

**AFG3000 Series  
Arbitrary Function Generators  
Specifications and Performance Verification  
Technical Reference**

[www.tektronix.com](http://www.tektronix.com)



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[www.valuetronics.com](http://www.valuetronics.com)

**Tektronix**

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## **Contacting Tektronix**

Tektronix, Inc.  
14150 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](http://www.tektronix.com) to find contacts in your area.

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## 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.*

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

### 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.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

**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:



CAUTION  
Refer to Manual



Protective Ground  
(Earth) Terminal



Chassis Ground



Mains Disconnected  
OFF (Power)



Mains Connected  
ON (Power)



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# Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

**Do Not Service Alone.** Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

**Disconnect Power.** To avoid electric shock, disconnect the mains power by means of the power cord or, if provided, the power switch.

**Use Care When Servicing With Power On.** Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.



# Preface

This manual provides instructions to verify the performance of the AFG3000 Series Arbitrary Function Generators to the module level.

Unless noted otherwise, the term “AFG3000 Series” refers to the models in the following table.

**Table 1: Supported products**

|         |          |          |
|---------|----------|----------|
| AFG3011 | AFG3021B | AFG3011C |
| AFG3101 | AFG3022B | AFG3021C |
| AFG3102 |          | AFG3022C |
| AFG3251 |          | AFG3051C |
| AFG3252 |          | AFG3052C |
|         |          | AFG3101C |
|         |          | AFG3102C |
|         |          | AFG3251C |
|         |          | AFG3252C |

To prevent personal injury or damage to the instrument, consider the following before attempting service:

- The procedures in this manual should be performed only by a qualified service person.
- Read the *General Safety Summary* and the *Service Safety Summary* at the beginning of this document.

When using this manual for servicing, be sure to follow all warnings, cautions, and notes.

The manual consists of the following sections:

- *Specifications* contains a description of the instrument and the characteristics that apply to it.
- *Performance Verification* contains procedures for confirming that the instrument functions properly and meets warranted limits.

The procedures described in this document should be performed every 12 months or after module replacement.

If the instruments do not meet performance criteria, repair is necessary.

## Finding other information

This manual focuses on the performance verification of the instrument. See the following list for other documents supporting the instrument. All documents except the Online Help are on the AFG3000 Series Product Documentation CD-ROM that ship with instrument.

| Document                                      | Description                                                                                                                                                                                                   |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>AFG3000 Series Quick Start User Manual</i> | A quick reference to major features of the instrument and how they operate. It also provides several tutorials to familiarize you with basic instrument features.                                             |
| <i>AFG3000 Series Programmer Manual</i>       | An encyclopedia of topics that describe the instrument interface and features, and gives background information on how to use them. It provides Menu Structures, User Interface, and Programming Information. |
| <i>AFG3000 Series Online Help</i>             | A online help system, integrated with the User Interface application that ships with this product. The help is preinstalled in the instrument.                                                                |

## Manual conventions

This manual uses certain conventions that you should become familiar with.

Some sections of the manual contain procedures for you to perform. To keep those instructions clear and consistent, this manual uses the following conventions:

- Front-panel controls and menu names appear in the same case (initial capitals, all uppercase, and so on) in the manual as is used on the instrument front-panel and menus. Front-panel labels are all upper case letters (for example, MENU, SELECT, PULSE GEN, and so on).
- Instruction steps are numbered unless there is only one step.

**Modules** Throughout this manual, any replaceable component, assembly, or part of the instrument is referred to generically as a module. In general, a module is an assembly (such as a circuit board). Sometimes a single component is a module; for example, the chassis of the instrument is a module.

**Safety** Symbols and terms related to safety appear in the Safety Summary near the beginning of this manual.

# Specifications

These specifications apply to all AFG3000 Series Arbitrary Function Generators. All specifications are guaranteed unless labeled “typical”. Typical specifications are provided for your convenience but are not guaranteed.

Specifications that are check marked with the ✓ symbol are checked directly (or indirectly) in the Performance Verification section.

All specifications apply to the arbitrary function generator unless noted otherwise. These specifications are valid under the following conditions:

- The instrument must have been calibrated/adjusted at an ambient temperature between +20 °C and +30 °C.
- The instrument must be operating at an ambient temperature between 0 °C and +50 °C.
- The instrument must have had a warm-up period of at least 20 minutes.
- The instrument must be in an environment with temperature, altitude, and humidity within the operating limits described in these specifications.

## Electrical specifications

Table 2: Operating mode

| Characteristic        | Description                              |
|-----------------------|------------------------------------------|
| Run mode              | Continuous, Modulation, Sweep, and Burst |
| Burst count           | 1 to 1,000,000 cycles or infinite        |
| Internal trigger rate | 1.000 $\mu$ s to 500.0 s                 |

**Table 3: Waveforms**

| Characteristic                                  | Description                                                                                                                  |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Standard                                        | Sine, Square, Pulse, Ramp, More (Sin(x)/x, Noise, DC, Gaussian, Lorentz, Exponential Rise, Exponential Decay, and Haversine) |
| Arbitrary waveform                              |                                                                                                                              |
| Waveform length                                 | 2 to 131,072                                                                                                                 |
| Sampling rate                                   |                                                                                                                              |
| AFG3021B / 3022B / 3021C / 3022C / 3011 / 3011C | 250 MS/s                                                                                                                     |
| AFG3101 / 3101C / 3102 / 3102C / 3051C / 3052C  | 250 MS/s or 1 GS/s (rate changes automatically at $\leq 16K$ )                                                               |
| AFG3251 / 3251C / 3252 / 3252C                  | 250 MS/s or 2 GS/s (rate changes automatically at $\leq 16K$ )                                                               |
| Resolution                                      | 14 bits                                                                                                                      |
| Number of non-volatile waveform memories        | 4                                                                                                                            |

**Table 4: (Category) specifications**

| Characteristic                   | Description            | PV reference page |
|----------------------------------|------------------------|-------------------|
| Frequency range                  |                        |                   |
| Sine <sup>1</sup>                |                        |                   |
| AFG3011 / 3011C                  | 1 $\mu$ Hz to 10 MHz   |                   |
| AFG3021B / 3021C / 3022B / 3022C | 1 $\mu$ Hz to 25 MHz   |                   |
| AFG3051C / 3052C                 | 1 $\mu$ Hz to 50 MHz   |                   |
| AFG3101 / 3101C / 3102 / 3102C   | 1 $\mu$ Hz to 100 MHz  |                   |
| AFG3251 / 3251C / 3252 / 3252C   | 1 $\mu$ Hz to 240 MHz  |                   |
| Square                           |                        |                   |
| AFG3011 / 3011C                  | 1 $\mu$ Hz to 5 MHz    |                   |
| AFG3021B / 3022B                 | 1 $\mu$ Hz to 12.5 MHz |                   |
| AFG3021C / 3022C                 | 1 $\mu$ Hz to 25 MHz   |                   |
| AFG3051C / 3052C                 | 1 $\mu$ Hz to 40 MHz   |                   |
| AFG3101 / 3101C / 3102 / 3102C   | 1 $\mu$ Hz to 50 MHz   |                   |
| AFG3251 / 3251C / 3252 / 3252C   | 1 $\mu$ Hz to 120 MHz  |                   |
| Pulse                            |                        |                   |
| AFG3011 / 3011C                  | 1 mHz to 5 MHz         |                   |

Table 4: (Category) specifications (cont.)

| Characteristic                                                                    | Description           | PV reference page |
|-----------------------------------------------------------------------------------|-----------------------|-------------------|
| AFG3021B / 3022B                                                                  | 1 mHz to 12.5 MHz     |                   |
| AFG3021C / 3022C                                                                  | 1 mHz to 25 MHz       |                   |
| AFG3051C / 3052C                                                                  | 1 mHz to 40 MHz       |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                    | 1 mHz to 50 MHz       |                   |
| AFG3251 / 3251C / 3252 / 3252C                                                    | 1 mHz to 120 MHz      |                   |
| Ramp, Sin(x)/X, Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine |                       |                   |
| AFG3011 / 3011C                                                                   | 1 $\mu$ Hz to 100 kHz |                   |
| AFG3021B / 3022B                                                                  | 1 $\mu$ Hz to 250 kHz |                   |
| AFG3021C / 3022C                                                                  | 1 $\mu$ Hz to 500 kHz |                   |
| AFG3051C / 3022C                                                                  | 1 $\mu$ Hz to 800 kHz |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                    | 1 $\mu$ Hz to 1 MHz   |                   |
| AFG3251 / 3251C / 3252 / 3252C                                                    | 1 $\mu$ Hz to 2.4 MHz |                   |
| Arbitrary <sup>2</sup>                                                            |                       |                   |
| AFG3011 / 3011C                                                                   | 1 mHz to 5 MHz        |                   |
| AFG3021B / 3021C / 3022B / 3022C                                                  | 1 mHz to 12.5 MHz     |                   |
| AFG3051C / 3052C                                                                  | 1 mHz to 25 MHz       |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                    | 1 mHz to 50 MHz       |                   |
| AFG3251 / 3251C / 3252 / 3252C                                                    | 1 mHz to 120 MHz      |                   |
| Noise bandwidth (-3 dB), typical                                                  |                       |                   |
| AFG3011 / 3011C                                                                   | 10 MHz                |                   |
| AFG3021B / 3021C / 3022B / 3022C                                                  | 25 MHz                |                   |
| AFG3051 / 3052C                                                                   | 50 MHz                |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                    | 100 MHz               |                   |
| AFG3251 / 3251C / 3252 / 3252C                                                    | 240 MHz               |                   |

Table 4: (Category) specifications (cont.)

| Characteristic       | Description                                                                             | PV reference page                     |
|----------------------|-----------------------------------------------------------------------------------------|---------------------------------------|
| Resolution           | 1 $\mu$ Hz or 12 digits                                                                 |                                       |
| ✓ Accuracy stability | $\pm 1$ ppm, 0 °C to 50 °C (except Arb)<br>$\pm 1$ ppm $\pm 1$ mHz, 0 °C to 50 °C (Arb) | (See page 49, Frequency/period test.) |
| Accuracy aging       | $\pm 1$ ppm/year                                                                        |                                       |

<sup>1</sup> Triggered/Gated Burst mode:  
 AFG3011 / 3011C, 1  $\mu$ Hz to 5 MHz;  
 AFG3021B/3021C/3022B/3022C, 1  $\mu$ Hz to 12.5 MHz;  
 AFG3051C/3052C, 1  $\mu$ Hz to 25 MHz;  
 AFG3101/3101C/3102/3102C, 1  $\mu$ Hz to 50 MHz;  
 AFG3251/3251C/3252/3252C, 1  $\mu$ Hz to 120 MHz

<sup>2</sup> Triggered/Gated Burst mode:  
 AFG3011 / 3011C, 1 mHz to 2.5 MHz;  
 AFG3021B/3021C/3022B/3022C, 1 mHz to 6.25 MHz;  
 AFG3051C/3052C, 1 MHz to 12.5 MHz;  
 AFG3101/3101C/3102/3102C, 1 mHz to 25 MHz;  
 AFG3251/AFG3252, 1 mHz to 60 MHz

Table 5: Phase (except DC, Noise, and Pulse)

| Characteristics    | Description    |
|--------------------|----------------|
| Range <sup>1</sup> | –360° to +360° |

<sup>1</sup> Resolution: 0.01° (sine), 0.1° (other standard waveforms)

Table 6: Lead delay (pulse)

| Characteristic             | Description                                                                     |
|----------------------------|---------------------------------------------------------------------------------|
| Range                      |                                                                                 |
| Continuous mode            | 0 ps to period                                                                  |
| Triggered/Gated Burst mode | 0 ps to period – [pulse width + 0.8 * (leading edge time + trailing edge time)] |
| Resolution                 | 10 ps or 8 digits                                                               |

Table 7: Amplitude

| Characteristic                                   | Description                                                                                                         | PV reference page |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------|
| Range <sup>1</sup>                               |                                                                                                                     |                   |
| AFG3011 / 3011C                                  | 20 mV <sub>p-p</sub> to 20 V <sub>p-p</sub><br>40 mV <sub>p-p</sub> to 40 V <sub>p-p</sub> (into open circuit load) |                   |
| AFG3021B / 3021C / 3022B / 3022C / 3051C / 3052C | 10 mV <sub>p-p</sub> to 10 V <sub>p-p</sub><br>20 mV <sub>p-p</sub> to 20 V <sub>p-p</sub> (into open circuit load) |                   |
| AFG3101 / 3101C / 3102 / 3102C                   | 20 mV <sub>p-p</sub> to 10 V <sub>p-p</sub><br>40 mV <sub>p-p</sub> to 20 V <sub>p-p</sub> (into open circuit load) |                   |

Table 7: Amplitude (cont.)

| Characteristic                                                                               | Description                                                                                                         | PV reference page              |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------|
| AFG3251 / 3252 / 3251C / 3252C                                                               | 50 mV <sub>p-p</sub> to 5 V <sub>p-p</sub><br>100 mV <sub>p-p</sub> to 10 V <sub>p-p</sub> (into open circuit load) |                                |
| ✓ Accuracy                                                                                   |                                                                                                                     | (See page 50, Amplitude test.) |
| AFG3011 / 3011C                                                                              | ±(2% of setting +2 mV) (at 1 kHz sine waveform amplitude > 10 mV <sub>p-p</sub> , 0V offset)                        |                                |
| AFG3021B / 3021C / 3022B / 3022C / 3101 / 3101C / 3102 / 3102C / 3251 / 3251C / 3252 / 3252C | ±(1% of setting +1 mV) (at 1 kHz sine waveform, amplitude > 10 mV <sub>p-p</sub> , 0 V offset)                      |                                |
| Resolution                                                                                   | 0.1 mV <sub>p-p</sub> , 0.1 mV <sub>rms</sub> , 1 mV, 0.1 dBm or 4 digits                                           |                                |
| Units <sup>2</sup>                                                                           | V <sub>p-p</sub> , V <sub>rms</sub> , dBm, and Volt (High level and Low level)                                      |                                |
| Output impedance                                                                             | 50 Ω                                                                                                                |                                |
| Isolation                                                                                    | 42 V <sub>pk</sub> maximum to earth                                                                                 |                                |

<sup>1</sup> AFG3251/ 3251C / 3252 / 3252C (frequency range: >200 MHz to 240 MHz): 50 mV<sub>p-p</sub> to 4 V<sub>p-p</sub> into 50 Ω, 100 mV<sub>p-p</sub> to 8 V<sub>p-p</sub> into open circuit load

<sup>2</sup> dBm is used only for sine waveform. V<sub>rms</sub> is not available for Arb and Noise waveforms.

Table 8: DC offset

| Characteristic                                                                               | Description                                                                                                                                                          | PV reference page              |
|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Range                                                                                        |                                                                                                                                                                      |                                |
| AFG3011 / 3011C                                                                              | ±(10 V <sub>pk</sub> ac+dc into 50 Ω<br>±(20 V <sub>pk</sub> ac+dc into open circuit)                                                                                |                                |
| AFG3021B / 3021C / 3022B / 3022C / 3051C / 3052C                                             | ±(5 V <sub>pk</sub> ac+dc into 50 Ω<br>±(10 V <sub>pk</sub> ac+dc into open-circuit load)                                                                            |                                |
| AFG3101 / 3101C / 3102 / 3102C                                                               | ±5 V DC into 50 Ω load<br>±10 V <sub>pk</sub> ac+dc into open-circuit load                                                                                           |                                |
| AFG3251 / 3251C / 3252 / 3252C                                                               | ±2.5 V DC into 50 Ω load<br>±5 V DC open circuit                                                                                                                     |                                |
| ✓ Accuracy <sup>1</sup>                                                                      | ±(1% of  setting  +5 mV + 0.5% of amplitude (V <sub>p-p</sub> )) (except for AFG3011C)<br>±(2% of  setting  +10 mV + 1% of amplitude (V <sub>p-p</sub> )) (AFG3011C) | (See page 52, DC Offset test.) |
| AFG3011 / 3011C                                                                              |                                                                                                                                                                      |                                |
| AFG3021B / 3021C / 3022B / 3022C / 3101 / 3101C / 3102 / 3102C / 3251 / 3251C / 3252 / 3252C | ±(1% of  setting  +5 mV + 0.5% of amplitude (V <sub>p-p</sub> ))                                                                                                     |                                |
| Resolution                                                                                   | 1 mV                                                                                                                                                                 |                                |

Table 8: DC offset (cont.)

| Characteristic   | Description | PV reference page |
|------------------|-------------|-------------------|
| Output impedance | 50 $\Omega$ |                   |

<sup>1</sup> AFG3011 / 3011C: Add 1.0 mV per °C for operation outside the range of 20 °C to 30 °C.  
 AFG3021B / 3021C / 3022B / 3022C and AFG3101 / 31010C / 3102 / 3102C: Add 0.5 mV per °C for operation outside the range of 20 °C to 30 °C.  
 AFG3251 / 3251C / 3252 / 3252C: Add 2.0 mV per °C for operation outside the range of 20 °C to 30 °C.

