

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

AWG7000B Series
Arbitrary Waveform Generators
Specifications and Performance Verification

Technical Reference



077-2487-00

Tektronix

AWG7000B Series
Arbitrary Waveform Generators
Specifications and Performance Verification

Technical Reference

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

www.tektronix.com

077-2487-00

Tektronix

Copyright © Tektronix. All rights reserved. Licensed software products are owned by Tektronix or its subsidiaries or suppliers, and are protected by national copyright laws and international treaty provisions.

Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specifications and price change privileges reserved.

TEKTRONIX and TEK are registered trademarks of Tektronix, Inc.

Contacting Tektronix

Tektronix, Inc.
14200 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

Warranty

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

THIS WARRANTY IS GIVEN BY TEKTRONIX WITH RESPECT TO THE PRODUCT IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

[W2 – 15AUG04]

Table of Contents

General Safety Summary iv
Preface vii
Related Documents vii

Specifications

Specifications 1-1
Performance Conditions 1-1
Electrical Specifications 1-2
Mechanical (Physical) Characteristics 1-13
Environmental Characteristics 1-14

Performance Verification

Performance Verification Procedures 2-1
Brief Procedures 2-2
Diagnostics 2-2
Calibration 2-3
Functional Test 2-4
Performance Tests 2-7
Prerequisites 2-7
Required Equipment 2-7
Test Record 2-9
10 MHz Reference Frequency Accuracy 2-17
Analog Offset Accuracy 2-18
Analog Amplitude Accuracy 2-20
Analog Harmonic Distortion 2-23
Analog Non-Harmonic Spurious Signal 2-25
Analog Phase Noise 2-26
Marker High and Low Level Accuracy 2-29
Marker Output Delay Accuracy 2-31
DC Output Voltage Accuracy 2-34

List of Figures

Figure 2-1: Diagnostics dialog box 2-2
Figure 2-2: Calibration dialog box 2-3
Figure 2-3: Equipment connections for checking the analog and marker outputs 2-5
Figure 2-4: Output waveform from the Analog, Mkr 1, and Mkr 2 connectors 2-6
Figure 2-5: Equipment connection for verifying the 10 MHz reference frequency accuracy 2-17
Figure 2-6: Equipment connection for measuring the termination resistance 2-18
Figure 2-7: Equipment connection for verifying the analog offset accuracy 2-19
Figure 2-8: Equipment connections for verifying the analog harmonic distortion 2-23
Figure 2-9: Equipment connections for verifying the non-harmonic spurious signal 2-25
Figure 2-10: Equipment connections for verifying the analog phase noise 2-27
Figure 2-11: Example of the analog phase noise measurement 2-28
Figure 2-12: Equipment connection for verifying the marker high and low level accuracy 2-29
Figure 2-13: Equipment connections for verifying the marker output delay accuracy 2-32
Figure 2-14: Equipment connection for verifying the DC output voltage accuracy 2-34

List of Tables

Table 1-1: Run mode 1-2
Table 1-2: Arbitrary waveform 1-2
Table 1-3: Clock generator 1-3
Table 1-4: Trigger generator 1-3
Table 1-5: Inter-channel skew control (2 channel model only) 1-3
Table 1-6: Interleave adjustment (AWG7122B Option 06) 1-4
Table 1-7: Waveform rotation control for analog output 1-4
Table 1-8: Analog output (standard) 1-4
Table 1-9: Analog output (Option 02 and Option 06) 1-6
Table 1-10: Interleave analog output (AWG7122B Option 06) 1-7
Table 1-11: Marker output 1-9
Table 1-12: Trigger and gate input 1-9
Table 1-13: Event input 1-10
Table 1-14: Reference clock input 1-11
Table 1-15: Oscillator (external clock) input 1-11
Table 1-16: DC output 1-12
Table 1-17: 10 MHz clock output 1-12
Table 1-18: TekLink port 1-12
Table 1-19: CPU module and peripheral devices 1-12
Table 1-20: Display 1-13
Table 1-21: Power supply 1-13
Table 1-22: Mechanical characteristics 1-13
Table 1-23: Environmental characteristics 1-14
Table 2-1: Required equipment 2-7
Table 2-2: Test Waveforms 2-8
Table 2-3: Analog offset accuracy 2-19
Table 2-4: Analog amplitude accuracy 2-21
Table 2-5: Analog harmonic distortion 2-24
Table 2-6: Analog non-harmonic spurious signal 2-26
Table 2-7: Analog phase noise 2-28
Table 2-8: Marker High and Low level accuracy 2-30
Table 2-9: DC output voltage accuracy 2-34

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Power Disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Do Not Operate With Suspected Failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Terms in this Manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

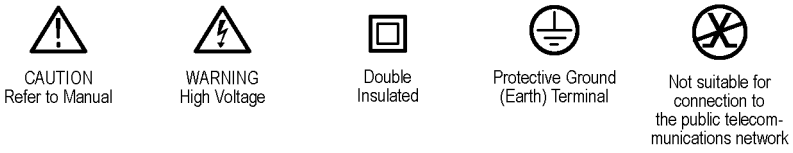
CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and Terms on the Product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

The following symbol(s) may appear on the product:



Preface

This manual contains specifications and performance verification procedures for the AWG7000B Series Arbitrary Waveform Generators.

Related Documents

The following user documents are also available for this product:

- *AWG5000B and AWG7000B Series Arbitrary Waveform Generators Quick Start User Manual*. This document describes the functions and use of the instrument.
- *AWG7000B Series Arbitrary Waveform Generators Service Manual*. This is a PDF only manual that provides module-level service information.

Specifications

Specifications

This section contains the specifications for the instruments.

All specifications are guaranteed unless noted as "typical". Typical specifications are provided for your convenience but are not guaranteed. Specifications that are marked with the ✓ symbol are checked in this manual.

Performance Conditions

To meet specifications, the following conditions must be met:

- The instrument must have been calibrated/adjusted at an ambient temperature between +20 °C and +30 °C.
- The instrument must be operating within the environmental limits. (See Table 1-23 on page 1-14.)
- The instrument must be powered from a source that meets the specifications. (See Table 1-21 on page 1-13.)
- The instrument must have been operating continuously for at least 20 minutes within the specified operating temperature range.

Electrical Specifications

Table 1-1: Run mode

Characteristics	Description
Continuous mode	An arbitrary waveform is output continuously.
Triggered mode	An arbitrary waveform is output only once when a trigger signal is applied. After the waveform is output, the instrument waits for the next trigger signal.
Gated mode	An arbitrary waveform is output only when a gate signal is asserted. The waveform output is repeated while the gate signal stays asserted. When the gate signal is deasserted, the waveform output stops immediately.
Sequence mode	Standard: Sequence switching with wait trigger Option 08: Fast sequence switching

Table 1-2: Arbitrary waveform

Characteristics	Description
Waveform length [1]	
Without Option 01	1 to 32,400,000 points (interleave is off) 1 to 64,800,000 points (interleave is on)
With Option 01	1 to 64,800,000 points (interleave is off) 1 to 129,600,000 points (interleave is on)
Waveform granularity	1 point
Hardware limitation	4 points (AWG7061B, AWG7062B, AWG7121B, AWG7122B) 8 points (AWG7122B option 06, interleave: on)
DAC resolution	10 bits or 8 bits selectable (when the 10 bits DAC mode is selected, marker output is disabled.)
Number of waveforms	Up to 32,000 waveforms (pre-defined waveforms are not included)
Sequence length	1 to 16,000 steps
Sequence controls	Standard: Repeat count, Wait-for-Trigger (ON only), Go-to-N, and Jump are available. Option 08: Repeat count, Wait-for-Trigger (ON or OFF), Go-to-N, and Jump are available.
Repeat count	1 to 65,536 or infinite (all channels operate the same sequence)
Jump timing	Synchronous or Asynchronous selectable
Sequence switching time, typical	
AWG7061B and AWG7062B	300 ns
AWG7121B and AWG7122B	170 ns
AWG7061B Option 08 and AWG7062B Option 08	833 ps
AWG7121B Option 08 and AWG7122B Option 08	571 ps
AWG7122B Option 02, 08	417 ps
AWG7122B Option 06, 08	267 ps

[1] The following hardware limitation is applied to the instrument:
960 points minimum (interleave is off)
1920 points minimum (interleave is on)

Table 1-3: Clock generator

Characteristics	Description
Sampling rate control	
Range	
AWG7121B and AWG7122B	10.0000 MS/s to 12.0000 GS/s (interleave is off)
AWG7122B Option 06 [1]	12.0000 GS/s to 24.0000 GS/s (interleave is on)
AWG7061B and AWG7062B	10.0000 MS/s to 6.0000 GS/s
Resolution	8 digits
✓ Internal clock frequency	Within ± (1 ppm + aging)
Internal clock frequency accuracy, typical	Aging: within ± 1 ppm/year
✓ Reference oscillator accuracy	Within ± (1 ppm + aging)
Reference oscillator accuracy, typical	Aging: within ± 1 ppm/year

[1] Interleaving is applied to analog output. When interleaving is on, marker data with even numbers will be output.

Table 1-4: Trigger generator

Characteristics	Description
Trigger rate [1]	
Range	1.0 µs to 10.0 s
Resolution	3 digits and 0.1 µs minimum
Accuracy	Same as the reference oscillator

[1] Trigger is ignored when all the following conditions are met:

- Instrument type: AWG7122B with option 06, without option 08
- Run mode: Sequence
- Interleave: On

Table 1-5: Inter-channel skew control (2 channel model only)

Characteristics	Description
Skew control	
Range	–100 ps to +100 ps
Resolution	1 ps
Skew accuracy, typical [1]	± (10% of effective skew setting +10 ps)

[1] Effective skew setting is the absolute value of the difference between the skew setting on channels.

Table 1-6: Interleave adjustment (AWG7122B Option 06)

Characteristics	Description
Phase adjustment	
Range	–180 ° to +180 °
Resolution	0.1 °
Amplitude adjustment	
Range [1]	–0.25 Vp-p to +2.5 Vp-p
Resolution	0.001 V

[1] Range depends on the amplitude settings.
(Amplitude setting + Adjustment) and (Amplitude setting – Adjustment) should be within the following range:
0.5 to 1.0 Vp-p when zeroing is off
0.25 to 0.5 Vp-p when zeroing is on

Table 1-7: Waveform rotation control for analog output

Characteristics	Description
Phase control	
Range	–180° to +180° of waveform
Resolution	0.1° of waveform
Time control	
Range	–1/2 period to +1/2 period of waveform
Resolution	0.1 ps
Point control	
Range	–50% to +50% of waveform
Resolution	0.001 points

Table 1-8: Analog output (standard)

Characteristics	Description
Connector type	SMA
Type of output	(+) and (–) complementary output
Output impedance	50 Ω
Amplitude controls	
Range	
Normal mode	50 mV to 2.0 V peak-peak
Direct D/A mode	50 mV to 1.0 V peak-peak
Resolution	1 mV
Offset controls	
Range	
Normal mode	–0.5 V to +0.5 V
Direct D/A mode	N/A
Resolution	1 mV

Table 1-8: Analog output (standard) (cont.)

