for CH2 and record the test result.

4.7.3 Test Record Form

Channel: CH1

Setting	Measured Value		Limit	Pass/Fail	
Waveform: Square Frequency: 1 MHz	Rise Time		≤3 ns		
Amplitude: 0 dBm Offset: 0 Vdc	Fall Time		≤3 ns		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Setting	Measured Value		Limit	Pass/Fail	
Waveform: Square Frequency: 1 MHz	Rise Time		≤3 ns		
Amplitude: 0 dBm Offset: 0 Vdc	Fall Time		≤3 ns		

4.8 Overshoot Test

4.8.1 Specification

Square Overshoot	
Specification	Typical (0 dBm amplitude, >1 kHz frequency), <5%

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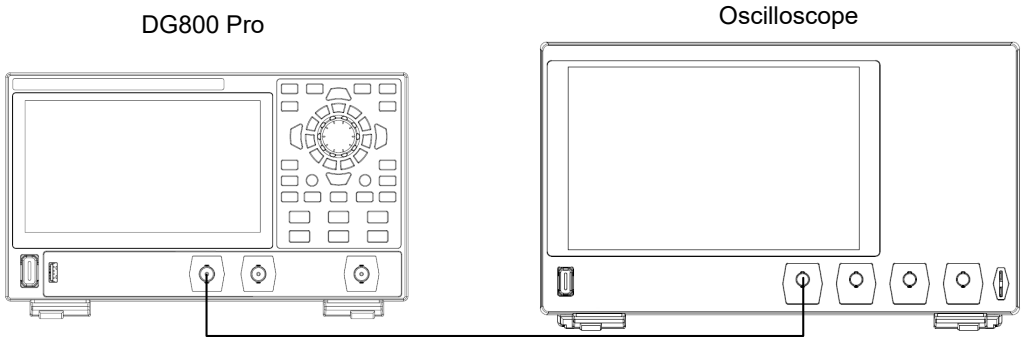
4.8.2 Test Procedures

1. As shown in the figure below, use the dual BNC cable to connect the output terminal of DG800 Pro to the signal input terminal of the oscilloscope. This case takes CH1 as an example. The test method also applies to CH2.



2. Press the front-panel Default key of DG800 Pro and a prompt message is displayed. Click or tap **OK** to restore the instrument to its factory default settings.
3. Set up the DG800 Pro series:
   a. Set the output impedance of CH1 to 50 Ω (in CH1 setup interface, click or tap the **Channel** tab and select "Load" in the drop-down menu of **Imped**).
   b. Set the CH1 to output a Square wave with 1 MHz frequency, 0 dBm amplitude, and 0 Vdc offset.
   c. Click or tap the front-panel CH1 On/Off key to enable the output of CH1. You can also click or tap the CH1 channel label at the bottom of the display.
4. Set up the oscilloscope:
   a. Set the vertical scale to 200 mV/div.
   b. Set the horizontal timebase to 100 ns.
   c. Adjust the trigger level.
   d. Set the input impedance to 50 Ω.
   e. Enable the overshoot measurement function.
5. Record the measured value of the oscilloscope and verify that the value is within the specified range.
6. (Two-channel models only) Repeat the steps above to test the overshoot for CH2 and record the test result.

4.8.3 Test Record Form

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Channel: CH1

Setting	Measured Value	Limit	Pass/Fail
Waveform: Square Frequency: 1 MHz Amplitude: 0 dBm Offset: 0 Vdc		<5%	

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Setting	Measured Value	Limit	Pass/Fail
Waveform: Square Frequency: 1 MHz Amplitude: 0 dBm Offset: 0 Vdc		<5%	

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5 Appendix: Test Record Form

RIGOL DG800 Pro Series Function/Arbitrary Waveform Generator Performance Verification Test Record Form

Model: _____ **Tested by:** _____ **Test Date:** _____

Frequency Accuracy Test

Channel: CH1

Waveform	Setting	Measured Value	Limit[1]	Pass/Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		0.999999 MHz to 1.000001 MHz		
Square			0.999999 MHz to 1.000001 MHz		
Ramp			0.999999 MHz to 1.000001 MHz		
Pulse			0.999999 MHz to 1.000001 MHz		
Harmonic			0.999999 MHz to 1.000001 MHz		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Waveform	Setting	Measured Value	Limit[1]	Pass/Fail	
Sine	Frequency: 1 MHz Amplitude: 1 Vpp		0.999999 MHz to 1.000001 MHz		
Square			0.999999 MHz to 1.000001 MHz		
Ramp			0.999999 MHz to 1.000001 MHz		
Pulse			0.999999 MHz to 1.000001 MHz		
Harmonic			0.999999 MHz to 1.000001 MHz		

Note[1]: $\pm 10^{-6}$ of the setting value (except Arb and Sequence), 0℃ to 40℃

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AC Amplitude Accuracy Test

Channel: CH1

Amplitude Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz Offset: 0 Vdc Impedance: 50 Ω		6.3 mVrms to 7.8 mVrms		
100 mVpp			34.3 mVrms to 36.4 mVrms		
500 mVpp			174.3 mVrms to 179.3 mVrms		
1 Vpp			349.3 mVrms to 357.8 mVrms		
5 Vpp			1.7494 mVrms to 1.7862 mVrms		
10 Vpp			3.4995 mVrms to 3.5716 mVrms		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Amplitude Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
20 mVpp	Frequency: 1 kHz Offset: 0 Vdc Impedance: 50 Ω		6.3 mVrms to 7.8 mVrms		
100 mVpp			34.3 mVrms to 36.4 mVrms		
500 mVpp			174.3 mVrms to 179.3 mVrms		
1 Vpp			349.3 mVrms to 357.8 mVrms		
5 Vpp			1.7494 mVrms to 1.7862 mVrms		
10 Vpp			3.4995 mVrms to 3.5716 mVrms		

Note[1]: 1 kHz Sine, amplitude > 1 mVpp, 0 Vdc offset, unit: Vpp. ±(1% of the setting value + 2 mVpp).

