



4 Series MSO (MSO44, MSO46)

Specifications and Performance Verification

Technical Reference

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

Register now!
Click the following link to protect your product.
www.tek.com/register



077-1546-05

Copyright © Tektronix. All rights reserved. Licensed software products are owned by Tektronix or its subsidiaries or suppliers, and are protected by national copyright laws and international treaty provisions. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specifications and price change privileges reserved.

TEKTRONIX and TEK are registered trademarks of Tektronix, Inc.

Contacting Tektronix

Tektronix, Inc.

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.tek.com to find contacts in your area.

Table of Contents

| | |
|--|----|
| List of Figures..... | 5 |
| List of Tables..... | 6 |
| Important safety information..... | 7 |
| General safety summary..... | 7 |
| To avoid fire or personal injury..... | 7 |
| Probes and test leads..... | 9 |
| Service safety summary..... | 9 |
| Terms in this manual..... | 10 |
| Terms on the product..... | 10 |
| Symbols on the product..... | 10 |
| Specifications..... | 11 |
| Analog channel input and vertical specification..... | 11 |
| Trigger system..... | 20 |
| Serial Trigger specifications..... | 23 |
| Digital acquisition system..... | 23 |
| Digital volt meter (DVM)..... | 23 |
| Trigger frequency counter..... | 24 |
| Arbitrary Function Generator system..... | 24 |
| Display system..... | 26 |
| Processor system..... | 27 |
| Data storage specifications..... | 28 |
| Power supply system..... | 28 |
| Safety characteristics..... | 29 |
| Mechanical specifications..... | 29 |
| Performance verification procedures..... | 30 |
| Test records..... | 30 |
| Instrument information, self test record..... | 30 |
| Input Impedance test record..... | 31 |
| DC Gain Accuracy test record..... | 31 |
| DC Offset Accuracy test record..... | 34 |
| Analog Bandwidth test record..... | 40 |
| Random Noise High Res acquisition mode test record..... | 60 |
| Long term sample rate through AFG DC offset accuracy test records..... | 77 |
| Performance tests..... | 85 |
| Prerequisites..... | 85 |
| Self test..... | 86 |
| Check input impedance..... | 86 |
| Check DC gain accuracy..... | 87 |
| Check DC offset accuracy..... | 90 |
| Check analog bandwidth..... | 91 |
| Check random noise..... | 93 |
| Check long term sample rate..... | 94 |
| Check digital threshold accuracy..... | 95 |
| Check AUX Out output voltage levels..... | 97 |

| | |
|---|-----|
| Check DVM voltage accuracy (DC)..... | 98 |
| Check DVM voltage accuracy (AC)..... | 99 |
| Check trigger frequency accuracy and maximum input frequency..... | 100 |
| Arbitrary function generator..... | 100 |
| Check AFG sine and ramp frequency accuracy..... | 100 |
| Check AFG square and pulse frequency accuracy..... | 101 |
| Check AFG signal amplitude accuracy..... | 102 |
| Check AFG DC offset accuracy..... | 104 |

List of Figures

Figure 1: Frequency/period test..... 101

Figure 2: Frequency/period test..... 102

Figure 3: 50 Ω terminator accuracy..... 103

Figure 4: Amplitude test..... 103

Figure 5: 50 Ω terminator accuracy..... 104

Figure 6: DC offset tests..... 105

List of Tables

Table 1: Expected gain worksheet..... 89

Table 2: CF (Calibration Factor) = $1.414 \times ((50 / \text{Measurement } \Omega) + 1)$103

Table 3: CF (Calibration Factor) = $0.5 \times ((50 / \text{Measurement } \Omega) + 1)$104

Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, see the *Service safety summary* that follows the *General safety summary*.

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

This product shall be used in accordance with local and national codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

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.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of 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. Do not use the provided power cord for other products.

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. Do not disable the power cord grounding connection.

Power disconnect.

The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to operate the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

Connect and disconnect properly..

Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Use only insulated voltage probes, test leads, and adapters supplied with the product, or indicated by Tektronix to be suitable for the product.

Observe all terminal ratings.

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

Do not exceed the Measurement Category (CAT) rating and voltage or current rating of the lowest rated individual component of a product, probe, or accessory. Use caution when using 1:1 test leads because the probe tip voltage is directly transmitted to the product.

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

Do not float the common terminal above the rated voltage for that terminal.

The measurement terminals on this product are not rated for connection to Category III or IV circuits.

Do not operate without covers.

Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

Avoid exposed circuitry.

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

Do not operate with suspected failures.

If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Do not operate in wet/damp conditions.

Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry.

Remove the input signals before you clean the product.

Provide proper ventilation.

Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment

Always place the product in a location convenient for viewing the display and indicators.

Avoid improper or prolonged use of keyboards, pointers, and button pads. Improper or prolonged keyboard or pointer use may result in serious injury.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use care when lifting and carrying the product. This product is provided with a handle or handles for lifting and carrying.



WARNING: The product is heavy. To reduce the risk of personal injury or damage to the device get help when lifting or carrying the product.



WARNING: The product is heavy. Use a two-person lift or a mechanical aid.

Use only the Tektronix rackmount hardware specified for this product.

Probes and test leads

Before connecting probes or test leads, connect the power cord from the power connector to a properly grounded power outlet.

Keep fingers behind the protective barrier, protective finger guard, or tactile indicator on the probes. Remove all probes, test leads and accessories that are not in use.

Use only correct Measurement Category (CAT), voltage, temperature, altitude, and amperage rated probes, test leads, and adapters for any measurement.

Beware of high voltages.

Understand the voltage ratings for the probe you are using and do not exceed those ratings. Two ratings are important to know and understand:

- The maximum measurement voltage from the probe tip to the probe reference lead.
- The maximum floating voltage from the probe reference lead to earth ground.

These two voltage ratings depend on the probe and your application. Refer to the Specifications section of the manual for more information.



WARNING: To prevent electrical shock, do not exceed the maximum measurement or maximum floating voltage for the oscilloscope input BNC connector, probe tip, or probe reference lead.

Connect and disconnect properly.

Connect the probe output to the measurement product before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement product.

De-energize the circuit under test before connecting or disconnecting the current probe.

Connect the probe reference lead to earth ground only.

Do not connect a current probe to any wire that carries voltages or frequencies above the current probe voltage rating.

Inspect the probe and accessories.

Before each use, inspect probe and accessories for damage (cuts, tears, or defects in the probe body, accessories, or cable jacket). Do not use if damaged.

Ground-referenced oscilloscope use.

Do not float the reference lead of this probe when using with ground-referenced oscilloscopes. The reference lead must be connected to earth potential (0 V).

Floating measurement use.

Do not float the reference lead of this probe above the rated float voltage.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock.

Do not touch exposed connections.

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, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

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.

Verify safety after repair.

Always recheck ground continuity and mains dielectric strength after performing a repair.

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.

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.

Symbols on the product

When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

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



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal



Chassis Ground



Standby



Functional
Earth Terminal

Specifications

This chapter contains specifications for the instrument. All specifications are guaranteed unless noted as "typical." Typical specifications are provided for your convenience but are not guaranteed. Specifications that are marked with the ✓ symbol are checked in Performance Verification.

All specifications apply to all models unless noted otherwise. To meet specifications, two conditions must first be met:

- The instrument must have been operating continuously for twenty minutes within the specified operating temperature range.
- You must perform the Signal Path Compensation (SPC) operation described in the [Self test](#) on page 86 procedure in *Performance Verification* section. If the operating temperature changes by more than 10 °C (18 °F), you must perform the SPC operation again.

Analog channel input and vertical specification

| | |
|---|--|
| Number of input channels | MSO44: 4 BNC MSO46: 6 BNC |
| Input coupling | DC, AC |
| Input resistance selection | 1 M Ω or 50 Ω |
| ✓ Input impedance 1 MΩ DC coupled | 1 M Ω \pm 1% |
| Input capacitance 1 MΩ DC coupled, typical | 13 pF \pm 1.5 pF |
| ✓ Input impedance 50 Ω, DC coupled | 50 Ω \pm 1% (VSWR \leq 1.5:1, typical) |
| Maximum input voltage, 1 MΩ | 300 V _{RMS} at the BNC Derate at 20 dB/decade between 4.5 MHz and 45 MHz; derate 14 dB/decade between 45 MHz and 450 MHz. Above 450 MHz, 5.5 V _{RMS} Maximum peak input voltage at the BNC: \pm 425 V |
| Maximum input voltage, 50 Ohm | 5 V _{RMS} , with peaks \leq \pm 20 V (DF \leq 6.25%) |
| Number of digitized bits | 8 bits at 6.25 GS/s 12 bits at 3.125 GS/s 13 bits at 1.25 GS/s 14 bits at 625 MS/s 15 bits at 312.5 MS/s 16 bits at 125 MS/s Displayed vertically with 25 digitization levels (DL ¹) for 8-bit and 400 digitization levels for 12-bit per division, 10.24 divisions dynamic range. |
| Sensitivity range, coarse | |
| 1 MΩ | 500 μ V/div to 10 V/div in a 1-2-5 sequence |

¹ DL is the abbreviation for digitization level. A DL is the smallest voltage level change that can be resolved by an 8-bit A-D Converter. This value is also known as an LSB (least significant bit).

50 Ω 500 $\mu\text{V}/\text{div}$ to 1 V/div in a 1-2-5 sequence

Note: 500 $\mu\text{V}/\text{div}$ is a 2X digital zoom of 1 mV/div or a 4x digital zoom of 2 mV/div , depending on the instrument bandwidth configuration

Sensitivity range, fine

Allows continuous adjustment from 1 mV/div to 10 V/div , 1 $\text{M}\Omega$ and from 1 mV/div to 1 V/div , 50 Ω

1 $\text{M}\Omega$ 500 $\mu\text{V}/\text{div}$ to 10 V/div

50 Ω 500 $\mu\text{V}/\text{div}$ to 1 V/div

Sensitivity resolution, fine $\leq 1\%$ of current setting

✓ DC gain accuracy

Step Gain, 50 Ω $\pm 1.0\%$, ($\pm 2.5\%$ at 1 mV/div and 500 $\mu\text{V}/\text{div}$ settings), de-rated at 0.100%/ $^{\circ}\text{C}$ above 30 $^{\circ}\text{C}$

Step Gain, 1 $\text{M}\Omega$ $\pm 1.0\%$, ($\pm 2.0\%$ at 1 mV/div and 500 $\mu\text{V}/\text{div}$ settings), de-rated at 0.100%/ $^{\circ}\text{C}$ above 30 $^{\circ}\text{C}$

Variable gain $\pm 1.5\%$, derated at 0.100%/ $^{\circ}\text{C}$ above 30 $^{\circ}\text{C}$.



Note: 500 $\mu\text{V}/\text{div}$ is a 2X digital zoom of 1 mV/div or a 4x digital zoom of 2 mV/div , depending on the instrument bandwidth configuration. As such, it is guaranteed by testing the nonzoomed setting.

Offset ranges, maximum Input signal cannot exceed maximum input voltage for the 50 Ω input path.

| Volts/div Setting | Maximum offset range, 50 Ω Input |
|--|---|
| 500 $\mu\text{V}/\text{div}$ - 99 mV/div | $\pm 1 \text{ V}$ |
| 100 mV/div - 1 V/div | $\pm 10 \text{ V}$ |

| Volts/div Setting | Maximum offset range, 1 $\text{M}\Omega$ Input |
|--|--|
| 500 $\mu\text{V}/\text{div}$ - 63 mV/div | $\pm 1 \text{ V}$ |
| 64 mV/div - 999 mV/div | $\pm 10 \text{ V}$ |
| 1 V/div - 10 V/div | $\pm 100 \text{ V}$ |



Note: 500 $\mu\text{V}/\text{div}$ is a 2X digital zoom of 1 mV/div or a 4x digital zoom of 2 mV/div , depending on the instrument bandwidth configuration. As such, it is guaranteed by testing the nonzoomed setting.

Position range ± 5 divisions

✓ Offset accuracy $\pm (0.005 \times |\text{offset} - \text{position}| + 0.2 \text{ div (0.4 div in 500 } \mu\text{V}/\text{div}))$

Number of waveforms for average acquisition mode 2 to 10,240 Waveforms, default 16 waveforms

DC voltage measurement accuracy, Average acquisition mode

| Measurement Type | DC Accuracy (In Volts) |
|--------------------------------|---|
| Average of ≥ 16 waveforms | $\pm ((\text{DC Gain Accuracy}) * \text{reading} - (\text{offset} - \text{position}) + \text{Offset Accuracy} + 0.1 * \text{V}/\text{div setting})$ |
| Table continued... | |

| Measurement Type | DC Accuracy (In Volts) |
|--|--|
| Delta volts between any two averages of ≥ 16 waveforms acquired with the same oscilloscope setup and ambient conditions | $\pm(\text{DC Gain Accuracy} * \text{reading} + 0.05 \text{ div})$ |

DC voltage measurement accuracy, sample acquisition mode, typical

| Measurement Type | DC Accuracy (In Volts) |
|--|--|
| Any Sample | $\pm(\text{DC Gain Accuracy} * \text{reading} - (\text{offset} - \text{position}) + \text{Offset Accuracy} + 0.15 \text{ div} + 0.6 \text{ mV})$ |
| Delta Volts between any two samples acquired with the same oscilloscope setup and ambient conditions | $\pm(\text{DC Gain Accuracy} * \text{reading} + 0.15 \text{ div} + 1.2 \text{ mV})$ |

Bandwidth selections

50 Ω : 20 MHz, 250 MHz, and the full bandwidth value of your model

1 M Ω : 20 MHz, 250 MHz, 350 MHz², 500 MHz

✓ Analog bandwidth 50 Ω DC coupled

1.5 GHz models

| Volts/Div Setting | Bandwidth |
|-----------------------------------|---------------|
| 1 mV/div - 1 V/div | DC - 1.50 GHz |
| 500 μ V/div - 995 μ V/div | DC - 250 MHz |

1 GHz models

| Volts/Div Setting | Bandwidth |
|-----------------------------------|---------------|
| 1 mV/div - 1 V/div | DC - 1.00 GHz |
| 500 μ V/div - 995 μ V/div | DC - 250 MHz |

500 MHz models

| Volts/Div Setting | Bandwidth |
|-----------------------------------|--------------|
| 1 mV/div - 1 V/div | DC - 500 MHz |
| 500 μ V/div - 995 μ V/div | DC - 250 MHz |

350 MHz models

| Volts/Div Setting | Bandwidth |
|-----------------------------------|--------------|
| 1 mV/div - 1 V/div | DC - 350 MHz |
| 500 μ V/div - 995 μ V/div | DC - 250 MHz |

200 MHz models

| Volts/Div Setting | Bandwidth |
|-----------------------------------|--------------|
| 1 mV/div - 1 V/div | DC - 200 MHz |
| 500 μ V/div - 995 μ V/div | DC - 200 MHz |

² 350 MHz models cannot be configured to 500 MHz in 1 M Ω mode.

Analog bandwidth, 1 M Ω , typical**All model bandwidths except 350 MHz, 200 MHz**

The limits stated above are for ambient temperature of $\leq 30^{\circ}\text{C}$ and the bandwidth selection set to FULL. Reduce the upper bandwidth frequency by 1% for each $^{\circ}\text{C}$ above 30°C .

| Volts/Div Setting | Bandwidth |
|---|--------------|
| 1 mV/div - 10 V/div | DC - 500 MHz |
| 500 $\mu\text{V}/\text{div}$ - 995 $\mu\text{V}/\text{div}$ | DC - 250 MHz |

350 MHz models

| Volts/Div Setting | Bandwidth |
|---|--------------|
| 1 mV/div - 10 V/div | DC - 350 MHz |
| 500 $\mu\text{V}/\text{div}$ - 995 $\mu\text{V}/\text{div}$ | DC - 250 MHz |

200 MHz models

| Volts/Div Setting | Bandwidth |
|---|--------------|
| 1 mV/div - 10 V/div | DC - 200 MHz |
| 500 $\mu\text{V}/\text{div}$ - 995 $\mu\text{V}/\text{div}$ | DC - 200 MHz |

Analog bandwidth with TPP0500, TPP1000 and TPP0250 probes, typical

The limits are for ambient temperature of $\leq 30^{\circ}\text{C}$ and the bandwidth selection set to FULL. Reduce the upper bandwidth frequency by 1% for each $^{\circ}\text{C}$ above 30°C .

| Instrument | Volts/Div Setting | Bandwidth |
|----------------|----------------------|------------------------------|
| 1.5 GHz, 1 GHz | 5 mV/div - 100 V/div | DC - 1 GHz (TPP1000 Probe) |
| 500 MHz | 5 mV/div - 100 V/div | DC - 500 MHz (TPP0500 Probe) |
| 350 MHz | 5 mV/div - 100 V/div | DC - 350 MHz (TPP0500 Probe) |
| 200 MHz | 5 mV/div - 100 V/div | DC - 200 MHz (TPP0250 Probe) |

Lower frequency limit, AC coupled, typical

< 10 Hz when AC 1 M Ω coupled. The AC coupled lower frequency limits are reduced by a factor of 10 (< 1 Hz) when 10X passive probes are used.

Upper frequency limit, 250 MHz bandwidth limited, typical

250 MHz, $\pm 25\%$

Upper frequency limit, 20 MHz bandwidth limited, typical

20 MHz, $\pm 25\%$

Calculated rise time, typical

| Model | 50 Ω | TP1000 Probe | TPP0500 Probe | TPP0250 Probe |
|--------------------|------------------------|--------------|---------------|---------------|
| | 500 μV -1 V | 5 mV-10 V | 5 mV-10 V | 5 mV-10 V |
| 1.5 GHz | 333ps | 450ps | 900ps | 1.8ns |
| 1 GHz | 450ps | 450ps | 900ps | 1.8ns |
| 500 MHz | 900ps | 900ps | 900ps | 1.8ns |
| 350 MHz | 1.3ns | 1.3ns | 1.3ns | 1.8ns |
| Table continued... | | | | |

| Model | 50 Ω | TP1000 Probe | TPP0500 Probe | TPP0250 Probe |
|---------|-----------------|--------------|---------------|---------------|
| | 500 μ V-1 V | 5 mV-10 V | 5 mV-10 V | 5 mV-10 V |
| 200 MHz | 2.3ns | 2.3ns | 2.3ns | 2.3ns |

Peak Detect or Envelope mode Minimum pulse width is >640 ps (6.25 GS/s)
pulse response, typical

Effective bits (ENOB), typical

Typical effective bits for a 9-division p-p sine-wave input, 50 mV/div, 50-ohm

Sample mode, 50 Ω , 50 mV/div

| Bandwidth | Input frequency | ENOB at 6.25 GS/s |
|-----------|-----------------|-------------------|
| 1.5 GHz | 10 MHz | 6.80 |
| 1.5 GHz | 300 MHz | 6.80 |
| 1 GHz | 10 MHz | 7.10 |
| 1 GHz | 300 MHz | 7.10 |
| 500 MHz | 10 MHz | 7.40 |
| 500 MHz | 150 MHz | 7.40 |
| 350 MHz | 10 MHz | 7.60 |
| 350 MHz | 100 MHz | 7.60 |
| 250 MHz | 10 MHz | 7.60 |
| 250 MHz | 100 MHz | 7.60 |
| 200 MHz | 10 MHz | 7.60 |
| 200 MHz | 100 MHz | 7.60 |
| 20 MHz | 10 MHz | 7.70 |

High Res mode, 50 Ω , 50 mV/div

| Bandwidth | Input frequency | ENOB at 6.25 GS/s |
|-----------|-----------------|-------------------|
| 1.5 GHz | 10 MHz | 7.10 |
| 1.5 GHz | 300 MHz | 7.10 |
| 1 GHz | 10 MHz | 7.60 |
| 1 GHz | 300 MHz | 7.60 |
| 500 MHz | 10 MHz | 7.90 |
| 500 MHz | 150 MHz | 7.90 |
| 350 MHz | 10 MHz | 8.20 |
| 350 MHz | 100 MHz | 8.20 |
| 250 MHz | 10 MHz | 8.20 |
| 250 MHz | 100 MHz | 8.20 |
| 200 MHz | 10 MHz | 8.20 |
| 200 MHz | 100 MHz | 8.20 |

Table continued...

| Bandwidth | Input frequency | ENOB at 6.25 GS/s |
|-----------|-----------------|-------------------|
| 20 MHz | 10 MHz | 8.90 |

Random noise, Sample and High Res Acquisition modes, 50 Ω and 1 M Ω , 6.25 GS/s

✓ 1.5 GHz models, Sample mode (RMS), 50 Ω

| V/div | 1.5 GHz |
|------------|-------------|
| 1 mV/div | 635 μ V |
| 2 mV/div | 635 μ V |
| 5 mV/div | 817 μ V |
| 10 mV/div | 843 μ V |
| 20 mV/div | 920 μ V |
| 50 mV/div | 1.582 mV |
| 100 mV/div | 3.686 mV |
| 1 V/div | 23.753 mV |

All models, Sample mode (RMS), 50 Ω , typical

| V/div | 1.5 GHz | 1 GHz | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1 mV/div | 490 μ V | 300 μ V | 220 μ V | 145 μ V | 120 μ V | 80 μ V |
| 2 mV/div | 490 μ V | 350 μ V | 220 μ V | 150 μ V | 130 μ V | 80 μ V |
| 5 mV/div | 630 μ V | 380 μ V | 230 μ V | 175 μ V | 160 μ V | 110 μ V |
| 10 mV/div | 650 μ V | 400 μ V | 280 μ V | 220 μ V | 215 μ V | 155 μ V |
| 20 mV/div | 710 μ V | 510 μ V | 410 μ V | 340 μ V | 340 μ V | 260 μ V |
| 50 mV/div | 1.220 mV | 980 μ V | 890 μ V | 760 μ V | 760 μ V | 630 μ V |
| 100 mV/div | 2.84 mV | 2.23 mV | 1.93 mV | 1.61 mV | 1.61 mV | 1.25 mV |
| 1 V/div | 18.3 mV | 19.0 mV | 17.3 mV | 15.0 mV | 15.0 mV | 12.5 mV |

✓ All models except 1.5 GHz, High Res mode (RMS), 50 Ω

| V/div | 1 GHz | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|-----------|-------------|-------------|-------------|-------------|-------------|
| 1 mV/div | 336 μ V | 259 μ V | 194 μ V | 161 μ V | 96 μ V |
| 2 mV/div | 363 μ V | 259 μ V | 194 μ V | 161 μ V | 96 μ V |
| 5 mV/div | 394 μ V | 304 μ V | 239 μ V | 174 μ V | 96 μ V |
| 10 mV/div | 434 μ V | 356 μ V | 284 μ V | 206 μ V | 103 μ V |
| 20 mV/div | 551 μ V | 466 μ V | 349 μ V | 298 μ V | 141 μ V |

Table continued...

| V/div | 1 GHz | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|------------|-----------|-----------|-------------|-------------|-------------|
| 50 mV/div | 1.038 mV | 1.038 mV | 739 μ V | 596 μ V | 259 μ V |
| 100 mV/div | 2.102 mV | 1.596 mV | 1.349 mV | 1.349 mV | 609 μ V |
| 1 V/div | 16.874 mV | 12.850 mV | 11.617 mV | 11.617 mV | 4.906 mV |

All models except 1.5 GHz,
High Res mode (RMS), 50
 Ω , typical

| V/div | 1 GHz | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|------------|-------------|-------------|-------------|-------------|-------------|
| 1 mV/div | 260 μ V | 200 μ V | 150 μ V | 125 μ V | 75 μ V |
| 2 mV/div | 280 μ V | 200 μ V | 150 μ V | 125 μ V | 75 μ V |
| 5 mV/div | 305 μ V | 235 μ V | 185 μ V | 135 μ V | 75 μ V |
| 10 mV/div | 335 μ V | 275 μ V | 220 μ V | 160 μ V | 80 μ V |
| 20 mV/div | 425 μ V | 360 μ V | 270 μ V | 230 μ V | 110 μ V |
| 50 mV/div | 800 μ V | 800 μ V | 570 μ V | 460 μ V | 200 μ V |
| 100 mV/div | 1.62 mV | 1.23 mV | 1.04 mV | 1.04 mV | 470 μ V |
| 1 V/div | 13.00 mV | 9.90 mV | 8.95 mV | 8.95 mV | 3.78 mV |

All models, Sample mode
(RMS), 1 M Ω , typical

| V/div | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|------------|-------------|-------------|-------------|-------------|
| 1 mV/div | 210 μ V | 140 μ V | 120 μ V | 78 μ V |
| 2 mV/div | 210 μ V | 140 μ V | 120 μ V | 78 μ V |
| 5 mV/div | 230 μ V | 160 μ V | 135 μ V | 96 μ V |
| 10 mV/div | 270 μ V | 200 μ V | 190 μ V | 135 μ V |
| 20 mV/div | 370 μ V | 300 μ V | 300 μ V | 240 μ V |
| 50 mV/div | 760 μ V | 600 μ V | 650 μ V | 750 μ V |
| 100 mV/div | 1.75 mV | 1.350 mV | 1.45 mV | 1.22 mV |
| 1 V/div | 19.00 mV | 15.25 mV | 15.70 mV | 11.20 mV |

All models, High Res mode
(RMS), 1 M Ω , typical

| V/div | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|-----------|-------------|-------------|-------------|-------------|
| 1 mV/div | 200 μ V | 140 μ V | 120 μ V | 75 μ V |
| 2 mV/div | 200 μ V | 140 μ V | 120 μ V | 75 μ V |
| 5 mV/div | 210 μ V | 150 μ V | 130 μ V | 75 μ V |
| 10 mV/div | 230 μ V | 160 μ V | 150 μ V | 80 μ V |
| 20 mV/div | 280 μ V | 200 μ V | 200 μ V | 100 μ V |

Table continued...

| V/div | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|------------|-------------|-------------|-------------|-------------|
| 50 mV/div | 520 μ V | 370 μ V | 410 μ V | 180 μ V |
| 100 mV/div | 1.24 mV | 880 μ V | 930 μ V | 460 μ V |
| 1 V/div | 14.30 mV | 10.20 mV | 10.30 mV | 5.45 mV |

✓ All models, High Res mode (RMS), 1 M Ω

| V/div | 500 MHz | 350 MHz | 250/200 MHz | 20 MHz |
|------------|-------------|-------------|-------------|-------------|
| 1 mV/div | 259 μ V | 181 μ V | 155 μ V | 96 μ V |
| 2 mV/div | 259 μ V | 181 μ V | 155 μ V | 96 μ V |
| 5 mV/div | 271 μ V | 194 μ V | 168 μ V | 96 μ V |
| 10 mV/div | 298 μ V | 206 μ V | 194 μ V | 103 μ V |
| 20 mV/div | 363 μ V | 259 μ V | 259 μ V | 129 μ V |
| 50 mV/div | 674 μ V | 479 μ V | 531 μ V | 233 μ V |
| 100 mV/div | 1.609 mV | 1.141 mV | 1.206 mV | 596 μ V |
| 1 V/div | 18.561 mV | 13.239 mV | 13.369 mV | 7.074 mV |

Delay between analog channels, full bandwidth, typical

≤ 100 ps for any two channels with input impedance set to 50 Ω , DC coupling with equal Volts/div or above 10 mV/div

Deskew range

-125 ns to +125 ns with a resolution of 40 ps

Crosstalk (channel isolation), typical

$\geq 200:1$ up to the rated bandwidth for any two channels having equal Volts/div settings

Total probe power

TekVPI+ Compliant probe interfaces: (4 per MSO44, 6 per MSO46) and 1 TekVPI interface for Aux In
MSO46: 80 W maximum (40 W maximum for channels 1-3, 40 W maximum for channels 4-6 and Aux In)
MSO44: 80 W maximum (40 W maximum for channels 1-3, 40 W maximum for channel 4 and Aux In)

Probe power per channel

| Voltage | Max Amperage | Voltage Tolerance |
|---------|--------------------------------------|-------------------|
| 5 V | 60 mA | $\pm 10\%$ |
| 12 V | 1.67 A (20 W maximum software limit) | $\pm 10\%$ |

TekVPI interconnect

All analog channel inputs on the front panel conform to the TEKVP1 specification.

Timebase system

Sample rate

| Max HW Capability | Number of Channels |
|-------------------|--------------------|
| 6.25 GS/s | 1-6 |

Interpolated waveform rate range

500 GS/sec, 250 GS/sec, 125 GS/sec, 62.5 GS/sec, 25 GS/sec, and 12.5 GS/sec

Record length range

Standard

1 kpoints to 31.25 Mpoints in single sample increments

Optional

62.5 Mpoints

Seconds/Division range

| Model | 1 K | 10 K | 100 K | 1 M | 10 M | 31.25 M | 62.5 M |
|---------------------------|---------------|----------------|-----------------|-----|------|---------|--------|
| MSO4X Standard 31.25 M | 200 ps - 64 s | 200 ps - 640 s | 200 ps - 1000 s | | | | N/A |
| MSO4X Option 62.5 M | 200 ps - 64 s | 200 ps - 640 s | 200 ps - 1000 s | | | | |

Maximum triggered acquisition rate, typical

Analog or digital channels: single channel [Analog or Digital 8-bit channel] on screen, measurements and math turned off. >20 wfm/sec

FastAcq Update Rate (analog only): >500 K/second with one channel active and >100 K/second with all channels active.

Digital channel: >20/second with one channel (8-bits) active. There is no FastAcq for digital channels, but they do not slow down FastAcq for active analog channels.

Aperture uncertainty

$\leq 0.450 \text{ ps} + (10^{-11} * \text{Measurement Duration})_{\text{RMS}}$, for measurements having duration $\leq 100 \text{ ms}$

✓ Timebase accuracy

$\pm 2.5 \times 10^{-6}$ over any $\geq 1 \text{ ms}$ time interval

| Description | Specification |
|--------------------------------|--|
| Factory Tolerance | $\pm 5.0 \times 10^{-7}$ At calibration, 25 °C ambient, over any $\geq 1 \text{ ms}$ interval |
| Temperature stability, typical | $\pm 5.0 \times 10^{-7}$ Tested at operating temperatures |
| Crystal aging | $\pm 1.5 \times 10^{-6}$ Frequency tolerance change at 25 °C over a period of 1 year |

Delta-time measurement accuracy, nominal

The formulas to calculate the peak-to-peak or rms nominal delta-time measurement accuracy (DTA) for a given instrument setting and input signal is as follows (assumes insignificant signal content above Nyquist

frequency):

$$DTA_{pp}(\text{typical}) = 10 \times \sqrt{\left(\frac{N}{SR_1}\right)^2 + \left(\frac{N}{SR_2}\right)^2 + \left(0.450 \text{ ps} + \left(1 \times 10^{-11} \times t_p\right)\right)^2} + TBA \times t_p$$

$$DTA_{RMS} = \sqrt{\left(\frac{N}{SR_1}\right)^2 + \left(\frac{N}{SR_2}\right)^2 + \left(0.450 \text{ ps} + \left(1 \times 10^{-11} \times t_p\right)\right)^2} + TBA \times t_p$$

Where:

N = input-referred guaranteed noise limit (V_{RMS})

SR_1 = Slew Rate (1st Edge) around 1st point in measurement

SR_2 = Slew Rate (2nd Edge) around 2nd point in measurement

t_p = delta-time measurement duration (sec)

TBA = timebase accuracy or Reference Frequency Error ± 0.5 ppm

(Assumes insignificant error due to aliasing or over-drive.)

The term under the square root sign is the stability and is due to TIE (Time Interval Error). The errors due to this term occur throughout a single-shot measurement. The second term is due to both the absolute center-frequency accuracy and the center-frequency stability of the timebase and varies between multiple single-shot measurements over the observation interval (the amount of time from the first single-shot measurement to the final single-shot measurement).



Note: The formulas assume negligible errors due to measurement interpolation, and apply only when the interpolated sample rate is 25 GS/s or higher.

Trigger system

Trigger bandwidth (edge, pulse, and logic), typical

| | |
|---------------------------------|---------|
| 1.5 GHz models, Edge | 1.5 GHz |
| 1.5 GHz models, Pulse and Logic | 1 GHz |
| 1 GHz models | 1 GHz |
| 500 MHz models | 500 MHz |
| 350 MHz models | 350 MHz |
| 200 MHz models | 200 MHz |

Edge-type trigger sensitivity, DC coupled, typical

| Path | Range | Specification |
|--------------------------------|---------------------------|---|
| 1 M Ω path (all models) | 0.5 mV/div to 0.99 mV/div | 4.5 div from DC to instrument bandwidth |
| | ≥ 1 mV/div | The greater of 5 mV or 0.7 div |

Table continued...

| Path | Range | Specification |
|------------------------------|-------|--|
| 50 Ω path, all models | | The greater of 5.6 mV or 0.7 div from DC to the lesser of 500 MHz or instrument BW, & 7 mV or 0.8 div from > 500 MHz to instrument bandwidth |
| Line | | Fixed |

Trigger jitter, typical

$$\leq 7 \text{ pSRMS}$$

Edge-type trigger sensitivity, not DC coupled, typical

| Trigger Coupling | Typical Sensitivity |
|------------------|--|
| NOISE REJ | 2.5 times the DC Coupled limits |
| HF REJ | 1.0 times the DC Coupled limits from DC to 50 kHz. Attenuates signals above 50 kHz. |
| LF REJ | 1.5 times the DC Coupled limits for frequencies above 50 kHz. Attenuates signals below 50 kHz. |

Logic-type triggering, minimum logic or rearm time, typical

| Triggering type | Pulse width | Rearm time | Time skew needed for 100% and no triggering ³ |
|----------------------|----------------------------|----------------------------|--|
| Logic | 160 ps + t_{rise} | 160 ps + t_{rise} | >360 ps / <150 ps |
| Time qualified logic | 320 ps + t_{rise} | 320 ps + t_{rise} | >360 ps / <150 ps |

t_{rise} is rise time of the instrument.

Minimum clock pulse widths for setup/hold time violation trigger, typical

| Minimum pulsewidth, clock active ⁴ | Minimum pulsewidth, clock inactive ⁵ |
|---|---|
| 320 ps + t_{rise} | 320 ps + t_{rise} |

t_{rise} is rise time of the instrument.

Setup/hold violation trigger, setup and hold time ranges, typical

| Feature | Min | Max |
|-------------------|--------|------|
| Setup Time | 0 ns | 20 s |
| Hold Time | 0 ns | 20 s |
| Setup + Hold Time | 320 ps | 22 s |

Input coupling on clock and data channels must be the same.

For Setup Time, positive numbers mean a data transition before the clock.

For Hold Time, positive numbers mean a data transition after the clock edge.

Setup + Hold Time is the algebraic sum of the Setup Time and the Hold Time programmed by the user.

³ For Logic, time between channels refers to the length of time a logic state derived from more than one channel must exist to be recognized. For Events, the time is the minimum time between a main and delayed event that will be recognized if more than one channel is used.

⁴ Active pulsewidth is the width of the clock pulse from its active edge (as defined in the Clock Edge menu item) to its inactive edge.

⁵ Inactive pulsewidth is the width of the pulse from its inactive edge to its active edge.

Pulse type trigger, minimum pulse, rearm time, transition time

| Pulse class | Minimum pulse width | Minimum rearm time |
|-------------------------------------|------------------------------------|------------------------------------|
| Runt | $160 \text{ ps} + t_{\text{rise}}$ | $160 \text{ ps} + t_{\text{rise}}$ |
| Time-Qualified Runt | $160 \text{ ps} + t_{\text{rise}}$ | $160 \text{ ps} + t_{\text{rise}}$ |
| Width | $160 \text{ ps} + t_{\text{rise}}$ | $160 \text{ ps} + t_{\text{rise}}$ |
| Slew Rate (minimum transition time) | $160 \text{ ps} + t_{\text{rise}}$ | $160 \text{ ps} + t_{\text{rise}}$ |

For trigger class width, pulse width refers to the width of the pulse being measured. Rearm time refers to the time between pulses.

For trigger class runt, pulse width refers to the width of the pulse being measured. Rearm time refers to the time between pulses.

For trigger class slew rate, pulse width refers to the delta time being measured. Rearm time refers to the time it takes the signal to cross the two trigger thresholds again.

t_{rise} is rise time of the instrument.

Active pulsewidth is the width of the clock pulse from its active edge (as defined in the Clock Edge menu item) to its inactive edge

Inactive pulsewidth is the width of the pulse from its inactive edge to its active edge.

Transition time trigger, delta time range

160 ps to 20 s.

Time range for glitch, pulse width, timeout, time-qualified runt, or time-qualified window triggering

160 ps to 20 s.

Time accuracy for pulse, glitch, timeout, or width triggering

| Time Range | Accuracy |
|----------------|---|
| 1 ns to 500 ns | $\pm(160 \text{ ps} + \text{Time Base Error} * \text{Setting})$. |
| 520 ns to 1 s | $\pm(160 \text{ ps} + \text{Time Base Error} * \text{Setting})$. |

| Time Range | Accuracy |
|------------------|--|
| 320 ps to 500 ns | $\pm(160 \text{ ps} + (\text{Time-Base-Accuracy} * \text{Setting}))$ |
| 520 ns to 10 s | $\pm(160 \text{ ps} + (\text{Time-Base-Accuracy} * \text{Setting}))$ |

B trigger after events, minimum pulse width and maximum event frequency, typical

Minimum pulse width: $160 \text{ ps} + t_{\text{rise}}$

Maximum event frequency: Instrument bandwidth.

t_{rise} is rise time of the instrument.

B trigger, minimum time between arm and trigger, typical

320 ps

For trigger after time, this is the time between the end of the time period and the B trigger event.

For trigger after events, this is the time between the last A trigger event and the first B trigger event.

B trigger after time, time range 160 ps to 20 seconds

B trigger after events, event range 1 to 65,471

Trigger level ranges

| Source | Range |
|-------------------------|------------------------------------|
| Any Channel | ±5 divs from center of screen |
| Aux In Trigger, typical | ±8 V |
| Line | Fixed at about 50% of line voltage |

This specification applies to logic and pulse thresholds.

Trigger holdoff range 0 ns to 20 seconds

Serial Trigger specifications

Maximum serial trigger bits 128 bits

Optional serial bus interface triggering Please refer to the *Serial Triggering and Analysis 3 Series MDO, 4/5/6 Series MSO Applications Datasheet* (part number 61W-61101-x), located on the Tektronix Web site, for information on available serial triggering options and their triggering capabilities.

Digital acquisition system

Digital channel maximum sample rate 6.25 GS/s

Transition detect (digital peak detect) Displayed data at sample rates less than 6.25 GS/s (decimated data), that contains multiple transitions between sample points will be displayed with a bright white colored edge.

Digital-To-Analog trigger skew 3 ns

Digital to digital skew 3 ns from bit 0 of any TekVPI channel to bit 0 of any TekVPI channel.

Digital skew within a FlexChannel 160 ps within any TekVPI channel

Digital volt meter (DVM)

Measurement types DC, AC_{RMS}+DC, AC_{RMS}

Voltage resolution 4 digits

✓ **Voltage accuracy**

DC: $\pm((1.5\% * |\text{reading} - \text{offset} - \text{position}|) + (0.5\% * |(\text{offset} - \text{position})|) + (0.1 * \text{Volts/div}))$

De-rated at 0.100%/°C of $|\text{reading} - \text{offset} - \text{position}|$ above 30 °C

Signal ± 5 divisions from screen center

AC: ± 2% (40 Hz to 1 kHz) with no harmonic content outside 40 Hz to 1 kHz range

AC, typical: $\pm 2\%$ (20 Hz to 10 kHz)

For AC measurements, the input channel vertical settings must allow the V_{pp} input signal to cover between 4 and 10 divisions and must be fully visible on the screen

Trigger frequency counter

- ✓ **Accuracy** $\pm(1 \text{ count} + \text{time base accuracy} * \text{input frequency})$
The signal must be at least 8 mV_{pp} or 2 div, whichever is greater.
- ✓ **Maximum input frequency** 10 Hz to maximum bandwidth of the analog channel
The signal must be at least 8 mV_{pp} or 2 div, whichever is greater.
- Resolution** 8-digits

Arbitrary Function Generator system

Function types Arbitrary, sine, square, pulse, ramp, triangle, DC level, Gaussian, Lorentz, exponential rise/fall, sin(x)/x, random noise, Haversine, Cardiac

Amplitude range Values are peak-to-peak voltages

| Waveform | 50 Ω | 1 M Ω |
|------------------|-----------------|----------------|
| Arbitrary | 10 mV to 2.5 V | 20 mV to 5 V |
| Sine | 10 mV to 2.5 V | 20 mV to 5 V |
| Square | 10 mV to 2.5 V | 20 mV to 5 V |
| Pulse | 10 mV to 2.5 V | 20 mV to 5 V |
| Ramp | 10 mV to 2.5 V | 20 mV to 5 V |
| Triangle | 10 mV to 2.5 V | 20 mV to 5 V |
| Gaussian | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Lorentz | 10 mV to 1.2 V | 20 mV to 2.4 V |
| Exponential Rise | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Exponential Fall | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Sine(x)/x | 10 mV to 1.5 V | 20 mV to 3.0 V |
| Random Noise | 10 mV to 2.5 V | 20 mV to 5 V |
| Haversine | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Cardiac | 10 mV to 2.5 V | 20 mV to 5 V |

Maximum sample rate 250 MS/s

Arbitrary function record length 128 K Samples

Sine waveform

| | |
|---|---|
| Frequency range | 0.1 Hz to 50 MHz |
| Frequency setting resolution | 0.1 Hz |
| Frequency accuracy | 130 ppm (frequency \leq 10 kHz), 50 ppm (frequency $>$ 10 kHz) This is for Sine, Ramp, Square and Pulse waveforms only. |
| Amplitude range | 20 mV _{pp} to 5 V _{pp} into Hi-Z; 10 mV _{pp} to 2.5 V _{pp} into 50 Ω |
| Amplitude flatness, typical | ± 0.5 dB at 1 kHz ± 1.5 dB at 1 kHz for < 20 mV _{pp} amplitudes |
| Total harmonic distortion, typical | 1% for amplitude ≥ 200 mV _{pp} into 50 Ω load 2.5% for amplitude > 50 mV AND < 200 mV _{pp} into 50 Ω load This is for Sine wave only. |
| Spurious free dynamic range, typical | 40 dB ($V_{pp} \geq 0.1$ V); 30 dB ($V_{pp} \geq 0.02$ V), 50 Ω load |
| Square and pulse waveform | |
| Frequency range | 0.1 Hz to 25 MHz |
| Frequency setting resolution | 0.1 Hz |
| Duty cycle range | 10% - 90% or 10 ns minimum pulse, whichever is larger Minimum pulse time applies to both on and off time, so maximum duty cycle will reduce at higher frequencies to maintain 10 ns off time |
| Duty cycle resolution | 0.1% |
| Minimum pulse width, typical | 10 ns. This is the minimum time for either on or off duration. |
| Rise/Fall time, typical | 5.5 ns, 10% - 90% |
| Pulse width resolution | 100 ps |
| Overshoot, typical | < 4 % for signal steps greater than 100 mV _{pp} This applies to overshoot of the positive-going transition (+overshoot) and of the negative-going (-overshoot) transition |
| Asymmetry, typical | $\pm 1\% \pm 5$ ns, at 50% duty cycle |
| Jitter, typical | < 60 ps TIE _{RMS} , ≥ 100 mV _{pp} amplitude, 40%-60% duty cycle |
| Cardiac maximum frequency | 1 MHz |
| Ramp and triangle waveform | |
| Frequency range | 0.1 Hz to 500 kHz |
| Frequency setting resolution | 0.1 Hz |
| Variable symmetry | 0% - 100% |
| Symmetry resolution | 0.1% |

| | |
|---|---|
| DC level range | ±2.5 V into Hi-Z ±1.25 V into 50 Ω |
| Gaussian pulse, Haversine, and Lorentz pulse | |
| Maximum frequency | 5 MHz |
| Exponential rise fall maximum frequency | 5 MHz |
| Sin(x)/x | |
| Maximum frequency | 2 MHz |
| Random noise amplitude range | 20 mV _{pp} to 5 V _{pp} into Hi-Z 10 mV _{pp} to 2.5 V _{pp} into 50 Ω For both isolated noise signal and additive noise signal. |
| ✓ Sine and ramp frequency accuracy | 1.3 x 10 ⁻⁴ (frequency ≤10 kHz) 5.0 x 10 ⁻⁵ (frequency >10 kHz) |
| ✓ Square and pulse frequency accuracy | 1.3 x 10 ⁻⁴ (frequency ≤10 KHz); 5.0 x 10 ⁻⁵ (frequency >10 KHz) |
| Signal amplitude resolution | 1 mV (Hi-Z) 500 μV (50 Ω) |
| ✓ Signal amplitude accuracy | ±[(1.5% of peak-to-peak amplitude setting) + (1.5% of absolute DC offset setting) + 1 mV] (frequency = 1 kHz) |
| DC offset range | ±2.5 V into Hi-Z ±1.25 V into 50 Ω |
| DC offset resolution | 1 mV (Hi-Z) 500 μV (50 Ω) |
| ✓ DC offset accuracy | ±[(1.5% of absolute offset voltage setting) + 1 mV] Add 3 mV of uncertainty per 10 °C change from 25 °C ambient. Refer DC Offset Accuracy test record on page 34 |

Display system

| | |
|--------------------|--|
| Display type | Display area - 11.38 inches (289 mm) (H) x 6.5 inches (165 mm) (V), 13.3 inches (338 mm) diagonal, 6-bit RGB color, (1920 X 1080) TFT liquid crystal display (LCD) with capacitive touch |
| Resolution | 1,920 horizontal × 1,080 vertical pixels |
| Luminance, typical | 400 cd/m ² , (Minimum: 320 cd/m ²) |

Display luminance is specified for a new display set at full brightness.

Processor system

Host processor Texas Instruments AM5728

Operating system Closed Linux

Input_Output port specifications

Ethernet interface An 8-pin RJ-45 connector that supports 10/100/1000 Mb/s

Video signal output A 29-pin HDMI connector
Recommended resolution: 1920 x 1080 @ 60 Hz. Note that video out may not be hot pluggable. HDMI cable may need to be attached before power up for dual display functions to work depending upon the instrument firmware revision

USB interface (Host, Device ports)
Front panel USB Host ports: Three USB 2.0 Hi-Speed ports
Rear panel USB Host ports: Two USB 2.0 Hi-Speed ports
Rear panel USB Device port: One USB 2.0 Hi-Speed Device port providing USBTMC support

Probe compensator signal output voltage and frequency, typical

| Characteristic | Value |
|----------------|----------------------------|
| Output Voltage | Default: 0-2.5 V amplitude |
| Impedance | 1 k Ω |
| Frequency | 1 kHz |

Auxiliary output, AUX OUT, Trigger Out, Event, or Reference Clock Out

Selectable output Acquisition Trigger Out
Reference Clock Out
AFG Trigger Out

Acquisition Trigger Out User selectable transition from HIGH to LOW, or LOW to HIGH, indicates the trigger occurred. The signal returns to its previous state after approximately 100 ns

Acquisition trigger jitter 380 ps (peak-to-peak)

Reference Clock Out Reference clock output tracks the acquisition system and can be referenced from either the internal clock reference or the external clock reference

AFG Trigger Out The output frequency is dependent on the frequency of the AFG signal as shown in the following table:

| AFG signal frequency | AFT trigger frequency |
|--------------------------|-----------------------|
| ≤ 4.9 MHz | Signal frequency |
| > 4.9 MHz to 14.7 MHz | Signal frequency / 3 |
| > 14.7 MHz to 24.5 MHz | Signal frequency / 5 |
| > 24.5 MHz to 34.3 MHz | Signal frequency / 7 |
| > 34.3 MHz to 44.1 MHz | Signal frequency / 9 |
| Table continued... | |

| AFG signal frequency | AFT trigger frequency |
|----------------------|-----------------------|
| > 44.1 MHz to 50 MHz | Signal frequency / 11 |

AUX OUT Output Voltage

| Characteristic | Limits |
|----------------|--|
| Vout (HI) | ≥ 2.5 V open circuit; ≥ 1.0 V into a 50 Ω load to ground |
| Vout (LO) | ≤ 0.7 V into a load of ≤ 4 mA; ≤ 0.25 V into a 50 Ω load to ground |

External reference input

| | |
|-------------------------------|---|
| Nominal input frequency | 10 MHz |
| Frequency Variation Tolerance | 9.99996 MHz to 10.00004 MHz ($\pm 4.0 \times 10^{-6}$) |
| Sensitivity, typical | V_{in} 1.5 V _{p-p} using a 50 Ω termination |
| Maximum input signal | 7 V _{pp} |
| Impedance | 1.2 K Ohms $\pm 20\%$ in parallel with 18 pf ± 5 pf at 10 MHz |

Data storage specifications

Nonvolatile memory retention time, typical No time limit for front panel settings, saved waveforms, setups, product licensing, and calibration constants.

Real-time clock A programmable clock providing time in years, months, days, hours, minutes, and seconds.

Nonvolatile memory capacity

| | |
|---------------------|---|
| 32 GB Primary MMC | Stores the operating system, application software and factory data. No user data |
| 32 GB Secondary MMC | Stores saved setups and waveforms, Ethernet settings, log files, user data and user settings |
| 2 Kbit EEPROM | Memory on the main board that stores the instrument serial number, instrument start up count, total uptime factory data, security option passwords, and user-settable security option passwords |
| 1 Kbit EEPROM | Memory on the main board that stores power management controller factory data |
| 1 KB Flash Memory | Memory on the main board that stores the SODIMM memory configuration data (SPD). Two to four pieces depending on model |
| 32 KB Flash Memory | Memory on the main board that stores microcontroller firmware. Two pieces |
| 64 KB Flash Memory | Memory on the main board that stores microcontroller firmware. Two pieces |

Power supply system

Power

| | |
|-------------------|---|
| Power consumption | 400 Watts maximum |
| Source voltage | 100 - 240 V $\pm 10\%$ (50 Hz to 60 Hz) |
| Source frequency | 50 Hz to 60 Hz $\pm 10\%$, at 100 - 240 V $\pm 10\%$ |
| Fuse Rating | 12.5 A, 250 V _{ac} |

Safety characteristics

| | |
|----------------------|---|
| Safety certification | US NRTL Listed - UL61010-1 and UL61010-2-030 |
| | Canadian Certification - CAN/CSA-C22.2 No. 61010.1 and CAN/CSA-C22.2 No 61010.2.030 |
| | EU Compliance - Low Voltage Directive 2014-35-EU and EN61010-1. |
| | International Compliance - IEC 61010-1 and IEC61010-2-030 |

| | |
|------------------|---|
| Pollution degree | Pollution degree 2, indoor, dry location use only |
|------------------|---|

Environmental specifications

Temperature

| | |
|---------------|-------------------------------------|
| Operating | +0 °C to +50 °C (32 °F to 122 °F) |
| Non-operating | -30 °C to +70 °C (-22 °F to 158 °F) |

Humidity

| | |
|---------------|---|
| Operating | 5% to 90% relative humidity (% RH) at up to +40 °C |
| | 5% to 50% RH above +40 °C up to +50 °C, noncondensing, and as limited by a maximum wet-bulb temperature of +39 °C |
| Non-operating | 5% to 90% relative humidity (% RH) at up to +40 °C |
| | 5% to 50% RH above +40 °C up to +50 °C, noncondensing, and as limited by a maximum wet-bulb temperature of +39 °C |

Altitude

| | |
|---------------|-----------------------------------|
| Operating | Up to 3,000 meters (9,843 feet) |
| Non-operating | Up to 12,000 meters (39,370 feet) |


Mechanical specifications

| | |
|------------|---|
| Dimensions | Height: 11.299 in (286.99 mm), feet folded in, handle to back |
| | Height: 13.8 in (351 mm) feet folded in, handle up |
| | Width: 15.9 in (405 mm) from handle hub to handle hub |
| | Depth: 6.1 in (155 mm) from back of feet to front of knobs, handle up |
| | Depth: 10.4 in (265 mm) feet folded in, handle to the back |

| | |
|--------|---------------------|
| Weight | < 16.8 lbs (7.6 kg) |
|--------|---------------------|

| | |
|---------|---|
| Cooling | The clearance requirement for adequate cooling is 2.0 in (50.8 mm) on the right side of the instrument (when viewed from the front) and on the rear of the instrument |
|---------|---|

Performance verification procedures

This chapter contains performance verification procedures for the specifications marked with the  symbol. The following equipment, or a suitable equivalent, is required to complete these procedures.

The performance verification procedures verify the performance of your instrument. They do not adjust your instrument. If your instrument fails any of the performance verification tests, repeat the failing test, verifying that the test equipment and settings are correct. If the instrument continues to fail a test, contact Tektronix Customer Support for assistance.

These procedures cover all 4 Series MSO instruments (MSO44, MSO46) .

Print the test records on the following pages and use them to record the performance test results for your oscilloscope. Disregard checks and test records that do not apply to the specific model you are testing.



Note: Completion of the performance verification procedure does not update the instrument time and date.

Required equipment:

| Required equipment | Minimum requirements | Examples |
|--|---|--|
| DC voltage source | 3 mV to 4 V, $\pm 0.1\%$ accuracy | Fluke 9500B Oscilloscope Calibrator with a 9530 Output Module |
| Leveled sine wave generator | 50 kHz to 2 GHz, $\pm 4\%$ amplitude accuracy | |
| Time mark generator | 80 ms period, $\pm 1.0 \times 10^{-6}$ accuracy, rise time < 50 ns | |
| Logic probe | Low capacitance digital probe, 8 channels. | TLP058 probe |
| BNC-to-0.1 inch pin adapter to connect the logic probe to the signal source. | BNC-to-0.1 inch pin adapter; female BNC to 2x16 .01 inch pin headers. | Tektronix adapter part number 878-1429-00; to connect the Fluke 9500B to the TLP058 probe. |
| Digital multimeter (DMM) | 0.1% accuracy or better | Tektronix DMM4020 |
| One 50 Ω terminator | Impedance 50 Ω ; connectors: female BNC input, male BNC output | Tektronix part number 011-0049-02 |
| One 50 Ω BNC cable | Male-to-male connectors | Tektronix part number 012-0057-01 |
| Optical mouse | USB, PS2 | Tektronix part number 119-7054-00 |
| RF vector signal generator | Maximum bandwidth of instrument | Tektronix TSG4100A |

You might need additional cables and adapters, depending on the actual test equipment you use.

Test records

Instrument information, self test record

| Model | Serial # | Procedure performed by | Date |
|-------|----------|------------------------|------|
| | | | |

| Test | Passed | Failed |
|-----------|--------|--------|
| Self Test | | |

Input Impedance test record

| Input Impedance | | | | |
|---|----------------|----------------|-------------|-----------------|
| Performance checks | Vertical scale | Low limit | Test result | High limit |
| All models | | | | |
| Channel 1 Input Impedance, 1 M Ω | 100 mV/div | 990 k Ω | | 1.01 M Ω |
| Channel 1 Input Impedance, 50 Ω | 10 mV/div | 49.5 Ω | | 50.5 Ω |
| | 100 mV/div | 49.5 Ω | | 50.5 Ω |
| Channel 2 Input Impedance, 1 M Ω | 100 mV/div | 990 k Ω | | 1.01 M Ω |
| Channel 2 Input Impedance, 50 Ω | 10 mV/div | 49.5 Ω | | 50.5 Ω |
| | 100 mV/div | 49.5 Ω | | 50.5 Ω |
| Channel 3 Input Impedance, 1 M Ω | 100 mV/div | 990 k Ω | | 1.01 M Ω |
| Channel 3 Input Impedance, 50 Ω | 10 mV/div | 49.5 Ω | | 50.5 Ω |
| | 100 mV/div | 49.5 Ω | | 50.5 Ω |
| Channel 4 Input Impedance, 1 M Ω | 100 mV/div | 990 k Ω | | 1.01 M Ω |
| Channel 4, Input Impedance, 50 Ω | 10 mV/div | 49.5 Ω | | 50.5 Ω |
| | 100 mV/div | 49.5 Ω | | 50.5 Ω |
| MSO46 | | | | |
| Channel 5 Input Impedance, 1 M Ω | 100 mV/div | 990 k Ω | | 1.01 M Ω |
| Channel 5 Input Impedance, 50 Ω | 10 mV/div | 49.5 Ω | | 50.5 Ω |
| | 100 mV/div | 49.5 Ω | | 50.5 Ω |
| Channel 6 Input Impedance, 1 M Ω | 100 mV/div | 990 k Ω | | 1.01 M Ω |
| Channel 6 Input Impedance, 50 Ω | 10 mV/div | 49.5 Ω | | 50.5 Ω |
| | 100 mV/div | 49.5 Ω | | 50.5 Ω |

DC Gain Accuracy test record

| DC Gain Accuracy | | | | | |
|--------------------|-----------|----------------|-----------|-------------|------------|
| Performance checks | Bandwidth | Vertical scale | Low limit | Test result | High limit |
| Table continued... | | | | | |

| DC Gain Accuracy | | | | | |
|---|---------|------------|-------|--|------|
| Channel 1 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 Ω | 20 MHz | 1 mV/div | -2.5% | | 2.5% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |
| Channel 1 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M Ω | 20 MHz | 1 mV/div | -2% | | 2% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |
| Channel 2 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 Ω | 20 MHz | 1 mV/div | -2.5% | | 2.5% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |

Table continued...

| DC Gain Accuracy | | | | | |
|---|---------|------------|-------|--|------|
| Channel 2 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M Ω | 20 MHz | 1 mV/div | -2% | | 2% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |
| Channel 3 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 Ω | 20 MHz | 1 mV/div | -2.5% | | 2.5% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |
| Channel 3 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M Ω | 20 MHz | 1 mV/div | -2% | | 2% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |

Table continued...

| DC Gain Accuracy | | | | | |
|---|---------|------------|-------|--|------|
| Channel 4 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 Ω | 20 MHz | 1 mV/div | -2.5% | | 2.5% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |
| Channel 4 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M Ω | 20 MHz | 1 mV/div | -2% | | 2% |
| | | 2 mV/div | -1% | | 1% |
| | | 5 mV/div | -1% | | 1% |
| | | 10 mV/div | -1% | | 1% |
| | | 20 mV/div | -1% | | 1% |
| | | 50 mV/div | -1% | | 1% |
| | | 100 mV/div | -1% | | 1% |
| | | 200 mV/div | -1% | | 1% |
| | | 500 mV/div | -1% | | 1% |
| | | 1 V/div | -1% | | 1% |
| | 250 MHz | 20 mV/div | -1% | | 1% |
| | FULL | 20 mV/div | -1% | | 1% |

DC Offset Accuracy test record

| Offset Accuracy | | | | | |
|--|----------------|------------------------------|-----------|-------------|------------|
| Performance checks | Vertical scale | Vertical offset ⁶ | Low limit | Test result | High limit |
| All models | | | | | |
| Channel 1 DC Offset Accuracy, 20 MHz BW, 50 Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 5.0 V | 4.955 V | | 5.045 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -5.0 V | -5.045 V | | -4.955 V |

Table continued...

⁶ Use this value for both the calibrator output and the oscilloscope offset setting.

| Offset Accuracy | | | | | |
|---|----------------|------------------------------|-----------|-------------|------------|
| Performance checks | Vertical scale | Vertical offset ⁶ | Low limit | Test result | High limit |
| Channel 1 DC Offset Accuracy, 20 MHz BW, 1 M Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 1.0 V | 0.975 V | | 1.025 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -1.0 V | -1.025 V | | -0.975 V |
| | 500 mV/div | 9.0 V | 8.855 V | | 9.145 V |
| | 500 mV/div | 0 V | -100 mV | | 100 mV |
| | 500 mV/div | -9.0 V | -9.145 V | | -8.855 V |
| | 1.01 mV/div | 10 V | 9.748 V | | 10.252 V |
| | 1.01 mV/div | 0 V | -202 mV | | 202 mV |
| | 1.01 mV/div | -10 V | -10.252 V | | -9.748 V |
| | 5 mV/div | 10 V | 8.95 V | | 11.05 V |
| | 5 mV/div | 0 V | -1000 mV | | 1000 mV |
| | 5 mV/div | -10 V | -11.05 V | | -8.95 V |
| Channel 2 DC Offset Accuracy, 20 MHz BW, 50 Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 5.0 V | 4.955 V | | 5.045 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -5.0 V | -5.045 V | | -4.955 V |

Table continued...

⁶ Use this value for both the calibrator output and the oscilloscope offset setting.

| Offset Accuracy | | | | | |
|---|----------------|------------------------------|-----------|-------------|------------|
| Performance checks | Vertical scale | Vertical offset ⁶ | Low limit | Test result | High limit |
| Channel 2 DC Offset Accuracy, 20 MHz BW, 1 M Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 1.0 V | 0.975 V | | 1.025 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -1.0 V | -1.025 V | | -0.975 V |
| | 500 mV/div | 9.0 V | 8.855 V | | 9.145 V |
| | 500 mV/div | 0 V | -100 mV | | 100 mV |
| | 500 mV/div | -9.0 V | -9.145 V | | -8.855 V |
| | 1.01 mV/div | 10 V | 9.748 V | | 10.252 V |
| | 1.01 mV/div | 0 V | -202 mV | | 202 mV |
| | 1.01 mV/div | -10 V | -10.252 V | | -9.748 V |
| | 5 mV/div | 10.0 V | 8.95 V | | 11.05 V |
| | 5 mV/div | 0 V | -1000 mV | | 1000 mV |
| | 5 mV/div | -10.0 V | -11.05 V | | -8.95 V |
| Channel 3 DC Offset Accuracy, 20 MHz BW, 50 Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 5.0 V | 4.955 V | | 5.045 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -5.0 V | -5.045 V | | -4.955 V |

Table continued...

⁶ Use this value for both the calibrator output and the oscilloscope offset setting.

| Offset Accuracy | | | | | |
|---|----------------|------------------------------|-----------|-------------|------------|
| Performance checks | Vertical scale | Vertical offset ⁶ | Low limit | Test result | High limit |
| Channel 3 DC Offset Accuracy, 20 MHz BW, 1 M Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 1.0 V | 0.975 V | | 1.025 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -1.0 V | -1.025 V | | -0.975 V |
| | 500 mV/div | 9.0 V | 8.855 V | | 9.145 V |
| | 500 mV/div | 0 V | -100 mV | | 100 mV |
| | 500 mV/div | -9.0 V | -9.145 V | | -8.855 V |
| | 1.01 mV/div | 10.0 V | 9.748 V | | 10.252 V |
| | 1.01 mV/div | 0 V | -202 mV | | 202 mV |
| | 1.01 mV/div | -10.0 V | -10.252 V | | -9.748 V |
| | 5 mV/div | 10 V | 8.95 V | | 11.05 V |
| | 5 mV/div | 0 V | -1000 mV | | 1000 mV |
| | 5 mV/div | -10 V | -11.05 V | | -8.95 V |
| Channel 4 DC Offset Accuracy, 20 MHz BW, 50 Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 5.0 V | 4.955 V | | 5.045 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -5.0 V | -5.045 V | | -4.955 V |

Table continued...

⁶ Use this value for both the calibrator output and the oscilloscope offset setting.

| Offset Accuracy | | | | | |
|---|----------------|------------------------------|-----------|-------------|------------|
| Performance checks | Vertical scale | Vertical offset ⁶ | Low limit | Test result | High limit |
| Channel 4 DC Offset Accuracy, 20 MHz BW, 1 M Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 1.0 V | 0.975 V | | 1.025 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -1.0 V | -1.025 V | | -0.975 V |
| | 500 mV/div | 9.0 V | 8.855 V | | 9.145 V |
| | 500 mV/div | 0 V | -100 mV | | 100 mV |
| | 500 mV/div | -9.0 V | -9.145 V | | -8.855 V |
| | 1.01 mV/div | 10.0 V | 9.748 V | | 10.252 V |
| | 1.01 mV/div | 0 V | -202 mV | | 202 mV |
| | 1.01 mV/div | -10.0 V | -10.252 V | | -9.748 V |
| | 5 mV/div | 10 V | 8.95 V | | 11.05 V |
| | 5 mV/div | 0 V | -1000 mV | | 1000 mV |
| | 5 mV/div | -10 V | -11.05 V | | -8.95 V |
| MSO46 | | | | | |
| Channel 5 DC Offset Accuracy, 20 MHz BW, 50 Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 5.0 V | 4.955 V | | 5.045 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -5.0 V | -5.045 V | | -4.955 V |
| Table continued... | | | | | |

⁶ Use this value for both the calibrator output and the oscilloscope offset setting.

| Offset Accuracy | | | | | |
|---|----------------|------------------------------|-----------|-------------|------------|
| Performance checks | Vertical scale | Vertical offset ⁶ | Low limit | Test result | High limit |
| Channel 5 DC Offset Accuracy, 20 MHz BW, 1 M Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 1.0 V | 0.975 V | | 1.025 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -1.0 V | -1.025 V | | -0.975 V |
| | 500 mV/div | 9.0 V | 8.855 V | | 9.145 V |
| | 500 mV/div | 0 V | -100 mV | | 100 mV |
| | 500 mV/div | -9.0 V | -9.145 V | | -8.855 V |
| | 1.01 mV/div | 10.0 V | 9.748 V | | 10.252 V |
| | 1.01 mV/div | 0 V | -202 mV | | 202 mV |
| | 1.01 mV/div | -10.0 V | -10.252 V | | -9.748 V |
| | 5 mV/div | 10.0 V | 8.95 V | | 11.05 V |
| | 5 mV/div | 0 V | -1000 mV | | 1000 mV |
| | 5 mV/div | -10.0 V | -11.05 V | | -8.95 V |
| Channel 6 DC Offset Accuracy, 20 MHz BW, 50 Ω | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 5.0 V | 4.955 V | | 5.045 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -5.0 V | -5.045 V | | -4.955 V |

Table continued...

⁶ Use this value for both the calibrator output and the oscilloscope offset setting.

| Offset Accuracy | | | | | |
|---|----------------|------------------------------|-----------|-------------|------------|
| Performance checks | Vertical scale | Vertical offset ⁶ | Low limit | Test result | High limit |
| Channel 6 DC Offset Accuracy, 20 MHz BW, 1 MΩ | 1 mV/div | 900 mV | 895.3 mV | | 904.7 mV |
| | 1 mV/div | 0 V | -0.2 mV | | 0.2 mV |
| | 1 mV/div | -900 mV | -904.7 mV | | -895.3 mV |
| | 100 mV/div | 1.0 V | 0.975 V | | 1.025 V |
| | 100 mV/div | 0 V | -20 mV | | 20 mV |
| | 100 mV/div | -1.0 V | -1.025 V | | -0.975 V |
| | 500 mV/div | 9.0 V | 8.855 V | | 9.145 V |
| | 500 mV/div | 0 V | -100 mV | | 100 mV |
| | 500 mV/div | -9.0 V | -9.145 V | | -8.855 V |
| | 1.01 mV/div | 10.0 V | 9.748 V | | 10.252 V |
| | 1.01 mV/div | 0 V | -202 mV | | 202 mV |
| | 1.01 mV/div | -10.0 V | -10.252 V | | -9.748 V |
| | 5 mV/div | 10.0 V | 8.95 V | | 11.05 V |
| | 5 mV/div | 0 V | -1000 mV | | 1000 mV |
| | 5 mV/div | -10.0 V | -11.05 V | | -8.95 V |

Analog Bandwidth test record

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|-----------|----------------|----------------------|--------------------|--------------------|---------|--|
| Bandwidth at Channel | Impedance | Vertical scale | Horizontal scale | V _{in-pp} | V _{bw-pp} | Limit | Test result Gain = V _{bw-pp} /V _{in-pp} |
| 1.5 GHz models | | | | | | | |
| Channel 1 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |

Table continued...

⁶ Use this value for both the calibrator output and the oscilloscope offset setting.

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|------------------------|------------|----------------------|--|--|--------------|--|
| Channel 1 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 2 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 2 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 3 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 3 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 4 | | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 4 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| 1.5 GHz MSO46 | | | | | | | |
| Channel 5 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 5 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 6 | 50 Ω | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 6 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| 1 GHz models | | | | | | | |
| Channel 1 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|------------------------|------------|----------------------|--|--|--------------|--|
| Channel 1 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 2 | 50 Ω | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 2 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 3 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 3 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 4 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 4 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| 1 GHz MSO46 | | | | | | | |
| Channel 5 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 5 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 6 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 6 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| 500 MHz models | | | | | | | |
| Channel 1 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|------------------------|------------|----------------------|--|--|--------------|--|
| Channel 1 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 2 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 2 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 3 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 3 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 4 | | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 4 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| 500 MHz models (MSO46) | | | | | | | |
| Channel 5 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 5 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 6 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 6 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| 350 MHz models | | | | | | | |
| Channel 1 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|------------------------|------------|----------------------|--|--|--------------|--|
| Channel 1 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 2 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 2 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 3 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 3 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 4 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 4 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Six channel models (MSO46) | | | | | | | |
| Channel 5 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 5 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 6 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 6 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| 200 MHz | | | | | | | |
| Channel 1 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|------------------------|------------|----------------------|--|--|--------------|--|
| Channel 1 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 2 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 2 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 3 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 3 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Channel 4 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Table continued... | | | | | | | |

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|---------------|------------|----------------------|--|--|---------|--|
| Channel 4 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| Six channel models (MSO46) | | | | | | | |
| Channel 5 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 5 | 1 MΩ, typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Table continued...

| Analog Bandwidth performance checks | | | | | | | |
|-------------------------------------|------------------------|------------|----------------------|--|--|--------------|--|
| Channel 6 | 50 Ω | 1 mV/div | 5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (Full BW) | | | ≥ 0.707 | |
| Channel 6 | 1 M Ω , typical | 1 mV/div | 5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 2 mV/div | 2.5 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 5 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 10 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 50 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 100 mV/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |
| | | 1 V/div | 1 ns/div (500 MHz) | | | ≥ 0.707 | |

Random Noise High Res acquisition mode test record

| Performance Checks | | | 1 M Ω | | 50 Ω | |
|---|----------|---------------|------------------|-----------------|------------------|-----------------|
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| Random Noise, Sample acquisition mode: 1.5 GHz models | | | | | | |
| 1.5 GHz models (MSO44, MSO46) | | | | | | |
| Channel 1 | 1 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 2 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |

Table continued...

| Performance Checks | | | 1 MΩ | | 50 Ω | | |
|---|---------------|---------------|------------------|-----------------|------------------|-----------------|-------|
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) | |
| Random Noise, Sample acquisition mode: 1.5 GHz models | | | | | | | |
| | 5 mV/div | Full | | | | 0.817 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| | 10 mV/div | Full | | | | 0.843 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| | 20 mV/div | Full | | | | 0.92 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| | 50 mV/div | Full | | | | 1.582 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| | 100 mV/div | Full | | | | 3.686 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| | 1 V/div | Full | | | | 23.753 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| | Channel 2 | 1 mV/div | Full | | | | 0.635 |
| | | | 250 MHz limit | | | | |
| | | | 20 MHz | | | | |
| 2 mV/div | | Full | | | | 0.635 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| 5 mV/div | | Full | | | | 0.817 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| 10 mV/div | | Full | | | | 0.843 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| 20 mV/div | | Full | | | | 0.92 | |
| | | 250 MHz limit | | | | | |
| | | 20 MHz | | | | | |
| 50 mV/div | Full | | | | 1.582 | | |
| | 250 MHz limit | | | | | | |
| Table continued... | | | | | | | |

| Performance Checks | | | 1 M Ω | | 50 Ω | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| Random Noise, Sample acquisition mode: 1.5 GHz models | | | | | | |
| | 100 mV/div | 20 MHz | | | | |
| | | Full | | | | 3.686 |
| | | 250 MHz limit | | | | |
| | 1 V/div | 20 MHz | | | | |
| | | Full | | | | 23.753 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| Channel 3 | 1 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 2 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 5 mV/div | Full | | | | 0.817 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 10 mV/div | Full | | | | 0.843 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 20 mV/div | Full | | | | 0.92 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 50 mV/div | Full | | | | 1.582 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 100 mV/div | Full | | | | 3.686 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 1 V/div | Full | | | | 23.753 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| Channel 4 | 1 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 2 mV/div | Full | | | | 0.635 |
| | | | | | | |

Table continued...

| Performance Checks | | | 1 MΩ | | 50 Ω | |
|---|------------------------|---------------|------------------|-----------------|------------------|-----------------|
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| Random Noise, Sample acquisition mode: 1.5 GHz models | | | | | | |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | | 5 mV/div | Full | | | |
| | 250 MHz limit | | | | | |
| | 20 MHz | | | | | |
| | 10 mV/div | Full | | | | 0.843 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 20 mV/div | Full | | | | 0.92 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 50 mV/div | Full | | | | 1.582 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 100 mV/div | Full | | | | 3.686 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 1 V/div | Full | | | | 23.753 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 1.5 GHz models (MSO46) | | | | | |
| Channel 5 | 1 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 2 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 5 mV/div | Full | | | | 0.817 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 10 mV/div | Full | | | | 0.843 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 20 mV/div | Full | | | | 0.92 |
| | | 250 MHz limit | | | | |
| Table continued... | | | | | | |

| Performance Checks | | | 1 M Ω | | 50 Ω | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| Random Noise, Sample acquisition mode: 1.5 GHz models | | | | | | |
| | 50 mV/div | 20 MHz | | | | |
| | | Full | | | | 1.582 |
| | | 250 MHz limit | | | | |
| | 100 mV/div | 20 MHz | | | | |
| | | Full | | | | 3.686 |
| | | 250 MHz limit | | | | |
| | 1 V/div | 20 MHz | | | | |
| | | Full | | | | 23.753 |
| | | 250 MHz limit | | | | |
| | 20 MHz | | | | | |
| | | | | | | |
| | | | | | | |
| Channel 6 | 1 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 2 mV/div | Full | | | | 0.635 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 5 mV/div | Full | | | | 0.817 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 10 mV/div | Full | | | | 0.843 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 20 mV/div | Full | | | | 0.92 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 50 mV/div | Full | | | | 1.582 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 100 mV/div | Full | | | | 3.686 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |
| | 1 V/div | Full | | | | 23.753 |
| | | 250 MHz limit | | | | |
| | | 20 MHz | | | | |

| Random Noise, High Res acquisition mode: 1 GHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| 1 GHz models (MSO44, MSO46) | | | | | | |
| Channel 1 | 1 mV/div | Full | | | | 0.336 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | | | 0.363 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | | | 0.394 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | | | 0.434 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | | | 0.551 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | | | 2.102 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | | | 16.874 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| Channel 2 | 1 mV/div | Full | | | | 0.336 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | | | 0.363 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | | | 0.394 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | | | 0.434 |

Table continued...

| Random Noise, High Res acquisition mode: 1 GHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | | | 0.551 |
| | 20 mV/div | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | | | 1.038 |
| | 50 mV/div | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | | Full | | | | 2.102 |
| | 100 mV/div | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | | Full | | | | 16.874 |
| | 1 V/div | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| | | Full | | | | 0.336 |
| Channel 3 | 1 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | | | 0.363 |
| | 2 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | | | 0.394 |
| | 5 mV/div | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | | | 0.434 |
| | 10 mV/div | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | | | 0.551 |
| | 20 mV/div | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | | | 1.038 |
| | 50 mV/div | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | | Full | | | | 2.102 |
| | 100 mV/div | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | | Full | | | | |

Table continued...

| Random Noise, High Res aquisition mode: 1 GHz models | | | | | | |
|--|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 MΩ | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | 1 V/div | Full | | | | 16.874 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| Channel 4 | 1 mV/div | Full | | | | 0.336 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | | | 0.363 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | | | 0.394 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | | | 0.434 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | | | 0.551 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | | | 2.102 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | | | 16.874 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| 1 GHz models (MSO46) | | | | | | |
| Channel 5 | 1 mV/div | Full | | | | 0.336 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | | | 0.363 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | | | 0.394 |

Table continued...

Table continued...

| Random Noise, High Res acquisition mode: 1 GHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | | | 0.434 |
| | 10 mV/div | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | | | 0.551 |
| | 20 mV/div | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | | | 1.038 |
| | 50 mV/div | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | | Full | | | | 2.102 |
| | 100 mV/div | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | | Full | | | | 16.874 |
| | 1 V/div | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| | | Full | | | | 0.336 |
| Channel 6 | 1 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | | | 0.363 |
| | 2 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | | | 0.394 |
| | 5 mV/div | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | | | 0.434 |
| | 10 mV/div | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | | | 0.551 |
| | 20 mV/div | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | | | 1.038 |
| | 50 mV/div | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | | Full | | | | |

Table continued...

| Random Noise, High Res acquisition mode: 1 GHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | 100 mV/div | Full | | | | 2.102 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | | | 16.874 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |

| Random Noise, High Res acquisition mode: 500 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| 500 MHz models (MSO44, MSO46) | | | | | | |
| Channel 1 | 1 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.271 | | 0.304 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.298 | | 0.356 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | 0.363 | | 0.466 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.674 | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.609 | | 1.596 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 18.561 | | 12.85 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |

Table continued...

| Random Noise, High Res acquisition mode: 500 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| Channel 2 | 1 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.271 | | 0.304 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.298 | | 0.356 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | 0.363 | | 0.466 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.674 | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.609 | | 1.596 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 18.561 | | 12.85 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| Channel 3 | 1 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.271 | | 0.304 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.298 | | 0.356 |
| | | 250 MHz limit | | 0.194 | | 0.206 |

Table continued...

| Random Noise, High Res acquisition mode: 500 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | 20 mV/div | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | 0.363 | | 0.466 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.674 | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.609 | | 1.596 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 18.561 | | 12.85 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| Channel 4 | 1 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.271 | | 0.304 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.298 | | 0.356 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | 0.363 | | 0.466 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.674 | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.609 | | 1.596 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 18.561 | | 12.85 |

Table continued...

| Random Noise, High Res acquisition mode: 500 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| 500 MHz models (MSO46) | | | | | | |
| Channel 5 | 1 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.271 | | 0.304 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.298 | | 0.356 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | 0.363 | | 0.466 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.674 | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.609 | | 1.596 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 18.561 | | 12.85 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| Channel 6 | 1 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.259 | | 0.259 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.271 | | 0.304 |
| | | 250 MHz limit | | 0.168 | | 0.174 |

Table continued...

| Random Noise, High Res acquisition mode: 500 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | 10 mV/div | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.298 | | 0.356 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | 20 mV/div | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | 0.363 | | 0.466 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | 50 mV/div | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | 0.674 | | 1.038 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | 100 mV/div | 20 MHz | | 0.233 | | 0.259 |
| | | Full | | 1.609 | | 1.596 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | 1 V/div | 20 MHz | | 0.596 | | 0.609 |
| | | Full | | 18.561 | | 12.85 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |

| Random Noise, High Res acquisition mode: 350 MHz models | | | | | | |
|---|-----------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| 350 MHz models (MSO44, MSO46) | | | | | | |
| Channel 1 | 1 mV/div | Full | | 0.181 | | 0.194 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.181 | | 0.194 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.194 | | 0.239 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.206 | | 0.284 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | 0.259 | | 0.349 |
| | | 250 MHz limit | | 0.259 | | 0.298 |

Table continued...

| Random Noise, High Res acquisition mode: 350 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | 50 mV/div | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | 0.479 | | 0.139 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.141 | | 1.349 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 13.239 | | 11.617 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| Channel 2 | 1 mV/div | Full | | 0.181 | | 0.194 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.181 | | 0.194 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.194 | | 0.239 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.206 | | 0.284 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | 0.259 | | 0.349 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.479 | | 0.139 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.141 | | 1.349 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 13.239 | | 11.617 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| Channel 3 | 1 mV/div | Full | | 0.181 | | 0.194 |

Table continued...

| Random Noise, High Res acquisition mode: 350 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.181 | | 0.194 |
| | 2 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.194 | | 0.239 |
| | 5 mV/div | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.206 | | 0.284 |
| | 10 mV/div | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | 0.259 | | 0.349 |
| | 20 mV/div | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | 0.479 | | 0.139 |
| | 50 mV/div | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | | Full | | 1.141 | | 1.349 |
| | 100 mV/div | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | | Full | | 13.239 | | 11.617 |
| | 1 V/div | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| | | Full | | 0.181 | | 0.194 |
| Channel 4 | 1 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.181 | | 0.194 |
| | 2 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.194 | | 0.239 |
| | 5 mV/div | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.206 | | 0.284 |
| | 10 mV/div | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | | | |

Table continued...

| Random Noise, High Res aquisition mode: 350 MHz models | | | | | | |
|--|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| | 20 mV/div | Full | | 0.259 | | 0.349 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.479 | | 0.139 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.141 | | 1.349 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 13.239 | | 11.617 |
| | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| 350 MHz models (MSO46) | | | | | | |
| Channel 5 | 1 mV/div | Full | | 0.181 | | 0.194 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 2 mV/div | Full | | 0.181 | | 0.194 |
| | | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 5 mV/div | Full | | 0.194 | | 0.239 |
| | | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | 10 mV/div | Full | | 0.206 | | 0.284 |
| | | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | 20 mV/div | Full | | 0.259 | | 0.349 |
| | | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | 50 mV/div | Full | | 0.479 | | 0.139 |
| | | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | 100 mV/div | Full | | 1.141 | | 1.349 |
| | | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | 1 V/div | Full | | 13.239 | | 11.617 |
| Table continued... | | | | | | |

Table continued...

| Random Noise, High Res acquisition mode: 350 MHz models | | | | | | |
|---|------------|---------------|------------------|-----------------|------------------|-----------------|
| Performance Checks | | | 1 M Ω | | 50 Ω | |
| | V/div | Bandwidth | Test result (mV) | High limit (mV) | Test result (mV) | High limit (mV) |
| Channel 6 | | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| | | Full | | 0.181 | | 0.194 |
| | 1 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.181 | | 0.194 |
| | 2 mV/div | 250 MHz limit | | 0.155 | | 0.161 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.181 | | 0.194 |
| | 5 mV/div | 250 MHz limit | | 0.168 | | 0.174 |
| | | 20 MHz | | 0.096 | | 0.096 |
| | | Full | | 0.194 | | 0.239 |
| | 10 mV/div | 250 MHz limit | | 0.194 | | 0.206 |
| | | 20 MHz | | 0.103 | | 0.103 |
| | | Full | | 0.206 | | 0.284 |
| | 20 mV/div | 250 MHz limit | | 0.259 | | 0.298 |
| | | 20 MHz | | 0.129 | | 0.141 |
| | | Full | | 0.259 | | 0.349 |
| | 50 mV/div | 250 MHz limit | | 0.531 | | 0.596 |
| | | 20 MHz | | 0.233 | | 0.259 |
| | | Full | | 0.479 | | 0.139 |
| | 100 mV/div | 250 MHz limit | | 1.206 | | 1.349 |
| | | 20 MHz | | 0.596 | | 0.609 |
| | | Full | | 1.141 | | 1.349 |
| | 1 V/div | 250 MHz limit | | 13.369 | | 11.617 |
| | | 20 MHz | | 7.074 | | 4.906 |
| | | Full | | 13.239 | | 11.617 |

Long term sample rate through AFG DC offset accuracy test records

| Long Term Sample Rate | | | |
|-----------------------|--------------|-------------|--------------|
| Performance checks | Low limit | Test result | High limit |
| Long Term Sample Rate | -2 divisions | | +2 divisions |

| Digital Threshold Accuracy, typical | | | | |
|-------------------------------------|--|--|--|--|
| Performance checks: | | | | |
| Table continued... | | | | |

| Digital Threshold Accuracy, typical | | | | | | |
|-------------------------------------|-----------|-----------------|-----------------|-----------|-------------|------------|
| Digital channel | Threshold | V _{s-} | V _{s+} | Low limit | Test result | High limit |
| All models | | | | | | |
| Channel 1 | | | | | | |
| D0 | 0 V | | | -0.1 V | | 0.1 V |
| D1 | 0 V | | | -0.1 V | | 0.1 V |
| D2 | 0 V | | | -0.1 V | | 0.1 V |
| D3 | 0 V | | | -0.1 V | | 0.1 V |
| D4 | 0 V | | | -0.1 V | | 0.1 V |
| D5 | 0 V | | | -0.1 V | | 0.1 V |
| D6 | 0 V | | | -0.1 V | | 0.1 V |
| D7 | 0 V | | | -0.1 V | | 0.1 V |
| Channel 2 | | | | | | |
| D0 | 0 V | | | -0.1 V | | 0.1 V |
| D1 | 0 V | | | -0.1 V | | 0.1 V |
| D2 | 0 V | | | -0.1 V | | 0.1 V |
| D3 | 0 V | | | -0.1 V | | 0.1 V |
| D4 | 0 V | | | -0.1 V | | 0.1 V |
| D5 | 0 V | | | -0.1 V | | 0.1 V |
| D6 | 0 V | | | -0.1 V | | 0.1 V |
| D7 | 0 V | | | -0.1 V | | 0.1 V |
| Channel 3 | | | | | | |
| D0 | 0 V | | | -0.1 V | | 0.1 V |
| D1 | 0 V | | | -0.1 V | | 0.1 V |
| D2 | 0 V | | | -0.1 V | | 0.1 V |
| D3 | 0 V | | | -0.1 V | | 0.1 V |
| D4 | 0 V | | | -0.1 V | | 0.1 V |
| D5 | 0 V | | | -0.1 V | | 0.1 V |
| D6 | 0 V | | | -0.1 V | | 0.1 V |
| D7 | 0 V | | | -0.1 V | | 0.1 V |
| Channel 4 | | | | | | |
| D0 | 0 V | | | -0.1 V | | 0.1 V |
| D1 | 0 V | | | -0.1 V | | 0.1 V |
| D2 | 0 V | | | -0.1 V | | 0.1 V |
| D3 | 0 V | | | -0.1 V | | 0.1 V |
| D4 | 0 V | | | -0.1 V | | 0.1 V |
| D5 | 0 V | | | -0.1 V | | 0.1 V |
| D6 | 0 V | | | -0.1 V | | 0.1 V |
| Table continued... | | | | | | |

| Digital Threshold Accuracy, typical | | | | | | |
|-------------------------------------|-----|--|--|--------|--|-------|
| D7 | 0 V | | | -0.1 V | | 0.1 V |
| MSO46 models | | | | | | |
| Channel 5 | | | | | | |
| D0 | 0 V | | | -0.1 V | | 0.1 V |
| D1 | 0 V | | | -0.1 V | | 0.1 V |
| D2 | 0 V | | | -0.1 V | | 0.1 V |
| D3 | 0 V | | | -0.1 V | | 0.1 V |
| D4 | 0 V | | | -0.1 V | | 0.1 V |
| D5 | 0 V | | | -0.1 V | | 0.1 V |
| D6 | 0 V | | | -0.1 V | | 0.1 V |
| D7 | 0 V | | | -0.1 V | | 0.1 V |
| Channel 6 | | | | | | |
| D0 | 0 V | | | -0.1 V | | 0.1 V |
| D1 | 0 V | | | -0.1 V | | 0.1 V |
| D2 | 0 V | | | -0.1 V | | 0.1 V |
| D3 | 0 V | | | -0.1 V | | 0.1 V |
| D4 | 0 V | | | -0.1 V | | 0.1 V |
| D5 | 0 V | | | -0.1 V | | 0.1 V |
| D6 | 0 V | | | -0.1 V | | 0.1 V |
| D7 | 0 V | | | -0.1 V | | 0.1 V |

| AUX Out output voltage levels | | | | |
|---|------|--------------|-------------|---------------|
| Performance checks | Vout | Low limit | Test result | High limit |
| Output levels, 1 M Ω input impedance | Max | ≥ 2.5 V | | n/a |
| | Min | n/a | | ≤ 700 mV |
| Output levels, 50 Ω Input Impedance, | Max | ≥ 2.5 V | | n/a |
| | Min | n/a | | ≤ 250 mV |

| DVM voltage accuracy (DC) | | | | | |
|---------------------------|---------------|----------------|-----------|-------------|------------|
| Channel 1 | | | | | |
| Vertical Scale | Input Voltage | Offset Voltage | Low limit | Test result | High limit |
| 1 | -5 | -5 | -5.125 | | -4.875 |
| 0.5 | -2 | -2 | -2.06 | | -1.94 |
| 0.5 | -1 | -0.5 | -1.06 | | -0.94 |
| 0.2 | -0.5 | -0.5 | -0.5225 | | -0.4775 |

Table continued...

| DVM voltage accuracy (DC) | | | | | |
|---------------------------|---------------|----------------|-----------|-------------|------------|
| 0.01 | 0.002 | 0 | 0.00097 | | 0.00303 |
| 0.2 | 0.5 | 0.5 | 0.4775 | | 0.5225 |
| 0.5 | 1 | 0.5 | 0.94 | | 1.06 |
| 0.5 | 2 | 2 | 1.94 | | 2.06 |
| 1 | 5 | 5 | 4.875 | | 5.125 |
| Channel 2 | | | | | |
| Vertical Scale | Input Voltage | Offset Voltage | Low limit | Test result | High limit |
| 1 | -5 | -5 | -5.125 | | -4.875 |
| 0.5 | -2 | -2 | -2.06 | | -1.94 |
| 0.5 | -1 | -0.5 | -1.06 | | -0.94 |
| 0.2 | -0.5 | -0.5 | -0.5225 | | -0.4775 |
| 0.01 | 0.002 | 0 | 0.00097 | | 0.00303 |
| 0.2 | 0.5 | 0.5 | 0.4775 | | 0.5225 |
| 0.5 | 1 | 0.5 | 0.94 | | 1.06 |
| 0.5 | 2 | 2 | 1.94 | | 2.06 |
| 1 | 5 | 5 | 4.875 | | 5.125 |
| Channel 3 | | | | | |
| Vertical Scale | Input Voltage | Offset Voltage | Low limit | Test result | High limit |
| 1 | -5 | -5 | -5.125 | | -4.875 |
| 0.5 | -2 | -2 | -2.06 | | -1.94 |
| 0.5 | -1 | -0.5 | -1.06 | | -0.94 |
| 0.2 | -0.5 | -0.5 | -0.5225 | | -0.4775 |
| 0.01 | 0.002 | 0 | 0.00097 | | 0.00303 |
| 0.2 | 0.5 | 0.5 | 0.4775 | | 0.5225 |
| 0.5 | 1 | 0.5 | 0.94 | | 1.06 |
| 0.5 | 2 | 2 | 1.94 | | 2.06 |
| 1 | 5 | 5 | 4.875 | | 5.125 |
| Channel 4 | | | | | |
| Vertical Scale | Input Voltage | Offset Voltage | Low limit | Test result | High limit |
| 1 | -5 | -5 | -5.125 | | -4.875 |
| 0.5 | -2 | -2 | -2.06 | | -1.94 |
| 0.5 | -1 | -0.5 | -1.06 | | -0.94 |
| 0.2 | -0.5 | -0.5 | -0.5225 | | -0.4775 |
| 0.01 | 0.002 | 0 | 0.00097 | | 0.00303 |
| 0.2 | 0.5 | 0.5 | 0.4775 | | 0.5225 |
| 0.5 | 1 | 0.5 | 0.94 | | 1.06 |
| 0.5 | 2 | 2 | 1.94 | | 2.06 |
| 1 | 5 | 5 | 4.875 | | 5.125 |

| DVM voltage accuracy (DC) | | | | | |
|---------------------------|---------------|----------------|-----------|-------------|------------|
| MSO46 models | | | | | |
| Channel 5 | | | | | |
| Vertical Scale | Input Voltage | Offset Voltage | Low limit | Test result | High limit |
| 1 | -5 | -5 | -5.125 | | -4.875 |
| 0.5 | -2 | -2 | -2.06 | | -1.94 |
| 0.5 | -1 | -0.5 | -1.06 | | -0.94 |
| 0.2 | -0.5 | -0.5 | -0.5225 | | -0.4775 |
| 0.01 | 0.002 | 0 | 0.00097 | | 0.00303 |
| 0.2 | 0.5 | 0.5 | 0.4775 | | 0.5225 |
| 0.5 | 1 | 0.5 | 0.94 | | 1.06 |
| 0.5 | 2 | 2 | 1.94 | | 2.06 |
| 1 | 5 | 5 | 4.875 | | 5.125 |
| Channel 6 | | | | | |
| Vertical Scale | Input Voltage | Offset Voltage | Low limit | Test result | High limit |
| 1 | -5 | -5 | -5.125 | | -4.875 |
| 0.5 | -2 | -2 | -2.06 | | -1.94 |
| 0.5 | -1 | -0.5 | -1.06 | | -0.94 |
| 0.2 | -0.5 | -0.5 | -0.5225 | | -0.4775 |
| 0.01 | 0.002 | 0 | 0.00097 | | 0.00303 |
| 0.2 | 0.5 | 0.5 | 0.4775 | | 0.5225 |
| 0.5 | 1 | 0.5 | 0.94 | | 1.06 |
| 0.5 | 2 | 2 | 1.94 | | 2.06 |
| 1 | 5 | 5 | 4.875 | | 5.125 |

| DVM voltage accuracy (AC) | | | | |
|---------------------------|------------------------------|------------|-------------|------------|
| All models | | | | |
| Channel 1 | | | | |
| Vertical Scale | Input Signal | Low limit | Test result | High limit |
| 5 mV | 20 mV _{pp} at 1 kHz | 9.800 mV | | 10.200 mV |
| 10 mV | 50 mV _{pp} at 1 kHz | 24.5 mV | | 25.500 mV |
| 100 mV | 0.5 V _{pp} at 1 kHz | 245.000 mV | | 255.000 mV |
| 200 mV | 1 V _{pp} at 1 kHz | 490.000 mV | | 510.000 mV |
| 1 V | 5 V _{pp} at 1 kHz | 2.450 mV | | 2.550 mV |
| Channel 2 | | | | |
| Vertical Scale | Input Signal | Low limit | Test result | High limit |

Table continued...

| DVM voltage accuracy (AC) | | | | |
|---------------------------|------------------------------|------------|-------------|------------|
| 5 mV | 20 mV _{pp} at 1 kHz | 9.800 mV | | 10.200 mV |
| 10 mV | 50 mV _{pp} at 1 kHz | 24.5 mV | | 25.500 mV |
| 100 mV | 0.5 V _{pp} at 1 kHz | 245.000 mV | | 255.000 mV |
| 200 mV | 1 V _{pp} at 1 kHz | 490.000 mV | | 510.000 mV |
| 1 V | 5 V _{pp} at 1 kHz | 2.450 mV | | 2.550 mV |
| Channel 3 | | | | |
| Vertical Scale | Input Signal | Low limit | Test result | High limit |
| 5 mV | 20 mV _{pp} at 1 kHz | 9.800 mV | | 10.200 mV |
| 10 mV | 50 mV _{pp} at 1 kHz | 24.5 mV | | 25.500 mV |
| 100 mV | 0.5 V _{pp} at 1 kHz | 245.000 mV | | 255.000 mV |
| 200 mV | 1 V _{pp} at 1 kHz | 490.000 mV | | 510.000 mV |
| 1 V | 5 V _{pp} at 1 kHz | 2.450 mV | | 2.550 mV |
| Channel 4 | | | | |
| Vertical Scale | Input Signal | Low limit | Test result | High limit |
| 5 mV | 20 mV _{pp} at 1 kHz | 9.800 mV | | 10.200 mV |
| 10 mV | 50 mV _{pp} at 1 kHz | 24.5 mV | | 25.500 mV |
| 100 mV | 0.5 V _{pp} at 1 kHz | 245.000 mV | | 255.000 mV |
| 200 mV | 1 V _{pp} at 1 kHz | 490.000 mV | | 510.000 mV |
| 1 V | 5 V _{pp} at 1 kHz | 2.450 mV | | 2.550 mV |
| MSO46 models | | | | |
| Channel 5 | | | | |
| Vertical Scale | Input Signal | Low limit | Test result | High limit |
| 5 mV | 20 mV _{pp} at 1 kHz | 9.800 mV | | 10.200 mV |
| 10 mV | 50 mV _{pp} at 1 kHz | 24.5 mV | | 25.500 mV |
| 100 mV | 0.5 V _{pp} at 1 kHz | 245.000 mV | | 255.000 mV |
| 200 mV | 1 V _{pp} at 1 kHz | 490.000 mV | | 510.000 mV |
| 1 V | 5 V _{pp} at 1 kHz | 2.450 mV | | 2.550 mV |
| Channel 6 | | | | |
| Vertical Scale | Input Signal | Low limit | Test result | High limit |
| 5 mV | 20 mV _{pp} at 1 kHz | 9.800 mV | | 10.200 mV |
| 10 mV | 50 mV _{pp} at 1 kHz | 24.5 mV | | 25.500 mV |
| 100 mV | 0.5 V _{pp} at 1 kHz | 245.000 mV | | 255.000 mV |
| 200 mV | 1 V _{pp} at 1 kHz | 490.000 mV | | 510.000 mV |
| 1 V | 5 V _{pp} at 1 kHz | 2.450 mV | | 2.550 mV |

| Trigger frequency accuracy and trigger frequency counter maximum input frequency | | | | |
|--|----------------------|--------------|-------------|---------------|
| All models | | | | |
| Channel 1 | Hz | Low limit | Test result | High limit |
| | 100 Hz | 99.99974 Hz | | 100.00026 Hz |
| | 1 kHz | 999.9974 Hz | | 1.0000026 KHz |
| | 10 kHz | 9.999974 KHz | | 10.000026 kHz |
| | 100 kHz | 99.99974 kHz | | 100.00026 kHz |
| | 1 MHz | 999.9974 kHz | | 1.0000026 MHz |
| | 10 MHz | 9.999974 kHz | | 10.000026 MHz |
| | 100 MHz | 99.99974 MHz | | 100.00026 MHz |
| | 1 GHz ⁷ | 999.9974 MHz | | 1.0000026 GHz |
| | 1.5 GHz ⁸ | 1.499994 GHz | | 1.5000051 GHz |
| Channel 2 | Hz | Low limit | Test result | High limit |
| | 100 Hz | 99.99974 Hz | | 100.00026 Hz |
| | 1 kHz | 999.9974 Hz | | 1.0000026 KHz |
| | 10 kHz | 9.999974 KHz | | 10.000026 kHz |
| | 100 kHz | 99.99974 kHz | | 100.00026 kHz |
| | 1 MHz | 999.9974 kHz | | 1.0000026 MHz |
| | 10 MHz | 9.999974 kHz | | 10.000026 MHz |
| | 100 MHz | 99.99974 MHz | | 100.00026 MHz |
| | 1 GHz ⁷ | 999.9974 MHz | | 1.0000026 GHz |
| | 1.5 GHz ⁸ | 1.499994 GHz | | 1.5000051 GHz |
| Channel 3 | Hz | Low limit | Test result | High limit |
| | 100 Hz | 99.99974 Hz | | 100.00026 Hz |
| | 1 kHz | 999.9974 Hz | | 1.0000026 KHz |
| | 10 kHz | 9.999974 KHz | | 10.000026 kHz |
| | 100 kHz | 99.99974 kHz | | 100.00026 kHz |
| | 1 MHz | 999.9974 kHz | | 1.0000026 MHz |
| | 10 MHz | 9.999974 kHz | | 10.000026 MHz |
| | 100 MHz | 99.99974 MHz | | 100.00026 MHz |
| | 1 GHz ⁷ | 999.9974 MHz | | 1.0000026 GHz |
| | 1.5 GHz ⁸ | 1.499994 GHz | | 1.5000051 GHz |

Table continued...

⁷ 1 GHz models only.⁸ 1.5 GHz models only.

| Trigger frequency accuracy and trigger frequency counter maximum input frequency | | | | |
|--|----------------------|--------------|-------------|---------------|
| Channel 4 | Hz | Low limit | Test result | High limit |
| | 100 Hz | 99.99974 Hz | | 100.00026 Hz |
| | 1 kHz | 999.9974 Hz | | 1.0000026 KHz |
| | 10 kHz | 9.999974 KHz | | 10.000026 kHz |
| | 100 kHz | 99.99974 kHz | | 100.00026 kHz |
| | 1 MHz | 999.9974 kHz | | 1.0000026 MHz |
| | 10 MHz | 9.999974 kHz | | 10.000026 MHz |
| | 100 MHz | 99.99974 MHz | | 100.00026 MHz |
| | 1 GHz ⁷ | 999.9974 MHz | | 1.0000026 GHz |
| | 1.5 GHz ⁸ | 1.499994 GHz | | 1.5000051 GHz |

| Trigger frequency accuracy and trigger frequency counter maximum input frequency | | | | |
|--|----------------------|--------------|-------------|---------------|
| MSO46 models | | | | |
| Channel 5 | Hz | Low limit | Test result | High limit |
| | 100 Hz | 99.99974 Hz | | 100.00026 Hz |
| | 1 kHz | 999.9974 Hz | | 1.0000026 KHz |
| | 10 kHz | 9.999974 KHz | | 10.000026 kHz |
| | 100 kHz | 99.99974 kHz | | 100.00026 kHz |
| | 1 MHz | 999.9974 kHz | | 1.0000026 MHz |
| | 10 MHz | 9.999974 kHz | | 10.000026 MHz |
| | 100 MHz | 99.99974 MHz | | 100.00026 MHz |
| | 1 GHz ⁷ | 999.9974 MHz | | 1.0000026 GHz |
| | 1.5 GHz ⁸ | 1.499994 GHz | | 1.5000051 GHz |
| Channel 6 | Hz | Low limit | Test result | High limit |
| | 100 Hz | 99.99974 Hz | | 100.00026 Hz |
| | 1 kHz | 999.9974 Hz | | 1.0000026 KHz |
| | 10 kHz | 9.999974 KHz | | 10.000026 kHz |
| | 100 kHz | 99.99974 kHz | | 100.00026 kHz |
| | 1 MHz | 999.9974 kHz | | 1.0000026 MHz |
| | 10 MHz | 9.999974 kHz | | 10.000026 MHz |
| | 100 MHz | 99.99974 MHz | | 100.00026 MHz |
| | 1 GHz ⁷ | 999.9974 MHz | | 1.0000026 GHz |
| | 1.5 GHz ⁸ | 1.499994 GHz | | 1.5000051 GHz |

| AFG sine and ramp frequency accuracy |
|--------------------------------------|
| Performance checks |
| Table continued... |

| AFG sine and ramp frequency accuracy | | | | |
|--------------------------------------|---------------|--------------|-------------|--------------|
| | Waveform type | Minimum | Test result | Maximum |
| | Sine | 0.999950 MHz | | 1.000050 MHz |
| | Ramp | 499.975 kHz | | 500.025 kHz |

| AFG square and pulse frequency accuracy | | | | |
|---|---------------|--------------|-------------|--------------|
| Performance checks | | | | |
| | Waveform type | Minimum | Test result | Maximum |
| | Sine | 0.999950 MHz | | 1.000050 MHz |
| | Pulse | 0.999950 MHz | | 500.025 kHz |

| AFG signal amplitude accuracy | | | | |
|-------------------------------|------------------------|------------------------|-------------|------------------------|
| Performance checks | | | | |
| | Amplitude | Minimum | Test result | Maximum |
| | 30.0 mV _{PP} | 28.55 mV _{PP} | | 31.45 mV _{PP} |
| | 300.0 mV _{PP} | 294.5 mV _{PP} | | 305.5 mV _{PP} |
| | 800.0 mV _{PP} | 787.0 mV _{PP} | | 813.0 mV _{PP} |
| | 1.500 V _{PP} | 1.4765 V _{PP} | | 1.5235 V _{PP} |
| | 2.000 V _{PP} | 1.9690 V _{PP} | | 2.0310 V _{PP} |
| | 2.500 V _{PP} | 2.4615 V _{PP} | | 2.5385 V _{PP} |

| AFG DC offset accuracy | | | | |
|------------------------|---------|-------------|-------------|--------------|
| Performance checks | | | | |
| | Offset | Minimum | Test result | Maximum |
| | 1.25 V | 1.23025 Vdc | | 1.26975 Vdc |
| | 0 V | -0.001 Vdc | | +0.001 Vdc |
| | -1.25 V | -1.26975 | | -1.23025 Vdc |

Performance tests

This section contains a collection of manual procedures for checking that the instrument performs as warranted. They check all the characteristics that are designated as checked in *Specifications*. (The characteristics that are checked appear with a ✓ in *Specifications*).

Prerequisites

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

- The instrument must be in its normal operating configuration (no covers removed).
- You must have performed and passed the procedures under *Self Test*. (See [Self test](#) on page 86.)
- A signal-path compensation must have been done within the recommended calibration interval and at a temperature within $\pm 5^{\circ}\text{C}$ ($\pm 9^{\circ}\text{F}$) of the present operating temperature. (If the temperature was within the limits just stated at the time you did the prerequisite

Self Test, consider this prerequisite met). A signal-path compensation must have been done at an ambient humidity within 25% of the current ambient humidity and after having been at that humidity for at least 4 hours.

- The instrument must have been last adjusted at an ambient temperature between +18 °C and +28 °C (+64 °F and +82 °F), must have been operating for a warm-up period of at least 20 minutes, and must be operating at an ambient temperature as listed in the specifications. The warm-up requirement is usually met in the course of meeting the Self Test prerequisites listed above.
- The instrument must be powered from a source maintaining voltage and frequency within the limits described in the *Specifications* section.
- The instrument must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in the *Specifications* section.

Self test

This procedure verifies that the instrument passes the internal diagnostics and performs signal path compensation. No test equipment or hookups are required.

| Equipment required | Prerequisites |
|--------------------|--|
| None | Power on the instrument and allow a 20 minute warm-up period before performing this procedure. |

1. *Run the System Diagnostics (may take a few minutes):*
 - a. Disconnect all probes and/or cables from the oscilloscope inputs.
 - b. Tap **Utility > Self Test**. This displays the **Self Test** configuration menu.
 - c. Tap the **Run Self Test** button.
 - d. The internal diagnostics perform an exhaustive verification of proper instrument function. This verification may take several minutes. When the verification is finished, the status of each self test is shown in the menu.
 - e. Verify that the status of all tests is **Pass**.
 - f. Tap anywhere outside the menu to exit the menu.
2. *Run the signal-path compensation routine (may take 5 to 15 minutes per channel):*
 - a. Tap **Utility > Calibration**. This displays the **Calibration** configuration menu.
 - b. Tap the **Run SPC** button to start the routine.
 - c. Signal-path compensation may take 5 to 15 minutes to run per channel.
 - d. Verify that the **SPC Status** is **Passed**.
3. *Return to regular service:* Tap anywhere outside the menu to exit the **Calibration** menu.

The self test procedures are completed. If any of the above tests failed, run the tests again. If there are still failures, contact Tektronix Customer Support.



Note: You cannot run the remaining performance tests until the self tests pass and the SPC has successfully run.

Check input impedance

This test checks the input impedance on all channels.

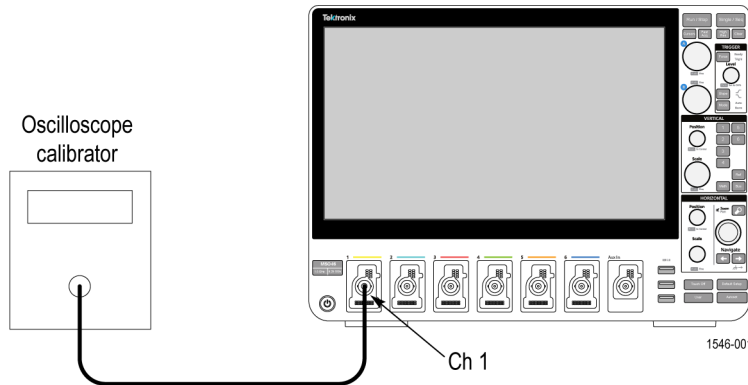
1. Connect the output of the oscilloscope calibrator (for example, Fluke 9500) to the oscilloscope channel 1 input, as shown in the following illustration.



WARNING: Be sure to set the generator to Off or 0 volts before connecting, disconnecting, and/or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.



Note: Impedance measuring equipment that produces a voltage across the channel that exceeds the measurement range of the instrument may report erroneous impedance results. A measurement voltage exceeds the measurement range of the instrument when the resulting trace is not visible on the graticule.

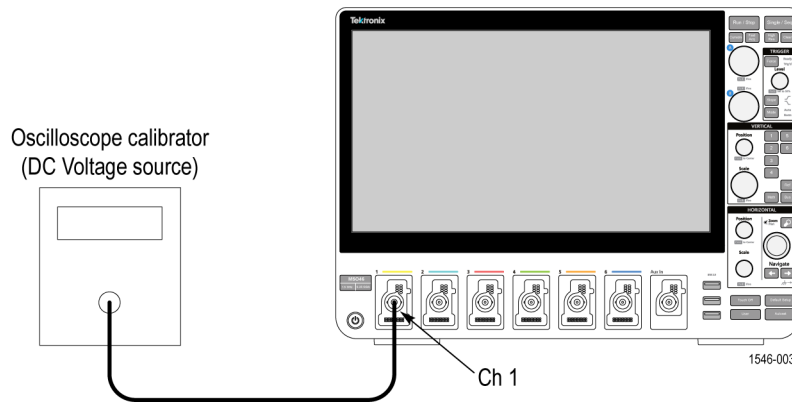


2. Set the calibrator to measure 1 M Ω impedance.
3. Tap **File > Default Setup**.
4. Test 1 M Ω input impedance as follows:
 - a. Tap the channel 1 button on the Settings bar.
 - b. Double tap the **Ch 1** badge to open its menu.
 - c. Set **Termination** to 1 M Ω .
 - d. Set the **Vertical Scale** to the value to test in the test record (first value is 10 mV/div).
5. Use the calibrator to measure the input impedance of the oscilloscope and enter the value in the test record.
6. Repeat steps 4.d on page 87 and 5 on page 87 for all vertical scale settings in the test record for the channel.
7. Test 50 Ω input impedance as follows:
 - a. Set the calibrator impedance to measure 50 Ω impedance.
 - b. Double-tap the **Ch 1** badge and set **Termination** to 50 Ω .
 - c. Repeat steps 4.d on page 87 through 6 on page 87 for all vertical scale settings in the test record for the channel.
8. Repeat the procedures for all remaining channels as follows:
 - a. Turn the calibrator output Off.
 - b. Move the calibrator connection to the next channel to test.
 - c. Double-tap the channel badge of the channel that you have finished testing and set **Display** to Off.
 - d. Tap the channel button on the Settings bar of the next channel to test.
 - e. Starting from step 2 on page 87, repeat the procedures until all channels have been tested.

Check DC gain accuracy

This test checks the DC gain accuracy.

1. Connect the oscilloscope to a calibrated DC voltage source. If you are using the Fluke 9500 calibrator, connect the calibrator head to the oscilloscope channel to test.



WARNING: Set the generator output to Off or 0 volts before connecting, disconnecting, and/or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.

2. Tap **File > Default Setup**.
3. Double-tap the **Acquisition** badge and set **Acquisition Mode** to **Average**.
4. Set the **Number of Waveforms** to **16**.
5. Tap outside the menu to close the menu.
6. Double-tap the **Trigger** badge and set the trigger **Source** to **AC line**.
7. Tap outside the menu to close it.
8. Add the **Mean** measurement to the Results bar:
 - a. Tap the **Add New... Measure** button to open the **Add Measurements** menu.
 - b. Set the **Source** to **Ch 1**.
 - c. In the **Amplitude Measurements** panel, double-tap the **Mean** button to add the Mean measurement badge to the Results bar.
9. Tap outside the menu to close it.
10. Double-tap the **Mean** results badge.
11. Tap **Show Statistics in Badge**.
12. Tap **FILTER/LIMIT RESULTS** to open the panel.
13. Tap **Limit Measurement Population** to toggle it to **On**.
14. Tap outside the menu to close it.
15. Tap the channel button of the channel to test, to add the channel badge to the Settings bar.
16. Double tap the channel to test badge to open its menu and set the channel settings:
 - a. Set **Vertical Scale** to **1 mV/div**.
 - b. Set **Termination** to **50 Ω**.
 - c. Tap **Bandwidth Limit** and set to **20 MHz**.
 - d. Tap outside the menu to close it.
17. Record the negative-measured and positive-measured mean readings in the *Expected gain worksheet* as follows:
 - a. On the calibrator, set the DC Voltage Source to the V_{negative} value as listed in the 1 mV row of the worksheet.
 - b. Double-tap the **Acquisition** badge and tap **Clear** to reset the measurement statistics.
 - c. Enter the **Mean** reading in the worksheet as $V_{\text{negative-measured}}$.
 - d. On the calibrator, set the DC Voltage Source to V_{positive} value as listed in the 1 mV row of the worksheet.
 - e. Double-tap the **Acquisition** badge (if not open) and tap **Clear**.
 - f. Enter the **Mean** reading in the worksheet as $V_{\text{positive-measured}}$.

Table 1: Expected gain worksheet

| Oscilloscope vertical scale setting | V _{diffExpected} | V _{negative} | V _{positive} | V _{negative-measured} | V _{positive-measured} | V _{diff} | Test result (Gain accuracy) |
|-------------------------------------|---------------------------|-----------------------|-----------------------|--------------------------------|--------------------------------|-------------------|-----------------------------|
| 1 mV/div | | | | | | | |
| 2 mV/div | | | | | | | |
| 5 mV/div | | | | | | | |
| 10 mV/div | | | | | | | |
| 20 mV/div | | | | | | | |
| 50 mV/div | | | | | | | |
| 100 mV/div | | | | | | | |
| 200 mV/div | | | | | | | |
| 500 mV/div | | | | | | | |
| 1.0 V/div | | | | | | | |
| 20 mV/div at 250 MHz | | | | | | | |
| 20 mV/div at Full BW | | | | | | | |

18. Calculate Gain Accuracy as follows:

a. Calculate V_{diff} as follows:

$$V_{diff} = |V_{negative-measured} - V_{positive-measured}|$$

b. Enter V_{diff} in the worksheet.

c. Calculate Gain Accuracy as follows:

$$\text{Gain Accuracy} = ((V_{diff} - V_{diffExpected}) / V_{diffExpected}) \times 100\%$$

d. Enter the Gain Accuracy value in the worksheet and in the test record.

19. Repeat steps 16 on page 88 through 18 on page 89 for all vertical scale settings in the work sheet and the test record.

20. Repeat tests at 1 MΩ impedance as follows:

a. Set the calibrator to 0 volts and 1 MΩ output impedance.

b. Double-tap the badge of the channel being tested.

c. Set the Termination to 1 MΩ

d. Repeat steps 16 on page 88 through 19 on page 89 for all vertical scale settings in the test record.

21. Repeat the procedure for all remaining channels:

a. Set the calibrator to 0 volts and 50 Ω output impedance.

b. Move the calibrator output to the next channel input to be tested.

c. Double-tap the channel badge of the channel that you have finished testing and set Display to Off.

d. Double-tap the Mean measurement badge.

e. Tap the Configure panel.

f. Tap the Source 1 field and select the next channel to test.

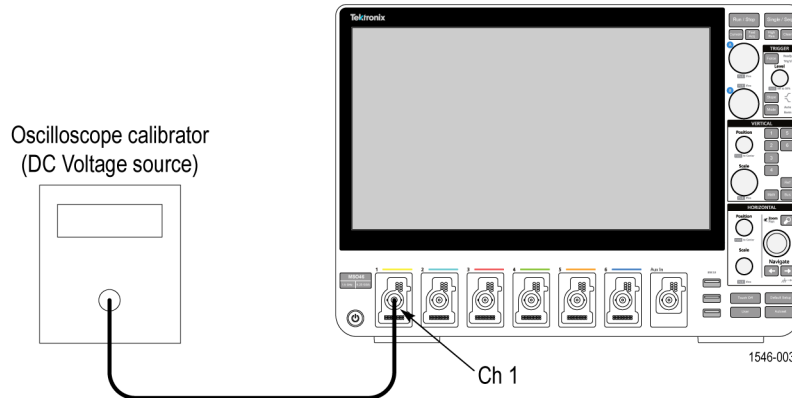
g. Starting from step 16 on page 88, set the values from the test record for the channel under test, and repeat the above steps until all channels have been tested.

22. Touch outside a menu to close the menu.

Check DC offset accuracy

This test checks the offset accuracy at 50 Ω and 1 M Ω input impedances.

1. Connect the oscilloscope to a calibrated DC voltage source. If you are using the Fluke 9500B calibrator as the DC voltage source, connect the calibrator head to the oscilloscope channel 1.



WARNING: Set the generator output to Off or 0 volts before connecting, disconnecting, or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.

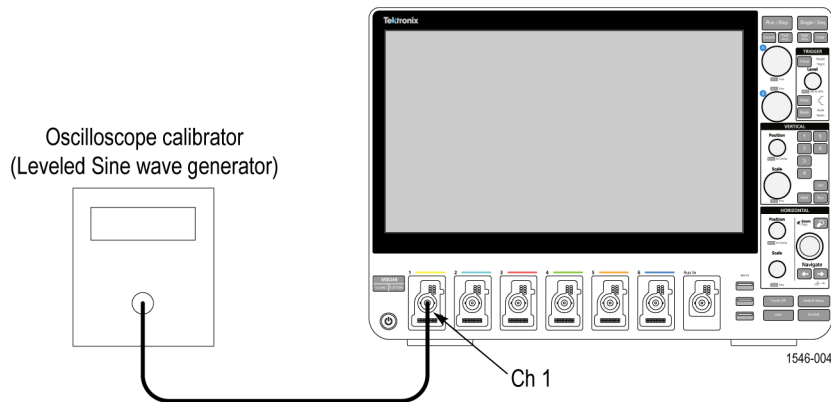
2. Tap **File > Default Setup**.
3. Double-tap the **Acquisition** badge and set **Acquisition Mode** to **Average**.
4. Set the **Number of Waveforms** to **16**.
5. Tap outside the menu to close the menu.
6. Double-tap the **Trigger** badge and set the trigger **Source** to **AC line**.
7. Add the **Mean** measurement to the Results bar:
 - a. Tap the **Add New... Measure** button to open the **Add Measurements** menu.
 - b. Set the **Source** to **Ch 1**.
 - c. In the **Amplitude Measurements** panel, double-tap the **Mean** button to add the Mean measurement badge to the Results bar.
8. Tap outside the menu to close it.
9. Double-tap the **Mean** results badge.
10. Tap **Show Statistics in Badge**.
11. Tap **FILTER/LIMIT RESULTS** to open the panel.
12. Tap **Limit Measurement Population** to toggle it to **On**.
13. Tap outside the menu to close it.
14. Tap the channel button on the Settings bar to add the channel under test to the Settings bar.
15. Double-tap the channel under test badge to open its configuration menu and change the vertical settings:
 - a. Set **Vertical Scale** to **1 mV/div**.
 - b. Set **Offset** to **900 mV**.
 - c. Set **Position** to 0 by tapping **Set to 0**.
 - d. Set **Termination** to **50 Ω** .
 - e. Tap **Bandwidth Limit** and set to **20 MHz**.
 - f. Tap outside the menu to close it.
16. Set the calibrator output to **+900 mV**, as shown in the test record, and turn the calibrator output On.
17. Enter the Mean measurement value in the test record.
18. Double-tap the channel under test badge to open its configuration menu and change the **Offset** to **-900 mV**.

19. Set the calibrator output to **-900 mV**, as shown in the test record.
20. Enter the Mean measurement value in the test record.
21. Repeat step 15 on page 90 through 20 on page 91, changing the channel vertical settings and the calibrator output as listed in the test record for the channel under test.
22. Repeat the channel tests at 1 M Ω impedance as follows:
 - a. Set the calibrator output to Off or 0 volts.
 - b. Change the calibrator impedance to **1 M Ω** and voltage to **+900 mV**.
 - c. Turn the calibrator output On.
 - d. Repeat steps 15 on page 90 through 20 on page 91, changing the channel **Termination** to **1 M Ω** and the vertical Offset value and the calibrator output as listed in the 1 M Ω test record for the channel under test.
23. Repeat the procedure for all remaining channels as follows:
 - a. Double-tap the **Mean** measurement badge.
 - b. Tap the **Configure** panel.
 - c. Tap the **Source 1** field and select the next channel to test.
 - d. Set the calibrator to **0** volts and **50 Ω** output impedance.
 - e. Move the calibrator output to the next channel input to test.
 - f. Double-tap the channel badge of the channel that you have finished testing and set **Display** to **Off**.
 - g. Tap the channel button on the oscilloscope Settings bar of the next channel to test.
 - h. Starting from step , repeat the procedure until all channels have been tested.

Check analog bandwidth

This test checks the bandwidth at 50 Ω and 1 M Ω terminations for each channel. The typical bandwidth at 1 M Ω termination is checked on the products as a functional check.

1. Connect the output of the calibrated leveled sine wave generator to the oscilloscope channel 1 input as shown in the following illustration.



WARNING: Set the generator to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.

2. Tap **File > Default Setup** to reset the instrument and add the channel 1 badge and signal to the display.
3. Add the peak-to-peak measurement as follows:
 - a. Tap the **Add New. Measure** button.
 - b. Set the **Source** to the channel under test.
 - c. In the **Amplitude Measurements** panel, double-tap the **Peak-to-Peak** measurement button to add the measurement badge to the Results bar.

- d. Tap outside the menu to close it.
- e. Double-tap the **Peak-to-Peak** results badge.
- f. Tap **Show Statistics in Badge**.
- g. Tap **FILTER/LIMIT RESULTS** to open the panel.
- h. Tap **Limit Measurement Population** to toggle it to **On**.
- i. Tap outside the menu to close it.
4. Set the channel under test settings:
 - a. Double-tap the badge of the channel under test to open its configuration menu.
 - b. Set **Vertical Scale** to **1 mV/div**.
 - c. Set **Termination** to **50 Ω**.
 - d. Tap outside the menu to close it.
5. Adjust the leveled sine wave signal source to display a waveform of 8 vertical divisions at the selected vertical scale with a set frequency of **10 MHz**. For example, at 5 mV/div, use a ≥ 40 mV_{p-p} signal; at 2 mV/div, use a ≥ 16 mV_{p-p} signal.



Note: At some V/div settings, the generator may not provide 8 vertical divisions of signal. Set the generator output to obtain as many vertical divisions of signal as possible.

6. Double-tap the **Horizontal** badge in the Settings bar.
7. Set the **Horizontal Scale** to **1 ms/division**.
8. Tap outside the menu to close it.
9. Record the **Peak-to-Peak** measurement in the **V_{in-pp}** entry of the test record.
10. Double-tap the **Horizontal** badge in the Settings bar.
11. Set the **Horizontal Scale** to **4 ns/division**.
12. Adjust the signal source to the maximum bandwidth frequency for the bandwidth and model being tested.
13. *Record the peak-to-peak measurement as follows:*

- a. Record the **Peak-to-Peak** measurement at the new frequency in the **V_{bw-pp}** entry of the test record.

14. Use the values of **V_{bw-pp}** and **V_{in-pp}** recorded in the test record, and the following equation, to calculate the Gain at bandwidth:

$$\text{Gain} = V_{bw-pp} / V_{in-pp}.$$

To pass the performance measurement test, Gain should be ≥ 0.707 . Enter **Gain** in the test record.

15. Repeat steps 4 on page 92 through 14 on page 92 for all combinations of Vertical Scale settings listed in the test record.
16. *Repeat the tests at 1 MΩ impedance as follows:*
 - a. Set the calibrator output to Off or 0 volts.
 - b. Change the calibrator impedance to **1 MΩ**.
 - c. Double-tap the badge of the channel under test to open its menu.
 - d. Set the **Termination** to **1 MΩ**.
 - e. Repeat steps 4 on page 92 through 16 on page 92, but leave the termination set to **1 MΩ**.
17. *Repeat the test for all remaining channels as follows:*
 - a. Set the calibrator to **0** volts and **50 Ω** output impedance.
 - b. Move the calibrator output to the next channel input to be tested.
 - c. Double-tap the channel badge of the channel that you have finished testing and set **Display** to **Off**.
 - d. Tap the channel button on the oscilloscope Settings bar of the next channel to test.
 - e. Double-tap the **Peak-to-Peak** measurement badge.
 - f. Tap the **Configure** panel.

- g. Tap the **Source 1** field and select the next channel to test.
- h. Starting from step 4 on page 92, repeat the procedure until all channels have been tested.

Check random noise

This test checks random noise at 1 M Ω and 50 Ω for each channel, in HiRes acquisition mode. You do not need to connect any test equipment to the oscilloscope for this test.

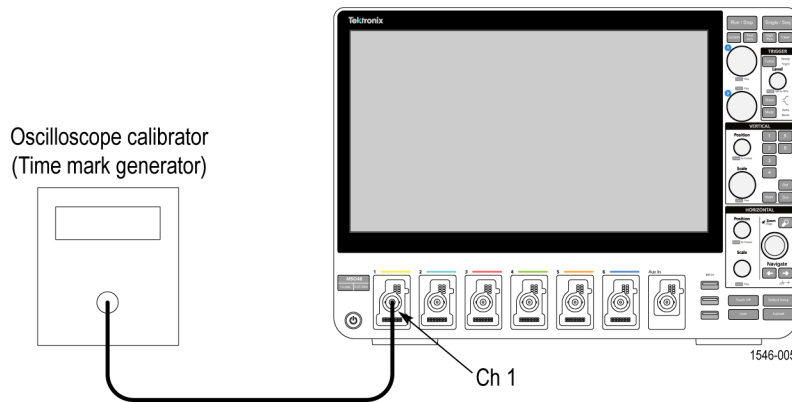
1. Disconnect everything from the oscilloscope inputs.
2. Tap **File > Default Setup**.
3. Turn on **HiRes** Mode except for 1.5 GHz instruments. 1.5 GHz instruments must be tested in **Sample** mode.
4. Add the **AC RMS** measurement:
 - a. Tap the **Add New... Measure** button.
 - b. Set the **Source** to the channel being tested.
 - c. In the **Amplitude Measurements** panel, double-tap the **AC RMS** measurement button to add the measurement badge to the Results bar.
 - d. Tap outside the menu to close it.
 - e. Double-tap the **AC RMS** measurement badge and tap **Show Statistics in Badge** to display statistics in the measurement badge.
 - f. Tap the **Filter / Limit Results** panel.
 - g. Turn on **Limit Measurement Population**.
 - h. Set the limit to **100**.
 - i. Tap outside the menu to close it.
5. Set up the Horizontal mode:
 - a. Double-tap the **Horizontal** setting badge.
 - b. Set **Horizontal Mode** to **Manual**.
 - c. Set the **Record Length** to **2 Mpts**.
 - d. Tap outside the menu to close it.
6. Double-tap the Channel badge of the channel being tested.
7. Set the **Vertical Scale** value to **1 mV**.
8. *Check 1 M Ω termination as follows:*
 - a. In the Channel badge menu, tap **1 M Ω termination**.
 - b. Tap the **Bandwidth Limit** field and select the highest frequency listed.
 - c. Set the channel **Position** value to **340 mdivs**.
 - d. Once the measurement count (N) in the AC RMS measurement badge reaches 100, record the AC RMS Mean value (the μ readout).
 - e. Set the channel vertical **Position** value to **360 mdivs**.
 - f. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the μ readout).
 - g. Average the two values and record the result in the **1 mV/div > Full** row of the **1 M Ω** column of the Test Result record.
 - h. In the channel badge menu, tap the **Bandwidth Limit** field and select **250 MHz**.
 - i. Set the channel vertical **Position** value to **340 mdivs**.
 - j. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the μ readout).
 - k. Set the channel vertical Position value to **360 mdivs**.
 - l. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the μ readout).
 - m. Average the two values and record the result in the **1 mV/div > 250MHz limit** row of the **1 M Ω** column of the Test Result record.

- n. Tap the **Bandwidth Limit** field and select **20 MHz**.
 - o. Set the channel vertical **Position** value to **340 mdivs**.
 - p. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - q. Set the channel vertical **Position** value to **360 mdivs**.
 - r. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - s. Average the two values and record the result in the **1 mV/div > 20MHz limit** row of the **1 MΩ** column of the Test Result record.
9. *Check 50 Ω termination as follows:*
- a. In the Channel badge, set **Termination** to **50 Ω**.
 - b. Tap the **Bandwidth Limit** field and select the highest frequency listed.
 - c. Set the channel vertical **Position** value to **340 mdivs**.
 - d. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - e. Set the channel vertical **Position** value to **360 mdivs**.
 - f. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - g. Average the two values and record the result in the **1 mV/div > Full** row of the **50 Ω** column of the Test Result record.
 - h. Tap the **Bandwidth Limit** field and select **250 MHz**.
 - i. Set the channel vertical **Position** value to **340 mdivs**.
 - j. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - k. Set the channel vertical **Position** value to **360 mdivs**.
 - l. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - m. Average the two values and record the result in the **1 mV/div > 250MHz limit** row of the **50 Ω** column of the Test Result record.
 - n. Tap the **Bandwidth Limit** field and select **20 MHz**.
 - o. Set the channel vertical **Position** value to **340 mdivs**.
 - p. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - q. Set the channel vertical **Position** value to **360 mdivs**.
 - r. Once the measurement count (N) in the measurement badge reaches 100, record the AC RMS Mean value (the **μ** readout).
 - s. Average the two values and record the result in the **1 mV/div > 20MHz limit** row of the **50 Ω** column of the Test Result record.
10. *Repeat 1 MΩ and 50 Ω tests at all V/div settings for the current channel:*
- a. In the Channel badge, set the **Vertical Scale** setting to the next value in the test record (2 mV, 5 mV, and so on, up to 1 V/div).
 - b. Repeat steps 8 on page 93 through 9 on page 94.
11. *Repeat all tests for the remaining input channels:*
- a. Double-tap the **AC RMS** measurement badge.
 - b. Tap the **Configure** panel.
 - c. Tap the **Source 1** field and select the next channel to test.
 - d. Double-tap the channel badge of the channel that you have finished testing and set **Display** to **Off**.
 - e. Tap the channel button on the oscilloscope Settings bar of the next channel to test.
 - f. Double-tap the channel badge for the channel being tested.
 - g. Starting at step 7 on page 93, repeat these procedures for each input channel.

Check long term sample rate

This test checks the sample rate and delay time accuracy (time base).

1. Connect the output of a time mark generator to the oscilloscope channel 1 input using a 50 Ω cable, as shown in the following illustration.



WARNING: Set the generator output to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.

2. Set the time mark generator period to **80 ms**. Use a time mark waveform with a fast rising edge.
3. If it is adjustable, set the time mark amplitude to approximately **2 V_{p-p}**.
4. Tap **File > Default Setup**.
5. Tap the channel 1 button on the Settings bar.
6. Double-tap the Channel 1 badge to open its Configuration menu.
7. Set **Termination** to **50 Ω**.
8. Set **Vertical Scale** to **500 mV**.
9. Set the **Position** value to center the time mark signal on the screen.
10. Tap outside the menu area to close it.
11. Double-tap the **Horizontal** settings badge.
12. Set the **Horizontal Scale** to **100 ns/div**.
13. Tap outside the menu area to close it.
14. Double-tap the **Trigger** settings badge.
15. Set **Source** to the channel being tested.
16. Set the **Level** as necessary for a triggered display.
17. Tap outside the menu area to close it.
18. Double-tap the **Horizontal** settings badge.
19. Adjust the **Position** value to move the trigger point to the center of the screen.
20. Turn **Delay** to **On** and set **Position** to **80 ms**.
21. Set the **Horizontal Scale** to **100 ns/div**.
22. Observe where the rising edge of the marker crosses the center horizontal graticule line. The rising edge should cross within ± 2 divisions of the vertical center graticule. Enter the deviation in the test record.



Note: A 2.5×10^{-6} time base error is 2 divisions of displacement.

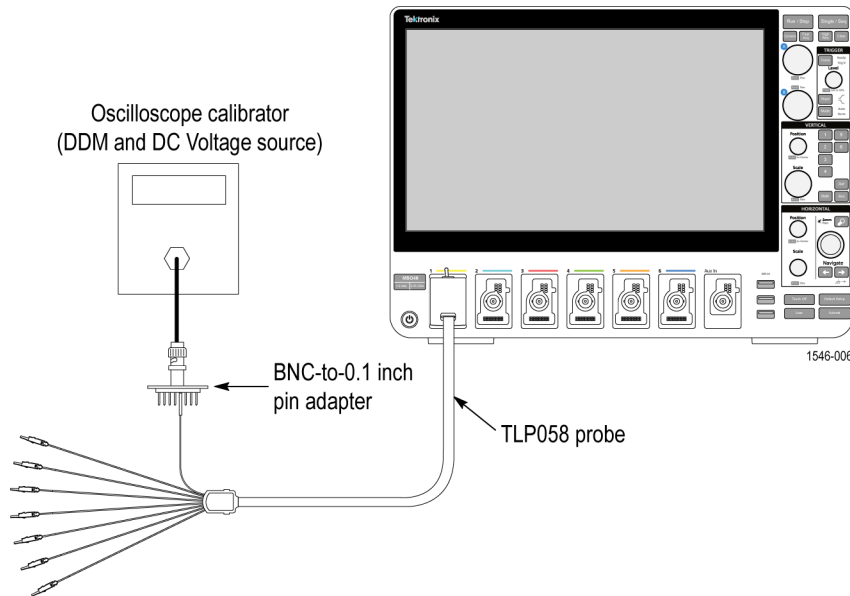
Check digital threshold accuracy

This test checks the threshold accuracy of the TLP058 logic probe digital channels D0-D7 at 0 V and 25 °C, for all oscilloscope input channels.



Note: Threshold Accuracy is a function of the logic probe only. It is a typical specification. The Threshold Accuracy test checks the typical logic probe performance, and may be considered a functional check of the oscilloscope digital input.

1. Connect a TLP058 digital probe to channel 1.



2. Connect the DC voltage source to digital channel D0.



WARNING: Set the generator output to Off or 0 volts before connecting, disconnecting, or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.

If you are using the Fluke 9500 calibrator as the DC voltage source, connect the calibrator head to the digital channel D0, using the BNC-to-0.1 inch pin adapter listed in the table. Be sure to connect channel D0 to both the corresponding signal pin and to a ground pin on the adapter.

3. Tap **File > Default Setup**. This resets the instrument and adds the channel 1 badge and signal to the display.
4. Display the digital channels and set the thresholds as follows:
 - a. Double-tap the badge of the channel under test on the Settings bar.
 - b. Double-tap the **Threshold** field at the bottom of the menu and set the value to **0 V**.
 - c. Tap **Set All Thresholds**. All thresholds are now set for the 0 V threshold check.
 - d. Tap outside the menu to close it.
5. Double-tap the **Horizontal** badge in the Settings bar.
6. Set the **Horizontal Scale** to **10 ns/div**.
7. Tap outside the menu to close it.
8. Set the calibrator DC voltage output (Vs) to **-400 mV**.
9. Wait 1 second. Verify that the logic level is low on **D0**.
10. Increment Vs by **+10 mV**. Wait 1 second and check the logic level of the channel D0 signal display.

If the signal level is a logic low or is alternating between high and low, continue to increment Vs by +10 mV, wait 1 second, and check the logic level until the logic state is a steady high.
11. Record this Vs value as **Vs-** for D0 of the test record.
12. Double-tap the **Trigger** badge and set the **Slope** to **Falling** edge.
13. Set the DC voltage source (Vs) to **+400 mV**.
14. Wait 1 second. Verify that the logic level is high.
15. Decrement Vs by **-10 mV**. Wait 1 second and check the logic level of the channel D0 signal display.

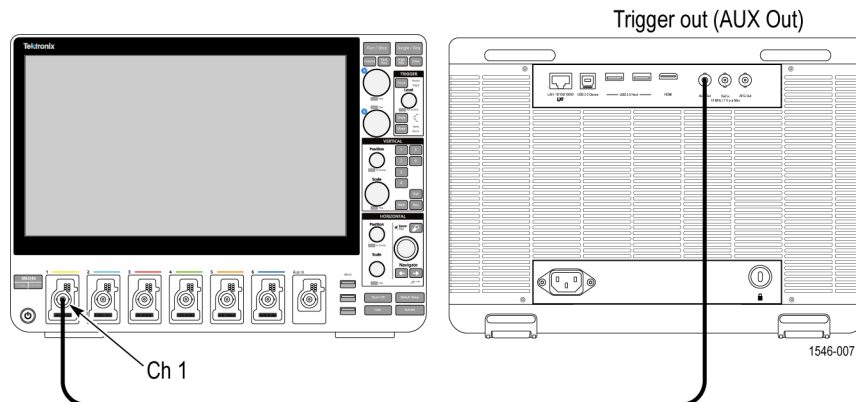
If the signal level is a logic high or is alternating between high and low, continue to decrement V_s by -10 mV, wait 1 second, and check the logic level until the logic state is a steady low.

16. Record this V_s value as **V_{s+}** for D0 of the test record.
17. Find the average using this formula: $V_{sAvg} = (V_{s-} + V_{s+})/2$.
18. Record the average as the test result for D0 in the test record. The test result should be between the low and high limits.
19. Repeat the procedure for all remaining digital channels as follows:
 - a. Connect the next digital channel to be tested (D1, D2, and so on) to the DC voltage source.
 - b. Repeat steps 8 on page 96 through 19 on page 97, until all digital channels have been tested for this input channel.
20. Repeat the procedure for all remaining input channels as follows:
 - a. Move the TLP058 digital probe from channel 1 to channel 2.
 - b. Set the generator output to 0 volts and Off.
 - c. Repeat steps starting at 2 on page 96 for the channel being tested (channel 2, channel 3, and so on).

Check AUX Out output voltage levels

This test checks the output voltage levels from the AUX Out connector.

1. Use a 50 Ω cable to connect the AUX Out signal from the rear of the instrument to the channel 1 input of the same instrument, as shown in the following illustration.



2. Tap **File > Default Setup**. This resets the instrument and adds the channel 1 badge and signal to the display.
3. Double-tap the badge of the channel 1 badge to open its configuration menu.
4. Set the **Vertical Scale** to **1 V/div**.
5. Tap outside the menu to close it.
6. Double-tap the **Horizontal** badge in the Settings bar.
7. Set the **Horizontal Scale** to **400 ns/div**.
8. Tap outside the menu to close it.
9. Record the Maximum and Minimum measurements at 1 M Ω termination as follows:
 - a. Tap the **Add New... Measure** button.
 - b. In the Amplitude Measurements panel, set the **Source** to **Ch 1**.
 - c. Double-tap the **Maximum** button to add the measurement badge to the Results bar.
 - d. Double-tap the **Minimum** button to add the measurement badge to the Results bar.
 - e. Tap outside the menu to close it.
 - f. Double-tap the **Maximum** results badge.

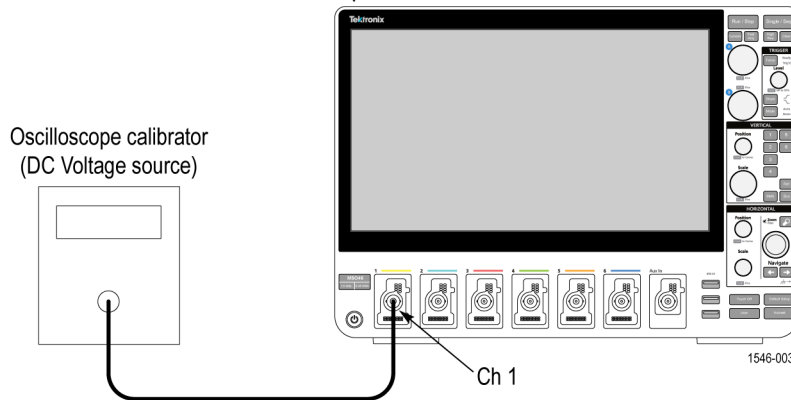
- g. Tap **Show Statistics in Badge**.
 - h. Tap **FILTER/LIMIT RESULTS** to open the panel.
 - i. Tap **Limit Measurement Population** to toggle it to **On**.
 - j. Tap outside the menu to close it.
 - k. Double-tap the **Minimum** results badge.
 - l. Tap **Show Statistics in Badge**.
 - m. Tap **FILTER/LIMIT RESULTS** to open the panel.
 - n. Tap **Limit Measurement Population** to toggle it to **On**.
 - o. Tap outside the menu to close it.
 - p. Enter the Maximum and Minimum measurement readings in the 1 M Ω row of the test record.
10. Record the Maximum and Minimum measurements at 50 Ω termination as follows:
- a. Double-tap the **Ch 1** badge to open its configuration menu.
 - b. Set **Termination** to 50 Ω .
 - c. Tap outside the menu to close it.
 - d. Enter the Maximum and Minimum measurement readings in the 50 Ω row of the test record.

Check DVM voltage accuracy (DC)

This test checks the DC voltage accuracy of the Digital Volt Meter (DVM) option. The DVM option is available for free when you register the instrument at tek.com.

Procedure

1. Connect the oscilloscope to a DC voltage source to run this test. If using the Fluke 9500 calibrator as the DC voltage source, connect the calibrator head to the oscilloscope channel to test.



WARNING: Set the generator output to Off or 0 volts before connecting, disconnecting, or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.

2. Set the calibrator impedance to 1 M Ω .
3. Tap **File > Default Setup**. This resets the instrument and adds the channel 1 badge and signal to the display.
4. Set the channel settings:
 - a) Double tap the badge of the channel under test to open its menu.
 - b) Check that **Position** is set to 0 divs. If not, set the position to 0 divisions.
 - c) Confirm that **Termination** is set to 1 M Ω .
 - d) Set the **Bandwidth Limit** to 20 MHz.
5. Set the calibrator impedance to 1 M Ω .


6. Double-tap the **Horizontal** badge and set **Horizontal Scale** to **1 ms/div**.
7. Tap outside the menu to close it.
8. Double-tap the **Acquisition** badge and set the **Acquisition Mode** to **Average**.
9. Verify or set the **Number of Waveforms** to **16**.
10. Tap outside the menu to close it.
11. Double-tap the **Trigger** badge and set the **Source** to **AC Line**.
12. Tap outside the menu to close it.
13. Tap the **DVM** button to add the DVM badge to the Results bar.
14. In the **DVM** menu, set **Source** to the channel to be tested.
15. Set **Mode** to **DC**.
16. Tap outside the menu to close it.
17. Set the calibrator to the input voltage shown in the test record (for example, -5 V for a 1 V/div setting).
18. In the channel under test menu, set the **Offset** value to that shown in the test record (for example, -5 V for -5 V input and 1 V/div setting).
19. Set the **Vertical Scale** field to match the value in the test record (for example, 1 V/div).
20. Enter the measured value on the DVM badge into the DVM Voltage Accuracy Tests record.
21. Repeat the procedure (steps [17](#) on page 99, [18](#) on page 99, [19](#) on page 99 and [20](#) on page 99) for each volts/division setting shown in the test record.
22. Repeat all steps, starting with step [4](#) on page 98, for each oscilloscope channel to check. To set the next channel to test:
 - a) Double tap the badge of the channel under test to open its menu.
 - b) Set **Display** to **Off**.
 - c) Tap the channel button in the Settings bar of the next channel to test to add that channel badge and signal to the display.

Check DVM voltage accuracy (AC)

This test checks the AC voltage accuracy of the Digital Volt Meter (DVM) option. The DVM option is available for free when you register the instrument at tek.com.

Procedure

1. Connect the output of the leveled square wave generator (for example, Fluke 9500) to the oscilloscope channel 1 input.


WARNING: Set the generator output to Off or 0 volts before connecting, disconnecting, or moving the test hookup during the performance of this procedure. The generator is capable of providing dangerous voltages.
2. Set the generator to **50 Ω** output impedance ($50\text{ }\Omega$ source impedance).
3. Set the generator to produce a square wave of the amplitude and frequency listed in the test record (for example, 20 mV_{pp} at 1 kHz).
4. Tap **File > Default Setup** to reset the instrument and add the channel 1 badge and signal to the display.
5. Tap the **DVM** button to add the DVM badge to the Results bar.
6. Set the DVM **Mode** to **AC RMS**.
7. In the DVM menu, set **Source** to the channel to be tested.
8. Double-tap the channel badge of the channel being tested to open its configuration menu.
9. Set **Termination** to **50 Ω** .
10. Use the **Vertical Scale** controls to set the signal height so that the signal covers between 4 and 8 vertical divisions on the screen.
11. Enter the DVM measured value in the test record.
12. Repeat steps [10](#) on page 99 and [11](#) on page 99 for each voltage and frequency combination shown in the record.
13. Repeat all steps to test all remaining oscilloscope channels. To set the next channel to test:
 - a) Double tap the badge of the channel under test to open its menu.

- b) Set **Display** to **Off**.
- c) Tap the channel button in the Settings bar of the next channel to test to add that channel badge and signal to the display.

Check trigger frequency accuracy and maximum input frequency

This test checks trigger frequency counter accuracy. The trigger frequency counter is part of the free DVM and trigger frequency option that is available when you register the instrument at tek.com.

Procedure

1. Tap **File > Default Setup** to reset the instrument and add the channel 1 badge and signal to the display.
2. Connect the **10 MHz Reference out** from the time mark generator to the **Ref In** connector on the back of the oscilloscope.
3. Connect the output of the time mark generator to the oscilloscope channel input being tested using a 50 Ω cable. Set the time mark generator to a 50 Ω source and a fast rising edge waveform (≥ 3 mV/ns).
4. Set the time mark generator frequency to the first value shown in the test record, starting at **100 Hz**.
5. Set the mark amplitude to **1 V_{pp}**, which makes a 2 divisions high waveform.
6. Double-tap the channel badge being tested (starting with channel 1) and set **Termination** to **50 Ω** .
7. Set the channel **Vertical Scale** to **500 mV/div**.
8. Tap outside the menu to close it.
9. Double-tap the **Acquisition** badge and set the **Timebase Reference Source** to .
10. Tap outside the menu to close it.
11. Double-tap the **Horizontal** badge and use the **Horizontal Scale** controls to display at least 2 cycles of the waveform.
12. Tap outside the menu to close it.
13. Double-tap the **Trigger** badge to open its menu.
 - a) Set the **Source** field to the input channel being tested.
 - b) Tap the **Set to 50%** button to obtain a stable display.
 - c) Tap the **Mode & Holdoff** panel to open the **Mode & Holdoff** configuration menu.
 - d) In the **Mode & Hold Off** menu, set the **Trigger Frequency Counter** to **On**. The trigger frequency readout is at the bottom of the Trigger badge.
 - e) Tap outside the menu to close it.
14. Double-tap the channel badge being tested (starting with channel 1) and use the **Position** controls to vertically center the time mark in the waveform graticule.
15. Enter the value of the trigger frequency (**F** readout in the **Trigger** badge) in the test record for that frequency.
16. Repeat this procedure for each frequency setting shown in the record. Make sure to adjust the Horizontal scale after each calibrator frequency change to show at least two cycles of the waveform on the screen.
17. Repeat all these steps to test each oscilloscope channel.

Arbitrary function generator

Check AFG sine and ramp frequency accuracy

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

1. Connect a 50 Ω cable from the **AFG Out** connector to the frequency counter input as shown in the following figure.

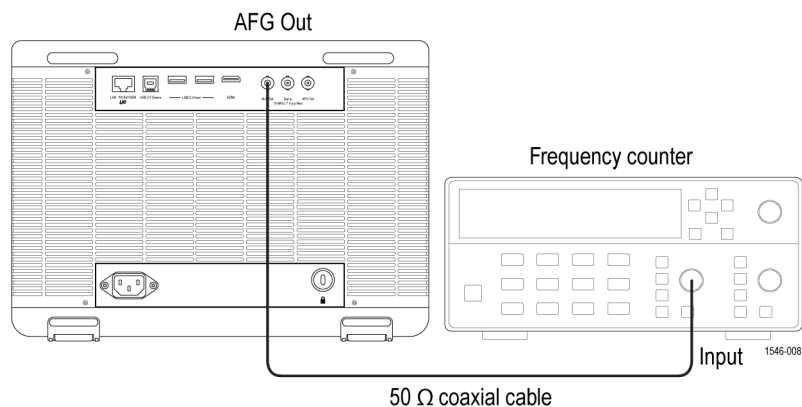


Figure 1: Frequency/period test

2. Tap **File > Default Setup** to set the instrument to the factory default settings.
3. Tap the **AFG** button to open the **AFG** menu.
4. Set the arbitrary function generator output as follows:

| Select menu | Setting |
|---------------|----------------------|
| Output | On |
| Waveform Type | Sine |
| Frequency | 1.000000 MHz |
| Amplitude | 1.00 V _{PP} |

5. Turn on the frequency counter:
 - a. Double-tap the **Trigger** badge to open its menu.
 - b. Set the **Source** field to the input channel being tested.
 - c. Tap the **Set to 50%** button to obtain a stable display.
 - d. Tap the **Mode & Holdoff** panel to open the Mode & Holdoff configuration menu
 - e. In the Mode & Hold Off menu, set the **Trigger Frequency Counter** to **On**. The trigger frequency readout is at the bottom of the Trigger badge.
 - f. Tap outside the menu to close it.
6. Check that the reading of the frequency counter is between **0.999950 MHz** and **1.000050 MHz**. Enter the value in the Test record.
7. Set the arbitrary function generator output as follows:

| Select menu | Setting |
|---------------|---------|
| Waveform Type | Ramp |
| Frequency | 500 kHz |

8. Check that reading of the frequency counter is between **499.975 kHz** and **500.025 kHz**. Enter the value in the Test record.

Check AFG square and pulse frequency accuracy

This test verifies the frequency accuracy of the arbitrary function generator. All output frequencies are derived from a single internally 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.

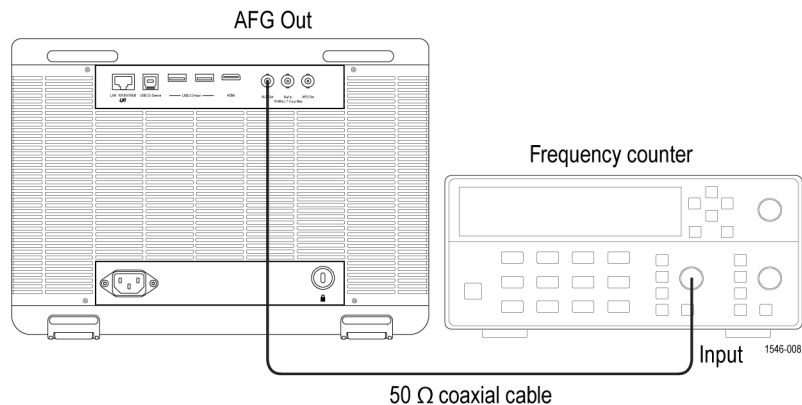


Figure 2: Frequency/period test

2. Tap **File > Default Setup** to set the instrument to the factory default settings.
3. Tap the **AFG** button to open the AFG menu.
4. Set the arbitrary function generator as follows:

| Select menu | Setting |
|---------------|----------------------|
| Waveform Type | Square |
| Frequency | 1.000000 MHz |
| Amplitude | 1.00 V _{PP} |
| Output | On |

5. Turn on the frequency counter:
 - a. Double-tap the **Trigger** badge to open its menu.
 - b. Set the **Source** field to the input channel being tested.
 - c. Tap the **Set to 50%** button to obtain a stable display.
 - d. Tap the **Mode & Holdoff** panel to open the Mode & Holdoff configuration menu
 - e. In the Mode & Hold Off menu, set the **Trigger Frequency Counter** to **On**. The trigger frequency readout is at the bottom of the Trigger badge.
 - f. Tap outside the menu to close it.
6. Check that the frequency counter readout is between **0.999950 MHz** and **1.00005 MHz**. Enter the value in the Test record.
7. Set up the arbitrary function generator as follows:

| Select menu | Setting |
|---------------|---------|
| Waveform Type | Pulse |

8. Check that reading of the frequency counter is between **0.999950 MHz** and **1.000050 MHz**. Enter the value in the Test record.

Check AFG signal amplitude accuracy

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 resistance value.



Figure 3: 50 Ω terminator accuracy

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

Table 2: CF (Calibration Factor) = 1.414 × ((50 / Measurement Ω) + 1)

| Measurement (reading of the DMM) | Calculated CF |
|----------------------------------|---------------|
| | |

Examples:

For a measurement of 50.50 Ω, CF = 1.414 (50 / 50.50 + 1) = **2.814**.

For a measurement of 49.62 Ω, CF = 1.414 (50 / 49.62 + 1) = **2.839**.

3. Connect the arbitrary function generator output to the DMM as shown in the following figure. Be sure to connect the 50 Ω terminator to the **AFG Out** connector.

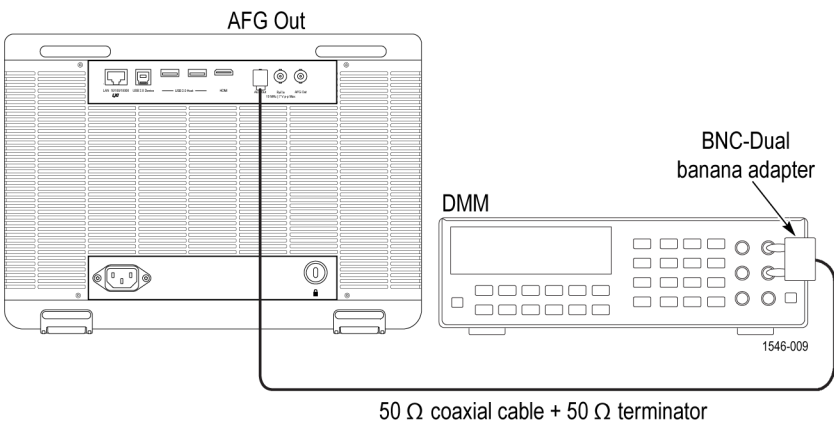


Figure 4: Amplitude test

4. Tap the **AFG** button and set up the arbitrary function generator output as follows:

| Select menu | Setting |
|----------------|---------------------|
| Waveform Type | Sine |
| Frequency | 1.000000 kHz |
| Amplitude | 30 mV _{PP} |
| Load Impedance | 50 Ω |
| Output | On |

5. Measure the **AC RMS** voltage readout on the DMM.
6. Multiply the DMM voltage by the calculated CF to get the corrected peak to peak voltage. Enter the resulting value in the Measurement field in the following table.
7. Change the AFG output amplitude to the next value in the table.

8. Repeat steps 5 on page 103 through 7 on page 103 for each amplitude value. Check that the peak to peak voltages are within the limits in the table below. Enter the values in the test record.

| Waveform Type | Frequency | Amplitude | Measurement | Range |
|---------------|-----------|------------------------|-------------|---|
| Sine | 1.000 kHz | 30.0 mV _{PP} | | 28.55 mV _{PP} - 31.45 mV _{PP} |
| Sine | 1.000 kHz | 300.0 mV _{PP} | | 294.5 mV _{PP} - 305.5 mV _{PP} |
| Sine | 1.000 kHz | 800.0 mV _{PP} | | 787.0 mV _{PP} - 813.0 mV _{PP} |
| Sine | 1.000 kHz | 1.500 V _{PP} | | 1.4765 V _{PP} - 1.5235 V _{PP} |
| Sine | 1.000 kHz | 2.000 V _{PP} | | 1.969 V _{PP} - 2.031 V _{PP} |
| Sine | 1.000 kHz | 2.500 V _{PP} | | 2.4615 V _{PP} - 2.5385 V _{PP} |

Check AFG DC offset accuracy

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 the 50 Ω terminator in advance of this 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 resistance value.

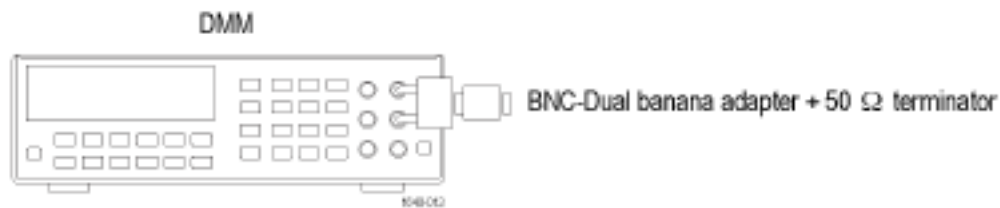


Figure 5: 50 Ω terminator accuracy

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

Table 3: CF (Calibration Factor) = $0.5 \times ((50 / \text{Measurement } \Omega) + 1)$

| Measurement (reading of the DMM) | Calculated CF |
|----------------------------------|---------------|
| | |

Examples:

- For a measurement of 50.50 Ω, CF = $0.5 (50 / 50.50 + 1) = \mathbf{0.9951}$.
 - For a measurement of 49.62 Ω, CF = $0.5 (50 / 49.62 + 1) = \mathbf{1.0038}$.
3. Connect the arbitrary function generator output to the DMM as shown in the following figure. Be sure to connect the 50 Ω terminator to the arbitrary function generator **AFG Output** connector.

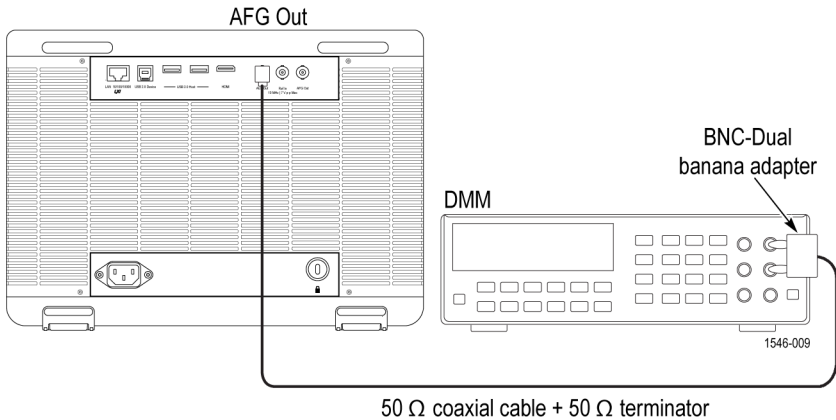


Figure 6: DC offset tests

- Tap the **AFG** button and set up the arbitrary function generator as follows:

| Select menu | Setting |
|---------------|----------|
| Waveform Type | DC |
| Offset | + 1.25 V |
| Output | On |

- Measure the voltage readout on the DMM.
- Multiply the DMM voltage by the calculated CF to get the corrected offset voltage. Enter the resulting value in the Measurement field in the following table.

| Function | Offset | Measurement | Range |
|----------|------------|-------------|------------------------------|
| DC | + 1.25 Vdc | Vdc | 1.23025 Vdc to 1.26975 Vdc |
| DC | 0.000 Vdc | Vdc | - 0.001 Vdc to + 0.001 Vdc |
| DC | - 1.25 Vdc | Vdc | -1.26975 Vdc to -1.23025 Vdc |

- Change the AFG output amplitude to the next value in the table, measure the voltage readout on the DMM, multiply the DMM readout by the calculated CF to get the corrected offset voltage, and enter the resulting value in the Measurement field in the table.
- Verify that the corrected offset measurements are within the range.