Characteristics	Description
✓ Amplitude accuracy	DC accuracy: within ± (3% of amplitude + 2 mV) at offset=0V
✓ Offset accuracy	DC accuracy: within ± (2% of amplitude + 10 mV) at minimum amplitude
Bandwidth, typical	
Normal mode	750 MHz, at –3 dB
Direct D/A mode	3.5 GHz, at –3 dB
Rise/fall time, typical	
Normal mode	350 ps (20% to 80%), when amplitude= 2.0 Vp-p, offset=0 V
Direct D/A mode	75 ps (20% to 80%), when amplitude=1.0 Vp-p
Overshoot, typical	< 10%, when amplitude=1.0 Vp-p
Low pass filter	
Normal mode	50 MHz, 200 MHz, Through (Bessel type)
Direct D/A mode	N/A
Delay from marker, typical	9.7 ns: low pass=50 MHz 3.9 ns: low pass=200 MHz 2.1 ns: low pass=through 0.5 ns: direct D/A mode (when amplitude=1.0 Vp-p, offset=0 V)
Skew between (+) and (–) outputs, typical	< 20 ps (direct D/A mode)
ON/OFF control	Output relay is available for each channel. A control is common to the complementary output.
✓ Harmonic distortion	Amplitude=1.0 Vp-p, offset=0 V, DAC resolution =8 bit, measured with 32-point sine waveform
AWG712xB Normal mode	< –35 dBc, when clock=12 GS/s, signal=375 MHz
AWG712xB Direct D/A mode	< –42 dBc, when clock=12 GS/s, signal=375 MHz
AWG706xB Normal mode	< –40 dBc, when clock=6 GS/s, signal=187.5 MHz
AWG706xB Direct D/A mode	< –45 dBc, when clock=6 GS/s, signal=187.5 MHz
✓ Non harmonic spurious	Amplitude=1.0 Vp-p, offset=0 V, measured with 32-point sine waveform
AWG7121B and AWG7122B	< –50 dBc, DC to 6 GHz, when clock=12 GS/s, signal=375 MHz
AWG7061B and AWG7062B	< –50 dBc, DC to 3 GHz, when clock=6 GS/s, signal=187.5 MHz
SFDR, typical	Normal output mode, amplitude=1.0 Vp-p, offset=0 V, DAC resolution =10 bits
AWG7121B and AWG7122B	43 dB, when clock=12 GS/s, signal=375 MHz
AWG7061B and AWG7062B	48 dBc, when clock=6 GS/s, signal=187.5 MHz
✓ Phase noise	Normal output mode, amplitude=1.0 Vp-p, offset=0 V, DAC resolution =8 bits
AWG7121B and AWG7122B	< –90 dBc/Hz at 10 kHz offset, when clock=12 GS/s, signal=375 MHz
AWG7061B and AWG7062B	< –90 dBc/Hz at 10 kHz offset, when clock=6 GS/s, signal=187.5 MHz
Random jitter on clock pattern, typical	Using 0101... clock pattern, amplitude=1.0 Vp-p, offset=0 V
Normal mode	1.6 ps rms

Table 1-8: Analog output (standard) (cont.)

Characteristics	Description
Direct D/A mode	0.9 ps rms
Total jitter on random pattern, typical	Using PN15 pattern, amplitude=1.0 Vp-p, offset=0 V, measured at bit error rate=1e-12
Normal mode	50 ps p-p at 500 MS/s
Direct D/A mode	30 ps p-p from 1 GS/s to 6 GS/s

Table 1-9: Analog output (Option 02 and Option 06)

Characteristics	Description
Connector type	SMA
Type of output	(+) and (–) complementary outputs
Output impedance	50 Ω
Amplitude controls	
Range	0.5 V to 1.0 V peak-peak
Resolution	1 mV
✓ Amplitude accuracy	DC accuracy: Within ± (2% of amplitude + 2 mV) at offset=0V
✓ DC offset	Within ± 10 mV
Bandwidth, typical	7.5 GHz at –3 dB
Rise/fall time, typical	35 ps (20% to 80%), when amplitude= 1.0 Vp-p
Overshoot, typical	< 3%, when amplitude=1.0 Vp-p
Delay from marker, typical	
Option 02	0.2 ns, when amplitude=1.0 Vp-p
Option 06	1.0 ns, when amplitude=1.0 Vp-p
Skew between (+) and (–) outputs, typical	< 12 ps
ON/OFF control	Output relay is available for each channel. A control is common to the complementary output.
✓ Harmonic distortion	Amplitude=1.0 Vp-p, measured with 32-point sine waveform
	< –42 dBc, when clock=12 GS/s, signal=375 MHz
✓ Non harmonic spurious	Amplitude=1.0 Vp-p, measured with 32-point sine waveform
	< –50 dBc, DC to 6 GHz, when clock=12 GS/s, signal=375 MHz
SFDR, typical	Amplitude=1.0 Vp-p, DAC resolution=10 bits
	44 dB, when clock=12 GS/s, signal=375 MHz 48 dB, when clock=6 GS/s, signal=187.5 MHz
✓ Phase noise	Amplitude=1.0 Vp-p, measured with 32-point sine waveform
	< –90 dBc/Hz at 10 kHz offset, when clock=12 GS/s, signal=375 MHz
Random jitter on clock pattern, typical	0.9 ps rms, using 0101... clock pattern, amplitude=1.0 Vp-p

Table 1-9: Analog output (Option 02 and Option 06) (cont.)

Characteristics	Description
Total jitter on random pattern, typical	20 ps p-p from 2 GS/s to 12 GS/s, PN15 pattern, amplitude=1.0 Vp-p, measured at bit error rate =1 e–12.
Level flatness, typical	At 500 MHz: –0.5 dB At 1GHz: –0.7 dB At 2 GHz: –1.3 dB At 3 GHz: –2.2 dB At 4 GHz: –3.2 dB At 5 GHz: –4.6 dB At 6 GHz: –6.3 dB At 7 GHz: –8.3 dB At 8 GHz: –10.7 dB Amplitude relative to 100 MHz. Measured by harmonics of pulse waveform. Includes sin(x)/x roll-off.

Table 1-10: Interleave analog output (AWG7122B Option 06)

Characteristics	Description
Connector type	SMA
Type of output	(+) and (–) complementary output
Output impedance	50 Ω
Zeroing control	Zeroing On and Off is selectable.
Amplitude controls	
Range	
When Zeroing is On	0.25 V to 0.5 V p-p
When Zeroing is Off	0.5 V to 1.0 V p-p
Resolution	1 mV
Amplitude accuracy, typical	DC accuracy at offset=0 V
When Zeroing is On	Within ± (40% of amplitude + 2 mV)
When Zeroing is Off	Within ± (8% of amplitude + 2 mV)
DC offset	Within ± 10 mV
Bandwidth, typical	7.5 GHz at –3 dB, when amplitude=0.5 Vp-p, zeroing=On
Rise/fall time, typical	35 ps (20% to 80%), when amplitude= 0.5 Vp-p, zeroing=On
Delay from marker, typical	0.9 ns when amplitude=0.5 Vp-p, zeroing=On
Skew between (+) and (–) outputs, typical	< 12 ps
ON/OFF control	Output relay is available for each channel. A control is common to the complementary output.
Harmonic distortion, typical	Measured with 32-point sine waveform
When Zeroing is On	< –38 dBc, when amplitude=0.5 Vp-p, clock=24 GS/s, signal=750 MHz
When Zeroing is Off	< –40 dBc, when amplitude=1.0 Vp-p, clock=24 GS/s, signal=750 MHz

Table 1-10: Interleave analog output (AWG7122B Option 06) (cont.)

Characteristics	Description
Non harmonic spurious, typical	Measured with 32-point sine waveform, measurement range: DC to sampling frequency/4
When Zeroing is On	< –45 dBc, DC to 6 GHz, when amplitude=0.5 Vp-p, clock=24 GS/s, signal=750 MHz
When Zeroing is Off	< –45 dBc, DC to 6 GHz, when amplitude=1.0 Vp-p, clock=24 GS/s, signal=750 MHz
SFDR, typical	Clock=24 GS/s, signal=3 GHz, measurement range: DC to sampling frequency/2
When Zeroing is On	30 dB, when amplitude=0.5 Vp-p
When Zeroing is Off	40 dB, when amplitude=1.0 Vp-p
✓ Phase noise	Measured with 32-point sine waveform
When Zeroing is On	< –85 dBc/Hz at 10 kHz offset, when amplitude=0.5 Vp-p, clock=24 GS/s, signal=750 MHz
When Zeroing is Off	< –85 dBc/Hz at 10 kHz offset, when amplitude=1.0 Vp-p, clock=24 GS/s, signal=750 MHz
Level flatness, typical	Amplitude relative to 100 MHz. Measured by harmonics of pulse waveform. Includes sin(x)/x roll-off.
When Zeroing is On	At 500 MHz: –0.5 dB At 1 GHz: –0.6 dB At 2 GHz: –1.0 dB At 3 GHz: –1.5 dB At 4 GHz: –2.0 dB At 5 GHz: –2.6 dB At 6 GHz: –3.3 dB At 7 GHz: –4.0 dB At 8 GHz: –4.6 dB At 9 GHz: –5.7 dB At 10 GHz: –6.8 dB At 11 GHz: –8.1 dB
When Zeroing is Off	At 500 MHz: –0.5 dB At 1 GHz: –0.7 dB At 2 GHz: –1.3 dB At 3 GHz: –2.2 dB At 4 GHz: –3.2 dB At 5 GHz: –4.6 dB At 6 GHz: –6.3 dB At 7 GHz: –8.3 dB At 8 GHz: –10.7 dB At 9 GHz: –14.0 dB At 10 GHz: –18.5 dB At 11 GHz: –25.8 dB

Table 1-11: Marker output

Characteristics	Description
Connector type	SMA
Number of outputs	Marker 1 and Marker 2 are available for each channel.
Type of output	(+) and (–) complementary output
Level controls	
Voltage window	–1.4 V to +1.4 V into 50 Ω
Amplitude	0.5 Vp-p to 1.4 Vp-p into 50 Ω
Resolution	0.01 V
✓ Level accuracy	DC accuracy: ± (10% of setting + 75 mV) into 50 Ω
Output current	± 28 mA max
Variable delay control	Available for Marker 1 and Marker 2
Range	0 to 300 ps
Resolution	1 ps
✓ Variable delay accuracy	± (5% of setting + 50 ps)
Rise/fall time, typical	45 ps (20% to 80% of swing), when Hi= 1.0 V, Low=0V
Random jitter on clock pattern, typical	1 ps rms (using 0101... clock pattern), when Hi= 1.0 V, Low=0V
Total jitter on random pattern, typical	30 ps p-p (using PN15 pattern, when Hi= 1.0 V, Low=0V, measured at bit error rate=1e-12)
Skew between (+) and (–) outputs, typical	< 13 ps
Skew between Marker 1 and Marker 2, typical	< 30 ps

Table 1-12: Trigger and gate input

Characteristics	Description
Connector [1]	BNC, front panel
Input impedance	1 kΩ or 50 Ω selectable
Polarity	Positive or negative selectable
Input voltage range	
When 1 kΩ selected	–10 V to 10 V
When 50 Ω selected	< 5 V rms
Threshold control	
Level	–5.0 V to 5.0 V
Resolution	0.1 V
Accuracy, typical	± (5% of setting + 0.1 V)
Input voltage swing	0.5 Vp-p minimum
Minimum pulse width	
Triggered mode	20 ns

Table 1-12: Trigger and gate input (cont.)

Characteristics	Description
Gated mode	1024 * sampling period + 210 ns
Trigger delay to analog output, typical	128 * sampling period + 250 ns
Trigger hold off, typical	832 * sampling period –100 ns
Gate delay to analog output, typical	640 * sampling period + 260 ns
Trigger jitter, typical	0.7 ns at 12 GS/s 0.8 ns at 9 GS/s 1.0 ns at 6 GS/s
Synchronized between external clock and trigger timing	12GS/s, x 1 clock divider, synchronous trigger mode with specific timing: 50 ps pk-pk, 10 ps rms
Synchronized between external 10 MHz reference and trigger timing	12GS/s setting, synchronous trigger mode with specific timing: 120 ps pk-pk, 30 ps rms
Synchronized between external variable reference and trigger timing	2^N (N: integer) Clock setting of reference, synchronous trigger mode with specific timing: 50 ps pk-pk, 10 ps rms
Trigger timing	Selectable synchronous mode or asynchronous mode, settable only through the program interface.