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DC Offset Accuracy Test

Channel: CH1

Offset Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
-2.5 Vdc	Frequency: 1 kHz Amplitude: 5 Vpp Impedance: 50 Ω		-2.552 Vdc to -2.448 Vdc		
-1 Vdc			-1.037 Vdc to -0.963 Vdc		
-500 mVdc			-0.532 Vdc to -0.468 Vdc		
0 Vdc			-0.027 Vdc to +0.027 Vdc		
+500 mVdc			0.468 Vdc to 0.532 Vdc		
+1 Vdc			0.963 Vdc to 1.037 Vdc		
+2.5 Vdc			2.448 Vdc to 2.552 Vdc		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Offset Setting	Setting	Measured Value	Limit[1]	Pass/Fail	
-2.5 Vdc	Frequency: 1 kHz Amplitude: 5 Vpp Impedance: 50 Ω		-2.552 Vdc to -2.448 Vdc		
-1 Vdc			-1.037 Vdc to -0.963 Vdc		
-500 mVdc			-0.532 Vdc to -0.468 Vdc		
0 Vdc			-0.027 Vdc to +0.027 Vdc		
+500 mVdc			0.468 Vdc to 0.532 Vdc		
+1 Vdc			0.963 Vdc to 1.037 Vdc		
+2.5 Vdc			2.448 Vdc to 2.552 Vdc		

Note[1]: the offset limit value is calculated from the offset setting value ± permissible error. The permissible error is calculated from the specification "±(1% of |the setting value| + 2 mVdc + 0.5% of the amplitude (Vpp))".

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AC Flatness Test

Channel: CH1

P_{ref}= _____

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
1 MHz	Amplitude: 0 dBm Impedance: 50 Ω			±0.1 dB		
10 MHz				±0.2 dB		
25 MHz				±0.2 dB		
50 MHz[2]				±0.2 dB		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

P_{ref}= _____

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
1 MHz	Amplitude: 0 dBm Impedance: 50 Ω			±0.1 dB		
10 MHz				±0.2 dB		
25 MHz				±0.2 dB		
50 MHz[2]				±0.2 dB		

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

Note[2]: DG852 Pro only.

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Harmonic Distortion Test

Channel: CH1

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
1 MHz	Waveform: Sine Amplitude: 0 dBm Offset: 0 Vdc	1 (Fundamental Wave):		<-55 dBc		
		2:				
10 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				
25 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				
50 MHz[2]		1 (Fundamental Wave):		<-50 dBc		
		2:				

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
1 MHz	Waveform: Sine Amplitude: 0 dBm Offset: 0 Vdc	1 (Fundamental Wave):		<-55 dBc		
		2:				
10 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				

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Frequency Setting	Setting	Measured Value	Calculation Result[1]	Limit	Pass/Fail	
25 MHz		1 (Fundamental Wave):		<-50 dBc		
		2:				
50 MHz[2]		1 (Fundamental Wave):		<-50 dBc		
		2:				

Note[1]: Calculation Result = Measured Value for the n^{th} Harmonic—Measured Value for the Fundamental Wave

Note[2]: for DG852 Pro only.

Spurious Signal Test

Channel: CH1

Output Frequency	Start Frequency	Stop Frequency	A	A - 4 dB	Limit	Pass/Fail	
1 MHz	0 Hz	10 MHz			<-65 dBc		
10 MHz	0 Hz	100 MHz			<-60 dBc		
25 MHz	0 Hz	120 MHz			<-60 dBc		
50 MHz[1]	0 Hz	150 MHz			<-60 dBc		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Output Frequency	Start Frequency	Stop Frequency	A	A - 4 dB	Limit	Pass/Fail	
1 MHz	0 Hz	10 MHz			<-65 dBc		
10 MHz	0 Hz	100 MHz			<-60 dBc		
25 MHz	0 Hz	120 MHz			<-60 dBc		
50 MHz[1]	0 Hz	150 MHz			<-60 dBc		

Note[1]: for DG852 Pro only.

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Rise/Fall Time Test

Channel: CH1

Setting	Measured Value		Limit	Pass/ Fail	
Waveform: Square Frequency: 1 MHz Amplitude: 0 dBm Offset: 0 Vdc	Rise Time		≤3 ns		
	Fall Time		≤3 ns		

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Setting	Measured Value		Limit	Pass/ Fail	
Waveform: Square Frequency: 1 MHz Amplitude: 0 dBm Offset: 0 Vdc	Rise Time		≤3 ns		
	Fall Time		≤3 ns		

Overshoot Test

Channel: CH1

Setting	Measured Value	Limit	Pass/ Fail
Waveform: Square Frequency: 1 MHz Amplitude: 0 dBm Offset: 0 Vdc		<5%	

Channel: CH2 (for DG822 Pro/DG852 Pro only)

Setting	Measured Value	Limit	Pass/ Fail
Waveform: Square Frequency: 1 MHz Amplitude: 0 dBm Offset: 0 Vdc		<5%	

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