Table 9: Internal noise add

| Characteristic | Description                    |
|----------------|--------------------------------|
| Range          | 0% to 50% of amplitude setting |
| Resolution     | 1%                             |

Table 10: Output characteristics

| Characteristic                                                             | Description                                                                                                                                                                                                     | PV reference page                         |
|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Sine wave                                                                  |                                                                                                                                                                                                                 |                                           |
| ✓ Flatness (at 1.0 V <sub>p-p</sub> amplitude (+4 dBm), relative to 1 kHz) |                                                                                                                                                                                                                 | (See page 54, AC Flatness test.)          |
| AFG3011 / 3011C                                                            | < 5 MHz: $\pm 0.15$ dB<br>5 MHz $\leq$ frq $\leq$ 10 MHz: $\pm 0.3$ dB                                                                                                                                          |                                           |
| AFG3021B / 3021C / 3022B / 3022C                                           | < 5 MHz: $\pm 0.15$ dB<br>5 MHz $\leq$ frq < 20 MHz: $\pm 0.3$ dB<br>20 MHz $\leq$ frq $\leq$ 25 MHz: $\pm 0.5$ dB                                                                                              |                                           |
| AFG3051C / 3052C                                                           | < 5 MHz: $\pm 0.15$ dB<br>5 MHz $\leq$ frq < 45 MHz: $\pm 0.3$ dB<br>45 MHz $\leq$ frq $\leq$ 50 MHz: $\pm 0.5$ dB                                                                                              |                                           |
| AFG3101 / 3101C / 3102 / 3102C                                             | < 5 MHz: $\pm 0.15$ dB<br>5 MHz $\leq$ frq < 25 MHz: $\pm 0.3$ dB<br>25 MHz $\leq$ frq $\leq$ 100 MHz: $\pm 0.5$ dB                                                                                             |                                           |
| AFG3251 / 3251C / 3252 / 3252C                                             | < 5 MHz: $\pm 0.15$ dB<br>5 MHz $\leq$ frq < 25 MHz: $\pm 0.3$ dB<br>25 MHz $\leq$ frq < 100 MHz: $\pm 0.5$ dB<br>100 MHz $\leq$ frq < 200 MHz: $\pm 1.0$ dB<br>200 MHz $\leq$ frq $\leq$ 240 MHz: $\pm 2.0$ dB |                                           |
| ✓ Harmonic distortion (at 1.0 V <sub>p-p</sub> amplitude)                  |                                                                                                                                                                                                                 | (See page 56, Harmonics Distortion test.) |
| AFG3011 / 3011C                                                            | 10 Hz $\leq$ frq < 20 kHz: < -60 dBc<br>20 kHz $\leq$ frq < 1 MHz: < -55 dBc<br>1 MHz $\leq$ frq $\leq$ 10 MHz: < -45 dBc                                                                                       |                                           |

Table 10: Output characteristics (cont.)

| Characteristic                                                                 | Description                                                                                                                                                        | PV reference page                                      |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| AFG3021B / 3021C / 3022B / 3022C                                               | 10 Hz $\leq$ frq < 20 kHz: < -70 dBc<br>20 kHz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq < 10 MHz: < -50 dBc<br>10 MHz $\leq$ frq $\leq$ 25 MHz: < -40 dBc |                                                        |
| AFG3051C / 3052C                                                               | 10 Hz $\leq$ frq < 20 kHz: < -70 dBc<br>20 kHz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq < 5 MHz: < -50 dBc<br>5 MHz $\leq$ frq $\leq$ 50 MHz: < -40 dBc   |                                                        |
| AFG3101 / 3101C / 3102 / 3102C                                                 | 10 Hz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq < 5 MHz: < -50 dBc<br>5 MHz $\leq$ frq $\leq$ 100 MHz: < -37 dBc                                           |                                                        |
| AFG3251 / 3251C / 3252 / 3252C                                                 | 10 Hz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq < 5 MHz: < -50 dBc<br>5 MHz $\leq$ frq < 25 MHz: < -37 dBc<br>25 MHz $\leq$ frq $\leq$ 240 MHz: < -30 dBc  |                                                        |
| ✓ Total harmonic distortion (at 1 V <sub>p-p</sub> amplitude)                  | 10 Hz to 20 kHz: < 0.2%                                                                                                                                            | (See page 59, <i>Total Harmonic Distortion test.</i> ) |
| ✓ Spurious <sup>1</sup> (nonharmonic) (at 1 V <sub>p-p</sub> amplitude)        |                                                                                                                                                                    | (See page 61, <i>Spurious test.</i> )                  |
| AFG3011 / 3011C                                                                | 10 Hz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq $\leq$ 10 MHz: < -50 dBc                                                                                   |                                                        |
| AFG3021B / 3021C / 3022B / 3022C                                               | 10 Hz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq $\leq$ 25 MHz: < -50 dBc                                                                                   |                                                        |
| AFG3051C / 3052C                                                               | 10 Hz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq $\leq$ 50 MHz: < -50 dBc                                                                                   |                                                        |
| AFG3101 / 3101C / 3102 / 3102C                                                 | 10 Hz $\leq$ frq < 1 MHz: < -60 dBc<br>1 MHz $\leq$ frq < 25 MHz: < -50 dBc<br>25 MHz $\leq$ frq $\leq$ 100 MHz: -50 dBc + 6 dBc/octave                            |                                                        |
| AFG3251 / 3251C / 3252 / 3252C                                                 | 10 Hz $\leq$ frq < 1 MHz: < -50 dBc<br>1 MHz $\leq$ frq < 25 MHz: < -47 dBc<br>25 MHz $\leq$ frq $\leq$ 240 MHz: -47 dBc + 6 dBc/octave                            |                                                        |
| Phase noise, typical (at 1 V <sub>p-p</sub> amplitude)                         |                                                                                                                                                                    |                                                        |
| AFG3011 / 3011C                                                                | 10 MHz: < -110 dBc/Hz at 10 kHz offset                                                                                                                             |                                                        |
| AFG3021B / 3021C / 3022B / 3022C / 3051C / 3052C / 3101 / 3101C / 3102 / 3102C | 20 MHz: < -110 dBc/Hz at 10 kHz offset                                                                                                                             |                                                        |
| Residual clock noise, typical                                                  |                                                                                                                                                                    |                                                        |
| AFG3011 / 3011C / 3021B / 3021C / 3022B / 3022C / 3051C / 3052C                | -63 dBm                                                                                                                                                            |                                                        |

Table 10: Output characteristics (cont.)

| Characteristic                                                                        | Description                   | PV reference page                   |
|---------------------------------------------------------------------------------------|-------------------------------|-------------------------------------|
| AFG3101 / 3101C / 3102 / 3102C / 3251C / 3251C / 3252 / 3252C                         | -57 dBm                       |                                     |
| Square wave                                                                           |                               |                                     |
| ↗ Rise time/fall time                                                                 |                               | (See page 64, Rise-Fall time test.) |
| AFG3011 / 3011C                                                                       | ≤ 50 ns                       |                                     |
| AFG3021B / 3022B                                                                      | ≤ 18 ns                       |                                     |
| AFG3021C / 3022C                                                                      | ≤ 9 ns                        |                                     |
| AFG3051C / 33052C                                                                     | ≤ 7 ns                        |                                     |
| AFG3101 / 3101C / 3102 / 3102C                                                        | ≤ 5 ns                        |                                     |
| AFG3251 / 3251C / 3252 / 3252C                                                        | ≤ 2.5 ns                      |                                     |
| Jitter (rms), typical                                                                 |                               |                                     |
| AFG3011 / 3011C / 3021B / 3021C / 3022B / 3022C                                       | 500 ps                        |                                     |
| AFG3051C / 33052C                                                                     | 300 ps                        |                                     |
| AFG3101 / 3101C / 3102 / 3102C                                                        | 200 ps                        |                                     |
| AFG3251 / 3251C / 3252 / 3252C                                                        | 100 ps                        |                                     |
| Pulse                                                                                 |                               |                                     |
| Pulse width                                                                           |                               |                                     |
| AFG3011 / 3011C                                                                       | 80 ns to 999.99 s             |                                     |
| AFG3021B / 3021C / 3022B / 3022C                                                      | 16 ns to 999.99 s             |                                     |
| AFG3051C / 33052C                                                                     | 12 ns to 999.99 s             |                                     |
| AFG3101 / 3101C / 3102 / 3102C                                                        | 8 ns to 999.99 s              |                                     |
| AFG3251 / 3251C / 3252 / 3252C                                                        | 4 ns to 999.99 s              |                                     |
| Resolution                                                                            | 10 ps or 5 digits             |                                     |
| Pulse duty                                                                            | 0.001% to 99.999%             |                                     |
| Leading edge/trailing edge transition time (at 10% to 90% of amplitude, respectively) |                               |                                     |
| AFG3011 / 3011C                                                                       | 50 ns to 0.625 * pulse period |                                     |
| AFG3021B / 3022B                                                                      | 18 ns to 0.625 * pulse period |                                     |

Table 10: Output characteristics (cont.)

| Characteristic                                                                  | Description                                             | PV reference page |
|---------------------------------------------------------------------------------|---------------------------------------------------------|-------------------|
| AFG3021C / 3022C                                                                | 9 ns to 0.625 * pulse period                            |                   |
| AFG3051C / 33052C                                                               | 7 ns to 0.625 * pulse period                            |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                  | 5 ns to 0.625 * pulse period                            |                   |
| AFG3251 / 3251C / 3252 / 3252C                                                  | 2.5 ns to 0.625 * pulse period                          |                   |
| Resolution                                                                      | 10 ps or 4 digits                                       |                   |
| Overshoot, typical                                                              | < 5%                                                    |                   |
| Jitter (rms), typical                                                           |                                                         |                   |
| AFG3011 / 3011C / 3021B / 3021C / 3022B / 3022C                                 | 500 ps                                                  |                   |
| AFG3051C / 33052C                                                               | 300 ps                                                  |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                  | 200 ps                                                  |                   |
| AFG3251 / 3251C / 3252 / 3252C                                                  | 100 ps                                                  |                   |
| Ramp                                                                            |                                                         |                   |
| Linearity (at frequency: 1 kHz, amplitude: 1 V <sub>p-p</sub> , symmetry: 100%) |                                                         |                   |
| AFG3011 / 3011C / 3251 / 3251C / 3252 / 3252C                                   | ≤ 0.2% of peak output at 10% to 90% of amplitude range  |                   |
| AFG3021B / 3021C / 3022B / 3022C / 3051C / 3052C                                | ≤ 0.1% of peak output at 10% to 90% of amplitude range  |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                  | ≤ 0.15% of peak output at 10% to 90% of amplitude range |                   |
| Symmetry                                                                        | 0% to 100%                                              |                   |
| Arbitrary                                                                       |                                                         |                   |
| Rise time/fall time, typical                                                    |                                                         |                   |
| AFG3011 / 3011C                                                                 | ≤ 80 ns                                                 |                   |
| AFG3021B / 3021C / 3022B / 3022C                                                | ≤ 14 ns                                                 |                   |
| AFG3051C / 33052C                                                               | ≤ 10 ns                                                 |                   |
| AFG3101 / 3101C / 3102 / 3102C                                                  | ≤ 8 ns                                                  |                   |
| AFG3251 / 3251C / 3252 / 3252C                                                  | ≤ 3 ns                                                  |                   |
| Jitter (rms), typical                                                           |                                                         |                   |

Table 10: Output characteristics (cont.)

| Characteristic                                  | Description                          | PV reference page |
|-------------------------------------------------|--------------------------------------|-------------------|
| AFG3011 / 3011C / 3021B / 3021C / 3022B / 3022C | 4 ns                                 |                   |
| AFG3051C / 3052C / 3101 / 3101C / 3102 / 3102C  | 1 ns at 1 GS/s<br>4 ns at 250 MS/s   |                   |
| AFG3251 / 3251C / 3252 / 3252C                  | 500 ps at 2 GS/s<br>4 ns at 250 MS/s |                   |

<sup>1</sup> Exclude harmonics and channel crosstalk.

Table 11: Modulation

| Characteristic                   | Description                                              |
|----------------------------------|----------------------------------------------------------|
| AM (Amplitude Modulation)        |                                                          |
| Carrier waveforms                | Standard waveforms (except Pulse, DC, and Noise) and Arb |
| Modulation source                | Internal or External                                     |
| Internal modulating waveforms    | Sine, Square, Ramp, Noise, and Arb <sup>1</sup>          |
| Internal modulating frequency    | 2 mHz to 50.00 kHz                                       |
| Depth                            | 0.0% to 120.0%                                           |
| FM (Frequency Modulation)        |                                                          |
| Carrier waveforms                | Standard waveforms (except Pulse, DC, and Noise) and Arb |
| Modulation source                | Internal or External                                     |
| Internal modulating waveforms    | Sine, Square, Ramp, Noise, and Arb <sup>2</sup>          |
| Internal modulating frequency    | 2 mHz to 50.00 kHz                                       |
| Peak deviation                   |                                                          |
| AFG3011 / 3011C                  | DC to 5 MHz                                              |
| AFG3021B / 3021C / 3022B / 3022C | DC to 12.5 MHz                                           |
| AFG3051C / 3052C                 | DC to 25 MHz                                             |
| AFG3101 / 3101C / 3102 / 3102C   | DC to 50 MHz                                             |
| AFG3251 / 3251C / 3252 / 3252C   | DC to 120 MHz                                            |
| PM (Phase Modulation)            |                                                          |
| Carrier waveforms                | Standard waveforms (except Pulse, DC, and Noise) and Arb |
| Modulation source                | Internal or External                                     |
| Internal modulating waveforms    | Sine, Square, Ramp, Noise, and Arb <sup>2</sup>          |

**Table 11: Modulation (cont.)**

| Characteristic                                 | Description                                                    |
|------------------------------------------------|----------------------------------------------------------------|
| Internal modulating frequency                  | 2 mHz to 50.00 kHz                                             |
| Phase deviation range                          | 0.0 to 180.0 degrees                                           |
| FSK (Frequency Shift Keying)                   |                                                                |
| Carrier waveforms                              | Standard waveforms (except Pulse, DC, and Noise) and Arb       |
| Modulation source                              | Internal or External                                           |
| Internal key rate                              | 2 mHz to 1.000 MHz                                             |
| Number of keys                                 | 2                                                              |
| PWM (Pulse Width Modulation)                   |                                                                |
| Carrier waveforms                              | Pulse                                                          |
| Modulation source                              | Internal or External                                           |
| Internal modulating waveforms                  | Sine, Square, Ramp, Noise, and Arb <sup>2</sup>                |
| Internal modulating frequency                  | 2 mHz to 50.00 kHz                                             |
| Deviation range                                | 0.0% to 50.0% of pulse period                                  |
| Sweep                                          |                                                                |
| Type                                           | Linear or Logarithmic                                          |
| Start/stop frequency (except Arb) <sup>3</sup> |                                                                |
| AFG3011 / 3011C                                | 1 $\mu$ Hz to 10 MHz                                           |
| AFG3021B / 3021C / 3022B / 3022C               | 1 $\mu$ Hz to 25 MHz                                           |
| AFG3051C / 3052C                               | 1 $\mu$ Hz to 50 MHz                                           |
| AFG3101 / 3101C / 3102 / 3102C                 | 1 $\mu$ Hz to 100 MHz                                          |
| AFG3251 / 3251C / 3252 / 3252C                 | 1 $\mu$ Hz to 240 MHz                                          |
| Start/stop frequency (Arb)                     |                                                                |
| AFG3011 / 3011C                                | 1 mHz to 5 MHz                                                 |
| AFG3021B / 3021C / 3022B / 3022C               | 1 mHz to 12.5 MHz                                              |
| AFG3051C / 3052C                               | 1 mHz to 25 MHz                                                |
| AFG3101 / 3101C / 3102 / 3102C                 | 1 mHz to 50 MHz                                                |
| AFG3251 / 3251C / 3252 / 3252C                 | 1 mHz to 120 MHz                                               |
| Sweep/hold/return time <sup>4</sup>            |                                                                |
| Range                                          | 1 ms to 300 s (sweep time)<br>0 ms to 300 s (hold/return time) |

**Table 11: Modulation (cont.)**

| Characteristic                     | Description      |
|------------------------------------|------------------|
| Resolution                         | 1 ms or 4 digits |
| Total sweep time accuracy, typical | $\leq 0.4\%$     |

- <sup>1</sup> The maximum waveform length for Arb is 4,096. Waveform data points over 4,096 are ignored.
- <sup>2</sup> The maximum waveform length for Arb is 2,048. Waveform data points over 2,048 are ignored.
- <sup>3</sup> Pulse, DC, and Noise waveforms are not available. Start and stop frequencies depend on the waveform shape.
- <sup>4</sup> Total sweep time = Sweep time + Hold time + Return time  $\leq 300$  s