1 Trigger is ignored when all the following conditions are met:
- Instrument type: AWG7122B with option 06, without option 08
- Run mode: Sequence
- Interleave: On

Table 1-13: Event input

Characteristics	Description
Connector type	BNC
Input impedance	1 kΩ or 50 Ω selectable
Polarity	Positive or negative selectable
Input voltage range	
When 1 kΩ selected	–10 V to 10 V
When 50 Ω selected	< 5 Vrms
Threshold control	
Level	–5.0 V to 5.0 V
Resolution	0.1 V
Accuracy, typical	± (5% of |setting| + 0.1 V)
Input voltage swing	0.5 Vp-p minimum
Minimum pulse width	20 ns

Table 1-13: Event input (cont.)

Characteristics	Description
Delay to analog output, typical	1024 * sampling period + 280 ns
Hold off time, typical	900 * sampling period + 150 ns

Table 1-14: Reference clock input

Characteristics	Description
Connector type	BNC
Input impedance	50 Ω (AC coupled)
Input voltage swing	0.2 Vp-p to 3 Vp-p
Fixed mode input frequency	10 MHz, 20 MHz, and 100 MHz within ± 0.1%
Variable mode input frequency range	5 MHz to 800 MHz Acceptable frequency drift while the instrument is operating: ± 0.1%
Variable mode multiplier rate	
AWG7121B and AWG7122B without interleave	1 to 2400
AWG7122B with interleave	2 to 4800
AWG7061B and AWG7062B	1 to 1200

Table 1-15: Oscillator (external clock) input

Characteristics	Description
Connector type	SMA
Input impedance	50 Ω (AC coupled)
Frequency range	6.0 GHz to 12.0 GHz
Input voltage swing	+ 7 dBm to +10 dBm
Divider	
AWG7121B and AWG7122B	1/1, 1/2, 1/4, 1/8, ... ,1/256
AWG7061B and AWG7062B	1/2, 1/4, 1/8, ... ,1/256

Table 1-16: DC output

Characteristics	Description
Connector type	2 x 4 pin header, 2.54 mm pitch (female)
Number of outputs	4
Output voltage control	
Range	–3.0 V to +5.0 V
Resolution	10 mV
Control	Independent for each output
✓ Output voltage accuracy	± (3% of |setting| + 120 mV) into High-Z load
Output current	±100 mA maximum
Output impedance, typical	1 Ω

Table 1-17: 10 MHz clock output

Characteristics	Description
Connector type	BNC
Output impedance	50 Ω (AC coupled)
Amplitude, typical	1.2 Vp-p into 50 Ω 2.4 Vp-p into 1 MΩ

Table 1-18: TekLink port

Characteristics	Description
Connector type	40 pins

Table 1-19: CPU module and peripheral devices

Characteristics	Description
CPU	Celeron D processor
Memory	2 GB DDR2-SDRAM
Hard disk drive	More than 80 GB
Optical disk drive	CD-RW/DVD drive
USB 2.0	6 (2 x front, 4 x rear)
LAN	1000/100/10 BASE-T
Video output	D-sub, 15 pins
GPIB	IEEE 488.2 standard interface, 24 pins
Keyboard	PS-2 compatible, mini-DIN, 6 pins
Mouse	PS-2 compatible, mini-DIN, 6 pins
Serial port	RS-232C, D-sub, 9 pins
Parallel port	D-sub, 25 pins

Table 1-20: Display

Characteristics	Description
Size	210 mm X 158 mm
Resolution	1024 X 768 pixels
Touch screen	Built-in touch screen

Table 1-21: Power supply

Characteristics	Description
Source voltage and frequency	
Rating voltage	100 VAC to 240 VAC
Frequency range	47 Hz to 63 Hz
Power consumption	450 W
Surge current	30 A peak (25 °C) for ≤ 5 line cycles, after product has been turned off for at least 30 s.

Mechanical (Physical) Characteristics

Table 1-22: Mechanical characteristics

Characteristics	Description
Net weight	
Without package	Approximately 19 kg (41.9 lb)
With package	Approximately 28 kg (61.7 lb)
Dimensions	
Height	245 mm (9.6 in)
Width	465 mm (18.3 in)
Length	500 mm (19.7 in)

Environmental Characteristics

Table 1-23: Environmental characteristics

Characteristics	Description
Temperature	
Operating	+10 °C to +40 °C
Non-operating	–20 °C to +60 °C
Relative humidity	
Operating	5% to 80% (no condensation) Maximum wet-bulb temperature 29 °C
Non-operating	5% to 90% (no condensation) Maximum wet-bulb temperature 29 °C
Altitude	
Operating	Up to 3,000 m (approximately 10,000 feet) Maximum operating temperature decreases 1 °C each 300 m above 1.5 km
Non-operating	Up to 12,000 m (approximately 40,000 feet)
Clearance	
Top and bottom	2 cm (0.8 in)
Side	15 cm (5.9 in)
Rear	7.5 cm (3.0 in)

Performance Verification

Performance Verification Procedures

Two types of performance verification procedures can be performed on the instrument: *Brief Procedures* and *Performance Tests*. You may not need to perform all of these procedures, depending on what you want to accomplish.

- To rapidly confirm that the instrument functions and was adjusted properly, perform *Diagnostics* and *Calibration*.

Advantages: These procedures are quick to do and require no external equipment or signal sources. These procedures perform extensive functional and accuracy testing to provide high confidence that the instrument will perform properly.

- To further check functionality, first perform Diagnostics and Calibration, and then perform *Functional Test*.

Advantages: The procedure requires minimal additional time to perform, and requires minimal equipment. The procedure can be used when the instrument is first received.

- If more extensive confirmation of performance is desired, complete the self tests and functional test, and then do the *Performance Tests*.

Advantages: These procedures add direct checking of warranted specifications. These procedures require specific test equipment. (See page 2-7, *Required Equipment*.)

If you are not familiar with operating this instrument, refer to the online help or the user information supplied with the instrument.

Brief Procedures

There are three procedures in this section that provide a quick way to confirm basic functionality and proper adjustment:

- *Diagnostics*
- *Calibration*
- *Functional Test*

Diagnostics

The following steps run the internal routines that confirm basic functionality and proper adjustment.

Equipment	Prerequisites
None	None

1. Disconnect all the cables from the output channels.
2. Select **System** > **Diagnostics...**.

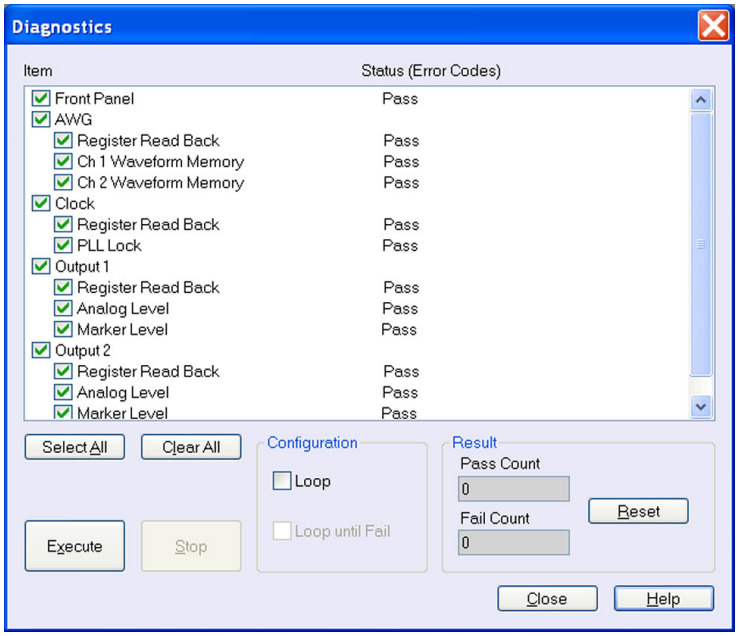


Figure 2-1: Diagnostics dialog box

3. In the Diagnostics dialog box, confirm that all the check boxes are selected. If they are not all selected, click the **Select All** button.

4. Click the **Execute** button to execute the diagnostics.

   The internal diagnostics perform an exhaustive verification of proper instrument function. This verification may take several minutes. When the verification is completed, the resulting status will appear in the dialog box.

5. Verify that **Pass** appears as Status in the dialog box when the diagnostics complete.

6. Click the **Close** button.

Calibration

Equipment	Prerequisites
None	Power on the instrument and allow a 20 minute warm-up before doing this procedure.

1. Select **System** > **Calibration...**.

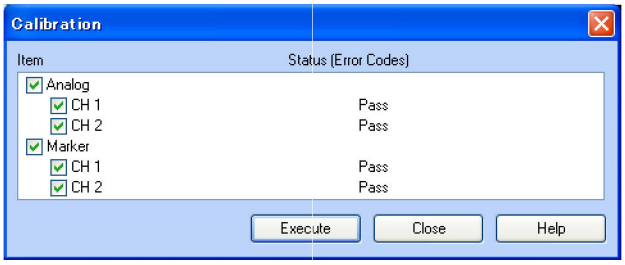


Figure 2-2: Calibration dialog box

2. Click the **Execute** button to start the routine.

3. Verify that **Pass** appears in the status column for all items when the calibration completes.

4. Click the **Close** button.

Functional Test

The purpose of the procedure is to confirm that the instrument functions properly. The required equipment is SMA cables, SMA terminations, SMA female to BNC male adapters, and an oscilloscope.

Checking the Analog and Marker Outputs

Required equipment	Prerequisites
Oscilloscope (DPO7054 or equivalent)	None
Three 50 Ω SMA cables	
Three 50 Ω SMA terminations	
Three SMA female to BNC male adapters	

1. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
2. Use a 50 Ω SMA cable and a SMA female to BNC male adapter to connect the Channel 1 Analog connector on the AWG7000B to the CH1 connector on the oscilloscope.
3. Use a 50 Ω SMA cable and a SMA female to BNC male adapter to connect the Channel 1 Mkr 1 connector on the AWG7000B to the CH2 connector on the oscilloscope.
4. Use the 50 Ω SMA cable and the SMA female to BNC male adapter to connect the Channel 1 Mkr 2 connector on the AWG7000B to the CH3 connector on the oscilloscope.
5. Use a 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Analog}}$ connector on the AWG7000B.
6. Use a 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Mkr 1}}$ connector on the AWG7000B.
7. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Mkr 2}}$ connector on the AWG7000B.

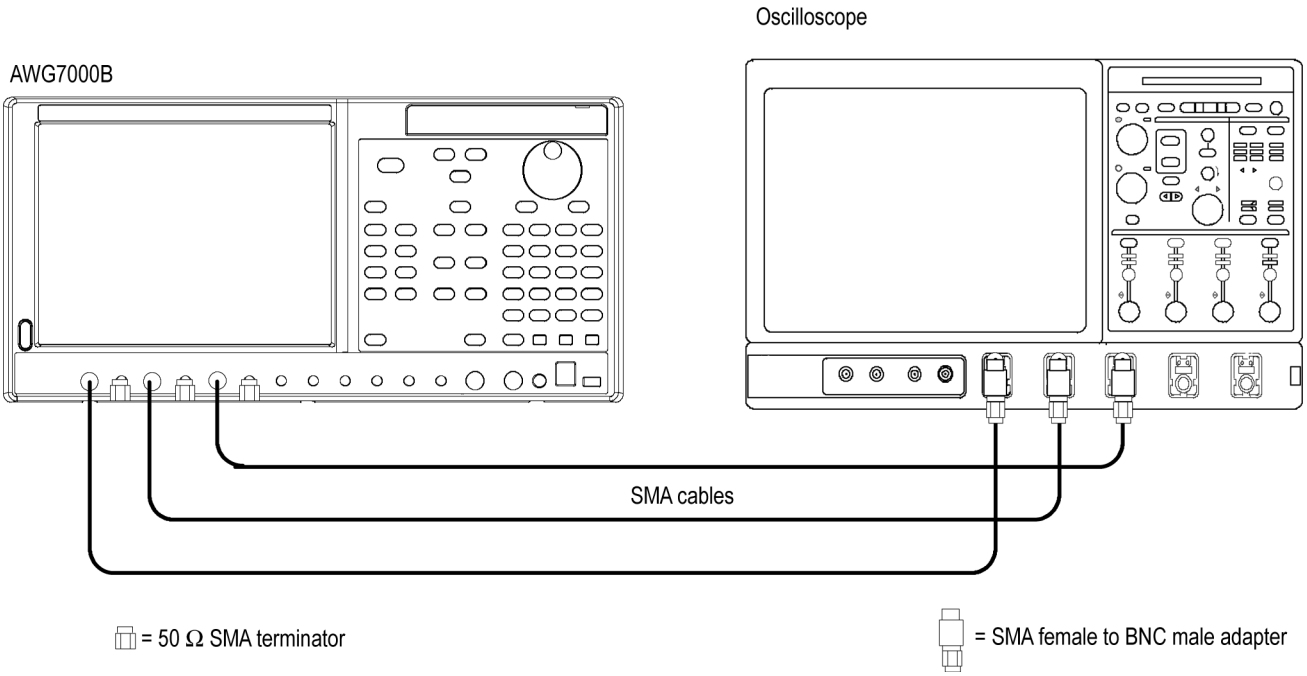


Figure 2-3: Equipment connections for checking the analog and marker outputs

8. Set the oscilloscope as follows:
   - **a.** Vertical scale: 1 V/div (CH1, CH2, and CH3)
   - **b.** Horizontal scale: 20 ns/div (for the AWG712xB), 40 ns/div (for the AWG706xB)
   - **c.** Input coupling: DC
   - **d.** Input impedance: 50 Ω
   - **e.** CH 1 position: +2 div (if necessary)
   - **f.** CH 2 position: -1 div (if necessary)
   - **g.** CH 3 position: -3 div (if necessary)
   - **h.** Trigger source: CH1
   - **i.** Trigger level: 0 mV
   - **j.** Trigger slope: Positive
   - **k.** Trigger mode: Auto
9. Press the **Factory Default** button on the AWG7000B.
10. Press the **Ch1 Select** button on the AWG7000B.

11. On the AWG7000B, load the **sine_mk1_mk2** waveform as an output waveform. Follow the steps below:

    a. Select **File** > **Open File...**.

    b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file.

    NOTE. *If your instrument is the AWG7061B or AWG7062B, a warning message is displayed when you open the pv_awg7000b.awg file. Ignore the message and press the OK button.*

    c. In the **Waveform List** window, select (drag and drop) the **sine_mk1_mk2** waveform on the **User Defined** tab.

12. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.

13. Press the **Run** button on the AWG7000B to output the waveform.

14. Check that the Channel 1 Analog, Mkr 1, and Mkr 2 waveforms are properly displayed on the oscilloscope screen. (See Figure 2-4.)

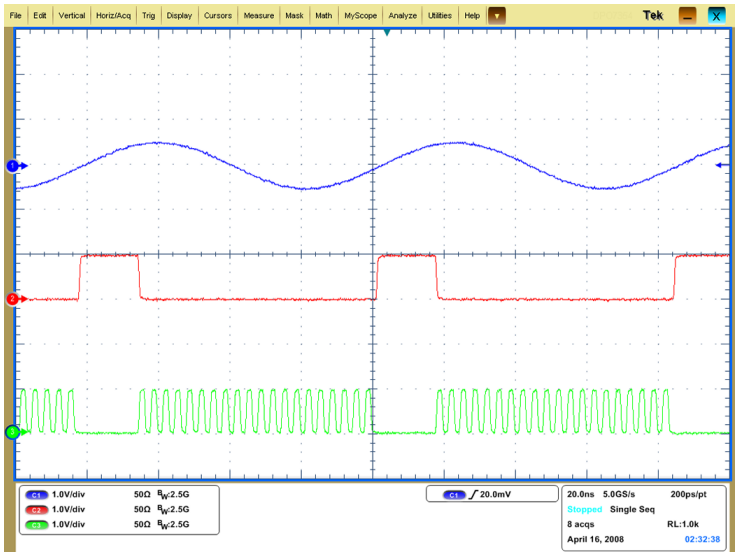


Figure 2-4: Output waveform from the Analog, Mkr 1, and Mkr 2 connectors

15. Press the **Ch 1 On** button again to disable the channel 1 output.

16. *For the AWG7122B or AWG7062B:* Repeat the test for the Channel 2 Analog, Mkr 1, and Mkr 2 outputs.

Performance Tests

This section contains performance verification procedures for the specifications marked with the ✓ symbol.

Prerequisites

The tests in this section comprise an extensive, valid confirmation of performance and functionality when the following requirements are met:

- The cabinet must be installed on the instrument.
- You must have performed and passed the procedure *Diagnostics* and *Calibration*, and the procedure *Functional Tests*.
- The instrument must have been last adjusted at an ambient temperature between +20 °C and +30 °C, must have been operating for a warm-up period of at least 20 minutes, and must be operating at an ambient temperatures between +10 °C and +40 °C.

Required Equipment

The following table lists the test equipment required to perform all of the performance verification procedure. The table identifies examples of recommended equipment and lists the required precision where applicable. If you substitute other test equipment for the listed examples, the equipment must meet or exceed the listed tolerances.

Table 2-1: Required equipment

Item	Qty.	Minimum requirements	Recommended equipment
Oscilloscope	1 ea.	Bandwidth: 500 MHz or higher 4 channels	Tektronix DPO7054
Frequency counter	1 ea.	Frequency accuracy: within ± 0.01 ppm	Agilent Technologies 53181A
Sampling oscilloscope	1 ea.	Bandwidth: 20 GHz or higher 2 channels	Tektronix CSA8200 with 80E03
Spectrum analyzer	1 ea.	Bandwidth: DC to 8 GHz	Tektronix RSA3308A
Digital multimeter	1 ea.	DC accuracy: within ± 0.01%	Keithley 2000 DMM or Agilent Technologies 34410A
50 Ω BNC cable	1 ea.	DC to 2 GHz	Tektronix part number 012-0057-01
50 Ω SMA cable	3 ea.	DC to 20 GHz	Tensolite 1-3636-465-5236
50 Ω SMA termination	3 ea.	DC to 18 GHz	Tektronix part number 015-1022-01 (supplied with the AWG7000B)
50 Ω BNC termination	1 ea.	DC to 1 GHz, feedthrough	Tektronix part number 011-0049-02

Table 2-1: Required equipment (cont.)

Item	Qty.	Minimum requirements	Recommended equipment
50 Ω SMA attenuator	2 ea.	5 X, 14 dB, DC to 18 GHz	Tektronix part number 015-1002-01
SMA-BNC adapter	3 ea.	SMA female to BNC male connector	Tektronix part number 015-0572-00
SMA-BNC adapter	1 ea.	SMA male to BNC female connector	Tektronix part number 015-0554-00
SMA-N adapter	1 ea.	SMA female to N male connector	Tensolite 5004CCSF
BNC-dual banana adapter	1 ea.	BNC to dual banana plugs	Tektronix part number 103-0090-00
DC output lead set	1 ea.	8-pin twisted pair, 24 inch	Tektronix part number 012-1697-00 (supplied with the AWG7000B)

Test Waveforms

The following table lists the test waveforms that are used for the performance verification procedures and functional test. These are included in the pv_awg7000b.awg file on the C: drive.

Table 2-2: Test Waveforms

No.	Waveform name	Purpose
1	dc_minus	For checking the analog amplitude accuracy
2	dc_plus	For checking the analog amplitude accuracy
3	dc_zero	For checking the analog offset accuracy
4	marker_hi	For checking the marker high level accuracy
5	marker_low	For checking the marker low level accuracy
6	sine32	For checking analog harmonic distortion, analog non-harmonic spurious signal, and analog phase noise
7	sine_mk1_mk2	For the functional test
8	square1	For checking the marker output delay accuracy test

NOTE. *If your instrument is the AWG7061B or AWG7062B, a warning message is displayed when you open the pv_awg7000b.awg file. Ignore the message and press the OK button.*

Test Record

Photocopy this page and the next eight pages, and use them to record the performance test results for your instrument.

AWG7000B Series Performance Test Record

Instrument Model:					
Instrument Serial Number:		Certificate Number:			
Temperature:		RH %:			
Date of Calibration:		Technician:			
Performance Test		**Minimum**	**Incoming**	**Outgoing**	**Maximum**
10 MHz Reference Frequency Accuracy		9.99998 MHz			10.00002 MHz
Analog Offset Accuracy					
AWG7000B standard					
Ch 1	Offset:				
	+0.5 V	480 mV			520 mV
	0.0 V	–10 mV			+10 mV
	–0.5 V	–520 mV			–480 mV
/Ch 1	Offset:				
	+0.5 V	480 mV			520 mV
	0.0 V	–10 mV			+10 mV
	–0.5 V	–520 mV			–480 mV
Ch 2	Offset:				
	+0.5 V	480 mV			520 mV
	0.0 V	–10 mV			+10 mV
	–0.5 V	–520 mV			–480 mV
/Ch 2	Offset:				
	+0.5 V	480 mV			520 mV
	0.0 V	–10 mV			+10 mV
	–0.5 V	–520 mV			–480 mV
AWG7121B Option 02					
Ch 1	Offset:				
	N/A (0V)	–10 mV			+10 mV
/Ch 1	Offset:				
	N/A (0V)	–10 mV			+10 mV

Performance Test			Minimum	Incoming	Outgoing	Maximum
AWG7122B Option 06						
Ch 1	Offset					
	N/A (0 V)		–10 mV			10 mV
/Ch 1	Offset					
	N/A (0 V)		–10 mV			10 mV
Ch 2	Offset					
	N/A (0 V)		–10 mV			10 mV
/Ch 2	Offset					
	N/A (0 V)		–10 mV			10 mV
Interleave	Offset	Output mode				
	N/A (0 V)	Interleave: On	–10 mV			10 mV
Analog Amplitude Accuracy						
AWG7000B standard						
Ch 1	Amplitude	Output mode				
	50 mVp-p	Direct D/A out: Off	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: Off	192 mV			208 mV
	500 mVp-p	Direct D/A out: Off	483 mV			517 mV
	1.0 Vp-p	Direct D/A/out: Off	0.968 V			1.032 V
	2.0 Vp-p	Direct D/A/out: Off	1.938 V			2.062 V
	50 mVp-p	Direct D/A out: On	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: On	192 mV			208 mV
	1.0 Vp-p	Direct D/A out: On	0.968 V			1.032 V
/Ch 1	Amplitude	Output mode				
	50 mVp-p	Direct D/A out: Off	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: Off	192 mV			208 mV
	500 mVp-p	Direct D/A out: Off	483 mV			517 mV
	1.0 Vp-p	Direct D/A/out: Off	0.968 V			1.032 V
	2.0 Vp-p	Direct D/A/out: Off	1.938 V			2.062 V
	50 mVp-p	Direct D/A out: On	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: On	192 mV			208 mV
	1.0 Vp-p	Direct D/A out: On	0.968 V			1.032 V

Performance Test			Minimum	Incoming	Outgoing	Maximum
Ch 2	Amplitude	Output mode				
	50 mVp-p	Direct D/A out: Off	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: Off	192 mV			208 mV
	500 mVp-p	Direct D/A out: Off	483 mV			517 mV
	1.0 Vp-p	Direct D/A/out: Off	0.968 V			1.032 V
	2.0 Vp-p	Direct D/A/out: Off	1.938 V			2.062 V
	50 mVp-p	Direct D/A out: On	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: On	192 mV			208 mV
	1.0 Vp-p	Direct D/A out: On	0.968 V			1.032 V
/Ch 2	Amplitude	Output mode				
	50 mVp-p	Direct D/A out: Off	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: Off	192 mV			208 mV
	500 mVp-p	Direct D/A out: Off	483 mV			517 mV
	1.0 Vp-p	Direct D/A/out: Off	0.968 V			1.032 V
	2.0 Vp-p	Direct D/A/out: Off	1.938 V			2.062 V
	50 mVp-p	Direct D/A out: On	46.5 mV			53.5 mV
	200 mVp-p	Direct D/A out: On	192 mV			208 mV
	1.0 Vp-p	Direct D/A out: On	0.968 V			1.032 V
AWG7121B Option 02						
Ch 1	Amplitude:					
	500 mVp-p		488 mV			512 mV
	1.0 Vp-p		0.978 V			1.022 V
/Ch 1	Amplitude:					
	500 mVp-p		488 mV			512 mV
	1.0 Vp-p		0.978 V			1.022 V
AWG7122B Option 06						
Ch 1	Amplitude					
	500 mVp-p		488 mV			512 mV
	1.0 Vp-p		0.978 mV			1.022 mV
/Ch 1	Amplitude					
	500 mVp-p		488 mV			512 mV
	1.0 Vp-p		0.978 mV			1.022 mV
Ch 2	Amplitude					
	500 mVp-p		488 mV			512 mV
	1.0 Vp-p		0.978 mV			1.022 mV
/Ch 2	Amplitude					
	500 mVp-p		488 mV			512 mV
	1.0 Vp-p		0.978 mV			1.022 mV