## Input and output specifications

**Table 12: Front panel**

| Characteristic                                  | Description                                          |
|-------------------------------------------------|------------------------------------------------------|
| Trigger output                                  |                                                      |
| Level                                           | Positive TTL level pulse into 1 k $\Omega$           |
| Impedance                                       | 50 $\Omega$                                          |
| Jitter (rms), typical                           |                                                      |
| AFG3011 / 3011C / 3021B / 3021C / 3022B / 3022C | 500 ps                                               |
| AFG3051C / 3052C                                | 300 ps                                               |
| AFG3101 / 3101C / 3102 / 3102C                  | 200 ps                                               |
| AFG3251 / 3251C / 3252 / 3252C                  | 100 ps                                               |
| Trigger input                                   |                                                      |
| Level                                           | TTL compatible                                       |
| Pulse width                                     | 100 ns minimum                                       |
| Impedance                                       | 10 k $\Omega$                                        |
| Slope                                           | Positive/negative, selectable                        |
| Trigger delay                                   | 0.0 ns to 85.000 s<br>Resolution: 100 ps or 5 digits |
| Jitter (rms), typical                           | Burst: < 500 ps (trigger input to signal output)     |

**Table 13: Rear panel**

| Characteristic            | Description                                                 |
|---------------------------|-------------------------------------------------------------|
| External modulation input |                                                             |
| Input range               | $\pm 1.0$ V full scale (except FSK) 3.3 V logic level (FSK) |
| Impedance                 | 10 k $\Omega$                                               |

Table 13: Rear panel (cont.)

| Characteristic               | Description                                                                 |
|------------------------------|-----------------------------------------------------------------------------|
| Frequency range              | AM, FM, PM, FSK, PWM: DC to 25 kHz (sampling rate: 122 kS/s)                |
| External reference output    | AFG3011 / 3011C / 3101 / 3101C / 3102 / 3102C / 3251 / 3251C / 3252 / 3252C |
| Impedance                    | 50 $\Omega$ , AC coupled                                                    |
| Amplitude, typical           | 1.2 Vp-p into 50 $\Omega$                                                   |
| External reference input     |                                                                             |
| Impedance                    | 1 k $\Omega$ , AC coupled                                                   |
| Required input voltage swing | 100 mVp-p to 5 Vp-p                                                         |
| Lock range                   | 10 MHz $\pm$ 35 kHz                                                         |
| CH1 Additional input         | AFG3101 / 3101C / 3102 / 3102C / 3251 / 3251C / 3252 / 3252C                |
| Impedance                    | 50 $\Omega$                                                                 |
| Input range                  | -1 V to +1 V (DC + peak AC)                                                 |
| Bandwidth                    | DC to 10 MHz (-3 dB) at 1 Vp-p                                              |

## General specifications

Table 14: Power

| Characteristic               | Description                                            |
|------------------------------|--------------------------------------------------------|
| Source voltage and frequency | 100 V to 240 V, 47 Hz to 63 Hz<br>115 V, 360 to 440 Hz |
| Power consumption            | Less than 120 W                                        |

Table 15: Environmental

| Characteristic                    | Description                                                                                            |
|-----------------------------------|--------------------------------------------------------------------------------------------------------|
| Temperature range                 |                                                                                                        |
| Operating                         | 0 °C to +50 °C                                                                                         |
| Non operating                     | -30 °C to +70 °C                                                                                       |
| Humidity                          |                                                                                                        |
| Operating<br>(non condensing)     | 0 °C to +40 °C: $\leq$ 80%<br>+40 °C to +50 °C: $\leq$ 60%                                             |
| Non operating<br>(non condensing) | <+40 °C: 5% to 90%<br>$\geq$ +40 °C to $\leq$ +60 °C: 5% to 80%<br>>+60 °C to $\leq$ +70 °C: 5% to 40% |
| Altitude                          |                                                                                                        |
| Operating                         | Up to 3,000 meters (9,843 feet)                                                                        |
| Non operating                     | Up to 12,000 meters (39,370 feet)                                                                      |

**Table 16: System characteristics**

| Characteristic                                             | Description                                                                          |            |             |
|------------------------------------------------------------|--------------------------------------------------------------------------------------|------------|-------------|
| Warm-up time, typical                                      | 20 minutes minimum                                                                   |            |             |
| Power on self diagnostics, typical                         | < 10 s                                                                               |            |             |
| Configuration times, typical                               | <i>USB</i>                                                                           | <i>LAN</i> | <i>GPIB</i> |
| Function change                                            | 81 ms                                                                                | 81 ms      | 81 ms       |
| Frequency change (except Pulse)                            | 2.5 ms                                                                               | 6 ms       | 3.2 ms      |
| Frequency change (Pulse)                                   | 40 ms                                                                                | 37 ms      | 32 ms       |
| Amplitude change                                           | 90 ms                                                                                | 97 ms      | 90 ms       |
| Select user Arbitrary waveform is 4K points (USB memory)   | 48 ms                                                                                | 50 ms      | 49 ms       |
| Select user Arbitrary waveform is 128K points (USB memory) | 260 ms                                                                               | 266 ms     | 240 ms      |
| Data download, typical                                     | 4000 points Arb waveform data (8 Kbytes)<br>GPIB: 320 ms<br>USB: 47 ms<br>LAN: 78 ms |            |             |
| Acoustic noise, typical                                    | < 50 dBA                                                                             |            |             |
| Weight (approximate)                                       | 4.5 kg (9.92 lbs)                                                                    |            |             |
| Dimensions                                                 | Refer to the following illustrations.                                                |            |             |

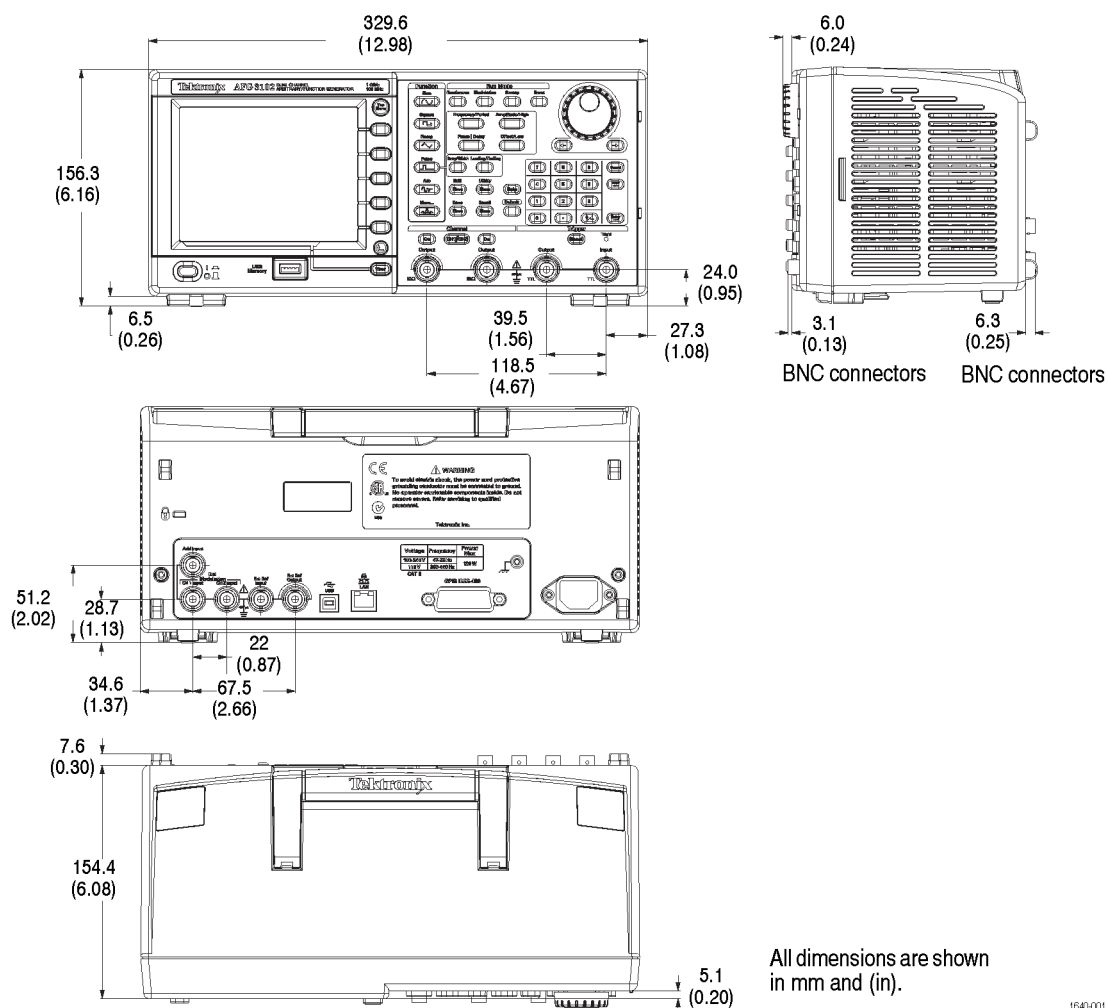


Figure 1: AFG3000 Series dimensions

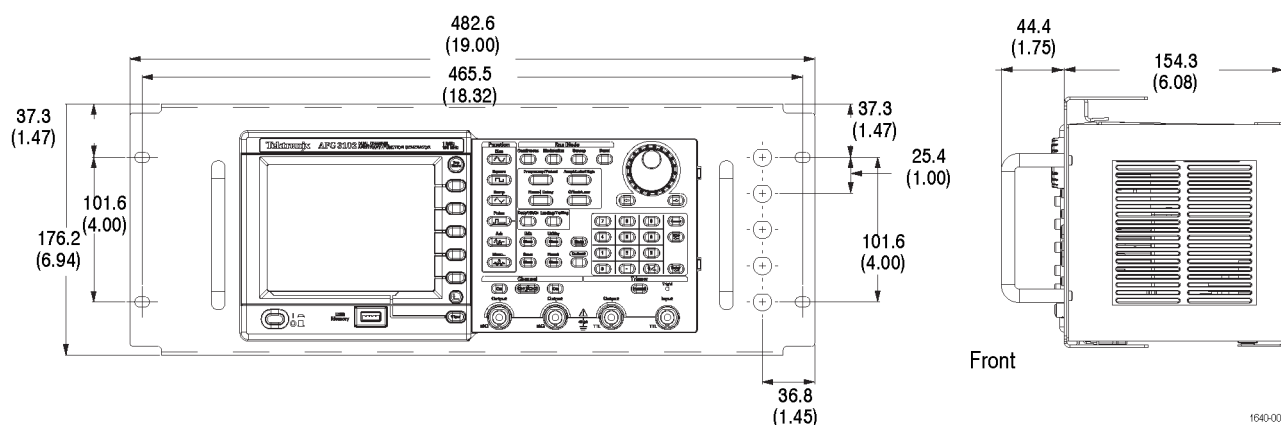


Figure 2: RM3100 Rackmount dimensions



# Performance verification

Two types of Performance Verification procedures can be performed on this product: Self Tests and Performance Tests. You may not need to perform all of these procedures, depending on what you want to accomplish.

- To quickly confirm that the AFG3000 Series Arbitrary Function Generators are operating properly, complete the Self Tests.
  - Advantage: These procedures require minimal time to perform, and test the internal hardware of the AFG3000 Series Arbitrary Function Generators.
- To further check functionality and proper calibration, first complete the Self Tests; then complete the Performance Tests.
  - Advantages: These procedures add direct checking of warranted specifications. These procedures require suitable test equipment and more time to execute. (See Table 19 on page 27.)

## Self tests

There are two types of tests in this section that provide a quick way to confirm basic functionality and proper adjustment:

- Diagnostics
- Calibration (you must perform this calibration before the performance tests.)

These procedures use internal diagnostics to verify that the instrument passes the internal circuit tests, and calibration routines to check and adjust the instrument internal calibration constants.

### Diagnostics

This procedure uses internal routines to verify that the instrument is operating correctly.

| Equipment required | None                                                                                                                                                                                                                                |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Prerequisites      | <ul style="list-style-type: none"><li>■ Power on the instrument and allow a 20 minute warm-up before doing this procedure.</li><li>■ The instrument must be operating at an ambient temperature between +0 °C and +50 °C.</li></ul> |

Do the following steps to run the internal routines that confirm basic functionality and proper adjustment:

1. Select Diagnostics in the Utility menu:

Utility (front-panel) > -more- (bezel) > Diagnostics/Calibration > Execute Diagnostics

2. Wait until the test is completed.

3. Verify passing of the diagnostics.

If the diagnostics completes without finding any problems, the message “PASSED” is displayed.

When an error is detected during diagnostic execution, the instrument displays an error code. Error codes are described in Error codes on (See page 23, *Error codes*.).

4. Press any front-panel button to exit the calibration.

## Calibration

This procedure uses internal routines to verify that the instrument is operating correctly.

### Equipment required

### None

### Prerequisites

- Power on the instrument and allow a 20 minute warm-up before doing this procedure.
- An ambient temperature is between +20 °C and +30 °C.

Do the following steps to run the internal routines that confirm basic functionality and proper adjustment:

1. Select Diagnostics in the Utility menu;

Utility (front-panel) > -more- (bezel) > Diagnostics/Calibration > Execute Calibration

2. Wait until the test is completed.

3. Verify passing of the calibration.

If the calibration completes without any problems, the message “PASSED” is displayed.

When an error is detected during calibration execution, the instrument displays an error code. Error codes are described in Error Codes on (See page 23, *Error codes*.).

4. Press any front-panel button to exit the diagnostics.

---

**NOTE.** Do not turn off the power while executing calibration. If the power is turned off during calibration, data stored in internal nonvolatile memory may be lost.

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## Error codes

If Diagnostics detects a malfunction, it displays the character string “Fail” and the error code. (See Table 17.) describes the Error code and related modules Category of the Diagnostics Error Code.

(See Table 17.) shows the error code and related modules reporting a failure.

**Table 17: Error codes**

| Error code                        | Description                                | Related module      |
|-----------------------------------|--------------------------------------------|---------------------|
| <b>— Calibration Error Codes—</b> |                                            |                     |
| 1101                              | CH1 Internal offset calibration failure    | A1x/A3x/A4x/A51/A61 |
| 1102                              | CH2 Internal offset calibration failure    | A12/A32/A42/A51/A61 |
| 1103                              | CH1 Output offset calibration failure      | A1x/A3x/A4x/A51/A61 |
| 1104                              | CH2 Output offset calibration failure      | A12/A32/A42/A51/A61 |
| 1105                              | CH1 Output gain Calibration failure        | A1x/A3x/A4x/A51/A61 |
| 1106                              | CH2 Output gain Calibration failure        | A12/A32/A42/A51/A61 |
| 1201                              | CH1 x3dB attenuator calibration failure    | A1x/A3x/A4x/A51/A61 |
| 1202                              | CH2 x3dB attenuator calibration failure    | A12/A32/A42/A51/A61 |
| 1203                              | CH1 x6dB attenuator calibration failure    | A1x/A3x/A4x/A51/A61 |
| 1204                              | CH2 x6dB attenuator calibration failure    | A12/A32/A42/A51/A61 |
| 1205                              | CH1 x10dB attenuator calibration failure   | A1x/A3x/A4x/A51/A61 |
| 1206                              | CH2 x10dB attenuator calibration failure   | A12/A32/A42/A51/A61 |
| 1207                              | CH1 x20dB 1 attenuator calibration failure | A1x/A3x/A4x/A51/A61 |
| 1208                              | CH2 x20dB 1 attenuator calibration failure | A12/A32/A42/A51/A61 |
| 1209                              | CH1 x20dB 2 attenuator calibration failure | A1x/A3x/A4x/A51/A61 |
| 1210                              | CH2 x20dB 2 attenuator calibration failure | A12/A32/A42/A51/A61 |
| 1211                              | CH1 Filter calibration failure             | A1x/A3x/A4x/A51/A61 |
| 1212                              | CH2 Filter calibration failure             | A12/A32/A42/A51/A61 |
| 1213                              | CH1 x20dB 3 attenuator calibration failure | A43                 |
| 1301                              | CH1 Sine Flatness calibration failure      | A1x/A3x/A4x/A51/A61 |
| 1302                              | CH2 Sine Flatness calibration failure      | A12/A32/A42/A51/A61 |
| 1401                              | CH1 ASIC TINT calibration failure          | A1x/A3x/A4x/A51/A61 |
| 1402                              | CH2 ASIC TINT calibration failure          | A12/A32/A42/A51/A61 |
| 1403                              | CH1 ASIC SGEN calibration failure          | A1x/A3x/A4x/A51/A61 |
| 1404                              | CH2 ASIC SGEN calibration failure          | A12/A32/A42/A51/A61 |
| 1405                              | CH1 ASIC clock duty calibration failure    | A1x/A3x/A4x/A51/A61 |
| 1406                              | CH2 ASIC clock duty calibration failure    | A12/A32/A42/A51/A61 |
| <b>— Diagnostics Error Codes—</b> |                                            |                     |
| 2100                              | Calibration data not found                 | A72                 |
| 2101                              | Calibration data checksum                  | A72                 |

Table 17: Error codes (cont.)

| Error code                         | Description                    | Related module      |
|------------------------------------|--------------------------------|---------------------|
| 2102                               | Calibration data invalid       | A72                 |
| 2201                               | ASIC1 memory failure           | A1x/A3x/A4x         |
| 2202                               | ASIC2 memory failure           | A12/A32/A42         |
| 2203                               | ASIC1 Overheat                 | A1x/A3x/A4x         |
| 2204                               | ASIC2 Overheat                 | A12/A32/A42         |
| — Output Diagnostics Error Codes — |                                |                     |
| 2301                               | CH1 Internal offset failure    | A1x/A3x/A4x         |
| 2302                               | CH2 Internal offset failure    | A12/A32/A42         |
| 2303                               | CH1 Output offset failure      | A1x/A3x/A4x/A51/A61 |
| 2304                               | CH2 Output offset failure      | A12/A32/A42/A51/A61 |
| 2305                               | CH1 Output gain failure        | A1x/A3x/A4x/A51/A61 |
| 2306                               | CH2 Output gain failure        | A12/A32/A42/A51/A61 |
| 2401                               | CH1 x3dB attenuator failure    | A1x/A3x/A4x         |
| 2402                               | CH2 x3dB attenuator failure    | A12/A32/A42         |
| 2403                               | CH1 x6dB attenuator failure    | A1x/A3x/A4x         |
| 2404                               | CH2 x6dB attenuator failure    | A12/A32/A42         |
| 2405                               | CH1 x10dB attenuator failure   | A1x/A3x/A4x         |
| 2406                               | CH2 x10dB attenuator failure   | A12/A32/A42         |
| 2407                               | CH1 x20dB 1 attenuator failure | A1x/A3x/A4x         |
| 2408                               | CH2 x20dB 1 attenuator failure | A12/A32/A42         |
| 2409                               | CH1 x20dB 2 attenuator failure | A1x/A3x/A4x         |
| 2410                               | CH2 x20dB 2 attenuator failure | A12/A32/A42         |
| 2411                               | CH1 Filter failure             | A51/A61             |
| 2412                               | CH2 Filter failure             | A51/A61             |
| 2413                               | CH1 x20dB 3 attenuator failure | A43                 |
| 2501                               | CH1 Sine Flatness failure      | A1x/A3x/A4x/A51/A61 |
| 2502                               | CH2 Sine Flatness failure      | A12/A32/A42/A51/A61 |

## Performance tests

The Performance Tests include functional tests, such as the interface functional test, in this manual.

- The Functional Tests verify the functions; they verify that the AFG3000 Series Arbitrary Function Generators features operate. They do not verify that they operate within limits.
- The Performance Tests verify that the AFG3000 Series Arbitrary Function Generators performs as warranted. The Performance Tests check all the characteristics that are designated as checked in Specifications.

**Table 18: Performance test items**

| <b>Titles</b>                        | <b>Test items</b>                        | <b>Reference Page</b>                                  |
|--------------------------------------|------------------------------------------|--------------------------------------------------------|
| Frequency/Period Test                | Internal clock output frequency accuracy | (See page 49, <i>Frequency/period test.</i> )          |
| Amplitude Test                       | Amplitude accuracy                       | (See page 50, <i>Amplitude test.</i> )                 |
| DC Offset Test                       | Amplitude accuracy                       | (See page 52, <i>DC Offset test.</i> )                 |
| AC Flatness Test                     | AC Flatness                              | (See page 54, <i>AC Flatness test.</i> )               |
| Harmonic Distortion Test             | Harmonic Distortion                      | (See page 56, <i>Harmonics Distortion test.</i> )      |
| THD (Total Harmonic Distortion) Test | Total Harmonic Distortion                | (See page 59, <i>Total Harmonic Distortion test.</i> ) |
| Spurious Test                        | Spurious                                 | (See page 61, <i>Spurious test.</i> )                  |
| Rise-Fall Time Test                  | Rise-Fall Time                           | (See page 64, <i>Rise-Fall time test.</i> )            |

### Performance conditions

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

- The cabinet covers must be on the AFG3000 Series.
- The instrument must have been performed and passed the procedures under calibration and diagnostics.
- The instrument must have been calibrated/adjusted at an ambient temperature between +20 °C and +30 °C.

- The instrument must be operating at an ambient temperature between +0 °C and +50 °C.
- The instrument must have had a warm-up period of at least 20 minutes.

**Equipment required**

The following table lists the required equipment used to complete the performance tests.

**Table 19: Test equipment**

| Description                     | Minimum requirements                                                                                                                                               | Recommended equipment             | Purpose                                             |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------|
| 1. Digital Multi Meter (DMM)    | AC volts, true rms, AC coupled Accuracy: $\pm 0.1\%$ to 1 kHz<br>DC volts Accuracy: 50 ppm, resolution 100 $\mu\text{V}$<br>Resistance Accuracy: $\pm 0.05 \Omega$ | Agilent 3458A                     | Measures voltage. Used in multiple procedures.      |
| 2. Power Meter                  | 100 kHz to 250 MHz 1 $\mu\text{W}$ to 100 mW (-30 dBm to +20 dBm) Accuracy: 0.02 dB<br>Resolution: 0.01 dB                                                         | R&S NRVS                          | Measures voltage. Used in multiple procedures.      |
| 3. Power Head                   | 100 kHz to 250 MHz 1 $\mu\text{W}$ to 100 mW (-30 dBm to +20 dBm)                                                                                                  | R&S NRV-Z5                        | Measures voltage. Used in multiple procedures.      |
| 4. Frequency Counter            | Accuracy: 0.01 ppm Phase measurement                                                                                                                               | Agilent 53132A                    | Checks clock frequency.                             |
| 5. Oscilloscope                 | 1 GHz Bandwidth 50 $\Omega$ input termination                                                                                                                      | Tektronix TDS5104B                | Checks output signals. Used in multiple procedures. |
| 6. Spectrum Analyzer            | 20 kHz to 1.25 GHz                                                                                                                                                 | Tektronix RSA3303A                | Checks output signals. Harmonics Spurious.          |
| 7. BNC Coaxial Cable            | 50 $\Omega$ , male to male BNC connector, 91 cm                                                                                                                    | Tektronix part number 012-0482-00 | Signal interconnection                              |
| 8. BNC terminator               | 50 $\Omega$ , $\pm 1 \Omega$ , 2 W, DC to 1 GHz, BNC                                                                                                               | Tektronix part number 011-0049-02 | Signal termination                                  |
| 9. Attenuator                   | 50 $\Omega$ , x10, BNC                                                                                                                                             | Tektronix part number 011-0059-03 | Signal attenuation                                  |
| 10. Adapter Dual-Banana Plug    | BNC (female) to dual banana                                                                                                                                        | Tektronix part number 103-0090-00 | Signal interconnection to a DMM                     |
| 11. Adapter BNC(female)-N(male) | BNC (female) to N (male)                                                                                                                                           | Tektronix part number 103-0045-00 | Signal interconnection to a Spectrum Analyzer       |

**Test record**

Photocopy the test records and use them to record the performance test results for your AFG3000 Series Arbitrary Function Generators.

**Table 20: AFG3000 Series Performance Test Record**

|                           |                     |
|---------------------------|---------------------|
| Instrument Serial Number: | Certificate Number: |
| Temperature:              | RH %:               |
| Date of Calibration:      | Technician:         |

**Frequency, Amplitude, DC Offset, and AC Flatness Test Record**

|                       | Minimum      | Test result | Maximum      |
|-----------------------|--------------|-------------|--------------|
| <b>Frequency</b>      |              |             |              |
| Sine at 1.000000 MHz  | 0.999999 MHz |             | 1.000001 MHz |
| Pulse at 1.000000 MHz | 0.999999 MHz |             | 1.000001 MHz |

**Amplitude (AFG3011 / 3011C)**

$$CF = 2 / (1 + 50 \Omega / \text{Measurement } \Omega) =$$

| CH1 Amplitude           | Minimum                                   | Test result | Maximum                                   |
|-------------------------|-------------------------------------------|-------------|-------------------------------------------|
| 30.0 mVrms at 1.00 kHz  | $(30.0 \times CF - 1.307) \text{ mVrms}$  |             | $(30.0 \times CF + 1.307) \text{ mVrms}$  |
| 300.0 mVrms at 1.00 kHz | $(300.0 \times CF - 6.71) \text{ mVrms}$  |             | $(300.0 \times CF + 6.71) \text{ mVrms}$  |
| 800.0 mVrms at 1.00 kHz | $(800.0 \times CF - 16.71) \text{ mVrms}$ |             | $(800.0 \times CF + 16.71) \text{ mVrms}$ |
| 1.500 Vrms at 1.00 kHz  | $(1.500 \times CF - 0.0307) \text{ Vrms}$ |             | $(1.500 \times CF + 0.0307) \text{ Vrms}$ |
| 2.000 Vrms at 1.00 kHz  | $(2.000 \times CF - 0.0407) \text{ Vrms}$ |             | $(2.000 \times CF + 0.0407) \text{ Vrms}$ |
| 2.500 Vrms at 1.00 kHz  | $(2.500 \times CF - 0.0507) \text{ Vrms}$ |             | $(2.500 \times CF + 0.0507) \text{ Vrms}$ |
| 3.500 Vrms at 1.00 kHz  | $(3.500 \times CF - 0.0707) \text{ Vrms}$ |             | $(3.500 \times CF + 0.0707) \text{ Vrms}$ |

**Amplitude (AFG302xB / 302xC / 305xC / 310x / 310xC)**

$$CF = 2 / (1 + 50 \Omega / \text{Measurement } \Omega) =$$

| CH1 Amplitude           | Minimum                                   | Test result | Maximum                                   |
|-------------------------|-------------------------------------------|-------------|-------------------------------------------|
| 30.0 mVrms at 1.00 kHz  | $(30.0 \times CF - 0.654) \text{ mVrms}$  |             | $(30.0 \times CF + 0.654) \text{ mVrms}$  |
| 300.0 mVrms at 1.00 kHz | $(300.0 \times CF - 3.35) \text{ mVrms}$  |             | $(300.0 \times CF + 3.35) \text{ mVrms}$  |
| 800.0 mVrms at 1.00 kHz | $(800.0 \times CF - 8.35) \text{ mVrms}$  |             | $(800.0 \times CF + 8.35) \text{ mVrms}$  |
| 1.500 Vrms at 1.00 kHz  | $(1.500 \times CF - 0.0154) \text{ Vrms}$ |             | $(1.500 \times CF + 0.0154) \text{ Vrms}$ |
| 2.000 Vrms at 1.00 kHz  | $(2.000 \times CF - 0.0204) \text{ Vrms}$ |             | $(2.000 \times CF + 0.0204) \text{ Vrms}$ |
| 2.500 Vrms at 1.00 kHz  | $(2.500 \times CF - 0.0254) \text{ Vrms}$ |             | $(2.500 \times CF + 0.0254) \text{ Vrms}$ |
| 3.500 Vrms at 1.00 kHz  | $(3.500 \times CF - 0.0354) \text{ Vrms}$ |             | $(3.500 \times CF + 0.0354) \text{ Vrms}$ |

| CH2 Amplitude           | Minimum                                   | Test result | Maximum                                   |
|-------------------------|-------------------------------------------|-------------|-------------------------------------------|
| 30.0 mVrms at 1.00 kHz  | $(30.0 \times CF - 0.654) \text{ mVrms}$  |             | $(30.0 \times CF + 0.654) \text{ mVrms}$  |
| 300.0 mVrms at 1.00 kHz | $(300.0 \times CF - 3.35) \text{ mVrms}$  |             | $(300.0 \times CF + 3.35) \text{ mVrms}$  |
| 800.0 mVrms at 1.00 kHz | $(800.0 \times CF - 8.35) \text{ mVrms}$  |             | $(800.0 \times CF + 8.35) \text{ mVrms}$  |
| 1.500 Vrms at 1.00 kHz  | $(1.500 \times CF - 0.0154) \text{ Vrms}$ |             | $(1.500 \times CF + 0.0154) \text{ Vrms}$ |
| 2.000 Vrms at 1.00 kHz  | $(2.000 \times CF - 0.0204) \text{ Vrms}$ |             | $(2.000 \times CF + 0.0204) \text{ Vrms}$ |
| 2.500 Vrms at 1.00 kHz  | $(2.500 \times CF - 0.0254) \text{ Vrms}$ |             | $(2.500 \times CF + 0.0254) \text{ Vrms}$ |

Frequency, Amplitude, DC Offset, and AC Flatness Test Record (cont.)

|                        |                                           |                                           |
|------------------------|-------------------------------------------|-------------------------------------------|
| 3.500 Vrms at 1.00 kHz | $(3.500 \times CF - 0.0354) \text{ Vrms}$ | $(3.500 \times CF + 0.0354) \text{ Vrms}$ |
|------------------------|-------------------------------------------|-------------------------------------------|

## Frequency, Amplitude, DC Offset, and AC Flatness Test Record (cont.)

## Amplitude (AFG325x / 325xC)

$$CF = 2 / (1 + 50 \Omega / \text{Measurement } \Omega) =$$

| CH1 Amplitude           | Minimum                                   | Test result | Maximum                                   |
|-------------------------|-------------------------------------------|-------------|-------------------------------------------|
| 0.030 Vrms at 1.00 kHz  | $(30.0 \times CF - 0.654) \text{ mVrms}$  |             | $(30.0 \times CF + 0.654) \text{ mVrms}$  |
| 0.300 Vrms at 1.00 kHz  | $(300.0 \times CF - 3.35) \text{ mVrms}$  |             | $(300.0 \times CF + 3.35) \text{ mVrms}$  |
| 0.800 Vrms at 1.00 kHz  | $(800.0 \times CF - 8.35) \text{ mVrms}$  |             | $(800.0 \times CF + 8.35) \text{ mVrms}$  |
| 1.500 Vrms at 1.00 kHz  | $(1.500 \times CF - 0.0154) \text{ Vrms}$ |             | $(1.500 \times CF + 0.0154) \text{ Vrms}$ |
| CH2 Amplitude           | Minimum                                   | Test result | Maximum                                   |
| 30.0 mVrms at 1.00 kHz  | $(30.0 \times CF - 0.654) \text{ mVrms}$  |             | $(30.0 \times CF + 0.654) \text{ mVrms}$  |
| 300.0 mVrms at 1.00 kHz | $(300.0 \times CF - 3.35) \text{ mVrms}$  |             | $(300.0 \times CF + 3.35) \text{ mVrms}$  |
| 800.0 mVrms at 1.00 kHz | $(800.0 \times CF - 8.35) \text{ mVrms}$  |             | $(800.0 \times CF + 8.35) \text{ mVrms}$  |
| 1.500 Vrms at 1.00 kHz  | $(1.500 \times CF - 0.0154) \text{ Vrms}$ |             | $(1.500 \times CF + 0.0154) \text{ Vrms}$ |

## DC Offset (AFG3011 / 3011C)

$$CF = 2 / (1 + 50 \Omega / \text{Measurement } \Omega) =$$

| CH1 DC Offset | Minimum                                  | Test result | Maximum                                  |
|---------------|------------------------------------------|-------------|------------------------------------------|
| +5.000 Vdc    | $(+5.000 \times CF - 0.110) \text{ Vdc}$ |             | $(+5.000 \times CF + 0.110) \text{ Vdc}$ |
| 0.000 Vdc     | -0.010 Vdc                               |             | +0.010 Vdc                               |
| -5.000 Vdc    | $(-5.000 \times CF - 0.110) \text{ Vdc}$ |             | $(-5.000 \times CF + 0.110) \text{ Vdc}$ |

## DC Offset (AFG302xB / 302xC / 305xC / 310x / 310xC)

$$CF = 2 / (1 + 50 \Omega / \text{Measurement } \Omega) =$$

| CH1 DC Offset | Minimum                                  | Test result | Maximum                                  |
|---------------|------------------------------------------|-------------|------------------------------------------|
| +5.000 Vdc    | $(+5.000 \times CF - 0.055) \text{ Vdc}$ |             | $(+5.000 \times CF + 0.055) \text{ Vdc}$ |
| 0.000 Vdc     | -0.005 Vdc                               |             | +0.005 Vdc                               |
| -5.000 Vdc    | $(-5.000 \times CF - 0.055) \text{ Vdc}$ |             | $(-5.000 \times CF + 0.055) \text{ Vdc}$ |
| CH2 DC Offset | Minimum                                  | Test result | Maximum                                  |
| +5.000 Vdc    | $(+5.000 \times CF - 0.055) \text{ Vdc}$ |             | $(+5.000 \times CF + 0.055) \text{ Vdc}$ |
| 0.000 Vdc     | -0.005 Vdc                               |             | +0.005 Vdc                               |
| -5.000 Vdc    | $(-5.000 \times CF - 0.055) \text{ Vdc}$ |             | $(-5.000 \times CF + 0.055) \text{ Vdc}$ |

## DC Offset (AFG325x / 325xC)

$$CF = 2 / (1 + 50 \Omega / \text{Measurement } \Omega) =$$

| CH1 DC Offset | Minimum                                  | Test result | Maximum                                  |
|---------------|------------------------------------------|-------------|------------------------------------------|
| +2.500 Vdc    | $(+2.500 \times CF - 0.030) \text{ Vdc}$ |             | $(+2.500 \times CF + 0.030) \text{ Vdc}$ |
| 0.000 Vdc     | -0.005 Vdc                               |             | +0.005 Vdc                               |
| -2.500 Vdc    | $(-2.500 \times CF - 0.030) \text{ Vdc}$ |             | $(-2.500 \times CF + 0.030) \text{ Vdc}$ |
| CH2 DC Offset | Minimum                                  | Test result | Maximum                                  |

**Frequency, Amplitude, DC Offset, and AC Flatness Test Record (cont.)**

|            |                                          |                                          |
|------------|------------------------------------------|------------------------------------------|
| +2.500 Vdc | $(+2.500 \times CF - 0.030) \text{ Vdc}$ | $(+2.500 \times CF + 0.030) \text{ Vdc}$ |
| 0.000 Vdc  | -0.005 Vdc                               | +0.005 Vdc                               |
| -2.500 Vdc | $(-2.500 \times CF - 0.030) \text{ Vdc}$ | $(-2.500 \times CF + 0.030) \text{ Vdc}$ |

## Frequency, Amplitude, DC Offset, and AC Flatness Test Record (cont.)

**AC Flatness (AFG3011 / 3011C)**

| <b>CH1 AC Flatness</b>                 | <b>Minimum</b>      | <b>Test result</b> | <b>Maximum</b>      |
|----------------------------------------|---------------------|--------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ————                | dB ( = Reference)  | ————                |
| Frequency 500 kHz                      | Reference - 0.15 dB | dB                 | Reference + 0.15 dB |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                 | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |
| Frequency 10.00 MHz                    | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |

**AC Flatness (AFG302xB / 302xC)**

| <b>CH1 AC Flatness</b>                 | <b>Minimum</b>      | <b>Test result</b> | <b>Maximum</b>      |
|----------------------------------------|---------------------|--------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ————                | dB ( = Reference)  | ————                |
| Frequency 500 kHz                      | Reference - 0.15 dB | dB                 | Reference + 0.15 dB |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                 | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |
| Frequency 15.00 MHz                    | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.50 dB | dB                 | Reference + 0.50 dB |

**CH2 AC Flatness**

|                                        |                     |                   |                     |
|----------------------------------------|---------------------|-------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ————                | dB ( = Reference) | ————                |
| Frequency 500 kHz                      | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 15.00 MHz                    | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |

**AC Flatness (AFG305xC)**

| <b>CH1 AC Flatness</b>                 | <b>Minimum</b>      | <b>Test result</b> | <b>Maximum</b>      |
|----------------------------------------|---------------------|--------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ————                | dB ( = Reference)  | ————                |
| Frequency 500 kHz                      | Reference - 0.15 dB | dB                 | Reference + 0.15 dB |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                 | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |
| Frequency 10.00 MHz                    | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |
| Frequency 15.00 MHz                    | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.30 dB | dB                 | Reference + 0.30 dB |
| Frequency 50.00 MHz                    | Reference - 0.50 dB | dB                 | Reference + 0.50 dB |

## Frequency, Amplitude, DC Offset, and AC Flatness Test Record (cont.)

## CH2 AC Flatness

| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ————                | dB ( = Reference) | ————                |
|----------------------------------------|---------------------|-------------------|---------------------|
| Frequency 500 kHz                      | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 10.00 MHz                    | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 15.00 MHz                    | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 50.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |

## Frequency, Amplitude, DC Offset, and AC Flatness Test Record (cont.)

## AC Flatness (AFG310x / 310xC)

| CH1 AC Flatness                        | Minimum             | Test result       | Maximum             |
|----------------------------------------|---------------------|-------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ———                 | dB ( = Reference) | ———                 |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 50.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 100.0 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |

| CH2 AC Flatness                        | Minimum             | Test result       | Maximum             |
|----------------------------------------|---------------------|-------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ———                 | dB ( = Reference) | ———                 |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 50.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 100.0 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |

## AC Flatness (AFG325x / 325xC)

| CH1 AC Flatness                        | Minimum             | Test result       | Maximum             |
|----------------------------------------|---------------------|-------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ———                 | dB ( = Reference) | ———                 |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 50.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 100.0 MHz                    | Reference - 1.00 dB | dB                | Reference + 1.00 dB |
| Frequency 150.00 MHz                   | Reference - 1.00 dB | dB                | Reference + 1.00 dB |
| Frequency 240.0 MHz                    | Reference - 2.00 dB | dB                | Reference + 2.00 dB |

| CH2 AC Flatness                        | Minimum             | Test result       | Maximum             |
|----------------------------------------|---------------------|-------------------|---------------------|
| Frequency 1.00 kHz<br>(Ampl: +4.0 dBm) | ———                 | dB ( = Reference) | ———                 |
| Frequency 1.00 MHz                     | Reference - 0.15 dB | dB                | Reference + 0.15 dB |
| Frequency 5.00 MHz                     | Reference - 0.30 dB | dB                | Reference + 0.30 dB |
| Frequency 25.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 50.00 MHz                    | Reference - 0.50 dB | dB                | Reference + 0.50 dB |
| Frequency 100.0 MHz                    | Reference - 1.00 dB | dB                | Reference + 1.00 dB |
| Frequency 150.00 MHz                   | Reference - 1.00 dB | dB                | Reference + 1.00 dB |
| Frequency 240.0 MHz                    | Reference - 2.00 dB | dB                | Reference + 2.00 dB |

## Harmonic Distortion Test Record

| Harmonic Distortion<br>(amplitude 1 V <sub>p-p</sub> ) | Fundamental<br>= reference       | 2nd     | 3rd     | 4th     | 5th     | Limit                     |
|--------------------------------------------------------|----------------------------------|---------|---------|---------|---------|---------------------------|
| <b>AFG3011 / 3011C</b>                                 | <b>Spectrum Analyzer reading</b> |         |         |         |         |                           |
| Sine 20 kHz                                            | 20 kHz                           | 40 kHz  | 60 kHz  | 80 kHz  | 100 kHz |                           |
| CH1 Harmonic Distortion (dBc)                          |                                  |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                            |         |         |         |         | Nth - reference < -55 dBc |
| Sine 100 kHz                                           | 100 kHz                          | 200 kHz | 300 kHz | 400 kHz | 500 kHz |                           |
| CH1 Harmonic Distortion (dBc)                          |                                  |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                            |         |         |         |         | Nth - reference < -55 dBc |
| Sine 1 MHz                                             | 1 MHz                            | 2 MHz   | 3 MHz   | 4 MHz   | 5 MHz   |                           |
| CH1 Harmonic Distortion (dBc)                          |                                  |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                            |         |         |         |         | Nth - reference < -45 dBc |
| Sine 10 MHz                                            | 10 MHz                           | 20 MHz  | 35 MHz  | 40 MHz  | 50 MHz  |                           |
| CH1 Harmonic Distortion (dBc)                          |                                  |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                            |         |         |         |         | Nth - reference < -45 dBc |
| <b>AFG302xB / 302xC</b>                                | <b>Spectrum Analyzer reading</b> |         |         |         |         |                           |
| Sine 20 kHz                                            | 20 kHz                           | 40 kHz  | 60 kHz  | 80 kHz  | 100 kHz |                           |
| CH1 Harmonic Distortion (dBc)                          |                                  |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                            |         |         |         |         | Nth - reference < -60 dBc |
| CH2 Harmonic Distortion (dBc)                          |                                  |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                            |         |         |         |         | Nth - reference < -60 dBc |
| Sine 100 kHz                                           | 100 kHz                          | 200 kHz | 300 kHz | 400 kHz | 500 kHz |                           |
| CH1 Harmonic Distortion (dBc)                          |                                  |         |         |         |         |                           |

## Harmonic Distortion Test Record (cont.)

| Harmonic Distortion<br>(amplitude 1 V <sub>p-p</sub> ) | Fundamental<br>= reference       | 2nd    | 3rd    | 4th     | 5th     | Limit                        |
|--------------------------------------------------------|----------------------------------|--------|--------|---------|---------|------------------------------|
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-60 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                                  |        |        |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-60 dBc |
| Sine 1 MHz                                             | 1 MHz                            | 2 MHz  | 3 MHz  | 4 MHz   | 5 MHz   |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                                  |        |        |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-50 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                                  |        |        |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-50 dBc |
| Sine 25MHz                                             | 25 MHz                           | 50 MHz | 75 MHz | 100 MHz | 125 MHz |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                                  |        |        |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-40 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                                  |        |        |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-40 dBc |
| <b>AFG305xC</b>                                        | <b>Spectrum Analyzer reading</b> |        |        |         |         |                              |
| Sine 20 kHz                                            | 20 kHz                           | 40 kHz | 60 kHz | 80 kHz  | 100 kHz |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                                  |        |        |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-60 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                                  |        |        |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |        |        |         |         | Nth - reference <<br>-60 dBc |

## Harmonic Distortion Test Record (cont.)

| Harmonic Distortion<br>(amplitude 1 V <sub>p-p</sub> ) | Fundamental<br>= reference | 2nd     | 3rd     | 4th     | 5th     | Limit                     |
|--------------------------------------------------------|----------------------------|---------|---------|---------|---------|---------------------------|
| Sine 100 kHz                                           | 100 kHz                    | 200 kHz | 300 kHz | 400 kHz | 500 kHz |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |         | Nth - reference < -60 dBc |
| CH2 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |         | Nth - reference < -60 dBc |
| Sine 1 MHz                                             | 1 MHz                      | 2 MHz   | 3 MHz   | 4 MHz   | 5 MHz   |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |         | Nth - reference < -50 dBc |
| CH2 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |         | Nth - reference < -50 dBc |
| Sine 5 MHz                                             | 5 MHz                      | 10 MHz  | 15 MHz  | 20 MHz  | 25 MHz  |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |         | Nth - reference < -40 dBc |
| CH2 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |         | Nth - reference < -40 dBc |
| Sine 25 MHz                                            | 25 MHz                     | 50 MHz  | 75 MHz  | 100 MHz | 125 MHz |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |         | Nth - reference < -40 dBc |
| CH2 Harmonic Distortion (dBc)                          |                            |         |         |         |         |                           |

## Harmonic Distortion Test Record (cont.)

| Harmonic Distortion<br>(amplitude 1 V <sub>p-p</sub> ) | Fundamental<br>= reference       | 2nd     | 3rd     | 4th     | 5th     | Limit                        |
|--------------------------------------------------------|----------------------------------|---------|---------|---------|---------|------------------------------|
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |         |         |         |         | Nth - reference <<br>-40 dBc |
| Sine 50 MHz                                            | 50 MHz                           | 100 MHz | 150 MHz | 200 MHz | 250 MHz |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                                  |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |         |         |         |         | Nth - reference <<br>-40 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                                  |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |         |         |         |         | Nth - reference <<br>-40 dBc |
| <b>AFG310x / 310xC</b>                                 | <b>Spectrum Analyzer reading</b> |         |         |         |         |                              |
| Sine 1 MHz                                             | 1 MHz                            | 2 MHz   | 3 MHz   | 4 MHz   | 5 MHz   |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                                  |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |         |         |         |         | Nth - reference <<br>-50 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                                  |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |         |         |         |         | Nth - reference <<br>-50 dBc |
| Sine 5 MHz                                             | 5 MHz                            | 10 MHz  | 15 MHz  | 20 MHz  | 25 MHz  |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                                  |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |         |         |         |         | Nth - reference <<br>-37 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                                  |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                            |         |         |         |         | Nth - reference <<br>-37 dBc |
| Sine 25MHz                                             | 25 MHz                           | 50 MHz  | 75 MHz  | 100 MHz | 125 MHz |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                                  |         |         |         |         |                              |

## Harmonic Distortion Test Record (cont.)

| Harmonic Distortion<br>(amplitude 1 V <sub>p-p</sub> ) | Fundamental<br>= reference | 2nd     | 3rd     | 4th     | 5th     | Limit                        |
|--------------------------------------------------------|----------------------------|---------|---------|---------|---------|------------------------------|
| reading -<br>reference<br>(dBc)                        | 0 dBc                      |         |         |         |         | Nth - reference <<br>-37 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                            |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                      |         |         |         |         | Nth - reference <<br>-37 dBc |
| Sine 100 MHz                                           | 100 MHz                    | 200 MHz | 300 MHz | 400 MHz | 500 MHz |                              |
| CH1 Harmonic<br>Distortion (dBc)                       |                            |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                      |         |         |         |         | Nth - reference <<br>-37 dBc |
| CH2 Harmonic<br>Distortion (dBc)                       |                            |         |         |         |         |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                      |         |         |         |         | Nth - reference <<br>-37 dBc |

## Harmonic Distortion Test Record (cont.)

| Harmonic Distortion<br>(amplitude 1 V <sub>p-p</sub> ) | Fundamental<br>= reference | 2nd     | 3rd     | 4th     | 5th      | Limit                     |
|--------------------------------------------------------|----------------------------|---------|---------|---------|----------|---------------------------|
| AFG325x                                                | Spectrum Analyzer reading  |         |         |         |          |                           |
| Sine 1 MHz                                             | 1 MHz                      | 2 MHz   | 3 MHz   | 4 MHz   | 5 MHz    |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |          |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |          | Nth - reference < -50 dBc |
| CH2 Harmonic Distortion (dBc)                          |                            |         |         |         |          |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |          | Nth - reference < -50 dBc |
| Sine 5 MHz                                             | 5 MHz                      | 10 MHz  | 15 MHz  | 20 MHz  | 25 MHz   |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |          |                           |
| reading - reference (dBc)                              | 0 dBc                      | dBc     | dBc     | dBc     | dBc      | Nth - reference < -37 dBc |
| CH2 Harmonic Distortion (dBc)                          |                            |         |         |         |          |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |          | Nth - reference < -37 dBc |
| Sine 100 MHz                                           | 100 MHz                    | 200 MHz | 300 MHz | 400 MHz | 500 MHz  |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |          |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |          | Nth - reference < -30 dBc |
| CH2 Harmonic Distortion (dBc)                          |                            |         |         |         |          |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |          | Nth - reference < -30 dBc |
| Sine 240 MHz                                           | 240 MHz                    | 480 MHz | 720 MHz | 960 MHz | 1.20 GHz |                           |
| CH1 Harmonic Distortion (dBc)                          |                            |         |         |         |          |                           |
| reading - reference (dBc)                              | 0 dBc                      |         |         |         |          | Nth - reference < -30 dBc |

Harmonic Distortion Test Record (cont.)

| Harmonic Distortion<br>(amplitude 1 V <sub>p-p</sub> ) | Fundamental<br>= reference | 2nd | 3rd | 4th | 5th | Limit                        |
|--------------------------------------------------------|----------------------------|-----|-----|-----|-----|------------------------------|
| CH2 Harmonic<br>Distortion (dBc)                       |                            |     |     |     |     |                              |
| reading -<br>reference<br>(dBc)                        | 0 dBc                      |     |     |     |     | Nth - reference <<br>-30 dBc |

## Total Harmonic Distortion (THD) Test Record

AFG3xxxx

Spectrum Analyzer reading

|                                                                 | Fundamental<br>=<br>reference | 2nd              | 3rd              | 4th              | 5th              | 6th              | 7th              |
|-----------------------------------------------------------------|-------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Sine 20.0 kHz                                                   | 20 kHz                        | 40 kHz           | 60 kHz           | 80 kHz           | 100 kHz          | 120 kHz          | 140 kHz          |
| CH1 reading (dBm)                                               | A <sub>1</sub> =              | A <sub>2</sub> = | A <sub>3</sub> = | A <sub>4</sub> = | A <sub>5</sub> = | A <sub>6</sub> = | A <sub>7</sub> = |
| reading - reference (A <sub>n</sub> - A <sub>1</sub> )<br>(dBc) | B <sub>1</sub> = 0            | B <sub>2</sub> = | B <sub>3</sub> = | B <sub>4</sub> = | B <sub>5</sub> = | B <sub>6</sub> = | B <sub>7</sub> = |
| C <sub>n</sub> = 10 B <sub>n</sub> /20                          | C <sub>1</sub> = 1            | C <sub>2</sub> = | C <sub>3</sub> = | C <sub>4</sub> = | C <sub>5</sub> = | C <sub>6</sub> = | C <sub>7</sub> = |
| $THD = \frac{\sqrt{\sum_{n=2}^7 C_n^2}}{C_1}$                   |                               |                  |                  |                  |                  |                  | Limit<br>< 0.2%  |
| CH2 reading (dBm)                                               | A <sub>1</sub> =              | A <sub>2</sub> = | A <sub>3</sub> = | A <sub>4</sub> = | A <sub>5</sub> = | A <sub>6</sub> = | A <sub>7</sub> = |
| reading - reference (A <sub>n</sub> - A <sub>1</sub> )<br>(dBc) | B <sub>1</sub> = 0            | B <sub>2</sub> = | B <sub>3</sub> = | B <sub>4</sub> = | B <sub>5</sub> = | B <sub>6</sub> = | B <sub>7</sub> = |
| C <sub>n</sub> = 10 B <sub>n</sub> /20                          | C <sub>1</sub> = 1            | C <sub>2</sub> = | C <sub>3</sub> = | C <sub>4</sub> = | C <sub>5</sub> = | C <sub>6</sub> = | C <sub>7</sub> = |
| $THD = \frac{\sqrt{\sum_{n=2}^7 C_n^2}}{C_1}$                   |                               |                  |                  |                  |                  |                  | Limit<br>< 0.2%  |

## Spurious Test Record (AFG3011 / 3011C)

| Spectrum Analyzer   |                     |                     |                    | Measurement        |                |           |
|---------------------|---------------------|---------------------|--------------------|--------------------|----------------|-----------|
| Frequency           | Center Frequency    | Span                | RBW                | Spurious Frequency | Spurious (Max) | Limit     |
| <b>CH1 Spurious</b> |                     |                     |                    |                    |                |           |
| Sine 100 kHz        | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -60 dBc |
| Sine 1.00 MHz       | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |
| Sine 10.00 MHz      | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |

## Spurious Test Record (AFG302xB / 302XC)

| Spectrum Analyzer   |                     |                     |                    | Measurement        |                |           |
|---------------------|---------------------|---------------------|--------------------|--------------------|----------------|-----------|
| Frequency           | Center Frequency    | Span                | RBW                | Spurious Frequency | Spurious (Max) | Limit     |
| <b>CH1 Spurious</b> |                     |                     |                    |                    |                |           |
| Sine 100 kHz        | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -60 dBc |
| Sine 1.00 MHz       | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |
| Sine 10.00 MHz      | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |
| Sine 25.00 MHz      | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |
| <b>CH2 Spurious</b> |                     |                     |                    |                    |                |           |
| Sine 100 kHz        | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -60 dBc |
| Sine 1.00 MHz       | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |
| Sine 10.00 MHz      | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |
| Sine 25.00 MHz      | 10 MHz /<br>300 MHz | 20 MHz /<br>600 MHz | 20 kHz /<br>20 kHz | MHz<br>MHz         | dBc<br>dBc     | < -50 dBc |

## Spurious Test Record (AFG305xC)

| Spectrum Analyzer |                  |      |     | Measurement        |                |       |
|-------------------|------------------|------|-----|--------------------|----------------|-------|
| Frequency         | Center Frequency | Span | RBW | Spurious Frequency | Spurious (Max) | Limit |

## Spurious Test Record (AFG305xC) (cont.)

**CH1 Spurious**

|                |                   |                   |                  |            |            |           |
|----------------|-------------------|-------------------|------------------|------------|------------|-----------|
| Sine 100 kHz   | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -60 dBc |
| Sine 1.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 10.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 25.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 50.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |

**CH2 Spurious**

|                |                   |                   |                  |            |            |           |
|----------------|-------------------|-------------------|------------------|------------|------------|-----------|
| Sine 100 kHz   | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -60 dBc |
| Sine 1.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 10.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 25.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 50.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |

## Spurious Test Record (AFG310x / 310xC)

| Spectrum Analyzer |                  |         |        | Measurement        |                |           |
|-------------------|------------------|---------|--------|--------------------|----------------|-----------|
| Frequency         | Center Frequency | Span    | RBW    | Spurious Frequency | Spurious (Max) | Limit     |
| CH1 Spurious      |                  |         |        |                    |                |           |
| Sine 100 kHz      | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -60 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 1.00 MHz     | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 10.00 MHz    | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 25.00 MHz    | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 50.00 MHz    | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -44 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 100.00 MHz   | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -38 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| CH2 Spurious      |                  |         |        |                    |                |           |
| Sine 100 kHz      | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -60 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 1.00 MHz     | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 10.00 MHz    | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 25.00 MHz    | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 50.00 MHz    | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -44 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| Sine 100.00 MHz   | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -38 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |

## Spurious Test Record (AFG325x / 325xC)

## CH1 Spurious

|                 |                   |                   |                  |            |            |           |
|-----------------|-------------------|-------------------|------------------|------------|------------|-----------|
| Sine 100 kHz    | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz 20 kHz    | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 1.00 MHz   | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -47 dBc |
| Sine 10.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -47 dBc |
| Sine 25.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -47 dBc |
| Sine 50.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -41 dBc |
| Sine 100.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -35 dBc |
| Sine 200.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -29 dBc |
| Sine 240.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -28 dBc |

## CH2 Spurious

|                 |                   |                   |                  |            |            |           |
|-----------------|-------------------|-------------------|------------------|------------|------------|-----------|
| Sine 100 kHz    | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -50 dBc |
| Sine 1.00 MHz   | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -47 dBc |
| Sine 10.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -47 dBc |
| Sine 25.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -47 dBc |
| Sine 50.00 MHz  | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -41 dBc |
| Sine 100.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -35 dBc |
| Sine 200.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -29 dBc |
| Sine 240.00 MHz | 10 MHz<br>300 MHz | 20 MHz<br>600 MHz | 20 kHz<br>20 kHz | MHz<br>MHz | dBc<br>dBc | < -28 dBc |

## Rise/Fall Time Test Record

## AFG3011 / 3011C

## CH1

|                               |       |       |
|-------------------------------|-------|-------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 50 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 50 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 50 ns |

**Rise/Fall Time Test Record (cont.)**

|                               |       |       |
|-------------------------------|-------|-------|
| Fall Time Amplitude: 10.0 Vpp | ----- | 50 ns |
|-------------------------------|-------|-------|

**AFG302xB****CH1**

|                               |       |      |
|-------------------------------|-------|------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 9 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 9 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 9 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 9 ns |

**CH2**

|                               |       |      |
|-------------------------------|-------|------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 9 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 9 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 9 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 9 ns |

**AFG302xC****CH1**

|                               |       |       |
|-------------------------------|-------|-------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 18 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 18 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 18 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 18 ns |

**CH2**

|                               |       |       |
|-------------------------------|-------|-------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 18 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 18 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 18 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 18 ns |

**AFG305xC****CH1**

|                               |       |      |
|-------------------------------|-------|------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 7 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 7 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 7 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 7 ns |

**CH2**

|                               |       |      |
|-------------------------------|-------|------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 7 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 7 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 7 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 7 ns |

**AFG310x / 310xC****CH1**

|                              |       |      |
|------------------------------|-------|------|
| Rise Time Amplitude: 1.0 Vpp | ----- | 5 ns |
| Fall Time Amplitude: 1.0 Vpp | ----- | 5 ns |

**Rise/Fall Time Test Record (cont.)**

|                               |       |      |
|-------------------------------|-------|------|
| Rise Time Amplitude: 10.0 Vpp | ----- | 5 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 5 ns |

**CH2**

|                               |       |      |
|-------------------------------|-------|------|
| Rise Time Amplitude: 1.0 Vpp  | ----- | 5 ns |
| Fall Time Amplitude: 1.0 Vpp  | ----- | 5 ns |
| Rise Time Amplitude: 10.0 Vpp | ----- | 5 ns |
| Fall Time Amplitude: 10.0 Vpp | ----- | 5 ns |

Rise-Fall Time

**AFG325x / 325xC****CH1**

|                              |       |        |
|------------------------------|-------|--------|
| Rise Time Amplitude: 1.0 Vpp | ----- | 2.5 ns |
| Fall Time Amplitude: 1.0 Vpp | ----- | 2.5 ns |
| Rise Time Amplitude: 5.0 Vpp | ----- | 2.5 ns |
| Fall Time Amplitude: 5.0 Vpp | ----- | 2.5 ns |

**CH2**

|                              |       |        |
|------------------------------|-------|--------|
| Rise Time Amplitude: 1.0 Vpp | ----- | 2.5 ns |
| Fall Time Amplitude: 1.0 Vpp | ----- | 2.5 ns |
| Rise Time Amplitude: 5.0 Vpp | ----- | 2.5 ns |
| Fall Time Amplitude: 5.0 Vpp | ----- | 2.5 ns |

## Frequency/period test

This test verifies the frequency accuracy of the arbitrary function generator. All output frequencies are derived from a single generated frequency. Only one frequency point of channel 1 is required to be checked.

1. Connect the arbitrary function generator to the frequency counter as shown in the following figure.

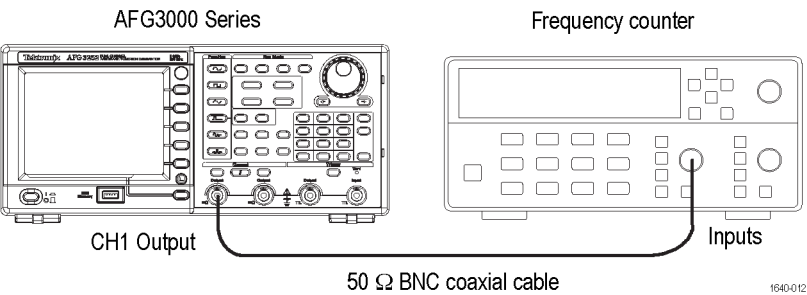


Figure 3: Frequency/period test

2. Push the Default front-panel button and the OK menu button to recall the arbitrary function generator default setup.
3. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting      | Operation                |
|------------------|--------------|--------------------------|
| Function         | Sine         | Sine (front)             |
| Frequency        | 1.000000 MHz | Frequency/Period (front) |
| Amplitude        | 1.00 Vpp     | Amplitude/High (front)   |
| Channel 1 Output | On           | On (front)               |

4. Check that reading of the Frequency Counter is between 0.999999 MHz and 1.000001 MHz.
5. Set up the arbitrary function generator using the following steps:

| Select menu | Setting | Operation     |
|-------------|---------|---------------|
| Function    | Pulse   | Pulse (front) |

6. Check that reading of the frequency counter is between 0.999999 MHz and 1.000001 MHz.

## Amplitude test

This test verifies the amplitude accuracy of the arbitrary function generator. All output amplitudes are derived from a combination of attenuators and 3 dB variable gain. Some amplitude points are checked. This test uses a 50 Ω terminator. It is necessary to know the accuracy of the 50 Ω terminator in advance of this amplitude test. This accuracy is used as a calibration factor.

1. Connect the 50 Ω terminator to the DMM as shown in the following figure and measure the register value.

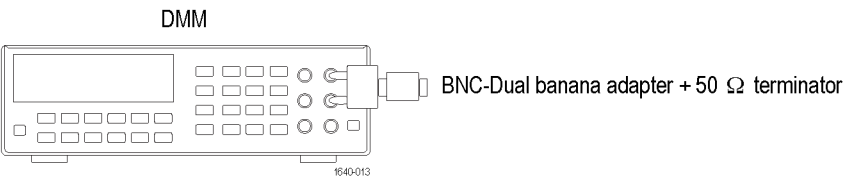


Figure 4: 50 Ω terminator accuracy

2. Calculate the 50 Ω calibration factor (CF) from the reading value and record as follows:

**CF (Calibration Factor) =  $2 / (1 + 50 \text{ } \Omega / \text{Measurement } \Omega)$**

| Measurement (reading of the DMM)<br>Ω | CF                                 |
|---------------------------------------|------------------------------------|
| Examples                              |                                    |
| 50.50 Ω                               | 1.0050 (= $2 / (1 + 50 / 50.50)$ ) |
| 49.62 Ω                               | 0.9962 (= $2 / (1 + 50 / 49.62)$ ) |

3. Connect the arbitrary function generator to the DMM as shown in the following figure. Be sure to connect the 50 Ω terminator to the arbitrary function generator Output connector side.

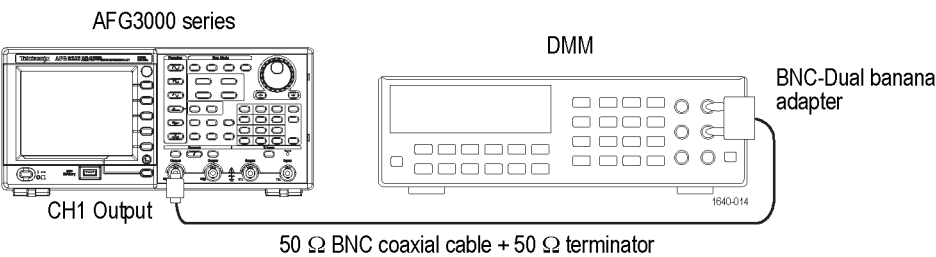


Figure 5: Amplitude test

4. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting                                                  | Operation                                                |
|------------------|----------------------------------------------------------|----------------------------------------------------------|
| Function         | Sine                                                     | Sine (front)                                             |
| Frequency        | 1.000000 kHz                                             | Frequency/Period (front)                                 |
| Amplitude Units  | V rms The voltage unit should be matched to that of DMM. | Top Menu > Amplitude/Level Menu > -more- > Units > V rms |
| Amplitude        | 0.030 Vrms                                               | Amplitude/High (front)                                   |
| Channel 1 Output | On                                                       | On (front)                                               |

5. Verify that each amplitude measurement is within the range specified in the following tables.
6. (Two channel models only) Repeat steps 3 through 4 for the channel 2 output.

#### AFG3011 / 3011C

| Function | Frequency | Amplitude   | Measurement | Range                               |
|----------|-----------|-------------|-------------|-------------------------------------|
| Sine     | 1.000 kHz | 30.0 mVrms  | mVrms       | $(30.0 \times CF \pm 1.307)$ mVrms  |
| Sine     | 1.000 kHz | 300.0 mVrms | mVrms       | $(300.0 \times CF \pm 6.71)$ mVrms  |
| Sine     | 1.000 kHz | 800.0 mVrms | mVrms       | $(800.0 \times CF \pm 16.71)$ mVrms |
| Sine     | 1.000 kHz | 1.500 Vrms  | Vrms        | $(1.500 \times CF \pm 0.0307)$ Vrms |
| Sine     | 1.000 kHz | 2.000 Vrms  | Vrms        | $(2.000 \times CF \pm 0.0407)$ Vrms |
| Sine     | 1.000 kHz | 2.500 Vrms  | Vrms        | $(2.500 \times CF \pm 0.0507)$ Vrms |
| Sine     | 1.000 kHz | 3.500 Vrms  | Vrms        | $(3.500 \times CF \pm 0.0707)$ Vrms |

#### AFG302xB / 302xC / 305xC / 310x / 310xC

| Function | Frequency | Amplitude   | Measurement | Range                               |
|----------|-----------|-------------|-------------|-------------------------------------|
| Sine     | 1.000 kHz | 30.0 mVrms  | mVrms       | $(30.0 \times CF \pm 0.654)$ mVrms  |
| Sine     | 1.000 kHz | 300.0 mVrms | mVrms       | $(300.0 \times CF \pm 3.35)$ mVrms  |
| Sine     | 1.000 kHz | 800.0 mVrms | mVrms       | $(800.0 \times CF \pm 8.35)$ mVrms  |
| Sine     | 1.000 kHz | 1.500 Vrms  | Vrms        | $(1.500 \times CF \pm 0.0154)$ Vrms |
| Sine     | 1.000 kHz | 2.000 Vrms  | Vrms        | $(2.000 \times CF \pm 0.0204)$ Vrms |
| Sine     | 1.000 kHz | 2.500 Vrms  | Vrms        | $(2.500 \times CF \pm 0.0254)$ Vrms |
| Sine     | 1.000 kHz | 3.500 Vrms  | Vrms        | $(3.500 \times CF \pm 0.0354)$ Vrms |

#### AFG325x / 325xC

| Function | Frequency | Amplitude   | Measurement | Range                               |
|----------|-----------|-------------|-------------|-------------------------------------|
| Sine     | 1.000 kHz | 30.0 mVrms  | mVrms       | $(30.0 \times CF \pm 0.654)$ mVrms  |
| Sine     | 1.000 kHz | 300.0 mVrms | mVrms       | $(300.0 \times CF \pm 3.35)$ mVrms  |
| Sine     | 1.000 kHz | 800.0 mVrms | mVrms       | $(800.0 \times CF \pm 8.35)$ mVrms  |
| Sine     | 1.000 kHz | 1.500 Vrms  | Vrms        | $(1.500 \times CF \pm 0.0154)$ Vrms |

DC Offset test

This test verifies the DC offset accuracy of the arbitrary function generator. This test uses a 50 Ω terminator. It is necessary to know the accuracy of a 50 Ω terminator in advance of this test. This accuracy is used for as a calibration factor.

- 1. Connect the 50 Ω terminator to the DMM as shown in the following figure and measure the register value.

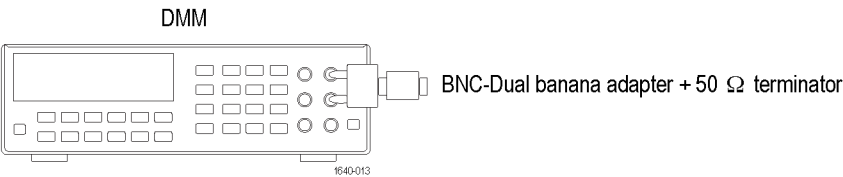


Figure 6: 50 Ω terminator accuracy

- 2. Calculate the 50 Ω calibration factor (CF) from the reading value and record as follows:

$$CF \text{ (Calibration Factor)} = 2 / (1 + 50 \text{ } \Omega / \text{Measurement } \Omega)$$

| Measurement (reading of the DMM)<br>Ω | CF                              |
|---------------------------------------|---------------------------------|
| Examples                              |                                 |
| 50.50 Ω                               | 1.0050 (= 2 / (1 + 50 / 50.50)) |
| 49.62 Ω                               | 0.9962 (= 2 / (1 + 50 / 49.62)) |

- 3. Connect the arbitrary function generator to the DMM as shown in the following figure. Be sure to connect the 50 Ω terminator to the arbitrary function generator Output connector side.

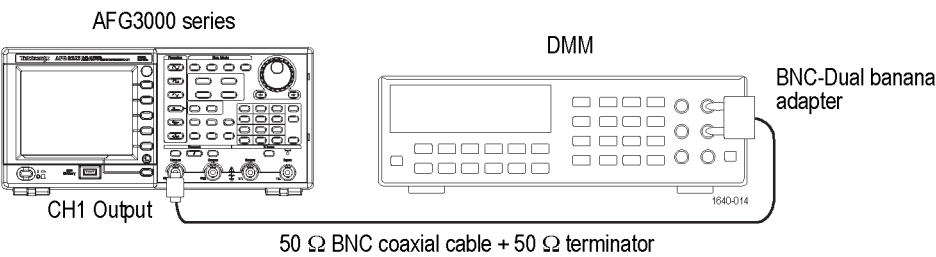


Figure 7: DC offset tests

- 4. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting                       | Operation                                 |
|------------------|-------------------------------|-------------------------------------------|
| Function         | DC                            | More... (front) > More Waveform Menu > DC |
| Offset           | + 5.000 V + 2.500 V (AFG325x) | Offset/Low (front)                        |
| Channel 1 Output | On                            | On (front)                                |

5. Verify that each offset measurement is within the range specified in the following tables.
6. (Two channel models only) Repeat steps 3 through 4 for the channel 2 output.

**AFG3011 / 3011C**

| Function | Offset      | Measurement | Range                                       |
|----------|-------------|-------------|---------------------------------------------|
| DC       | + 5.000 Vdc | Vdc         | $(5.000 \times CF \pm 0.110) \text{ Vdc}$   |
| DC       | 0.000 Vdc   | Vdc         | $\pm 0.010 \text{ Vdc}$                     |
| DC       | - 5.000 Vdc | Vdc         | $(- 5.000 \times CF \pm 0.110) \text{ Vdc}$ |

**AFG302xB / 302xC / 305xC / 310x / 310xC**

| Function | Offset      | Measurement | Range                                       |
|----------|-------------|-------------|---------------------------------------------|
| DC       | + 5.000 Vdc | Vdc         | $(5.000 \times CF \pm 0.055) \text{ Vdc}$   |
| DC       | 0.000 Vdc   | Vdc         | $\pm 0.005 \text{ Vdc}$                     |
| DC       | - 5.000 Vdc | Vdc         | $(- 5.000 \times CF \pm 0.055) \text{ Vdc}$ |

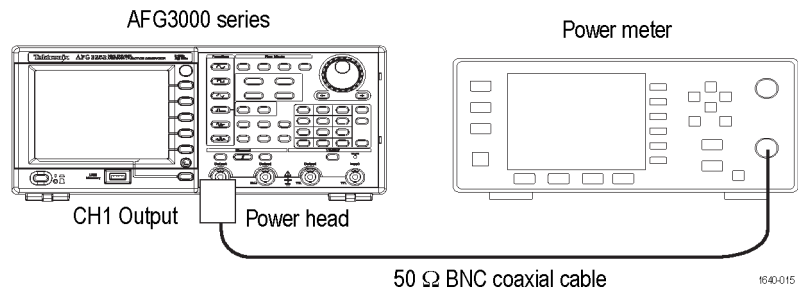
**AFG325x / 325xC**

| Function | Offset      | Measurement | Range                                       |
|----------|-------------|-------------|---------------------------------------------|
| DC       | + 2.500 Vdc | Vdc         | $(2.500 \times CF \pm 0.030) \text{ Vdc}$   |
| DC       | 0.000 Vdc   | Vdc         | $\pm 0.005 \text{ Vdc}$                     |
| DC       | - 2.500 Vdc | Vdc         | $(- 2.500 \times CF \pm 0.030) \text{ Vdc}$ |

## AC Flatness test

This test verifies the flatness of a sine wave to 1 kHz sine wave.

1. Connect the arbitrary function generator to the power meter with a power head as shown in the following figure.



**Figure 8: AC flatness tests**

2. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting   | Operation                                             |
|------------------|-----------|-------------------------------------------------------|
| Function         | Sine      | Sine (front)                                          |
| Frequency        | 500 kHz   | Frequency/Period (front)                              |
| Amplitude Units  | dBm       | TopMenu > Amplitude/Level Menu > -more- > Units > dBm |
| Amplitude        | + 4.0 dBm | Amplitude/High (front)                                |
| Channel 1 Output | On        | On (front)                                            |

3. Set the frequency of the Power Meter to 500 kHz.
4. Verify that the power measurement at each frequency is within the error specified in the following tables.
5. (Two channel models only) Repeat steps 3 through 4 for the channel 2 output.

**AFG3011 / 3011C**

| Function | Amplitude | Frequency | Measurement (dB) | Range (dB)           |
|----------|-----------|-----------|------------------|----------------------|
| Sine     | + 4.0 dBm | 1.00 kHz  | = Reference      | -----                |
| Sine     | + 4.0 dBm | 500 kHz   |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 1.00 MHz  |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 5.00 MHz  |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 10.00 MHz |                  | Reference $\pm$ 0.30 |

**AFG302xB / 302xC**

| Function | Amplitude | Frequency | Measurement (dB) | Range (dB)           |
|----------|-----------|-----------|------------------|----------------------|
| Sine     | + 4.0 dBm | 1.00 kHz  | = Reference      | -----                |
| Sine     | + 4.0 dBm | 5.00 kHz  |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 1.00 MHz  |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 5.00 MHz  |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 15.00 MHz |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 25.00 MHz |                  | Reference $\pm$ 0.50 |

**AFG305xC**

| Function | Amplitude | Frequency | Measurement (dB) | Range (dB)           |
|----------|-----------|-----------|------------------|----------------------|
| Sine     | + 4.0 dBm | 1.00 kHz  | = Reference      | -----                |
| Sine     | + 4.0 dBm | 5.00 kHz  |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 1.00 MHz  |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 5.00 MHz  |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 15.00 MHz |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 25.00 MHz |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 50.00 MHz |                  | Reference $\pm$ 0.50 |

**AFG310x / 310xC**

| Function | Amplitude | Frequency  | Measurement (dB) | Range (dB)           |
|----------|-----------|------------|------------------|----------------------|
| Sine     | + 4.0 dBm | 1.00 kHz   | = Reference      | -----                |
| Sine     | + 4.0 dBm | 1.00 MHz   |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 5.00 MHz   |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 25.00 MHz  |                  | Reference $\pm$ 0.50 |
| Sine     | + 4.0 dBm | 50.00 MHz  |                  | Reference $\pm$ 0.50 |
| Sine     | + 4.0 dBm | 100.00 MHz |                  | Reference $\pm$ 0.50 |

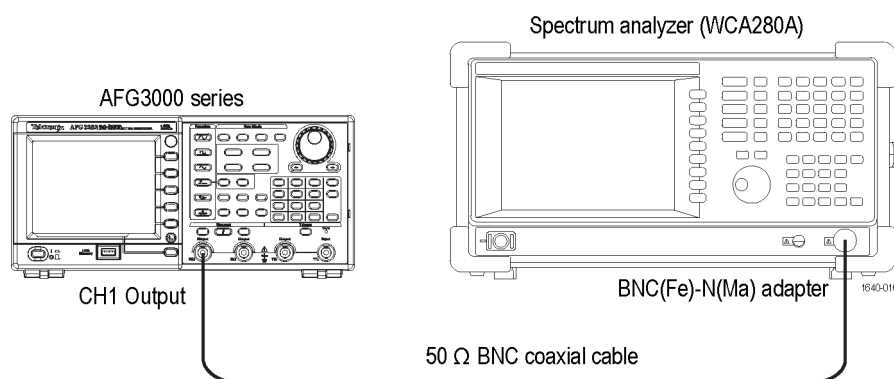
**AFG325x / 325xC**

| Function | Amplitude | Frequency  | Measurement (dB) | Range (dB)           |
|----------|-----------|------------|------------------|----------------------|
| Sine     | + 4.0 dBm | 1.00 kHz   | = Reference      | -----                |
| Sine     | + 4.0 dBm | 1.00 MHz   |                  | Reference $\pm$ 0.15 |
| Sine     | + 4.0 dBm | 5.00 MHz   |                  | Reference $\pm$ 0.30 |
| Sine     | + 4.0 dBm | 25.00 MHz  |                  | Reference $\pm$ 0.50 |
| Sine     | + 4.0 dBm | 50.00 MHz  |                  | Reference $\pm$ 0.50 |
| Sine     | + 4.0 dBm | 100.00 MHz |                  | Reference $\pm$ 1.00 |
| Sine     | + 4.0 dBm | 150.00 MHz |                  | Reference $\pm$ 1.00 |
| Sine     | + 4.0 dBm | 240.00 MHz |                  | Reference $\pm$ 2.00 |

## Harmonics Distortion test

This test verifies the harmonic distortion using a spectrum analyzer.

1. Connect the arbitrary function generator to the spectrum analyzer as shown in the following figure.



**Figure 9: Harmonic distortion tests**

2. Push the Default front-panel button and OK menu button to recall the arbitrary function generator default setup.

3. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting                                                                                         | Operation                                             |
|------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Function         | Sine                                                                                            | Sine (front)                                          |
| Frequency        | 20.00 kHz: AFG3011 / 3011C / 302xB / 302xC / 305xC<br>1.000 MHz: AFG310x / 310xC / 325x / 325xC | Frequency/Period (front)                              |
| Amplitude Units  | Vpp                                                                                             | TopMenu > Amplitude/Level Menu > -more- > Units > Vpp |
| Amplitude        | 1.00 Vpp                                                                                        | Amplitude/High (front)                                |
| Channel 1 Output | On                                                                                              | On (front)                                            |

4. Set up the spectrum analyzer according the frequency setup of the arbitrary function generator.
5. Set the Ref Level of the spectrum analyzer to 8 dBm.
6. Read the signal level in the Fundamental frequency for each signal. Use this level as a Reference value in step .
7. Verify that the differences between the reference level and the signal level in the frequency of higher-order at each frequency are below the limit specified in the following tables.
8. (Two channel models only) Repeat steps 2 through 4 for the channel 2 output.

| AFG3011 / 3011C |                   |                    |                   |                           |         |         |         |         |                 |
|-----------------|-------------------|--------------------|-------------------|---------------------------|---------|---------|---------|---------|-----------------|
| Frequency       | Spectrum Analyzer |                    |                   | Measurement               |         |         |         |         | Limit           |
|                 | Center Frequency  | Span               | RBW               | Fundamental (= Reference) | 2nd     | 3rd     | 4th     | 5th     | Nth - Reference |
| 20.00 kHz       | 100 kHz           | 200 kHz            | 500 Hz            | 20 kHz                    | 40 kHz  | 60 kHz  | 80 kHz  | 100 kHz | < -55 dBc       |
| 100.00 kHz      | 500 kHz           | 1 MHz              | 2 kHz             | 100 kHz                   | 200 kHz | 300 kHz | 400 kHz | 500 kHz | < -55 dBc       |
| 1.00 MHz        | 5.00 MHz          | 10 MHz             | 20 kHz            | 1 MHz                     | 2 MHz   | 3 MHz   | 4 MHz   | 5 MHz   | < -45 dBc       |
| 10.00 MHz       | 10 MHz/<br>50 MHz | 20 MHz/<br>100 MHz | 20 kHz/<br>20 kHz | 10 MHz                    | 20 MHz  | 30 MHz  | 40 MHz  | 50 MHz  | < -45dBc        |

| AFG302xB / 302xC |                   |         |        |                           |         |         |         |         |                 |
|------------------|-------------------|---------|--------|---------------------------|---------|---------|---------|---------|-----------------|
| Frequency        | Spectrum Analyzer |         |        | Measurement               |         |         |         |         | Limit           |
|                  | Center Frequency  | Span    | RBW    | Fundamental (= Reference) | 2nd     | 3rd     | 4th     | 5th     | Nth - Reference |
| 20.00 kHz        | 100 kHz           | 200 kHz | 500 Hz | 20 kHz                    | 40 kHz  | 60 kHz  | 80 kHz  | 100 kHz | < -60 dBc       |
| 100.00 kHz       | 500 kHz           | 1 MHz   | 2 kHz  | 100 kHz                   | 200 kHz | 300 kHz | 400 kHz | 500 kHz | < -60 dBc       |

**AFG302xB  
/ 302xC**

| Spectrum Analyzer |                  |         |        | Measurement |                   |        |         |         | Limit           |
|-------------------|------------------|---------|--------|-------------|-------------------|--------|---------|---------|-----------------|
| Frequency         | Center Frequency | Span    | RBW    | Fundamental | 2nd (= Reference) | 3rd    | 4th     | 5th     | Nth - Reference |
| 1.00 MHz          | 5.00 MHz         | 10 MHz  | 20 kHz | 1 MHz       | 2 MHz             | 3 MHz  | 4 MHz   | 5 MHz   | < -50 dBc       |
| 25.00 MHz         | 125 MHz          | 250 MHz | 20 kHz | 25 MHz      | 50 MHz            | 75 MHz | 100 MHz | 125 MHz | < -40 dBc       |

**AFG305xC**

| Spectrum Analyzer |                  |                 |                 | Measurement |                   |         |         |         | Limit           |
|-------------------|------------------|-----------------|-----------------|-------------|-------------------|---------|---------|---------|-----------------|
| Frequency         | Center Frequency | Span            | RBW             | Fundamental | 2nd (= Reference) | 3rd     | 4th     | 5th     | Nth - Reference |
| 100 kHz           | 500 kHz          | 1 MHz           | 2 kHz           | 100 kHz     | 200 kHz           | 300 kHz | 400 kHz | 500 kHz | < -60 dBc       |
| 1 MHz             | 5.00 MHz         | 10 MHz          | 20 kHz          | 1 MHz       | 2 MHz             | 3 MHz   | 4 MHz   | 5 MHz   | < -50 dBc       |
| 10 MHz            | 10 MHz / 25 MHz  | 20 MHz / 50 MHz | 20 kHz / 20 kHz | 5 MHz       | 10 MHz            | 15 MHz  | 20 MHz  | 25 MHz  | < -37 dBc       |
| 25 MHz            | 125 MHz          | 250 MHz         | 20 kHz          | 25 MHz      | 50 MHz            | 75 MHz  | 100 MHz | 125 MHz | < -37 dBc       |
| 50 MHz            | 500 MHz          | 1 GHz           | 100 kHz         | 100 MHz     | 200 MHz           | 300 MHz | 400 MHz | 500 MHz | < -37 dBc       |

**AFG310x  
/ 310xC**

| Spectrum Analyzer |                  |                 |                 | Measurement |                   |         |         |         | Limit           |
|-------------------|------------------|-----------------|-----------------|-------------|-------------------|---------|---------|---------|-----------------|
| Frequency         | Center Frequency | Span            | RBW             | Fundamental | 2nd (= Reference) | 3rd     | 4th     | 5th     | Nth - Reference |
| 1 MHz             | 5.00 MHz         | 10 MHz          | 20 kHz          | 1 MHz       | 2 MHz             | 3 MHz   | 4 MHz   | 5 MHz   | < -50 dBc       |
| 5 MHz             | 10 MHz / 25 MHz  | 20 MHz / 50 MHz | 20 kHz / 20 kHz | 5 MHz       | 10 MHz            | 15 MHz  | 20 MHz  | 25 MHz  | < -37 dBc       |
| 25 MHz            | 125 MHz          | 250 MHz         | 20 kHz          | 25 MHz      | 50 MHz            | 75 MHz  | 100 MHz | 125 MHz | < -37 dBc       |
| 100 MHz           | 500 MHz          | 1 GHz           | 100 kHz         | 100 MHz     | 200 MHz           | 300 MHz | 400 MHz | 500 MHz | < -37 dBc       |

**AFG325x  
/ 325xC**

| Spectrum Analyzer |                  |                 |                 | Measurement |                   |         |         |          | Limit           |
|-------------------|------------------|-----------------|-----------------|-------------|-------------------|---------|---------|----------|-----------------|
| Frequency         | Center Frequency | Span            | RBW             | Fundamental | 2nd (= Reference) | 3rd     | 4th     | 5th      | Nth - Reference |
| 1 MHz             | 5.00 MHz         | 10 MHz          | 20 kHz          | 1 MHz       | 2 MHz             | 3 MHz   | 4 MHz   | 5 MHz    | < -50 dBc       |
| 5 MHz             | 10 MHz / 25 MHz  | 20 MHz / 50 MHz | 20 kHz / 20 kHz | 5 MHz       | 10 MHz            | 15 MHz  | 20 MHz  | 25 MHz   | < -37 dBc       |
| 100 MHz           | 500 MHz          | 1 GHz           | 100 kHz         | 100 MHz     | 200 MHz           | 300 MHz | 400 MHz | 500 MHz  | < -30 dBc       |
| 240 MHz           | 625 MHz          | 1.25 GHz        | 100 kHz         | 240 MHz     | 480 MHz           | 720 MHz | 960 MHz | 1.20 GHz | < -30 dBc       |

## Total Harmonic Distortion test

This test verifies the total harmonic distortion (THD) using a spectrum analyzer.

1. Connect the arbitrary function generator to the spectrum analyzer as shown in the following figure.

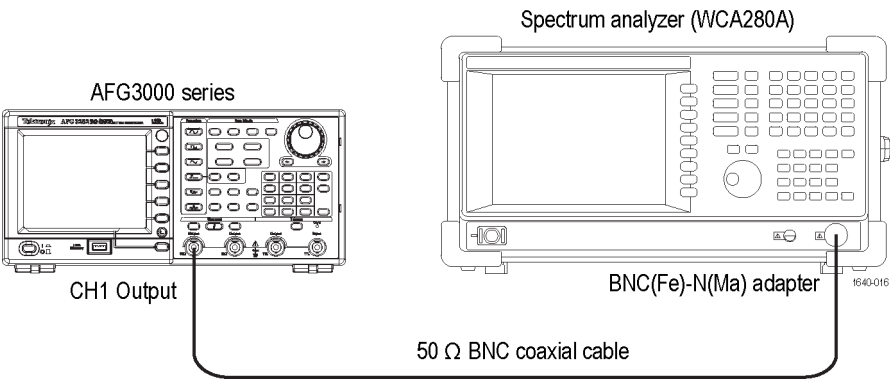


Figure 10: Total Harmonic distortion tests

2. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting   | Operation                                             |
|------------------|-----------|-------------------------------------------------------|
| Function         | Sine      | Sine (front)                                          |
| Frequency        | 20.00 kHz | Frequency/Period (front)                              |
| Amplitude Units  | Vpp       | TopMenu > Amplitude/Level Menu > -more- > Units > Vpp |
| Amplitude        | 1.00 Vpp  | Amplitude/High (front)                                |
| Channel 1 Output | On        | On (front)                                            |

3. Set up the spectrum analyzer according to the following table:

| Center Frequency | Span    | RBW    |
|------------------|---------|--------|
| 100 kHz          | 200 kHz | 500 Hz |

4. Set the Ref Level of the spectrum analyzer to 8 dBm.
5. When the THD cannot be measured directly, it is obtained by using the following calculation:

$$THD = \frac{\sqrt{\sum_{n=2}^{\infty} C_n^2}}{C_1}$$

6. Measure and record each level (A1 to A7) to the seventh harmonics of the 20 kHz sine wave.

7. Calculate the each B1 to B7, C1 to C7 value and the THD using the following table.

**NOTE.** When all the harmonic components are -62 dBm or less, the calculation of THD can be skipped because it is  $THD < 0.2\%$ .

8. Verify that the THD is less than 0.2%.
9. (Two channel models only) Repeat steps 2 through 4 for the channel 2 output.

| AFG3xxxx                                    |           | Measurement                   |           |           |           |           |           |                 |
|---------------------------------------------|-----------|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------------|
| Function                                    | Frequency | Fundamental<br>=<br>reference | 2nd       | 3rd       | 4th       | 5th       | 6th       | 7th             |
| sine                                        | 20.00 kHz | 20 kHz                        | 40 kHz    | 60 kHz    | 80 kHz    | 100 kHz   | 120 kHz   | 140 kHz         |
| reading (dBm)                               |           | A1 =                          | A2 =      | A3 =      | A4 =      | A5 =      | A6 =      | A7 =            |
| reading - reference Bn =<br>An - A1 (dBc)   |           | B1 = 0                        | B2 =      | B3 =      | B4 =      | B5 =      | B6 =      | B7 =            |
| Cn = 10 Bn/20                               |           | C1 = 1                        | C2 =      | C3 =      | C4 =      | C5 =      | C6 =      | C7 =            |
| $THD = \frac{\sqrt{\sum_{n=2} C_n^2}}{C_1}$ |           | THD =                         |           |           |           |           |           | Limit<br>< 0.2% |
| Sample: reading                             |           | 1.5 dBm                       | -58.5 dBm | -58.5 dBm | -63.5 dBm | -58.5 dBm | -63.5 dBm | -63.5 dBm       |
| reading - reference                         |           | 0                             | -60 dBm   | -60 dBm   | -65 dBm   | -60 dBm   | -65 dBm   | -65 dBm         |
| Cn =                                        |           | 1.000                         | 0.001     | 0.001     | 0.000562  | 0.001     | 0.000562  | 0.000562        |
| $THD = \frac{\sqrt{\sum_{n=2} C_n^2}}{C_1}$ |           | 0.1987%                       |           |           |           |           |           | Limit<br>< 0.2% |

## Spurious test

This test verifies the spurious using a spectrum analyzer.

1. Connect the arbitrary function generator to the spectrum analyzer as shown in the following figure.

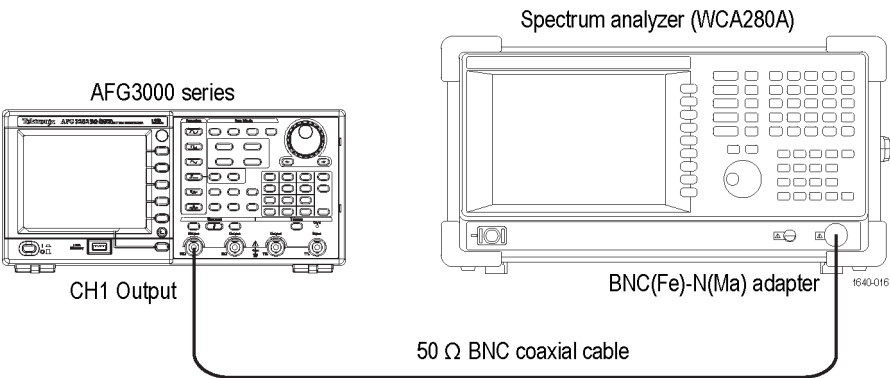


Figure 11: Spurious tests

2. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting    | Operation                                             |
|------------------|------------|-------------------------------------------------------|
| Function         | Sine       | Sine (front)                                          |
| Frequency        | 100.00 kHz | Frequency/Period (front)                              |
| Amplitude Units  | Vpp        | TopMenu > Amplitude/Level Menu > -more- > Units > Vpp |
| Amplitude        | 1.00 Vpp   | Amplitude/High (front)                                |
| Channel 1 Output | On         | On (front)                                            |

3. Set the center frequency of the spectrum analyzer to 10 MHz. Other settings are shown in the following tables.
4. Set the Ref Level of the spectrum analyzer to 8 dBm.
5. Measure the maximum spurious level other than harmonic distortion of 1 Vpp sine wave in each frequency.
6. Set the center frequency of the spectrum analyzer to 300 MHz. Other settings are shown in the following tables.
7. Measure the maximum spurious level other than harmonic distortion of 1 Vpp sine wave in each frequency.
8. Verify that the spurious signal at each frequency is equal to or less than the limit specified in the following tables.
9. (Two channel models only) Repeat steps 2 through 8 for the channel 2 output.

**AFG3011 /  
3011C**

| Spectrum analyzer |                  |         |        | Measurement        |                |           |
|-------------------|------------------|---------|--------|--------------------|----------------|-----------|
| Frequency         | Center Frequency | Span    | RBW    | Spurious Frequency | Spurious (Max) | Limit     |
| 100.00 kHz        | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -60 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 1.00 MHz          | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 10.00 MHz         | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |

**AFG302xB /  
302xC**

| Spectrum analyzer |                  |         |        | Measurement        |                |           |
|-------------------|------------------|---------|--------|--------------------|----------------|-----------|
| Frequency         | Center Frequency | Span    | RBW    | Spurious Frequency | Spurious (Max) | Limit     |
| 100.00 kHz        | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -60 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 1.00 MHz          | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 10.00 MHz         | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 25.00 MHz         | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |

**AFG305xC**

| Spectrum analyzer |                  |         |        | Measurement        |                |           |
|-------------------|------------------|---------|--------|--------------------|----------------|-----------|
| Frequency         | Center Frequency | Span    | RBW    | Spurious Frequency | Spurious (Max) | Limit     |
| 100.00 kHz        | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -60 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 1.00 MHz          | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 10.00 MHz         | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 25.00 MHz         | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 50.00 MHz         | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |

**AFG310x /  
310xC**

| Spectrum analyzer |                  |         |        | Measurement        |                |           |
|-------------------|------------------|---------|--------|--------------------|----------------|-----------|
| Frequency         | Center Frequency | Span    | RBW    | Spurious Frequency | Spurious (Max) | Limit     |
| 100.00 kHz        | 10 MHz           | 20 MHz  | 20 kHz | MHz                | dBc            | < -60 dBc |
|                   | 300 MHz          | 600 MHz | 20 kHz | MHz                | dBc            |           |

**AFG310x /  
310xC**

|            | Spectrum analyzer |         |        | Measurement |     |           |
|------------|-------------------|---------|--------|-------------|-----|-----------|
|            |                   |         |        |             |     |           |
| 1.00 MHz   | 10 MHz            | 20 MHz  | 20 kHz | MHz         | dBc | < -50 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz         | dBc |           |
| 10.00 MHz  | 10 MHz            | 20 MHz  | 20 kHz | MHz         | dBc | < -50 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz         | dBc |           |
| 25.00 MHz  | 10 MHz            | 20 MHz  | 20 kHz | MHz         | dBc | < -50 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz         | dBc |           |
| 50.00 MHz  | 10 MHz            | 20 MHz  | 20 kHz | MHz         | dBc | < -44 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz         | dBc |           |
| 100.00 MHz | 10 MHz            | 20 MHz  | 20 kHz | MHz         | dBc | < -38 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz         | dBc |           |

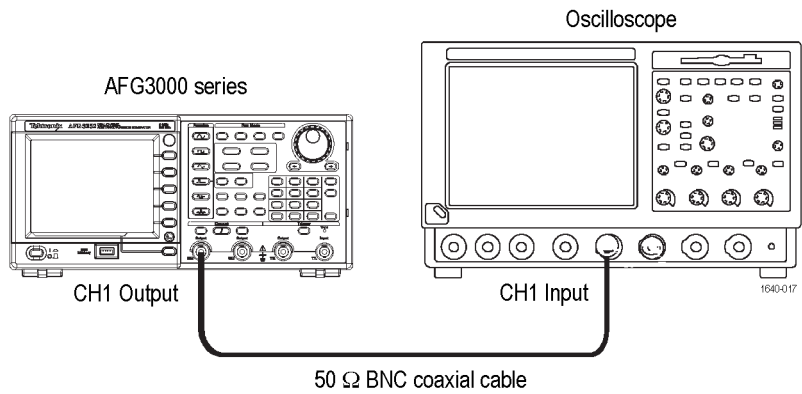
**AFG325x /  
325xC**

| Frequency  | Spectrum analyzer |         |        | Measurement        |                |           |
|------------|-------------------|---------|--------|--------------------|----------------|-----------|
|            | Center Frequency  | Span    | RBW    | Spurious Frequency | Spurious (Max) | Limit     |
| 100.00 kHz | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -50 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 1.00 MHz   | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -47 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 10.00 MHz  | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -47 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 25.00 MHz  | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -47 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 50.00 MHz  | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -41 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 100.00 MHz | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -35 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 200.00 MHz | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -29 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |
| 240.00 MHz | 10 MHz            | 20 MHz  | 20 kHz | MHz                | dBc            | < -28 dBc |
|            | 300 MHz           | 600 MHz | 20 kHz | MHz                | dBc            |           |

## Rise-Fall time test

This test verifies the pulse rise time of the arbitrary function generator.

1. Connect the arbitrary function generator to the oscilloscope as shown in the following figure.



**Figure 12: Rise-Fall time tests**

2. Set up the arbitrary function generator using the following steps:

| Select menu      | Setting                                                                                        | Operation                                             |
|------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Function         | Square                                                                                         | Square (front)                                        |
| Frequency        | 2.00 MHz: AFG3011 / 3011C<br>10.00 MHz: AFG302xB / 302xC / 305xC / 310x / 310xC / 325x / 325xC | Frequency/Period (front)                              |
| Amplitude Units  | Vpp                                                                                            | TopMenu > Amplitude/Level Menu > -more- > Units > Vpp |
| Amplitude        | 1.0 Vpp                                                                                        | Amplitude/High (front)                                |
| Offset           | 0.0 V                                                                                          | TopMenu > Offset/Low (front)                          |
| Channel 1 Output | On                                                                                             | On (front)                                            |

3. Set up the Oscilloscope so the square waveform of 5 division amplitude is displayed.
4. Verify that the rise/fall time of the square waveform on the oscilloscope at each amplitude is equal to or less than the limit specified in the following tables. Use 10-90% reference level for rise/fall time measurement.
5. (Two channel models only) Repeat steps 2 through 4 for the channel 2 output.

| AFG3011 / 3011C |           |        |           | Oscilloscope                         |                           | Measurement |
|-----------------|-----------|--------|-----------|--------------------------------------|---------------------------|-------------|
| Function        | Frequency | Offset | Amplitude | Vertical                             | Horizontal                | Limit       |
| Square          | 2.00 MHz  | 0.0 V  | 1.0 Vpp   | 200 mV/div                           | 20 ns/div or<br>25 ns/div | ≤ 50 ns     |
| Square          | 2.00 MHz  | 0.0 V  | 10.0 Vpp  | 200 mV/div<br>with x10<br>attenuator | 20 ns/div or<br>25 ns/div | ≤ 50 ns     |

| AFG302xB / 302xC |           |        |           | Oscilloscope                         |            | Measurement |
|------------------|-----------|--------|-----------|--------------------------------------|------------|-------------|
| Function         | Frequency | Offset | Amplitude | Vertical                             | Horizontal | Limit       |
| Square           | 10.00 MHz | 0.0 V  | 1.0 Vpp   | 200 mV/div                           | 5 ns/div   | ≤ 9 ns      |
| Square           | 10.00 MHz | 0.0 V  | 10.0 Vpp  | 200 mV/div<br>with x10<br>attenuator | 5 ns/div   | ≤ 9 ns      |

| AFG305xC |           |        |           | Oscilloscope                         |            | Measurement |
|----------|-----------|--------|-----------|--------------------------------------|------------|-------------|
| Function | Frequency | Offset | Amplitude | Vertical                             | Horizontal | Limit       |
| Square   | 10.00 MHz | 0.0 V  | 1.0 Vpp   | 200 mV/div                           | 5 ns/div   | ≤ 7 ns      |
| Square   | 10.00 MHz | 0.0 V  | 10.0 Vpp  | 200 mV/div<br>with x10<br>attenuator | 5 ns/div   | ≤ 7 ns      |

| AFG310x / 310xC |           |        |           | Oscilloscope                         |            | Measurement |
|-----------------|-----------|--------|-----------|--------------------------------------|------------|-------------|
| Function        | Frequency | Offset | Amplitude | Vertical                             | Horizontal | Limit       |
| Square          | 10.00 MHz | 0.0 V  | 1.0 Vpp   | 200 mV/div                           | 2 ns/div   | ≤ 5 ns      |
| Square          | 10.00 MHz | 0.0 V  | 10.0 Vpp  | 200 mV/div<br>with x10<br>attenuator | 2 ns/div   | ≤ 5 ns      |

| AFG325x / 325xC |           |        |           | Oscilloscope |            | Measurement |
|-----------------|-----------|--------|-----------|--------------|------------|-------------|
| Function        | Frequency | Offset | Amplitude | Vertical     | Horizontal | Limit       |
| Square          | 10.00 MHz | 0.0 V  | 1.0 Vpp   | 200 mV/div   | 1 ns/div   | ≤ 2.5 ns    |
| Square          | 10.00 MHz | 0.0 V  | 5.0 Vpp   | 1.0 V/div    | 1 ns/div   | ≤ 2.5 ns    |