Performance Test			Minimum	Incoming	Outgoing	Maximum
Analog Harmonic Distortion						
AWG712xB standard						
Ch 1	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			–35 dBc
	1.0 V	Direct D/A out: On	none			–42 dBc
Ch 2	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			–35 dBc
	1.0 V	Direct D/A out: On	none			–42 dBc
AWG706xB standard						
Ch 1	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			-40 dBc
	1.0 V	Direct D/A out: On	none			–45 dBc
Ch 2	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			–40 dBc
	1.0 V	Direct D/A out: On	none			–45 dBc
AWG7121B Option 02						
Ch 1	Amplitude					
	1.0 V		none			–42 dBc
AWG7122B Option 06						
Ch 1	Amplitude					
	1.0 V		none			–42 dBc
Ch 2	Amplitude					
	1.0 V		none			–42 dBc

Performance Test			Minimum	Incoming	Outgoing	Maximum
Analog Non-Harmonic Spurious						
AWG7000B standard						
Ch 1	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			–50 dBc
	1.0 V	Direct D/A out: On	none			–50 dBc
Ch 2	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			–50 dBc
	1.0 V	Direct D/A out: On	none			–50 dBc
AWG7121B Option 02						
Ch 1	Amplitude					
	1.0 V		none			–50 dBc
AWG7122B Option 06						
Ch 1	Amplitude					
	1.0 V		none			–50 dBc
Ch 2	Amplitude					
	1.0 V		none			–50 dBc
Analog Phase Noise (at 10 kHz offset)						
AWG7000B standard						
Ch 1	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			–90 dBc/Hz
	1.0 V	Direct D/A out: On	none			–90 dBc/Hz
Ch 2	Amplitude	Output mode				
	1.0 V	Direct D/A out: Off	none			–90 dBc/Hz
	1.0 V	Direct D/A out: On	none			–90 dBc/Hz
AWG7121B Option 02						
Ch 1	Amplitude					
	1.0 V		none			–90 dBc/Hz

Performance Test			Minimum	Incoming	Outgoing	Maximum
AWG7122B Option 06						
Ch 1	Amplitude					
	1.0 V		none			–90 dBc/Hz
Ch 2	Amplitude					
	1.0 V		none			–90 dBc/Hz
Interleave	Amplitude	Output mode				
	0.5 V	Interleave: On Zeroing: On	none			–85 dBc/Hz
	1.0 V	Interleave: On Zeroing: Off	none			–85 dBc/Hz
Marker High and Low Level Accuracy						
AWG7000B						
Ch 1	Mkr 1	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V
	/Mkr 1	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V

Performance Test			Minimum	Incoming	Outgoing	Maximum
	Mkr 2	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V
	/Mkr 2	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V
Ch 2	Mkr 1	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V
	/Mkr 1	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V

Performance Test			Minimum	Incoming	Outgoing	Maximum
	Mkr 2	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V
	/Mkr 2	High level setting				
		+1.4 V	1.185 V			1.615 V
		0.0 V	–75 mV			+75 mV
		–0.9 V	–1.065 V			–0.735 V
		Low level setting				
		+0.9 V	0.735 V			1.065 V
		0.0 V	–75 mV			+75 mV
		–1.4 V	–1.615 V			–1.185 V
Marker Output Delay Accuracy						
AWG7000B						
Ch 1	Mkr 1		92.5 ps			207.5 ps
	Mkr 2		92.5 ps			207.5 ps
Ch 2	Mkr 1		92.5 ps			207.5 ps
	Mkr 2		92.5 ps			207.5 ps
DC Output Accuracy						
AWG7000B						
	DC output:					
	+5 V		4.73 V			5.27 V
	+3 V		2.79 V			3.21 V
	0.0 V		–120 mV			+120 mV
	–3 V		–3.21 V			–2.79 V

10 MHz Reference Frequency Accuracy

Required equipment	Prerequisites
Frequency counter	(See page 2-7, *Prerequisites*.)
50 Ω BNC cable	

1. Use the 50 Ω BNC cable to connect the 10 MHz Reference Output connector on the AWG7000B to the frequency counter CH1 input.

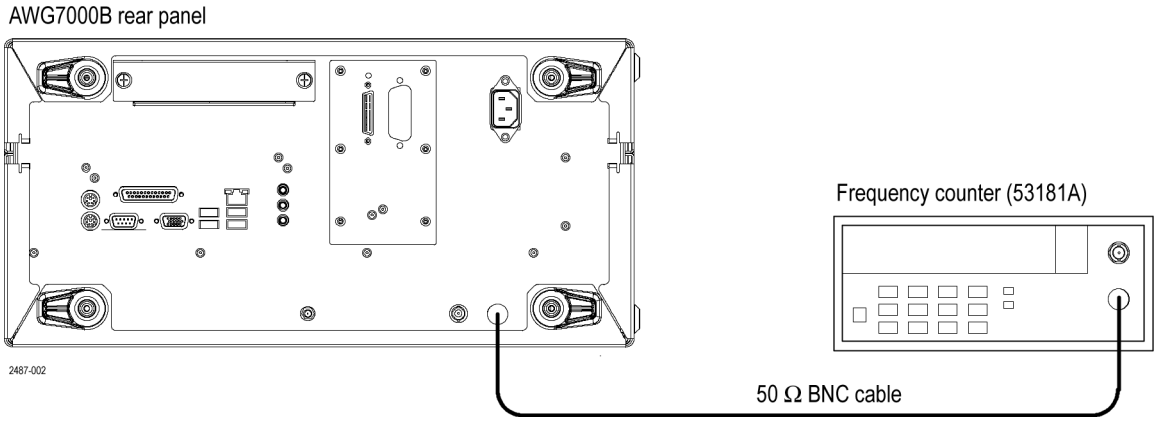


Figure 2-5: Equipment connection for verifying the 10 MHz reference frequency accuracy

2. Set the frequency counter as follows:
   a. MEASURE: Frequency1, Gate Time: 0.10 s
   b. CHANNEL1: Coupling: AC, Impedance: 50 Ω
3. Press the **Factory Default** button on the AWG7000B.
4. Verify that the frequency counter reading falls within the range of 9.99998 MHz to 10.00002 MHz (± 2 ppm).
5. Disconnect the test setup.

Analog Offset Accuracy

Required equipment	Prerequisites
Digital multimeter	(See page 2-7, *Prerequisites*.)
50 Ω BNC cable	
SMA male-BNC female adapter	
50 Ω BNC termination	
BNC-dual banana adapter	
50 Ω SMA termination	

Measuring the Termination Resistance

Before verifying the analog offset accuracy, you need to measure the resistance of the 50 Ω **BNC termination**.

1. Connect the BNC-dual banana adapter and 50 Ω BNC termination to the HI and LO inputs on the digital multimeter.

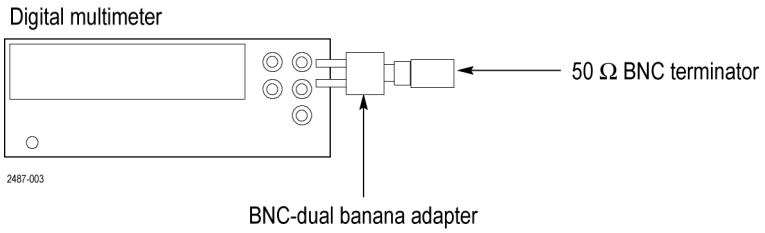


Figure 2-6: Equipment connection for measuring the termination resistance

2. Set the digital multimeter to the **W 2 wires** mode.
3. Measure the resistance and note the value as **Term_R**.
4. Set the digital multimeter to the **VDC** mode.
5. Disconnect the test setup.

NOTE. *Lead resistance is not included in the measurement results when using four wire ohms. The accuracy is higher especially for small resistances. Use a four wire method if necessary.*

Verifying the Analog Offset Accuracy

1. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
2. Use the 50 Ω BNC cable, SMA-BNC adapter, 50 Ω BNC termination, and BNC-Banana adapter to connect the Channel 1 Analog connector on the AWG7000B to the HI and LO inputs on the digital multimeter.
3. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Analog}}$ connector on the AWG7000B.

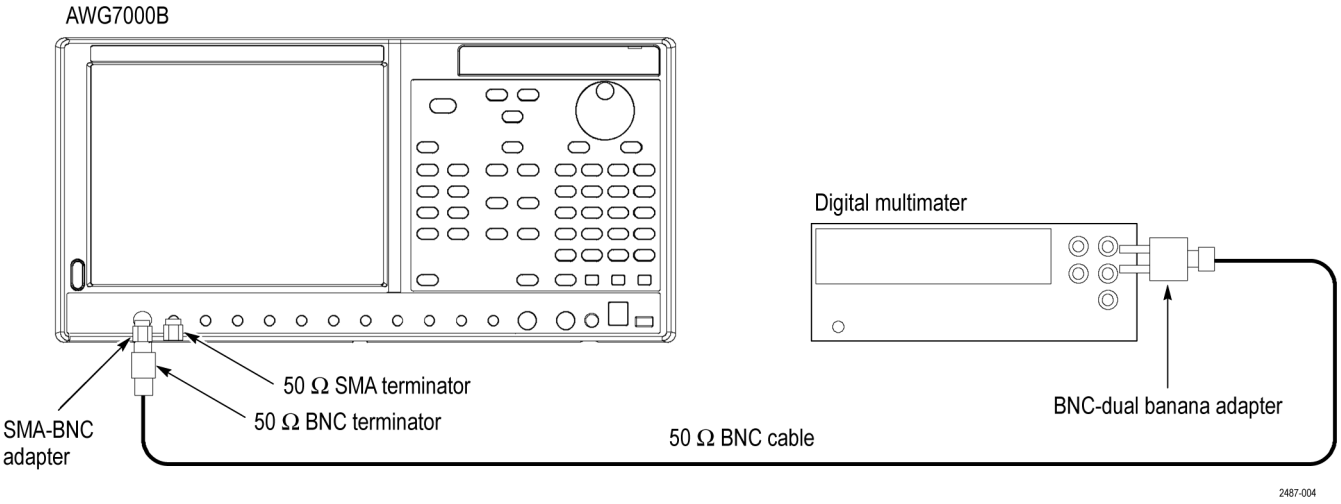


Figure 2-7: Equipment connection for verifying the analog offset accuracy

4. Press the **Factory Default** button on the AWG7000B.
5. Press the **Ch1 Select** button on the AWG7000B.
6. On the AWG7000B, load the **dc_zero** waveform as an output waveform.
   a. Select **File** > **Open File...**.
   b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file. The **Waveform List** window appears.
   c. In the window, select (drag and drop) the **dc_zero** waveform on the **User Defined** tab.
7. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.
8. Press the **Run** button on the AWG7000B to output the waveform.
9. Set the offset of the AWG7000B to the level shown in the first row (or the corresponding row for your instrument) of the following table:

Table 2-3: Analog offset accuracy

Model	Offset settings	Accuracy limits
AWG7000B standard	+0.5 V	480 mV to 520 mV
	0.0 V	–10 mV to +10 mV
	–0.5 V	–520 mV to –480 mV
AWG7121B Option 02	N/A (0 V)	–10 mV to +10 mV
AWG7122B Option 06	N/A (0 V)	–10 mV to +10 mV

10. Measure the output voltage on the digital multimeter and note the value as **Measured_voltage**.

11. Use the following formula to compensate the voltage for the 50 Ω BNC termination:

    Voltage = [(Term_R + 50) / (2 Term_R)] Measured_voltage

    Where Term_R is the resistance of the 50 Ω BNC termination measured in step 3 in the *Measuring the Termination Resistance*. (See page 2-18.)

12. Verify that the calculated value falls within the limits given in the table. (See Table 2-3 on page 2-19.)

13. Repeat steps 9 through 12 for each offset setting in the table. (See Table 2-3 on page 2-19.)

14. Move the SMA-BNC adapter from the Channel 1 Analog connector to the Channel 1 Analog connector and move the 50 Ω SMA termination from the Channel 1 Analog connector to the Channel 1 Analog connector.

15. Repeat steps 9 through 13.

16. *For the AWG7122B or AWG7062B:* Repeat steps 6 through 15 for the Channel 2 output.

17. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.

18. Disconnect the test setup.

Analog Amplitude Accuracy

Required equipment	Prerequisites
Digital multimeter	(See page 2-7, *Prerequisites*.)
50 Ω BNC cable	
SMA male-BNC female adapter	
50 Ω BNC termination	
BNC-dual banana adapter	
50 Ω SMA termination	

1. Perform *Measuring the Termination Resistance*. (See page 2-18.)
2. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
3. Use the 50 Ω BNC cable, SMA-BNC adapter, 50 Ω BNC termination, and BNC-Banana adapter to connect the Channel 1 Analog connector on the AWG7000B to the HI and LO inputs on the digital multimeter. (See Figure 2-7 on page 2-19.)
4. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Analog}}$ connector on the AWG7000B. (See Figure 2-7 on page 2-19.)
5. Press the **Factory Default** button on the AWG7000B.
6. Press the **Ch 1 Select** button on the AWG7000B.
7. On the AWG7000B, load the **dc_plus** waveform as an output waveform.
   a. Select **File** > **Open File...**.
   b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file. The **Waveform List** window appears.
   c. In the window, select (drag and drop) the **dc_plus** waveform on the **User Defined** tab.
8. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.
9. Press the **Run** button on the AWG7000B to output the waveform.
10. Set the amplitude and output mode of the AWG7000B as shown in the first row (or the corresponding row for your instrument) of the following table:

Table 2-4: Analog amplitude accuracy

Model	Amplitude settings	Output mode settings	Accuracy limits
AWG7000B standard	50 mVp-p	———-	46.5 mV to 53.5 mV
	200 mVp-p	———-	192 mV to 208 mV
	500 mVp-p	———-	483 mV to 517 mV
	1.0 Vp-p	———-	0.968 V to 1.032 V
	2.0 Vp-p	———-	1.938 V to 2.062 V
	50 mVp-p	Direct D/A out: On	46.5 mV to 53.5 mV
	200 mVp-p	Direct D/A out: On	192 mV to 208 mV
	1.0 Vp-p	Direct D/A out: On	0.968 V to 1.032 V

Table 2-4: Analog amplitude accuracy (cont.)

Model	Amplitude settings	Output mode settings	Accuracy limits
AWG7000B Option 02/ 06	500 mVp-p	Interleave: Off (Option 06)	488 mV to 512 mV
	1.0 Vp-p	Interleave: Off (Option 06)	0.978 V to 1.022 V

11. Measure the output voltage on the digital multimeter and note the value as **Measured_voltage_1**.

12. Use the following formula to compensate the voltage for the 50 Ω BNC termination:

V_high = [(Term_R + 50) / (2 Term_R)] Measured_voltage_1

Where Term_R is the resistance of the 50 Ω BNC termination measured in step 3 in the *Measuring the Termination Resistance*. (See page 2-18.)

13. In the **Waveform List** window, select the **dc_minus** waveform on the **User Defined** tab.

14. Measure the output voltage on the digital multimeter and note the value as **Measured_voltage_2**.

15. Use the following formula to compensate the voltage for the 50 Ω BNC termination:

V_low = [(Term_R + 50) / (2 Term_R)] Measured_voltage_2

Where Term_R is the resistance of the 50 Ω BNC termination measured in step 3 in the *Measuring the Termination Resistance*. (See page 2-18.)

16. Verify that the voltage difference |(V_high-V_low)| falls within the limits given in the table. (See Table 2-4 on page 2-21.)

17. Repeat steps 10 through 16 for each amplitude setting in the table. (See Table 2-4 on page 2-21.)

18. Move the SMA-BNC adapter from the Channel 1 Analog connector to the Channel 1 Analog connector and move the 50 Ω SMA termination from the Channel 1 Analog connector to the Channel 1 Analog connector.

19. Repeat steps 10 through 17.

20. *For the AWG7122B or AWG7062B:* Repeat steps 6 through 18 for the Channel 2 output.

21. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.

22. Disconnect the test setup.

Analog Harmonic Distortion

Required equipment	Prerequisites
Spectrum analyzer	(See page 2-7, *Prerequisites*.)
50 Ω SMA cable	
SMA-N adapter	
50 Ω SMA termination	

1. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
2. Use the 50 Ω SMA cable and SMA-N adapter to connect the Channel 1 Analog connector on the AWG7000B to the INPUT connector on the spectrum analyzer.
3. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Analog}}$ connector on the AWG7000B.

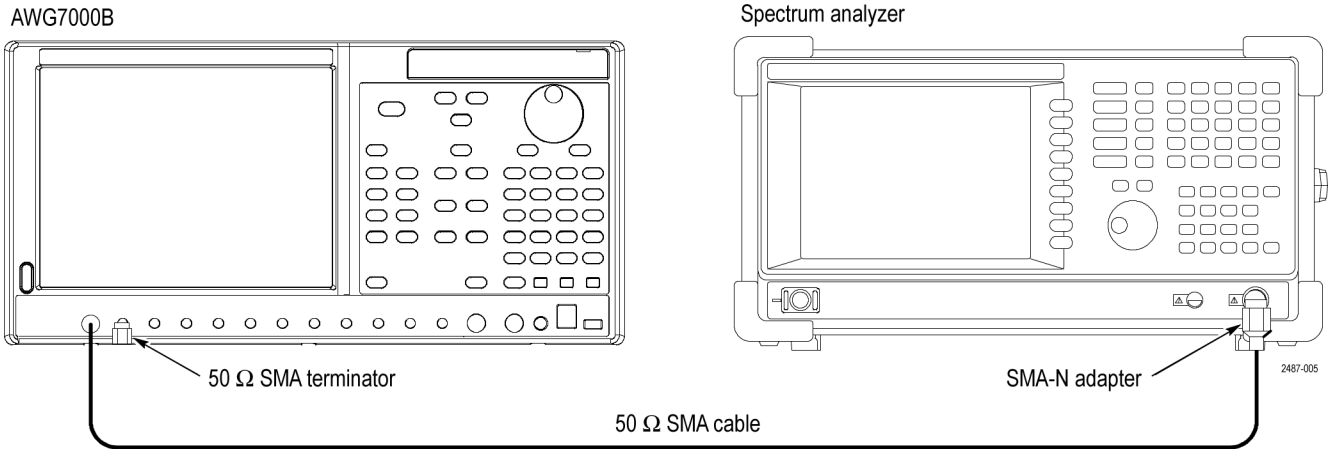


Figure 2-8: Equipment connections for verifying the analog harmonic distortion

4. Set the spectrum analyzer as follows:
   a. Center frequency: 1.5 GHz
   b. Span: 3 GHz
   c. RBW: 1 MHz
5. Press the **Factory Default** button on the AWG7000B.
6. Press the **Ch 1 Select** button on the AWG7000B.
7. On the AWG7000B, load the **sine_32** waveform as an output waveform.
   a. Select **File** > **Open File...**.

b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file. The **Waveform List** window appears.

c. In the window, select (drag and drop) the **sine_32** waveform on the **User Defined** tab.

8. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.

9. Press the **Run** button on the AWG7000B to output the waveform.

10. Make the AWG7000B settings shown in the first row (or corresponding row for your instrument) of the following table:

Table 2-5: Analog harmonic distortion

AWG7000B model and settings				Measurement frequency (MHz)				Accuracy limit
Model	**Output mode**	**Amplitude**	**Sampling rate (output frequency)**	**2nd**	**3rd**	**4th**	**5th**	**Nth reference**
AWG712xB	Direct out: Off	1.0 Vp-p	12 GS/s (375 MHz)	750	1125	1500	1875	< –35 dBc
	Direct out: On							< –42 dBc
AWG7121B Option 02	——	1.0 Vp-p	12 GS/s (375 MHz)	750	1125	1500	1875	< –42 dBc
AWG7122B Option 06	Interleave: Off	1.0 Vp-p	12 GS/s (375 MHz)	750	1125	1500	1875	< –42 dBc
AWG706xB	Direct out: Off	1.0 Vp-p	6 GS/s (187.5 MHz)	375	562.5	750	937.5	< –40 dBc
	Direct out: On							< –45 dBc

11. Use the delta measurement function of the spectrum analyzer to measure harmonic distortion of each measurement frequency.

12. Verify that the harmonic distortion falls within the limits given in the table. (See Table 2-5.)

13. Repeat steps 10 through 12 for each setting in the table. (See Table 2-5.)

14. *For the AWG7122B or AWG7062B:* Repeat the test for the Channel 2 output.

15. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.

16. Disconnect the test setup.

Analog Non-Harmonic Spurious Signal

Required equipment	Prerequisites
Spectrum analyzer	(See page 2-7, *Prerequisites*.)
50 Ω SMA cable	
SMA-N adapter	
50 Ω SMA termination	

1. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
2. Use the 50 Ω SMA cable and SMA-N adapter to connect the Channel 1 Analog connector on the AWG7000B to the INPUT connector on the spectrum analyzer.
3. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Analog}}$ connector on the AWG7000B.

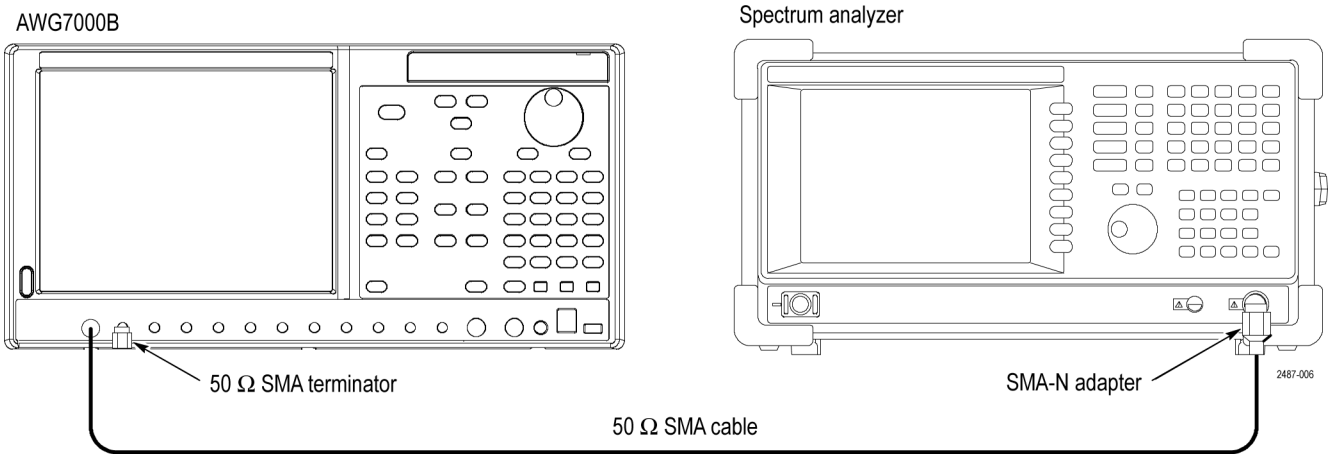


Figure 2-9: Equipment connections for verifying the non-harmonic spurious signal

4. Press the **Factory Default** button on the AWG7000B.
5. Press the **Ch1 Select** button on the AWG7000B.
6. On the AWG7000B, load the **sine_32** waveform as an output waveform.
   a. Select **File** > **Open File...**.
   b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file. The **Waveform List** window appears.
   c. In the window, select (drag and drop) the **sine_32** waveform on the **User Defined** tab.
7. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.
8. Press the **Run** button on the AWG7000B to output the waveform.

9. Make the AWG7000B and spectrum analyzer settings shown in the first row (or the corresponding row for your instrument) of the following table:

Table 2-6: Analog non-harmonic spurious signal

AWG7000B model and settings				Spectrum analyzer settings			
Model	**Output mode**	**Amplitude**	**Sampling rate (output frequency)**	**Center frequency**	**Span**	**RBW**	**Accuracy limit**
AWG712xB	Direct out: On/Off	1.0 Vp-p	12 GS/s (375 MHz)	1.5 GHz	3 GHz	1 MHz	< –50 dBc
				2 GHz	3 GHz	1 MHz	
				5 GHz	3 GHz	1 MHz	
AWG7121B Option 02	——-	1.0 Vp-p	12 GS/s (375 MHz)	1.5 GHz	3 GHz	1 MHz	< –50 dBc
				2 GHz	3 GHz	1 MHz	
				5 GHz	3 GHz	1 MHz	
AWG7122B Option 06	Interleave: Off	1.0 Vp-p	12 GS/s (375 MHz)	1.5 GHz	3 GHz	1 MHz	< –50 dBc
				2 GHz	3 GHz	1 MHz	
				5 GHz	3 GHz	1 MHz	
AWG706xB	Direct out: On/Off	1.0 Vp-p	6 GS/s (187.5 MHz)	1.5 GHz	3 GHz	1 MHz	< –50 dBc

10. Use the spectrum analyzer to measure non-harmonic spurious signal of the Analog output over a frequency range of DC to 6 GHz (for the AWG706xB, DC to 3 GHz). For example, note the reference level of the fundamental waveform, and then measure each spurious signal.
11. Verify that the non-harmonic spurious signal falls within the limits given in the table. (See Table 2-6.)
12. Repeat steps 9 through 11 for each setting in the table.
13. *For the AWG7122B or AWG7062B:* Repeat the test for the Channel 2 output.
14. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
15. Disconnect the test setup.

Analog Phase Noise

Required equipment	Prerequisites
Spectrum analyzer	(See page 2-7, *Prerequisites*.)
50 Ω SMA cable	
SMA-N adapter	
50 Ω SMA termination	

1. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
2. Use the 50 Ω SMA cable and SMA-N adapter to connect the Channel 1 Analog connector on the AWG7000B to the INPUT connector on the spectrum analyzer.
3. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Analog}}$ connector on the AWG7000B.

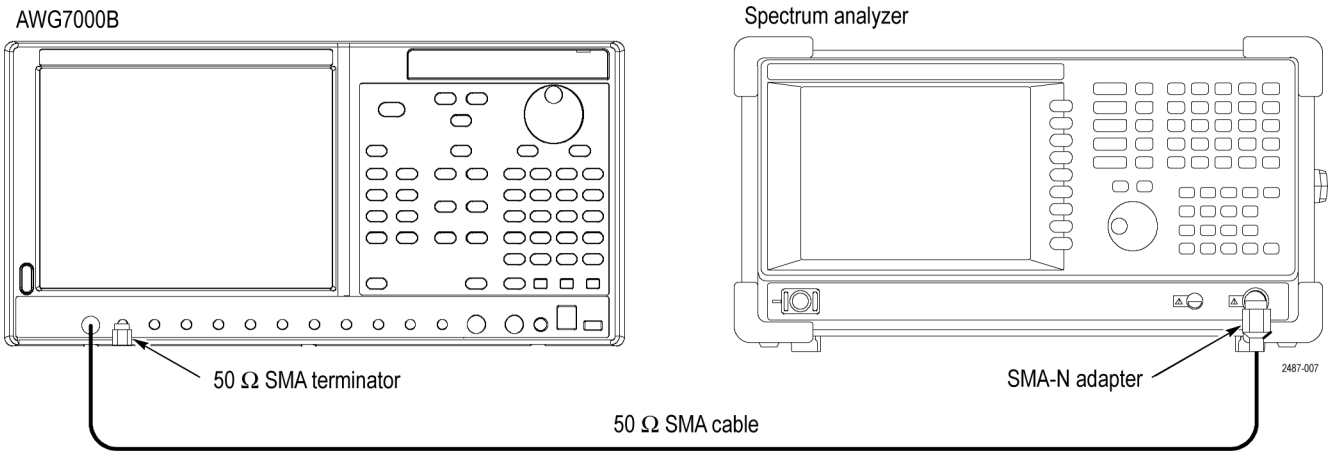


Figure 2-10: Equipment connections for verifying the analog phase noise

4. Press the **Factory Default** button on the AWG7000B.
5. On the AWG7000B, load the **sine_32** waveform as an output waveform.
   a. Select **File** > **Open File...**.
   b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file. The **Waveform List** window appears.
   c. In the window, select (drag and drop) the **sine_32** waveform on the **User Defined** tab.
6. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.
7. Press the **Run** button on the AWG7000B to output the waveform.
8. Make the AWG7000B and spectrum analyzer settings shown in the first row (or the corresponding row for your instrument) of the table. (See Table 2-7.)
9. Use the spectrum analyzer to measure phase noise of the Analog output.
10. Verify that the analog phase noise at 10 kHz offset falls within the limits given in the table.
11. Repeat steps 8 through 10 for each row in the following table.
12. *For the AWG7122B or AWG7062B:* Repeat the test for the Channel 2 output.

13. *For the AWG7122B Option 06:* Repeat the test for the Interleave output. Set the Timing Sampling Rate to 24 GS/s to turn on the Interleave.

Table 2-7: Analog phase noise

AWG7000B model and settings				Spectrum analyzer settings			
Model	**Output mode**	**Amplitude**	**Sampling rate**	**Center frequency**	**Span**	**RBW**	**Accuracy Limit at 10 kHz offset**
AWG712xB	Direct out: On/Off	1.0 Vp-p	12 GS/s	375 MHz	50 kHz	100 Hz	< –90 dBc/Hz
AWG7121B Option 02	——-	1.0 Vp-p	12 GS/s	375 MHz	50 kHz	100 Hz	< –90 dBc/Hz
AWG7122B Option 06	Interleave: Off	1.0 Vp-p	12 GS/s	375 MHz	50 kHz	100 Hz	< –90 dBc/Hz
	Interleave: On Zeroing: Off	1.0 Vp-p	24 GS/s	750 MHz	50 kHz	100 Hz	< –85 dBc/Hz
	Interleave: On Zeroing: On	0.5 Vp-p	24 GS/s	750 MHz	50 kHz	100 Hz	< –85 dBc/Hz
AWG706xB	Direct out: On/Off	1.0 Vp-p	6 GS/s	187.5 MHz	50 kHz	100 Hz	< –90 dBc/Hz

14. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.

15. Disconnect the test setup.

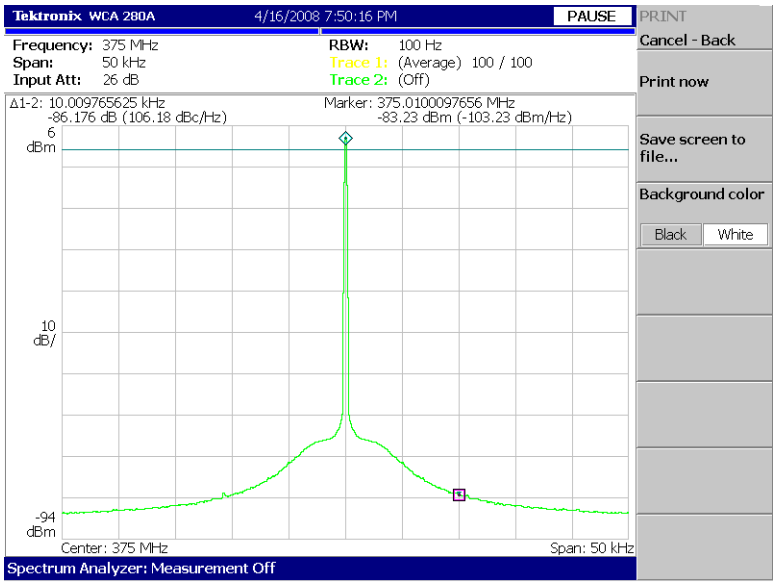


Figure 2-11: Example of the analog phase noise measurement

Marker High and Low Level Accuracy

Required equipment	Prerequisites
Digital multimeter	(See page 2-7, *Prerequisites*.)
50 Ω BNC cable	
SMA male-BNC female adapter	
50 Ω BNC termination	
BNC-dual banana adapter	
50 Ω SMA termination	

1. Perform *Measuring Termination Resistance*. (See page 2-18, *Measuring the Termination Resistance*.)
2. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
3. Use the 50 Ω BNC cable, SMA-BNC adapter, 50 Ω BNC termination, and BNC-Banana adapter to connect the Channel 1 Mkr 1 connector on the AWG7000B to the HI and LO inputs on the digital multimeter.
4. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Mkr 1}}$ connector on the AWG7000B.

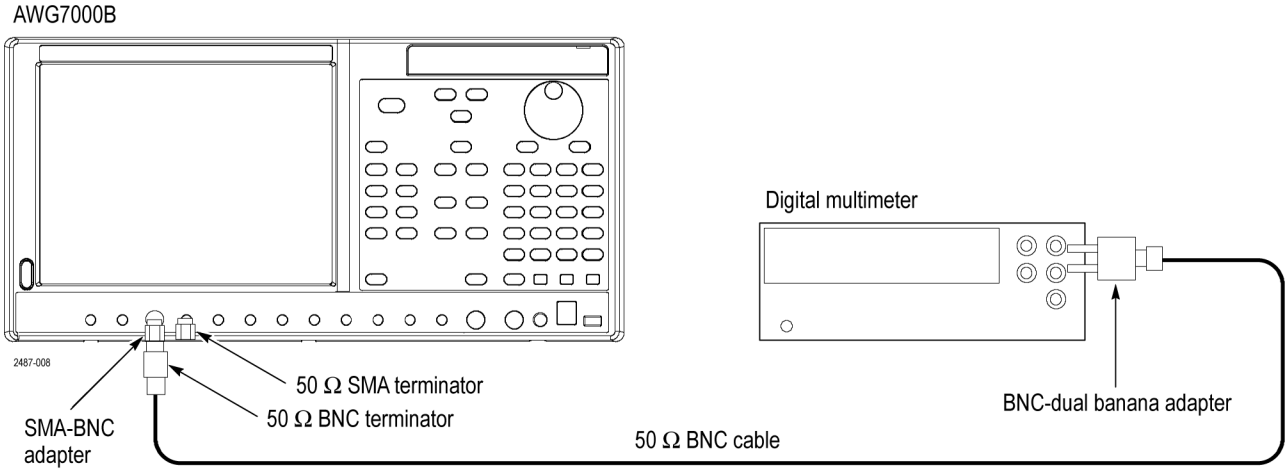


Figure 2-12: Equipment connection for verifying the marker high and low level accuracy

5. Press the **Factory Default** button on the AWG7000B.
6. Press the **Ch1 Select** button on the AWG7000B.
7. On the AWG7000B, load the **marker_hi** waveform as an output waveform.
   a. Select **File** > **Open File...**.
   b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file. The **Waveform List** window appears.
   c. In the window, select (drag and drop) the **marker_hi** waveform on the **User Defined** tab.
8. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.
9. Press the **Run** button on the AWG7000B to output the waveform.
10. Make the AWG7000B High Level setting shown in the first row of the following table:

Table 2-8: Marker High and Low level accuracy

High level settings	Accuracy limits
+ 1.4 V	1.185 V to 1.615 V
0.0 V	–75 mV to +75 mV
–0.9 V	–1.065 V to –0.735 V
Low level settings	**Accuracy limits**
+ 0.9 V	0.735 V to 1.065 V
0.0 V	–75 mV to +75 mV
–1.4 V	–1.615 V to –1.185 V

11. Measure the output voltage on the digital multimeter and note the value as **Measured_voltage_1**.
12. Use the following formula to compensate the voltage for the 50 Ω BNC termination:

    Marker_High = (Term_R + 50) / (2 Term_R) Measured_voltage_1

    Where Term_R is the resistance of the 50 Ω BNC termination measured in step 3 in the *Measuring the Termination Resistance*. (See page 2-18.)
13. Verify that the marker High level falls within the limits given in the table. (See Table 2-8.)
14. Repeat steps 10 through 13 for each row in the table. (See Table 2-8.)
15. In the **Waveform List** window, select the **marker_low** waveform on the **User Defined** tab.
16. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.

17. Press the **Run** button on the AWG7000B to output the waveform.
18. Make the AWG7000B Low Level setting shown in the first row of the table. (See Table 2-8.)
19. Measure the output voltage on the digital multimeter and note the value as **Measured_voltage_2**.
20. Use the following formula to compensate the voltage for the 50 Ω BNC termination:

    Marker_Low = (Term_R + 50) / (2 Term_R) Measured_voltage_2
21. Verify that the marker Low level falls within the limits given in the table. (See Table 2-8.)
22. Repeat steps 18 through 21 for each row in the table. (See Table 2-8.)
23. Press the **Ch 1 On** button to disable the channel 1 output.
24. Move the SMA-BNC adapter from the Channel 1 Mkr 1 connector to the Channel 1 Mkr 2 connector and move the 50 Ω SMA termination from the Channel 1 Mkr 2 connector to the Channel 1 Mkr 1 connector.

NOTE. *For the $\overline{\text{Mkr 1}}$ output, read marker_hi and marker_low as marker_low and marker_hi respectively.*

25. Repeat steps 8 through 22.
26. Repeat steps 8 through 25 for Channel 1 Mkr 2 and $\overline{\text{Mkr 2}}$.
27. *For the AWG7122B or AWG7062B:* Repeat the test for the Channel 2 marker outputs.
28. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
29. Disconnect the test setup.

Marker Output Delay Accuracy

Required equipment	Prerequisites
Sampling oscilloscope	(See page 2-7, *Prerequisites*.)
Two 50 Ω SMA cables	
Two 50 Ω SMA terminations	
Two 50 Ω SMA attenuators	

1. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.

2. Use a 50 Ω SMA cable and 50 Ω SMA attenuator to connect the Channel 1 Mkr 1 connector on the AWG7000B to the CH1 connector on the sampling oscilloscope.
3. Use the 50 Ω SMA cable and 50 Ω SMA attenuator to connect the Channel 1 Analog connector on the AWG7000B to the TRIGGER DIRECT connector on the sampling oscilloscope.
4. Use a 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Analog}}$ connector on the AWG7000B.
5. Use the 50 Ω SMA termination to terminate the Channel 1 $\overline{\text{Mkr 1}}$ connector on the AWG7000B.

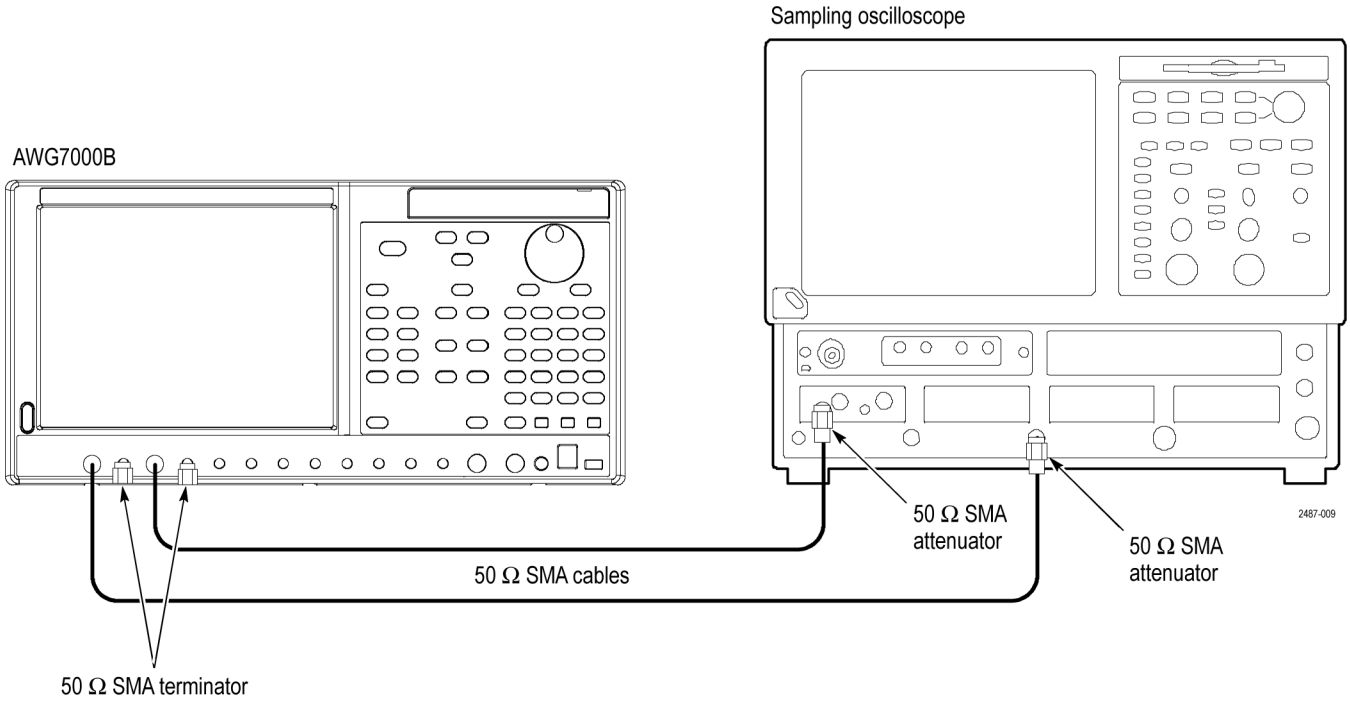


Figure 2-13: Equipment connections for verifying the marker output delay accuracy

6. Set the sampling oscilloscope as follows:
   a. Vertical scale: 250 mV/div
   b. Horizontal scale: 100 ps/div
   c. Trigger source: External Direct
   d. Trigger level: 0 V
   e. Trigger slope: positive
   f. Measure: Pulse measurement > Pulse Time > Delay
7. Press the **Factory Default** button on the AWG7000B.

8. On the AWG7000B, load the **square1** waveform as an output waveform.
   a. Select **File** > **Open File...**.
   b. In the dialog box, navigate to the **C:\Program Files\Tektronix\AWG\System\PV** directory, and then select the **pv_awg7000b.awg** file. The **Waveform List** window appears.
   c. In the window, select the **square1** waveform on the **User Defined** tab.
9. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.
10. Press the **Run** button on the AWG7000B to output the waveform.
11. On the oscilloscope, store the channel 1 waveform to **Ref 1** as a reference waveform.
12. On the AWG7000B, set the **Marker 1** delay value to **150 ps**.
13. Use the oscilloscope to measure the delay time between the Ref 1 waveform and channel 1 waveform at the 50% level.
14. Verify that the delay time is within the range of 92.5 ps to 207.5 ps.
15. Press the **Ch 1 On** button on the AWG7000B to disable the channel 1 output.
16. Move the SMA cable from the Channel 1 Mkr 1 connector to the Channel 1 Mkr 2 connector.
17. Move the SMA termination from the Channel 1 $\overline{\text{Mkr 1}}$ connector to the Channel 1 $\overline{\text{Mkr 2}}$ connector.
18. Press the **Ch 1 On** button on the AWG7000B to enable the channel 1 output.
19. On the oscilloscope, store the channel 1 waveform to **Ref 1** as a reference waveform.
20. On the AWG7000B, set the **Marker 2** delay value to **150 ps**.
21. Repeat steps 13 and 14.
22. *For the AWG7122B and AWG7062B:* Repeat the test for the Marker 1 and Marker 2 of the Channel 2.
23. Press the **All Outputs On/Off** button on the AWG7000B to turn off all the outputs.
24. Disconnect the test setup.

DC Output Voltage Accuracy

Required equipment	Prerequisites
Digital multimeter	(See page 2-7, *Prerequisites*.)
DC output lead set	
Test leads (provided with the digital multimeter)	

1. Use the test leads to connect the HI and LO inputs on the digital multimeter.
2. Use the DC output lead set to connect the DC Output connector on the AWG7000B.

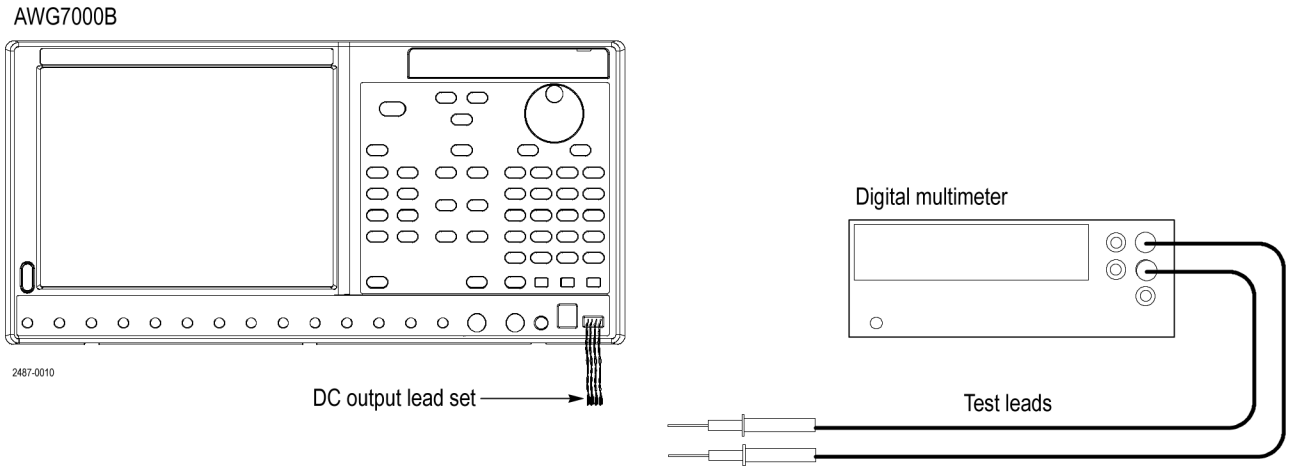


Figure 2-14: Equipment connection for verifying the DC output voltage accuracy

3. Set the digital multimeter to the **VDC** mode.
4. On the AWG7000B, select the **DC Outputs** tab in the **Settings** window.
5. On the DC Output tab, set the DC 1, DC 2, DC 3, and DC 4 levels to the setting shown in the first row of the following table:

Table 2-9: DC output voltage accuracy

Model	DC output settings	Accuracy limits
AWG7000B	+5 V	4.73 V to 5.27 V
	+3 V	2.79 V to 3.21 V
	0.0 V	–120 mV to +120 mV
	–3 V	–3.21 V to -2.79 V

6. On the DC Outputs tab, select the **DC Output** check box to enable the DC output. The DC Output LED on the front panel lights.

7. Attach the black test lead to the connector lead from DC1 GND.
8. Attach the red test lead to the connector lead from DC1.
9. Verify that the DC output level falls within the limits given in the table.
10. Repeat steps 8 through 9 for DC 2, DC 3, and DC 4.
11. Repeat steps 5 through 10 for each row.

This completes the AWG7000B performance verification.

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP