



**MSO70000C/DX,  
DPO70000C/DX, DPO7000C,  
MSO5000/B, and DPO5000/B  
Series Oscilloscopes  
Specifications and Performance Verification  
Technical Reference**



Revision D



077-0063-15





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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.

This document supports product firmware version 6.8.0 and above.

**Revision D**

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### **Contacting Tektronix**

Tektronix, Inc.  
14150 SW Karl Braun Drive  
P.O. Box 500  
Beaverton, OR 97077  
USA

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

- In North America, call 1-800-833-9200.
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# 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.

## 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.

**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 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.



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**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.*

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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.

## Terms in the manual

These terms may appear in this manual:



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

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

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## 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 symbols may appear on the product:



# Specifications (MSO70000C/DX, DPO70000C/DX, and DPO7000C series)

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 this manual. All specifications apply to all models unless noted otherwise.

**<4 GHz models.** Includes the DPO7000C Series instruments unless noted otherwise.

**Table 1: Instrument Model Numbers (<4 GHz)**

| DPO             |
|-----------------|
| 7354C (3.5 GHz) |
| 7254C (2.5 GHz) |
| 7104C (1 GHz)   |
| 7054C (500 MHz) |

**≥4 GHz, ≤20 GHz models.** Includes the MSO70000C and DPO70000C Series instruments unless noted otherwise.

**Table 2: Instrument Model Numbers (≥4 GHz, ≤20 GHz)**

| MSO               | DPO               |
|-------------------|-------------------|
| 70404C (4 GHz)    | 70404C (4 GHz)    |
| 70604C (6 GHz)    | 70604C (6 GHz)    |
| 70804C (8 GHz)    | 70804C (8 GHz)    |
| 71254C (12.5 GHz) | 71254C (12.5 GHz) |
| 71604C (16 GHz)   | 71604C (16 GHz)   |
| 72004C (20 GHz)   | 72004C (20 GHz)   |

**>20 GHz models.** Includes the MSO70000DX and DPO70000DX Series instruments unless noted otherwise.

**Table 3: Instrument Model Numbers (>20 GHz)**

| MSO              | DPO              |
|------------------|------------------|
| 72304DX (23 GHz) | 72304DX (23 GHz) |
| 72504DX (25 GHz) | 72504DX (25 GHz) |
| 73304DX (33 GHz) | 73304DX (33 GHz) |

**≥4 GHz models.** Includes all MSO70000C/DX and DPO70000C/DX Series instruments.

To meet specifications, two conditions must first be met:

- The instrument must have been calibrated in an ambient temperature between 18 °C and 28 °C (64 °F and 82 °F).
- The instrument must be operating within the environmental limits. (See page 1-78.)
- The instrument must be powered from a source that meets the specifications. (See page 2-18.)
- The instrument must have been operating continuously for at least 20 minutes within the specified operating temperature range. (60 minutes continuous operation required for the MSO/DPO70000DX instruments if the ambient relative humidity is greater than 60%.)
- You must perform the Signal Path Compensation procedure after the warm-up period. See the online help for instructions on how to perform signal path compensation. If the ambient temperature changes more than 5 °C, repeat the procedure.

## Vertical system analog channels

**Number of channels** Four channels, all identical

### Input connector

|                          |                                               |
|--------------------------|-----------------------------------------------|
| <b>≥ 4 GHz models</b>    | TekConnect. Power supply compatible with VPI. |
| <b>&lt; 4 GHz models</b> | BNC and VPI probe                             |

### Input coupling

|                               |                                                                                                                                                                                                                                                                                                               |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>&gt;20 GHz models</b>      | DC, 50 Ω to a programmable termination voltage, and GND.<br><br>GND coupling disconnects the input connector from all channel input circuitry and connects a ground reference to the channel input circuitry.<br><br>The termination in 50 Ω coupling can be connected to any DC value from –3.5 V to +3.5 V. |
| <b>≥4 GHz, ≤20 GHz models</b> | DC, 50 Ω, and GND. GND coupling disconnects the input connector from all channel input circuitry and connects a ground reference to the channel input circuitry.                                                                                                                                              |
| <b>&lt;4 GHz models</b>       | DC, AC, or GND. GND coupling approximates ground reference by measuring an unused preamplifier input that has been connected to ground. The signal being measured is not disconnected from the channel input load.                                                                                            |

### Input resistance >20 GHz models

|                             |                                                                                                   |
|-----------------------------|---------------------------------------------------------------------------------------------------|
| <b>≤1.2 VFS settings</b>    | 50 Ω ±3% at 18 to 28 °C (64 to 82 °F)<br><br>50 Ω ±4% over 5 to 45 °C (45 to 113 °F), type tested |
| <b>&gt;1.2 VFS settings</b> | 50 Ω ±4.4% over 5 to 45 °C (45 to 113 °F), type tested                                            |

**Input resistance  $\geq 4$  GHz**

**$\leq 20$  GHz models**

|                                                    |                                                                                                                |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>100 mV<sub>FS</sub> to 995 mV<sub>FS</sub>:</b> | 50 $\Omega$ $\pm 1.5\%$ at 25 °C (77 °F)<br>50 $\Omega$ $\pm 2\%$ over 10 to 45 °C (50 to 113 °F), type tested |
| <b>1 V<sub>FS</sub> to 5 V<sub>FS</sub>:</b>       | 50 $\Omega$ $\pm 2.2 \Omega$ over 10 to 45 °C (50 to 113 °F), type tested                                      |

**Input impedance DC coupled**

**$< 4$  GHz models**

|                                           |                                                          |
|-------------------------------------------|----------------------------------------------------------|
| <b>1 M<math>\Omega</math>, DC coupled</b> | 1 M $\Omega$ $\pm 1\%$ in parallel with 13 pF $\pm 2$ pF |
| <b>50 <math>\Omega</math>, DC coupled</b> | 50 $\Omega$ $\pm 1\%$ , typical                          |

**Maximum input voltage range**

**$> 20$  GHz models**

|                                            |                                                                                                  |
|--------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b><math>\leq 1.2</math> VFS settings:</b> | $\pm 1.5$ V relative to the termination bias (30 mA maximum)<br>$\pm 5$ V absolute maximum input |
| <b><math>&gt; 1.2</math> VFS settings:</b> | 8 V. Limited by maximum Vterm current and the attenuator power rating at maximum temperature.    |

**Maximum input voltage  $\geq 4$  GHz**

**and  $\leq 20$  GHz models**

|                                                     |                     |
|-----------------------------------------------------|---------------------|
| <b><math>&lt; 1.0</math> V/Full Scale settings:</b> | $\pm 3.3$ V Maximum |
| <b><math>\geq 1.0</math> V/Full Scale settings:</b> | $\pm 5.0$ V Maximum |

**Maximum input voltage  $< 4$  GHz**

**models**

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 M<math>\Omega</math> – DC coupled</b>                 | 150 V. Derate at 20 dB/decade to 9 VRMS above 200 kHz.                                                                                                                                                                                                                                                                                                                                         |
| <b>1 M<math>\Omega</math> – AC coupled, or GND coupled</b> | The maximum input voltage at the BNC, between center conductor and ground is 400 V peak. The RMS voltage is limited to $< 150$ V for arbitrary waveshapes including DC. The maximum pulse width for impulses with peaks over 150 V is 50 $\mu$ s. Example: At 0 V to 400 V peak, rectangular wave, the duty factor is 14%.<br><br>The maximum transient withstand voltage is $\pm 800$ V peak. |
| <b>50 <math>\Omega</math></b>                              | 5 V RMS, with peaks $\leq \pm 24$ V                                                                                                                                                                                                                                                                                                                                                            |

**Measurement category for MSO-DPO70K and DPO7K series only**

The measuring terminals on this product are not rated for connection to mains or Measurement Category II, III or IV circuits.

**Input termination voltage (VTerm)**

**range  $> 20$  GHz models**

|                                            |                  |
|--------------------------------------------|------------------|
| <b><math>\leq 1.2</math> VFS settings:</b> | -3.5 V to +3.5 V |
| <b><math>&gt; 1.2</math> VFS settings:</b> | 0 V              |

**Input termination voltage (VTerm)**

**range  $\leq 20$  GHz models**

0 V

**Input VSWR >20 GHz models, typical**

Measured with a TekConnect TCA-292D adaptor and a network analyzer.

|                              |                    |
|------------------------------|--------------------|
| <b>≤1.2 VFS settings:</b>    | 0 – 17 GHz: 1.4:1  |
|                              | 17 – 20 GHz: 1.6:1 |
|                              | 20 – 33 GHz: 2.0:1 |
| <b>&gt;1.2 VFS settings:</b> | 0 – 17 GHz: 1.4:1  |
|                              | 17 – 33 GHz: 2.0:1 |

**Input VSWR ≥4 GHz ≤20 GHz models**

Measured with a TekConnect SMA adapter and a network analyzer

| Input Frequency | VSWR < 1 V/Full Scale | VSWR ≥ 1 V/Full Scale |
|-----------------|-----------------------|-----------------------|
| <2.5 GHz        | 1.25:1                | 1.2:1                 |
| <6 GHz          | 1.5:1                 | 1.2:1                 |
| <14 GHz         | 2.1:1                 | 1.5:1                 |
| <15 GHz         | 2.5:1                 | 1.5:1                 |
| <20 GHz         | 3.2:1                 | 1.9:1                 |

**Input VSWR <4 GHz models**

| Input Frequency | VSWR  |
|-----------------|-------|
| <3.5 GHz        | 3.0:1 |
| <2.5 GHz        | 2.0:1 |
| <2 GHz          | 1.5:1 |
| <1 GHz          | 1.2:1 |

**Number of digitized bits**

8 bits

**Digitizer nonlinearity, typical**

< 1.0 DL (digitization level), differential; < 1 DL integral, independently based

**Sensitivity range**

|                                     |                                                                                                            |
|-------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>&gt;20 GHz models, 50 Ω</b>      | 62.5 mV <sub>FS</sub> to 6 V <sub>FS</sub>                                                                 |
| <b>≥4 GHz, ≤20 GHz models, 50 Ω</b> | 100 mV <sub>FS</sub> to 5 V <sub>FS</sub> . Below 100 mV <sub>FS</sub> , Full Scale (FS) is software zoom. |
| <b>&lt;4 GHz models, 50 Ω</b>       | 1 mV/div to 1 V/division, in a 1-2-5 sequence<br>Fine adjustment available with ≥1% resolution             |
| <b>&lt;4 GHz models, 1 MΩ</b>       | 1 mV/div to 10 V/division, in a 1-2-5 sequence<br>Fine adjustment available with ≥1% resolution            |

**DC gain accuracy sample or average acquisition mode ≥4 GHz models**

± 2%

**DC gain accuracy sample or average acquisition mode <4 GHz models**

± 1.0% with 0 V net offset  
Add 0.5% for ranges <2 mV/div

Add 1.5% x | net offset/Max offset | for ranges <5 mV/div

Add 0.5% x | net offset/Max offset | for ranges ≥ 5 mV/div

Add 0.5% for ranges ≥ 1 V/div in 1 MΩ coupling and with net offset >10 V

**DC voltage measurement accuracy >20 GHz models**

|                                                                                                                          | Gain setting                                | DC measurement accuracy                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Average acquisition mode (≥16 averages)                                                                                  | 62.5 mV <sub>FS</sub> – 1.2 V <sub>FS</sub> | ±[2%   reading - net offset   + 0.4%   net offset   + 0.2%   net offset – Vterm setting   +2.5 mV + 0.014 FS] |
|                                                                                                                          | 1.21 V <sub>FS</sub> – 6 V <sub>FS</sub>    | ±[2%   reading - net offset   + 0.4%   net offset   + 12.5 mV + 0.014 FS]                                     |
| Delta voltage measurement between any two averages of ≥16 waveforms acquired under the same setup and ambient conditions | 62.5 mV <sub>FS</sub> – 6 V <sub>FS</sub>   | ±[2%   reading – net offset   + 0.008 FS]                                                                     |

**DC voltage measurement accuracy ≥4 GHz ≤20 GHz models**

|                                                                                                                          | Gain setting                                 | DC measurement accuracy                                                  |
|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------------|
| Average acquisition mode (≥16 averages)                                                                                  | 100 mV <sub>FS</sub> to 995 mV <sub>FS</sub> | ±[2%   reading – net offset   + 0.35%   net offset   +1.5 mV + 0.014 FS] |
|                                                                                                                          | 1 V <sub>FS</sub> to 5 V <sub>FS</sub>       | ±[2%   reading – net offset   + 0.35%   net offset   +7.5 mV + 0.014 FS] |
| Delta voltage measurement between any two averages of ≥16 waveforms acquired under the same setup and ambient conditions | 100 mV <sub>FS</sub> to 5 V <sub>FS</sub>    | ±[2%   reading   + 0.008 FS]                                             |

**DC voltage measurement accuracy <4 GHz models**

DC accuracy (in volts)

Net offset = offset - ( position × volts/division).

**Average acquisition mode (≥16 averages)**

±(DC Gain Accuracy × | reading -(net offset) | + offset accuracy + 0.1 division)

**Delta voltage measurement between any two averages of ≥16 waveforms acquired with the same setup and ambient conditions**

±(DC Gain Accuracy × | reading | + 0.05 division)

|                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sample acquisition mode, typical</b>                                                                               | $\pm(\text{DC Gain Accuracy} \times  \text{reading} - (\text{net offset})  + \text{offset accuracy} + 0.15 \text{ division} + 0.6 \text{ mV})$                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Delta voltage measurement between any two samples acquired with the same setup and ambient conditions, typical</b> | $\pm(\text{DC Gain Accuracy} \times  \text{reading}  + 0.15 \text{ division} + 1.2 \text{ mV})$<br>Convert offset, position and the constant offset term to volts by multiplying by the appropriate volts/div.<br>Specification applies to any sample and to the High, Low, Max, Min, Mean, Cycle Mean, RMS, and Cycle RMS measurements. Delta volts specification applies to subtractive calculations involving two of these measurements. Delta volts specification applies to the Positive Overshoot, Negative Overshoot, peak-peak, and amplitude measurements. |
| <b>Position range</b>                                                                                                 | $\pm 5 \text{ divisions}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

---

## Offset range

### >20 GHz models

| Full Scale voltage range                    | Offset range |
|---------------------------------------------|--------------|
| 62.5 mV <sub>FS</sub> – 1.2 V <sub>FS</sub> | ±3.4 V       |
| >1.2 V <sub>FS</sub> – 6 V <sub>FS</sub>    | ±6 V         |

### ≥4 GHz, ≤20 GHz models

Offset is reduced to allow for position control according to the following formulas:

10 mV/div to 99.5 mV/div: Offset range =  $\pm(0.5 \text{ V} - (\text{V/div setting} \times 5 \text{ div}))$

100 mV/div to 500 mV/div: Offset range =  $\pm(2.5 \text{ V} - (\text{V/div setting} \times 5 \text{ div}))$

| SCALE range | Offset range |
|-------------|--------------|
| 10 mV/div   | ±0.450 V     |
| 12 mV/div   | ±0.440 V     |
| 14 mV/div   | ±0.430 V     |
| 16 mV/div   | ±0.420 V     |
| 18 mV/div   | ±0.410 V     |
| 19.9 mV/div | ±0.4005 V    |
| 20 mV/div   | ±0.400 V     |
| 30 mV/div   | ±0.350 V     |
| 40 mV/div   | ±0.300 V     |
| 49.8 mV/div | ±0.251 V     |
| 50 mV/div   | ±0.250 V     |
| 60 mV/div   | ±0.200 V     |
| 70 mV/div   | ±0.150 V     |
| 80 mV/div   | ±0.100 V     |
| 90 mV/div   | ±0.050 V     |
| 99.5 mV/div | ±0.0025 V    |
| 100 mV/div  | ±2.00 V      |
| 120 mV/div  | ±1.90 V      |
| 140 mV/div  | ±1.80 V      |
| 160 mV/div  | ±1.70 V      |
| 200 mV/div  | ±1.50 V      |
| 248 mV/div  | ±1.260 V     |
| 250 mV/div  | ±1.250 V     |
| 300 mV/div  | ±1.00 V      |
| 400 mV/div  | ±0.50 V      |
| 500 mV/div  | ±0.00 V      |

<4 GHz models, 50  $\Omega$  coupling

| SCALE range                | Offset range               |
|----------------------------|----------------------------|
| 1 mV/div to 50 mV/div      | $\pm 1.0$ V                |
| 50.5 mV/div to 99.5 mV/div | $\pm 1.5$ V - 10 divisions |
| 100 mV/div to 500 mV/div   | $\pm 10$ V                 |
| 505 mV/div to 1 V/div      | $\pm 15$ V - 10 divisions  |

<4 GHz models, 1 M $\Omega$  coupling

| SCALE range                | Offset range               |
|----------------------------|----------------------------|
| 1 mV/div to 50 mV/div      | $\pm 1$ V                  |
| 50.5 mV/div to 99.5 mV/div | $\pm 1.5$ V - 10 divisions |
| 100 mV/div to 500 mV/div   | $\pm 10$ V                 |
| 505 mV/div to 995 mV/div   | $\pm 15$ V - 10 divisions  |
| 1.0 V/div to 5 V/div       | $\pm 100$ V                |
| 5.05 V/div to 10 V/div     | $\pm 150$ V - 10 divisions |

Offset accuracy

Net offset = offset - (position  $\times$  volts/division).

 >20 GHz models

| Full scale voltage range                     | Offset accuracy                                                                                                                               |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 62.5 mV <sub>FS</sub> to 1.2 V <sub>FS</sub> | $\pm(0.4\% \mid \text{net offset} \mid + 0.2\% \mid \text{net offset} - \text{Vterm setting} \mid + 2.5 \text{ mV} + 1\% \text{ Full Scale})$ |
| >1.2 V <sub>FS</sub> to 6 V <sub>FS</sub>    | $\pm(0.6\% \mid \text{net offset} \mid + 13.4 \text{ mV} + 1\% \text{ Full Scale})$                                                           |

  $\geq 4$  GHz,  $\leq 20$  GHz models

| SCALE range              | Offset accuracy                                                                                  | Temperature variation                                         |
|--------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| 10 mV/div to 99.5 mV/div | $\pm(0.35\% \times \mid \text{net offset} \mid + 1.5 \text{ mV} + 1\% \times \text{Full Scale})$ |                                                               |
| 100 mV/div to 0.5 V/div  | $\pm(0.35\% \times \mid \text{net offset} \mid + 7.5 \text{ mV} + 1\% \times \text{Full Scale})$ | $\pm(0.45\% \times \mid \text{offset} \mid / ^\circ\text{C})$ |

<4 GHz models

| SCALE range              | Offset accuracy                                                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1 mV/div to 9.95 mV/div  | $\pm(0.2\% \times \mid \text{net offset} \mid + 1.5 \text{ mV} + 0.1 \text{ div} \times \text{V/div setting})$  |
| 10 mV/div to 99.5 mV/div | $\pm(0.35\% \times \mid \text{net offset} \mid + 1.5 \text{ mV} + 0.1 \text{ div} \times \text{V/div setting})$ |
| 100 mV/div to 1 V/div    | $\pm(0.35\% \times \mid \text{net offset} \mid + 15 \text{ mV} + 0.1 \text{ div} \times \text{V/div setting})$  |
| 1.01 V/div to 10 V/div   | $\pm(0.25\% \times \mid \text{net offset} \mid + 150 \text{ mV} + 0.1 \text{ div} \times \text{V/div setting})$ |

 Analog bandwidth >20 GHz models

Bandwidth with a TCA292D adapter.

Operating ambient temperature <30  $^\circ\text{C}$ . Use the Temperature variation table to determine the amount of performance derating above the temperature limit.

Enhanced bandwidth only applies to full scale (FS) stepped gain settings of 62.5 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, and 5 V.

The MSO/DPO73304DX, MSO/DPO72504DX, and MSO/DPO72304DX instrument bandwidths with BWE disabled are typical.

| <b>MSO/DPO73304DX</b> | <b>BW settings</b> | <b>Bandwidth</b>       | <b>Sample rate</b> |
|-----------------------|--------------------|------------------------|--------------------|
|                       | No BWE             | DC to >33 GHz, typical | All                |
|                       | 33 GHz BWE         | DC to >33 GHz          | 100 GS/s           |
|                       | 23 GHz BWE         | DC to >23 GHz          | 50 GS/s            |
| <b>MSO/DPO72504DX</b> | <b>BW settings</b> | <b>Bandwidth</b>       | <b>Sample rate</b> |
|                       | No BWE             | DC to >25 GHz, typical | All                |
|                       | 25 GHz BWE         | DC to >25 GHz          | 100 GS/s           |
|                       | 23 GHz BWE         | DC to >23 GHz          | 50 GS/s            |
| <b>MSO/DPO72304DX</b> | <b>BW settings</b> | <b>Bandwidth</b>       | <b>Sample rate</b> |
|                       | No BWE             | DC to >23 GHz, typical | 50, 100 GS/s       |
|                       | 23 GHz BWE         | DC to >23 GHz          | 50, 100 GS/s       |

| <b>Typical temperature derating</b> |                    |
|-------------------------------------|--------------------|
| <b>Frequency</b>                    | <b>TC, (dB/°C)</b> |
| DC — 5 GHz                          | 0.005 dB/°C        |
| 10 GHz                              | 0.010 dB/°C        |
| 15 GHz                              | 0.025 dB/°C        |
| 20 GHz                              | 0.045 dB/°C        |
| 25 GHz                              | 0.065 dB/°C        |
| 30 GHz                              | 0.115 dB/°C        |
| 33 GHz                              | 0.160 dB/°C        |

 **Analog bandwidth  $\geq 4$  GHz,  $\leq 20$  GHz models**

DC 50  $\Omega$  coupling, full bandwidth, TCA-292mm or TCA-N adapter, operating ambient temperature 15 °C to 40 °C (59 °F to 104 °F).

Enhanced bandwidth only applies to full scale (FS) settings of 100 mV, 200 mV, 500 mV, 1 V, and 2.5 V. Enhanced bandwidth of 4 GHz, 6 GHz, and 8 GHz is only available at 25 GS/s and 50 GS/s.

Use the Temperature variation table to determine the amount of performance derating above the temperature limit.

The MSO/DPO72004C and MSO/DPO71604C instrument bandwidths with BWE disabled are typical.

| <b>MSO/DPO72004C</b> | <b>BW Settings</b>                                    | <b>Bandwidth</b>       | <b>Temp constraint</b> |
|----------------------|-------------------------------------------------------|------------------------|------------------------|
|                      | 20 GHz BWE<br>20 mV, 50 mV, 100 mV, and<br>250 mV/div | DC to >20 GHz          | <30 °C                 |
|                      | 20 GHz BWE<br>100 mV full scale (10 mV/div)           | DC to >18 GHz          | <30 °C                 |
|                      | No BWE                                                | DC to >16 GHz, typical | <30 °C                 |

| <b>MSO/DPO71604C</b> | <b>BW Settings</b> | <b>Bandwidth</b>       | <b>Temp constraint</b> |
|----------------------|--------------------|------------------------|------------------------|
|                      | BWE                | DC to >16 GHz          | <30 °C                 |
|                      | No BWE             | DC to >16 GHz, typical | <30 °C                 |

| <b>MSO/DPO71254C</b> | <b>BW Settings</b> | <b>Bandwidth</b> | <b>Temp constraint</b> |
|----------------------|--------------------|------------------|------------------------|
|                      | BWE                | DC to >12.5 GHz  | <30 °C                 |
|                      | No BWE             | DC to >12.5 GHz  | <30 °C                 |

| <b>MSO/DPO70804C</b> | <b>BW Settings</b> | <b>Bandwidth</b> | <b>Temp constraint</b> |
|----------------------|--------------------|------------------|------------------------|
|                      | BWE                | DC to >8 GHz     | <45 °C                 |
|                      | No BWE             | DC to >8 GHz     | <45 °C                 |

| <b>MSO/DPO70604C</b> | <b>BW Settings</b> | <b>Bandwidth</b> | <b>Temp constraint</b> |
|----------------------|--------------------|------------------|------------------------|
|                      | BWE                | DC to >6 GHz     | <45 °C                 |
|                      | No BWE             | DC to >6 GHz     | <45 °C                 |

| <b>MSO/DPO70404C</b> | <b>BW Settings</b> | <b>Bandwidth</b> | <b>Temp constraint</b> |
|----------------------|--------------------|------------------|------------------------|
|                      | BWE                | DC to >4 GHz     | <45 °C                 |
|                      | No BWE             | DC to >4 GHz     | <45 °C                 |

| <b>Typical temperature variation</b> |             |
|--------------------------------------|-------------|
| Frequency                            | TC, (dB/°C) |
| DC — 11 GHz                          | 0           |
| 12.5 GHz                             | – 0.02      |
| 16 GHz                               | – 0.04      |
| 18 GHz                               | – 0.09      |
| 20 GHz                               | – 0.09      |

**Analog bandwidth with P7313 active probe, ≥4 GHz models**

|                              |                       |
|------------------------------|-----------------------|
| MSO/DPO72004C, MSO/DPO71604C | DC >12.5 GHz, typical |
| MSO/DPO71254C                | DC >11 GHz, typical   |
| MSO/DPO70804C                | DC >8 GHz, typical    |
| MSO/DPO70604C                | DC >6 GHz, typical    |
| MSO/DPO70404C                | DC >4 GHz, typical    |

**Analog bandwidth 50  $\Omega$  DC coupled <4 GHz models**

Full bandwidth, operating ambient of  $\leq 30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ ), derated by 1% for each  $^{\circ}\text{C}$  above  $30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ )

Note: The DPO7354C is guaranteed 3.5 GHz bandwidth with BWE On and can be verified with a 4-division sine wave. Typical bandwidth when measured with an 8-division sine wave is 3 GHz.

| <b>DPO7354C</b> | <b>SCALE range</b>      | <b>Bandwidth</b>                                |
|-----------------|-------------------------|-------------------------------------------------|
|                 | 10 mV/div to 1 V/div    | DC to 3.5 GHz, BWE on<br>DC to 2.5 GHz, BWE off |
|                 | 5 mV/div to 9.99 mV/div | DC to 2.0 GHz                                   |
|                 | 2 mV/div to 4.99 mV/div | DC to 500 MHz, typical                          |
|                 | 1 mV/div to 1.99 mV/div | DC to 200 MHz, typical                          |
| <b>DPO7254C</b> | <b>SCALE range</b>      | <b>Bandwidth</b>                                |
|                 | 10 mV/div to 1 V/div    | DC to 2.5 GHz                                   |
|                 | 5 mV/div to 9.99 mV/div | DC to 2.0 GHz                                   |
|                 | 2 mV/div to 4.99 mV/div | DC to 500 MHz, typical                          |
|                 | 1 mV/div to 1.99 mV/div | DC to 200 MHz, typical                          |
| <b>DPO7104C</b> | <b>SCALE range</b>      | <b>Bandwidth</b>                                |
|                 | 5 mV/div to 1 V/div     | DC to 1.0 GHz                                   |
|                 | 2 mV/div to 4.99 mV/div | DC to 500 MHz, typical                          |
|                 | 1 mV/div to 1.99 mV/div | DC to 200 MHz, typical                          |
|                 |                         |                                                 |
| <b>DPO7054C</b> | <b>SCALE range</b>      | <b>Bandwidth</b>                                |
|                 | 5 mV/div to 1 V/div     | DC to 500 MHz                                   |
|                 | 2 mV/div to 4.99 mV/div | DC to 400 MHz, typical                          |
|                 | 1 mV/div to 1.99 mV/div | DC to 200 MHz, typical                          |
|                 |                         |                                                 |

**Analog bandwidth 1 M $\Omega$  DC coupled <4 GHz models**

Full bandwidth, operating ambient temperature of  $\leq 30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ ), derated by 1% for each  $^{\circ}\text{C}$  above  $30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ )

| <b>SCALE range</b>      | <b>Bandwidth</b>       |
|-------------------------|------------------------|
| 5 mV/div to 10 V/div    | DC to 500 MHz, typical |
| 2 mV/div to 4.98 mV/div | DC to 350 MHz, typical |
| 1 mV/div to 1.99 mV/div | DC to 175 MHz, typical |

**Analog bandwidth with TAP2500 VPI probe, typical, DPO7254C**

Full bandwidth, operating ambient of  $\leq 30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ ), derated by 1% for each  $^{\circ}\text{C}$  above  $30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ )

| <b>SCALE range</b>       | <b>Bandwidth</b> |
|--------------------------|------------------|
| $\geq 100$ mV/div        | DC to 2.5 GHz    |
| 50 mV/div to 99.5 mV/div | DC to 2.0 GHz    |
| 20 mV/div to 49.8 mV/div | DC to 500 MHz    |
| 10 mV/div to 19.9 mV/div | DC to 200 MHz    |

**Analog bandwidth with X10 passive probe, typical, <4 GHz models**

Full bandwidth, operating ambient of  $\leq 30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ ), derated by 1% for each  $^{\circ}\text{C}$  above  $30^{\circ}\text{C}$  ( $86^{\circ}\text{F}$ )

| SCALE range             | Bandwidth     |
|-------------------------|---------------|
| 5 mV/div to 10 V/div    | DC to 500 MHz |
| 2 mV/div to 4.98 mV/div | DC to 300 MHz |
| 1 mV/div to 1.99 mV/div | DC to 175 MHz |

**Analog bandwidth selections <4 GHz models**

20 MHz, 250 MHz, and Full

**Lower frequency limit AC coupled <4 GHz models**

10 Hz when 1 M $\Omega$ , AC coupled. The limit is reduced by a factor of 10 when 10X, passive probes are used.

**Upper frequency limit 250 MHz bandwidth limited <4 GHz models**

250 MHz

**Upper frequency limit 20 MHz bandwidth limited <4 GHz models**

20 MHz

**Passband flatness, BWE, typical**

MSO/DPO73304DX, MSO/DPO72504DX, MSO/DPO72304DX

| Step settings                                                                                                                                                                                                                                                         | Temperature constraint  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 62.5 mV <sub>FS</sub> , 100 mV <sub>FS</sub> , 200 mV <sub>FS</sub> , 500 mV <sub>FS</sub> , 1 V <sub>FS</sub> , 2 V <sub>FS</sub> , and 5 V <sub>FS</sub><br>$\pm 0.5$ dB from DC to 50% of nominal bandwidth.<br>$\pm 1.5$ dB from 50% to 80% of nominal bandwidth. | At $25^{\circ}\text{C}$ |
| All other gain settings                                                                                                                                                                                                                                               |                         |
| $\pm 1.0$ dB from DC to 50% of nominal bandwidth<br>$\pm 2.0$ dB from 50% to 80% of nominal bandwidth.                                                                                                                                                                |                         |

MSO/DPO72004C, MSO/DPO71604C, MSO/DPO71254C

Use the Temperature variation table to determine the amount of performance derating above the temperature limit.

| Step settings                                                                                                                                                                                                               | Temperature constraint  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 100 mV <sub>FS</sub> , 200 mV <sub>FS</sub> , 500 mV <sub>FS</sub> , 1 V <sub>FS</sub> , and 2.5 V <sub>FS</sub><br>$\pm 0.5$ dB from DC to 50% of nominal bandwidth.<br>$\pm 1.5$ dB from 50% to 80% of nominal bandwidth. | At $25^{\circ}\text{C}$ |
| Non-step settings                                                                                                                                                                                                           |                         |
| $\pm 1.0$ dB from DC to 50% of nominal bandwidth<br>$\pm 2.0$ dB from 50% to 80% of nominal bandwidth.                                                                                                                      |                         |

**MSO/DPO70804C, MSO/DPO70604C, MSO/DPO70404C**

| Step settings                                                                                 | Temperature constraint |
|-----------------------------------------------------------------------------------------------|------------------------|
| ± 0.5 dB from DC to 50% of nominal bandwidth.<br>± 1 dB from 50% to 80% of nominal bandwidth. | 10 °C to 40 °C         |

**Typical temperature variation**

| Frequency   | TC, (dB/°C) |
|-------------|-------------|
| DC – 11 GHz | 0           |
| 12.5 GHz    | – 0.02      |
| 16 GHz      | – 0.04      |
| 18 GHz      | – 0.09      |
| 20 GHz      | – 0.09      |

**Calculated rise time 50 Ω, typical, >20 GHz models**

|                | DSP On    |           | DSP Off   |           |
|----------------|-----------|-----------|-----------|-----------|
|                | 10% - 90% | 20% - 80% | 10% - 90% | 20% - 80% |
| MSO/DPO73304DX | 13 ps     | 9 ps      | 21 ps     | 14 ps     |
| MSO/DPO72504DX | 16 ps     | 12 ps     | 22 ps     | 15 ps     |
| MSO/DPO72304DX | 17 ps     | 13 ps     | 24 ps     | 16 ps     |

**Calculated rise time 50 Ω, typical, ≥4 GHz ≤20 GHz models**

|                         | DSP On    |           | DSP Off   |           |
|-------------------------|-----------|-----------|-----------|-----------|
|                         | 10% - 90% | 20% - 80% | 10% - 90% | 20% - 80% |
| MSO/DPO72004C at 20 GHz | 19 ps     | 14 ps     | NA        | NA        |
| MSO/DPO72004C at 18 GHz | 22 ps     | 15 ps     | NA        | NA        |
| MSO/DPO71604C           | 24.5 ps   | 17 ps     | 30 ps     | 20 ps     |
| MSO/DPO71254C           | 32 ps     | 22 ps     | 33 ps     | 23 ps     |
| MSO/DPO70804C           | 49 ps     | 34 ps     | 47 ps     | 32 ps     |
| MSO/DPO70604C           | 65 ps     | 45 ps     | 62 ps     | 43 ps     |
| MSO/DPO70404C           | 98 ps     | 68 ps     | 93 ps     | 65 ps     |

**Calculated rise time 50 Ω, typical, <4 GHz models**

**DPO7354C**

| Scale                        | 10% - 90%                                        |
|------------------------------|--------------------------------------------------|
| 1 mV/div - 1.99 mV/div       | 1.2 ns                                           |
| 2 mV/div - 4.99 mV/div       | 650 ps                                           |
| 5 mV/div - 9.9 mV/div        | 180 ps                                           |
| 10 mV/div - 1 V/div, BWE off | 145 ps                                           |
| 10 mV/div - 1 V/div, BWE on  | 115 ps (signals limited to 4 vertical divisions) |

**DPO7254C**

| Scale                  | 10% - 90% |
|------------------------|-----------|
| 1 mV/div - 1.99 mV/div | 1.2 ns    |
| 2 mV/div - 4.99 mV/div | 650 ps    |
| 5 mV/div - 9.9 mV/div  | 180 ps    |
| 10 mV/div - 1 V/div    | 160 ps    |

**DPO7104C**

| Scale                  | 10% - 90% |
|------------------------|-----------|
| 1 mV/div - 1.99 mV/div | 1.2 ns    |
| 2 mV/div - 4.99 mV/div | 580 ps    |
| 5 mV/div - 9.9 mV/div  | 300 ps    |
| 10 mV/div - 1 V/div    | 300 ps    |

**DPO7054C**

| Scale                  | 10% - 90% |
|------------------------|-----------|
| 1 mV/div - 1.99 mV/div | 1.2 ns    |
| 2 mV/div - 4.99 mV/div | 680 ps    |
| 5 mV/div - 9.9 mV/div  | 460 ps    |
| 10 mV/div - 1 V/div    | 460 ps    |

**Step response settling time, typical, >20 GHz models**

The time by which the step response enters and stays below the indicated % error. Step transition occurs at the 50% amplitude point of the step leading edge.

**DSP off**

| Instrument          | Gain setting (FS)          | Settling Error             | Time            |
|---------------------|----------------------------|----------------------------|-----------------|
| MSO/<br>DPO73304DX, | 62.5 mV, 100 mV, 200 mV,   | <6%                        | 150 ps – 400 ps |
| MSO/<br>DPO72504DX, | 500 mV, 1 V, 1.2 V, 1.4 V, | <5% (<5.5%)                | 400 ps – 3 ns   |
| MSO/<br>DPO72304DX  | 2 V, 4 V                   | MSO/<br>DPO73304DX)<br><3% | 3 ns – 1 ms     |

**DSP on (fastest BWE setting)**

DSP on (fastest BWE setting) Instrument Gain setting (FS) Settling

| Instrument          | Gain setting (FS)          | Settling Error | Time            |
|---------------------|----------------------------|----------------|-----------------|
| MSO/<br>DPO73304DX  | 62.5 mV, 100 mV, 200 mV,   | <3.5%          | 150 ps – 400 ps |
| MSO/<br>DPO72504DX, | 500 mV, 1 V, 1.2 V, 1.4 V, | <2.5%          | 400 ps – 3 ns   |
| MSO/<br>DPO72304DX  | 2 V, 4 V                   | <1.5%          | 3 ns – 1 ms     |

**Step response settling time**  
**≥4 GHz, ≤20 GHz models**

The time by which the step response enters and stays below the indicated % error. Step transition occurs at the 50% amplitude point of the step leading edge.

**DSP off**

| Instrument                                                  | Gain setting (FS)                        | ± Step amplitude                    | Settling Error                      | Time                             |
|-------------------------------------------------------------|------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------|
| MSO/<br>DPO72004C<br>MSO/<br>DPO71604C<br>MSO/<br>DPO71254C | 100 mV, 200 mV, 500 mV, 1 V,<br>2 V, 5 V | ≤ 100% FS,<br>≤ 50% FS<br>overdrive | < 9%<br>< 5.5%<br>< 2.5%<br>< 0.15% | 150 ps<br>400 ps<br>3 ns<br>1 ms |
| MSO/<br>DPO70804C<br>MSO/<br>DPO70604C<br>MSO/<br>DPO70404C | 100 mV, 200 mV, 500 mV, 1 V,<br>2 V, 5 V | ≤ 100% FS,<br>≤ 50% FS<br>overdrive | < 6%<br>< 3%<br>< 2.5%<br>< 0.15%   | 150 ps<br>600 ps<br>3 ns<br>1 ms |

**DSP on**

| Instrument                                                  | Gain setting (FS)                               | ± Step amplitude                    | Settling Error                    |                                  |
|-------------------------------------------------------------|-------------------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|
|                                                             |                                                 |                                     | Amount                            | Time                             |
| MSO/<br>DPO72004C<br>MSO/<br>DPO71604C<br>MSO/<br>DPO71254C | 100 mV<br>200 mV<br>500 mV<br>1 V<br>2 V<br>5 V | ≤ 100% FS,<br>≤ 50% FS<br>overdrive | < 6%<br>< 3%<br>< 2.5%<br>< 0.15% | 100 ps<br>400 ps<br>3 ns<br>1 ms |
| MSO/<br>DPO70804C                                           | 100 mV<br>200 mV<br>500 mV<br>1 V<br>2 V<br>5 V | ≤ 100% FS,<br>≤ 50% FS<br>overdrive | < 6%<br>< 3%<br>< 2.5%<br>< 0.15% | 150 ps<br>600 ps<br>3 ns<br>1 ms |
| MSO/<br>DPO70604C                                           | 100 mV<br>200 mV<br>500 mV<br>1 V<br>2 V<br>5 V | ≤ 100% FS,<br>≤ 50% FS<br>overdrive | < 6%<br>< 3%<br>< 2.5%<br>< 0.15% | 200 ps<br>800 ps<br>3 ns<br>1 ms |
| MSO/<br>DPO70404C                                           | 100 mV<br>200 mV<br>500 mV<br>1 V<br>2 V<br>5 V | ≤ 100% FS,<br>≤ 50% FS<br>overdrive | < 6%<br>< 3%<br>< 2.5%<br>< 0.15% | 300 ps<br>1.2 ns<br>3 ns<br>1 ms |

**Pulse response peak detect or envelope mode <4 GHz models**

This instrument uses analog peak detection for pulse capture in Peak Detect or Envelope mode at sample rates of 125 MS per second and slower. At faster sample rates the instrument uses conventional sampling.

The minimum single pulse widths for 50% or greater amplitude capture for pulses greater than 2 divisions in magnitude.

| Sample rate setting | Minimum pulse width         |
|---------------------|-----------------------------|
| ≤ 10 GS/s           | 1 ÷ (sample rate) or 100 ps |
| 40 MS/s             | 1 ÷ (sample rate) or 25 ps  |

**Effective bits, typical,  $\geq 4$  GHz models**

Nine division sine wave input at the indicated frequency, sampled at  $500 \text{ mV}_{\text{FS}}$  vertical sensitivity and maximum sample rate.

**DSP on, Enhanced MIMO filter, full bandwidth**

|                 | <b>MSO/DPO73304DX</b> |          | <b>MSO/DPO72504DX</b> |          | <b>MSO/DPO72304DX</b> |          |
|-----------------|-----------------------|----------|-----------------------|----------|-----------------------|----------|
| Input frequency | 50 GS/s               | 100 GS/s | 50 GS/s               | 100 GS/s | 50 GS/s               | 100 GS/s |
| 10 MHz          | 5.4 bits              | 5.4 bits | 5.3 bits              | 5.7 bits | 5.3 bits              | 5.9 bits |
| 1 GHz           | 5.3 bits              | 5.2 bits | 5.3 bits              | 5.7 bits | 5.2 bits              | 5.8 bits |
| 2 GHz           | 5.2 bits              | 5.2 bits | 5.2 bits              | 5.5 bits | 5.2 bits              | 5.7 bits |
| 3 GHz           | 5.1 bits              | 5.1 bits | 5.1 bits              | 5.4 bits | 5.1 bits              | 5.6 bits |
| 4 GHz           | 5.2 bits              | 5.1 bits | 5.2 bits              | 5.4 bits | 5.2 bits              | 5.6 bits |
| 5 GHz           | 5.1 bits              | 5.2 bits | 5.1 bits              | 5.4 bits | 5.1 bits              | 5.6 bits |
| 6 GHz           | 5.1 bits              | 5.0 bits | 5.1 bits              | 5.3 bits | 5.0 bits              | 5.6 bits |
| 7 GHz           | 5.1 bits              | 5.0 bits | 5.1 bits              | 5.3 bits | 5.1 bits              | 5.5 bits |
| 8 GHz           | 5.1 bits              | 5.1 bits | 5.1 bits              | 5.3 bits | 5.1 bits              | 5.6 bits |
| 9 GHz           | 5.0 bits              | 5.1 bits | 5.1 bits              | 5.3 bits | 5.0 bits              | 5.6 bits |
| 10 GHz          | 5.1 bits              | 5.2 bits | 5.1 bits              | 5.5 bits | 5.0 bits              | 5.5 bits |
| 11 GHz          | 4.9 bits              | 5.1 bits | 4.9 bits              | 5.4 bits | 4.9 bits              | 5.4 bits |
| 12 GHz          | 5.0 bits              | 5.2 bits | 5.0 bits              | 5.5 bits | 5.0 bits              | 5.5 bits |
| 13 GHz          | 4.9 bits              | 5.1 bits | 4.9 bits              | 5.4 bits | 4.9 bits              | 5.4 bits |
| 14 GHz          | 4.9 bits              | 5.1 bits | 4.9 bits              | 5.3 bits | 4.8 bits              | 5.3 bits |
| 15 GHz          | 4.8 bits              | 4.9 bits | 4.8 bits              | 5.2 bits | 4.8 bits              | 5.1 bits |
| 16 GHz          | 4.8 bits              | 4.8 bits | 4.8 bits              | 5.2 bits | 4.7 bits              | 5.2 bits |
| 17 GHz          | 4.8 bits              | 4.9 bits | 4.8 bits              | 5.1 bits | 4.7 bits              | 5.2 bits |
| 18 GHz          | 4.8 bits              | 4.9 bits | 4.8 bits              | 5.1 bits | 4.8 bits              | 5.3 bits |
| 19 GHz          | 4.8 bits              | 4.8 bits | 4.7 bits              | 5.1 bits | 4.7 bits              | 5.2 bits |
| 20 GHz          | 4.6 bits              | 4.7 bits | 5.1 bits              | 5.1 bits | 4.7 bits              | 5.1 bits |
| 21 GHz          | 4.8 bits              | 4.8 bits | 4.9 bits              | 5.2 bits | 4.8 bits              | 5.3 bits |
| 22 GHz          | 4.6 bits              | 4.8 bits |                       | 5.1 bits | 4.8 bits              | 5.3 bits |
| 23 GHz          |                       | 4.9 bits |                       | 5.2 bits |                       | 5.2 bits |
| 24 GHz          |                       | 5.0 bits |                       | 5.2 bits |                       |          |
| 25 GHz          |                       | 4.8 bits |                       | 5.2 bits |                       |          |
| 26 GHz          |                       | 4.9 bits |                       |          |                       |          |
| 27 GHz          |                       | 4.8 bits |                       |          |                       |          |
| 28 GHz          |                       | 4.7 bits |                       |          |                       |          |
| 29 GHz          |                       | 4.9 bits |                       |          |                       |          |
| 30 GHz          |                       | 4.9 bits |                       |          |                       |          |
| 31 GHz          |                       | 4.8 bits |                       |          |                       |          |
| 32 GHz          |                       | 4.8 bits |                       |          |                       |          |
| 33 GHz          |                       | 4.8 bits |                       |          |                       |          |

**DSP on, full bandwidth**

Nine division sine wave input at the indicated frequency, sampled at 500 mV<sub>FS</sub> vertical sensitivity and maximum sample rate

|                 | MSO/DPO73304DX |          | MSO/DPO72504DX |          | MSO/DPO72304DX |          |
|-----------------|----------------|----------|----------------|----------|----------------|----------|
| Input frequency | 50 GS/s        | 100 GS/s | 50 GS/s        | 100 GS/s | 50 GS/s        | 100 GS/s |
| 10 MHz          | 5.2 bits       | 5.4 bits | 5.2 bits       | 5.7 bits | 5.2 bits       | 6.0 bits |
| 1 GHz           | 5.0 bits       | 5.4 bits | 5.0 bits       | 5.4 bits | 5.0 bits       | 5.5 bits |
| 2 GHz           | 5.0 bits       | 5.4 bits | 5.0 bits       | 5.1 bits | 5.0 bits       | 5.3 bits |
| 3 GHz           | 4.9 bits       | 5.0 bits | 4.9 bits       | 5.3 bits | 4.9 bits       | 5.4 bits |
| 4 GHz           | 4.8 bits       | 4.5 bits | 4.6 bits       | 4.6 bits | 4.5 bits       | 4.8 bits |
| 5 GHz           | 4.7 bits       | 4.7 bits | 4.7 bits       | 5.0 bits | 4.7 bits       | 5.3 bits |
| 6 GHz           | 4.7 bits       | 4.8 bits | 4.7 bits       | 5.0 bits | 4.7 bits       | 5.2 bits |
| 7 GHz           | 4.8 bits       | 4.9 bits | 4.8 bits       | 5.2 bits | 4.8 bits       | 5.3 bits |
| 8 GHz           | 4.8 bits       | 5.0 bits | 4.8 bits       | 5.0 bits | 4.8 bits       | 5.4 bits |
| 9 GHz           | 4.7 bits       | 5.0 bits | 4.7 bits       | 5.2 bits | 4.7 bits       | 5.3 bits |
| 10 GHz          | 4.7 bits       | 5.0 bits | 4.7 bits       | 5.3 bits | 4.7 bits       | 5.4 bits |
| 11 GHz          | 4.7 bits       | 5.0 bits | 4.7 bits       | 5.1 bits | 4.7 bits       | 5.2 bits |
| 12 GHz          | 4.7 bits       | 5.1 bits | 4.7 bits       | 5.2 bits | 4.7 bits       | 5.3 bits |
| 13 GHz          | 4.7 bits       | 4.7 bits | 4.7 bits       | 5.1 bits | 4.7 bits       | 5.2 bits |
| 14 GHz          | 4.8 bits       | 5.0 bits | 4.8 bits       | 5.2 bits | 4.8 bits       | 5.2 bits |
| 15 GHz          | 4.6 bits       | 4.8 bits | 4.6 bits       | 5.0 bits | 4.6 bits       | 5.1 bits |
| 16 GHz          | 4.6 bits       | 4.6 bits | 4.6 bits       | 5.0 bits | 4.6 bits       | 5.2 bits |
| 17 GHz          | 4.6 bits       | 4.8 bits | 4.6 bits       | 5.0 bits | 4.6 bits       | 5.1 bits |
| 18 GHz          | 4.6 bits       | 4.7 bits | 4.6 bits       | 4.9 bits | 4.6 bits       | 5.1 bits |
| 19 GHz          | 4.6 bits       | 4.5 bits | 4.6 bits       | 4.8 bits | 4.6 bits       | 5.0 bits |
| 20 GHz          | 4.5 bits       | 4.4 bits | 4.6 bits       | 4.8 bits | 4.6 bits       | 5.0 bits |
| 21 GHz          | 4.6 bits       | 4.4 bits | 4.6 bits       | 4.8 bits | 4.6 bits       | 5.1 bits |
| 22 GHz          | 4.6 bits       | 4.6 bits | 4.6 bits       | 4.8 bits | 4.6 bits       | 5.1 bits |
| 23 GHz          |                | 4.6 bits |                | 5.0 bits |                | 5.1 bits |
| 24 GHz          |                | 4.7 bits |                | 4.9 bits |                |          |
| 25 GHz          |                | 4.7 bits |                | 5.1 bits |                |          |
| 26GHz           |                | 4.6 bits |                |          |                |          |
| 27 GHz          |                | 4.6 bits |                |          |                |          |
| 28 GHz          |                | 4.6 bits |                |          |                |          |
| 29 GHz          |                | 4.6 bits |                |          |                |          |
| 30 GHz          |                | 4.6 bits |                |          |                |          |
| 31 GHz          |                | 4.5 bits |                |          |                |          |
| 32 GHz          |                | 4.5 bits |                |          |                |          |
| 33 GHz          |                | 4.5 bits |                |          |                |          |

**Enhanced bandwidth**

|                 | <b>MSO/DPO72004C</b> |           | <b>MSO/DPO71604C</b> |          | <b>MSO/DPO71254C</b> |          |
|-----------------|----------------------|-----------|----------------------|----------|----------------------|----------|
| Input frequency | 50 GS/s              | 100 GS/s  | 50 GS/s              | 100 GS/s | 50 GS/s              | 100 GS/s |
| 10 MHz          | 5.0 bits             | 5.3 bits  | 5.6 bits             | 6.0 bits | 5.9 bits             | 6.2 bits |
| 1 GHz           | 5.0 bits             | 5.3 bits  | 5.6 bits             | 5.9 bits | 5.8 bits             | 6.1 bits |
| 2 GHz           | 4.9 bits             | 5.2 bits  | 5.6 bits             | 5.9 bits | 5.7 bits             | 5.9 bits |
| 3 GHz           | 4.9 bits             | 5.0 bits  | 4.6 bits             | 4.4 bits | 4.8 bits             | 4.5 bits |
| 4 GHz           | 4.8 bits             | 4.9 bits  | 4.2 bits             | 4.0 bits | 4.3 bits             | 4.0 bits |
| 5 GHz           | 4.8 bits             | 4.9 bits  | 4.6 bits             | 4.4 bits | 5.5 bits             | 5.2 bits |
| 6 GHz           | 4.7 bits             | 4.8 bits  | 4.5 bits             | 4.3 bits | 4.9 bits             | 4.8 bits |
| 7 GHz           | 4.0 bits             | 3.97 bits | 3.9 bits             | 3.7 bits | 5.5 bits             | 5.6 bits |
| 8 GHz           | 3.6 bits             | 3.9 bits  | 3.4 bits             | 3.5 bits | 5.6 bits             | 5.8 bits |
| 9 GHz           | 3.2 bits             | 3.2 bits  | 5.1 bits             | 5.1 bits | 5.6 bits             | 5.8 bits |
| 10 GHz          | 2.8 bits             | 2.8 bits  | 5.5 bits             | 5.7 bits | 5.6 bits             | 5.8 bits |
| 11 GHz          | 3.9 bits             | 3.9 bits  | 5.4 bits             | 5.6 bits | 5.6 bits             | 5.8 bits |
| 12 GHz          | 4.8 bits             | 5.0 bits  | 5.4 bits             | 5.6 bits | 5.6 bits             | 5.7 bits |
| 13 GHz          | 4.5 bits             | 4.7 bits  | 5.2 bits             | 5.4 bits |                      |          |
| 14 GHz          | 4.4 bits             | 4.6 bits  | 5.1 bits             | 5.3 bits |                      |          |
| 15 GHz          | 4.5 bits             | 4.7 bits  | 5.1 bits             | 5.0 bits |                      |          |
| 16 GHz          | 4.5 bits             | 4.7 bits  | 4.8 bits             | 5.0 bits |                      |          |
| 17 GHz          | 4.1 bits             | 4.6 bits  |                      |          |                      |          |
| 18 GHz          | 4.2 bits             | 4.7 bits  |                      |          |                      |          |
| 19 GHz          | 4.6 bits             | 4.8 bits  |                      |          |                      |          |
| 20 GHz          | 4.8 bits             | 5.0 bits  |                      |          |                      |          |

**Enhanced bandwidth**

|                 | <b>MSO/DPO70804C</b> | <b>MSO/DPO70604C</b> | <b>MSO/DPO70404C</b> |
|-----------------|----------------------|----------------------|----------------------|
| Input frequency | 25 GS/s              | 25 GS/s              | 25 GS/s              |
| 10 MHz          | 5.7 bits             | 5.8 bits             | 6.0 bits             |
| 1 GHz           | 5.7 bits             | 5.8 bits             | 5.9 bits             |
| 2 GHz           | 5.7 bits             | 5.7 bits             | 5.8 bits             |
| 3 GHz           | 5.5 bits             | 5.6 bits             | 5.7 bits             |
| 4 GHz           | 5.5 bits             | 5.6 bits             | 5.7 bits             |
| 5 GHz           | 5.5 bits             | 5.5 bits             |                      |
| 6 GHz           | 5.4 bits             | 5.4 bits             |                      |
| 7 GHz           | 5.4 bits             |                      |                      |
| 8 GHz           | 5.3 bits             |                      |                      |

Without enhanced bandwidth

| Input frequency | MSO/DPO73304DX |           | MSO/DPO72504DX |          | MSO/DPO72304DX |          |
|-----------------|----------------|-----------|----------------|----------|----------------|----------|
|                 | 50 GS/s        | 100 GS/s  | 50 GS/s        | 100 GS/s | 50 GS/s        | 100 GS/s |
| 10 MHz          | 5.2 bits       | 5.2 bits  | 5.2 bits       | 5.2 bits | 5.2 bits       | 5.4 bits |
| 1 GHz           | 4.8 bits       | 4.8 bits  | 5.0 bits       | 5.0 bits | 5.0 bits       | 5.0 bits |
| 2 GHz           | 4.9 bits       | 4.9 bits  | 5.0 bits       | 5.0 bits | 5.0 bits       | 5.1 bits |
| 3 GHz           | 4.8 bits       | 4.8 bits  | 4.9 bits       | 4.9 bits | 4.9 bits       | 5.1 bits |
| 4 GHz           | 4.7 bits       | 4.7 bits  | 4.5 bits       | 4.7 bits | 4.7 bits       | 4.7 bits |
| 5 GHz           | 4.7 bits       | 4.7 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.8 bits |
| 6 GHz           | 4.7 bits       | 4.7 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.8 bits |
| 7 GHz           | 4.7 bits       | 4.7 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.9 bits |
| 8 GHz           | 4.6 bits       | 4.6 bits  | 4.8 bits       | 4.8 bits | 4.7 bits       | 4.9 bits |
| 9 GHz           | 4.7 bits       | 4.6 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.9 bits |
| 10 GHz          | 4.7 bits       | 4.7 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.9 bits |
| 11 GHz          | 4.7 bits       | 4.7 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.9 bits |
| 12 GHz          | 4.7 bits       | 4.7 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.9 bits |
| 13 GHz          | 4.5 bits       | 4.5 bits  | 4.5 bits       | 4.5 bits | 4.5 bits       | 4.8 bits |
| 14 GHz          | 4.7 bits       | 4.7 bits  | 4.7 bits       | 4.7 bits | 4.7 bits       | 4.9 bits |
| 15 GHz          | 4.6 bits       | 4.6 bits  | 4.6 bits       | 4.6 bits | 4.6 bits       | 4.7 bits |
| 16 GHz          | 4.5 bits       | 4.4 bits  | 4.5 bits       | 4.4 bits | 4.5 bits       | 4.7 bits |
| 17 GHz          | 4.5 bits       | 4.4 bits  | 4.5 bits       | 4.4 bits | 4.5 bits       | 4.7 bits |
| 18 GHz          | 4.5 bits       | 4.4 bits  | 4.5 bits       | 4.4 bits | 4.5 bits       | 4.6 bits |
| 19 GHz          | 4.2 bits       | 4.1 bits  | 4.5 bits       | 4.4 bits | 4.5 bits       | 4.5 bits |
| 20 GHz          | 4.3 bits       | 4.2 bits  | 4.5 bits       | 4.5 bits | 4.5 bits       | 4.5 bits |
| 21 GHz          | 4.5 bits       | 4.5 bits  | 4.6 bits       | 4.6 bits | 4.5 bits       | 4.6 bits |
| 22 GHz          | 4.5 bits       | 4.4 bits  | 4.6 bits       | 4.6 bits | 4.5 bits       | 4.8 bits |
| 23 GHz          | 4.5 bits       | 4.4 bits  | 4.6 bits       | 4.6 bits | 4.3 bits       | 4.8 bits |
| 24 GHz          | 4.4 bits       | 4.5 bits  | 4.6 bits       | 4.6 bits |                |          |
| 25 GHz          | 4.5 bits       | 4.4 bits  | 4.5 bits       | 4.5 bits |                |          |
| 26GHz           | 4.4 bits       | 4.3 bits  |                |          |                |          |
| 27 GHz          | 4.1 bits       | 4.34 bits |                |          |                |          |
| 28 GHz          | 4.1 bits       | 4.1 bits  |                |          |                |          |
| 29 GHz          | 4.2 bits       | 3.8 bits  |                |          |                |          |
| 30 GHz          | 4.2 bits       | 4.2 bits  |                |          |                |          |
| 31 GHz          | 4.4 bits       | 4.2 bits  |                |          |                |          |
| 32 GHz          | 4.1 bits       | 4.1 bits  |                |          |                |          |
| 33 GHz          | 4.3 bits       | 4.2 bits  |                |          |                |          |

**Without enhanced bandwidth**

|                 | <b>MSO/DPO72004C</b> |          | <b>MSO/DPO71604C</b> |          | <b>MSO/DPO71254C</b> |          |
|-----------------|----------------------|----------|----------------------|----------|----------------------|----------|
| Input frequency | 50 GS/s              | 100 GS/s | 50 GS/s              | 100 GS/s | 50 GS/s              | 100 GS/s |
| 10 MHz          | 5.4 bits             | 2.0 bits | 5.4 bits             | 2.0 bits | 5.6 bits             | 2.0 bits |
| 1 GHz           | 5.4 bits             | 2.0 bits | 5.4 bits             | 2.0 bits | 5.5 bits             | 2.0 bits |
| 2 GHz           | 5.3 bits             | 2.0 bits | 5.3 bits             | 2.0 bits | 5.4 bits             | 2.0 bits |
| 3 GHz           | 5.3 bits             | 2.0 bits | 4.6 bits             | 2.0 bits | 4.6 bits             | 2.0 bits |
| 4 GHz           | 5.2 bits             | 2.0 bits | 4.3 bits             | 2.0 bits | 4.4 bits             | 2.0 bits |
| 5 GHz           | 5.2 bits             | 2.0 bits | 4.6 bits             | 2.0 bits | 5.3 bits             | 2.0 bits |
| 6 GHz           | 5.0 bits             | 2.0 bits | 4.4 bits             | 2.0 bits | 5.2 bits             | 2.0 bits |
| 7 GHz           | 4.8 bits             | 2.0 bits | 4.1 bits             | 2.0 bits | 4.5 bits             | 2.0 bits |
| 8 GHz           | 4.4 bits             | 2.0 bits | 3.4 bits             | 2.0 bits | 5.0 bits             | 2.0 bits |
| 9 GHz           | 4.1 bits             | 2.0 bits | 3.2 bits             | 2.0 bits | 5.0 bits             | 2.0 bits |
| 10 GHz          | 4.0 bits             | 2.0 bits | 3.5 bits             | 2.0 bits | 5.1 bits             | 2.0 bits |
| 11 GHz          | 4.1 bits             | 2.0 bits | 4.1 bits             | 2.0 bits | 5.2 bits             | 2.0 bits |
| 12 GHz          | 3.8 bits             | 2.0 bits | 3.5 bits             | 2.0 bits | 5.1 bits             | 2.0 bits |
| 13 GHz          | 4.1 bits             | 2.0 bits | 4.1 bits             | 2.0 bits |                      |          |
| 14 GHz          | 4.7 bits             | 2.0 bits | 4.7 bits             | 2.0 bits |                      |          |
| 15 GHz          | 4.7 bits             | 2.0 bits | 4.7 bits             | 2.0 bits |                      |          |
| 16 GHz          | 4.7 bits             | 2.0 bits | 4.7 bits             | 2.0 bits |                      |          |

**Without enhanced bandwidth**

|                 | <b>MSO/DPO70804C</b> | <b>MSO/DPO70604C</b> | <b>MSO/DPO70404C</b> |
|-----------------|----------------------|----------------------|----------------------|
| Input frequency | 25 GS/s              | 25 GS/s              | 25 GS/s              |
| 10 MHz          | 5.6 bits             | 5.7 bits             | 5.8 bits             |
| 1 GHz           | 5.6 bits             | 5.7 bits             | 5.8 bits             |
| 2 GHz           | 5.4 bits             | 5.6 bits             | 5.7 bits             |
| 3 GHz           | 5.4 bits             | 5.5 bits             | 5.6 bits             |
| 4 GHz           | 5.3 bits             | 5.4 bits             | 5.6 bits             |
| 5 GHz           | 5.2 bits             | 5.3 bits             |                      |
| 6 GHz           | 5.2 bits             | 5.3 bits             |                      |
| 7 GHz           | 5.2 bits             |                      |                      |
| 8 GHz           | 5.7 bits             |                      |                      |

Effective bits, typical, <4 GHz models

DPO7354C, Enhanced bandwidth

| 40 GS/s         | Analog bandwidth setting |          |          |          |          |          |
|-----------------|--------------------------|----------|----------|----------|----------|----------|
| Input Frequency | 3.5 GHz                  | 3.0 GHz  | 2.5 GHz  | 2.0 GHz  | 1.0 GHz  | 0.5 GHz  |
| 10 MHz          | 5.9 bits                 | 6.1 bits | 6.2 bits | 6.4 bits | 6.8 bits | 7.1 bits |
| 510 MHz         | 5.9 bits                 | 6.0 bits | 6.1 bits | 6.4 bits | 6.8 bits | 7.1 bits |
| 1010 MHz        | 5.6 bits                 | 5.7 bits | 5.8 bits | 6.1 bits | 6.8 bits |          |
| 1510 MHz        | 5.6 bits                 | 5.8 bits | 6.2 bits | 6.3 bits |          |          |
| 2010 MHz        | 5.8 bits                 | 6.0 bits | 6.1 bits | 6.3 bits |          |          |
| 2510 MHz        | 5.7 bits                 | 5.7 bits | 5.9 bits |          |          |          |
| 3010 MHz        | 5.7 bits                 | 5.8 bits |          |          |          |          |
| 3510 MHz        | 5.6 bits                 |          |          |          |          |          |

| 20 GS/s         | Analog bandwidth setting |          |          |          |          |          |
|-----------------|--------------------------|----------|----------|----------|----------|----------|
| Input Frequency | 3.5 GHz                  | 3.0 GHz  | 2.5 GHz  | 2.0 GHz  | 1.0 GHz  | 0.5 GHz  |
| 10 MHz          | 5.8 bits                 | 6.0 bits | 6.2 bits | 6.3 bits | 6.7 bits | 7.0 bits |
| 510 MHz         | 5.8 bits                 | 6.0 bits | 6.1 bits | 6.3 bits | 6.7 bits | 7.0 bits |
| 1010 MHz        | 5.6 bits                 | 5.6 bits | 5.7 bits | 6.0 bits | 6.7 bits |          |
| 1510 MHz        | 5.6 bits                 | 5.8 bits | 6.1 bits | 6.2 bits |          |          |
| 2010 MHz        | 5.8 bits                 | 6.0 bits | 6.1 bits | 6.2 bits |          |          |
| 2510 MHz        | 5.6 bits                 | 5.7 bits | 5.8 bits |          |          |          |
| 3010 MHz        | 5.7 bits                 | 5.7 bits |          |          |          |          |
| 3510 MHz        | 5.5 bits                 |          |          |          |          |          |

| 10 GS/s         | Analog bandwidth setting |          |          |          |          |          |
|-----------------|--------------------------|----------|----------|----------|----------|----------|
| Input Frequency | 3.5 GHz                  | 3.0 GHz  | 2.5 GHz  | 2.0 GHz  | 1.0 GHz  | 0.5 GHz  |
| 10 MHz          | 5.8 bits                 | 5.9 bits | 6.1 bits | 6.2 bits | 6.7 bits | 7.0 bits |
| 510 MHz         | 5.7 bits                 | 5.9 bits | 6.0 bits | 6.2 bits | 6.7 bits | 7.0 bits |
| 1010 MHz        | 5.5 bits                 | 5.6 bits | 5.7 bits | 6.0 bits | 6.7 bits |          |
| 1510 MHz        | 5.5 bits                 | 5.7 bits | 6.0 bits | 6.1 bits |          |          |
| 2010 MHz        | 5.6 bits                 | 5.8 bits | 6.0 bits | 6.1 bits |          |          |
| 2510 MHz        | 5.5 bits                 | 5.6 bits | 5.7 bits |          |          |          |
| 3010 MHz        | 5.6 bits                 | 5.7 bits |          |          |          |          |
| 3510 MHz        | 5.4 bits                 |          |          |          |          |          |

DPO7354C, Without enhanced bandwidth

| 40 GS/s         | Analog bandwidth setting |          |          |          |
|-----------------|--------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                  | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 5.9 bits                 | 6.3 bits | 6.5 bits | 6.6 bits |
| 510 MHz         | 5.8 bits                 | 6.3 bits |          |          |
| 1010 MHz        | 5.6 bits                 |          |          |          |
| 1510 MHz        | 5.6 bits                 |          |          |          |

| 40 GS/s  | Analog bandwidth setting |  |  |  |
|----------|--------------------------|--|--|--|
| 2010 MHz | 5.1 bits                 |  |  |  |
| 2510 MHz | 4.6 bits                 |  |  |  |

| 20 GS/s         | Analog bandwidth setting |          |          |          |
|-----------------|--------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                  | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 5.9 bits                 | 6.3 bits | 6.5 bits | 6.6 bits |
| 510 MHz         | 5.8 bits                 | 6.3 bits |          |          |
| 1010 MHz        | 5.6 bits                 |          |          |          |
| 1510 MHz        | 5.6 bits                 |          |          |          |
| 2010 MHz        | 5.2 bits                 |          |          |          |
| 2510 MHz        | 4.6 bits                 |          |          |          |

| 10 GS/s         | Analog bandwidth setting |          |          |          |
|-----------------|--------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                  | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 5.9 bits                 | 6.3 bits | 6.5 bits | 6.6 bits |
| 510 MHz         | 5.8 bits                 | 6.3 bits |          |          |
| 1010 MHz        | 5.6 bits                 |          |          |          |
| 1510 MHz        | 5.7 bits                 |          |          |          |
| 2010 MHz        | 5.7 bits                 |          |          |          |
| 2510 MHz        | 5.5 bits                 |          |          |          |

**DPO7254C, Enhanced  
bandwidth**

| <b>40 GS/s</b>  | <b>Analog bandwidth setting</b> |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                         | 2.0 GHz  | 1.0 GHz  | 0.5 GHz  |
| 10 MHz          | 6.2 bits                        | 6.4 bits | 6.9 bits | 7.2 bits |
| 510 MHz         | 6.1 bits                        | 6.3 bits | 6.9 bits | 7.2 bits |
| 1010 MHz        | 5.9 bits                        | 6.1 bits | 6.9 bits |          |
| 1510 MHz        | 6.1 bits                        | 6.4 bits |          |          |
| 2010 MHz        | 6.1 bits                        | 6.3 bits |          |          |
| 2510 MHz        | 5.6 bits                        |          |          |          |

| <b>20 GS/s</b>  | <b>Analog bandwidth setting</b> |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                         | 2.0 GHz  | 1.0 GHz  | 0.5 GHz  |
| 10 MHz          | 6.1 bits                        | 6.3 bits | 6.8 bits | 7.1 bits |
| 510 MHz         | 6.1 bits                        | 6.3 bits | 6.8 bits | 7.1 bits |
| 1010 MHz        | 5.8 bits                        | 6.1 bits | 6.8 bits |          |
| 1510 MHz        | 6.0 bits                        | 6.3 bits |          |          |
| 2010 MHz        | 6.1 bits                        | 6.3 bits |          |          |
| 2510 MHz        | 5.6 bits                        |          |          |          |

| <b>10 GS/s</b>  | <b>Analog bandwidth setting</b> |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                         | 2.0 GHz  | 1.0 GHz  | 0.5 GHz  |
| 10 MHz          | 6.1 bits                        | 6.4 bits | 6.9 bits | 7.2 bits |
| 510 MHz         | 6.1 bits                        | 6.3 bits | 6.9 bits | 7.2 bits |
| 1010 MHz        | 5.7 bits                        | 6.1 bits | 6.9 bits |          |
| 1510 MHz        | 5.9 bits                        | 6.4 bits |          |          |
| 2010 MHz        | 6.0 bits                        | 6.3 bits |          |          |
| 2510 MHz        | 5.5 bits                        |          |          |          |

**DPO7254C, Without enhanced bandwidth**

| <b>40 GS/s</b>  | <b>Analog bandwidth setting</b> |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                         | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 5.9 bits                        | 6.3 bits | 6.5 bits | 6.6 bits |
| 510 MHz         | 5.9 bits                        | 6.3 bits |          |          |
| 1010 MHz        | 5.6 bits                        |          |          |          |
| 1510 MHz        | 5.6 bits                        |          |          |          |
| 2010 MHz        | 5.2 bits                        |          |          |          |
| 2510 MHz        | 4.5 bits                        |          |          |          |

| <b>20 GS/s</b>  | <b>Analog bandwidth setting</b> |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                         | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 5.9 bits                        | 6.3 bits | 6.5 bits | 6.6 bits |
| 510 MHz         | 5.9 bits                        | 6.3 bits |          |          |
| 1010 MHz        | 5.6 bits                        |          |          |          |
| 1510 MHz        | 5.6 bits                        |          |          |          |
| 2010 MHz        | 5.2 bits                        |          |          |          |
| 2510 MHz        | 4.5 bits                        |          |          |          |

| <b>10 GS/s</b>  | <b>Analog bandwidth setting</b> |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|
| Input Frequency | 2.5 GHz                         | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 5.9 bits                        | 6.3 bits | 6.5 bits | 6.6 bits |
| 510 MHz         | 5.9 bits                        | 6.3 bits |          |          |
| 1010 MHz        | 5.6 bits                        |          |          |          |
| 1510 MHz        | 5.7 bits                        |          |          |          |
| 2010 MHz        | 5.8 bits                        |          |          |          |
| 2510 MHz        | 5.5 bits                        |          |          |          |

**DPO7104C, Enhanced  
bandwidth**

| 20 GS/s         | Analog bandwidth setting |          |
|-----------------|--------------------------|----------|
| Input Frequency | 1.0 GHz                  | 0.5 GHz  |
| 10 MHz          | 6.7 bits                 | 7.2 bits |
| 510 MHz         | 6.7 bits                 | 7.2 bits |
| 1010 MHz        | 6.7 bits                 |          |

| 10 GS/s         | Analog bandwidth setting |          |
|-----------------|--------------------------|----------|
| Input Frequency | 1.0 GHz                  | 0.5 GHz  |
| 10 MHz          | 6.6 bits                 | 7.1 bits |
| 510 MHz         | 6.5 bits                 | 7.1 bits |
| 1010 MHz        | 6.5 bits                 |          |

| 5 GS/s          | Analog bandwidth setting |          |
|-----------------|--------------------------|----------|
| Input Frequency | 1.0 GHz                  | 0.5 GHz  |
| 10 MHz          | 6.4 bits                 | 7.0 bits |
| 510 MHz         | 6.4 bits                 | 7.0 bits |
| 1010 MHz        | 6.3 bits                 |          |

**DPO7104C, Without enhanced  
bandwidth**

| 20 GS/s         | Analog bandwidth setting |          |          |          |
|-----------------|--------------------------|----------|----------|----------|
| Input Frequency | 1.0 GHz                  | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 6.4 bits                 | 6.4 bits | 6.6 bits | 6.7 bits |
| 510 MHz         | 6.1 bits                 | 6.4 bits |          |          |
| 1010 MHz        | 5.7 bits                 |          |          |          |

| 10 GS/s         | Analog bandwidth setting |          |          |          |
|-----------------|--------------------------|----------|----------|----------|
| Input Frequency | 1.0 GHz                  | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 6.4 bits                 | 6.4 bits | 6.6 bits | 6.7 bits |
| 510 MHz         | 6.3 bits                 | 6.4 bits |          |          |
| 1010 MHz        | 6.3 bits                 |          |          |          |

| 5 GS/s          | Analog bandwidth setting |          |          |          |
|-----------------|--------------------------|----------|----------|----------|
| Input Frequency | 1.0 GHz                  | 0.5 GHz  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 6.4 bits                 | 6.4 bits | 6.6 bits | 6.7 bits |
| 510 MHz         | 6.3 bits                 | 6.4 bits |          |          |
| 1010 MHz        | 6.3 bits                 |          |          |          |

**DPO7054C, Enhanced bandwidth**

| 10 GS/s         | Analog bandwidth setting |
|-----------------|--------------------------|
| Input Frequency | 0.5 GHz                  |
| 10 MHz          | 6.8 bits                 |
| 510 MHz         | 6.8 bits                 |

| 5 GS/s          | Analog bandwidth setting |
|-----------------|--------------------------|
| Input Frequency | 0.5 GHz                  |
| 10 MHz          | 6.7 bits                 |
| 510 MHz         | 6.7 bits                 |

| 2.5 GS/s        | Analog bandwidth setting |
|-----------------|--------------------------|
| Input Frequency | 0.5 GHz                  |
| 10 MHz          | 6.5 bits                 |
| 510 MHz         | 6.4 bits                 |

**DPO7054C, Without enhanced bandwidth**

| 10 GS/s         | Analog bandwidth setting |          |          |
|-----------------|--------------------------|----------|----------|
| Input Frequency | 0.5 GHz                  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 6.5 bits                 | 6.6 bits | 6.7 bits |
| 510 MHz         | 6.4 bits                 |          |          |

| 5 GS/s          | Analog bandwidth setting |          |          |
|-----------------|--------------------------|----------|----------|
| Input Frequency | 0.5 GHz                  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 6.5 bits                 | 6.6 bits | 6.7 bits |
| 510 MHz         | 6.4 bits                 |          |          |

| 2.5 GS/s        | Analog bandwidth setting |          |          |
|-----------------|--------------------------|----------|----------|
| Input Frequency | 0.5 GHz                  | 0.25 GHz | 0.02 GHz |
| 10 MHz          | 6.5 bits                 | 6.6 bits | 6.7 bits |
| 510 MHz         | 6.4 bits                 |          |          |

## Noise typical >20 GHz models

Without enhanced bandwidth

| Gain setting, full scale | MSO/DPO73304DX | MSO/DPO72504DX | MSO/DPO72304DX |
|--------------------------|----------------|----------------|----------------|
| 62.5 mV                  | 0.88 mV        | 0.83 mV        | 0.79 mV        |
| 100 mV                   | 0.96 mV        | 0.90 mV        | 0.86 mV        |
| 200 mV                   | 1.53 mV        | 1.47 mV        | 1.41 mV        |
| 500 mV                   | 4.19 mV        | 3.57 mV        | 3.14 mV        |
| 1 V                      | 8.30 mV        | 6.94 mV        | 6.10 mV        |
| 2.0 V                    | 18.84 mV       | 16.70 mV       | 14.19 mV       |
| 3.0 V                    | 24.64 mV       | 21.53 mV       | 19.09 mV       |
| 4.0 V                    | 37.91 mV       | 31.53 mV       | 26.01 mV       |
| 5.0 V                    | 43.36 mV       | 36.74 mV       | 31.84 mV       |
| 6.0 V                    | 47.93 mV       | 41.00 mV       | 36.97 mV       |

Enhanced bandwidth

| Gain setting, full scale | MSO/DPO73304DX |         | MSO/DPO72504DX |         | MSO/DPO72304DX |         |
|--------------------------|----------------|---------|----------------|---------|----------------|---------|
|                          | 100 GS/s       | 50 GS/s | 100 GS/s       | 50 GS/s | 100 GS/s       | 50 GS/s |
| 62.5 mV                  | 0.84 mV        | 0.84 mV | 0.82 mV        | 0.90 mV | 0.75 mV        | 0.76 mV |
| 100 mV                   | 0.93 mV        | 0.93 mV | 0.81 mV        | 0.92 mV | 0.78 mV        | 0.79 mV |
| 150 mV                   | 1.31 mV        | 1.29 mV | 1.17 mV        | 1.29 mV | 1.08 mV        | 1.19 mV |
| 200 mV                   | 1.52 mV        | 1.6 mV  | 1.40 mV        | 1.56 mV | 1.14 mV        | 1.19 mV |
| 200 mV                   | 2.49 mV        | 2.52 mV | 2.28 mV        | 2.49 mV | 2.10 mV        | 2.29 mV |
| 400 mV                   | 2.92 mV        | 2.52 mV | 2.80 mV        | 3.08 mV | 2.58 mV        | 2.29 mV |
| 500 mV                   | 3.55 mV        | 2.52 mV | 3.35 mV        | 3.75 mV | 2.65 mV        | 2.67 mV |
| 600 mV                   | 4.86 mV        | 4.86 mV | 4.5 mV         | 4.80 mV | 4.14 mV        | 4.42 mV |
| 700 mV                   | 5.25 mV        | 5.39 mV | 5.04 mV        | 5.39 mV | 4.64 mV        | 4.96 mV |
| 800 mV                   | 5.76 mV        | 6.08 mV | 5.52 mV        | 6.00 mV | 5.08 mV        | 5.52 mV |
| 900 mV                   | 5.76 mV        | 6.66 mV | 6.12 mV        | 6.66 mV | 5.63 mV        | 6.13 mV |
| 1 V                      | 6.80 mV        | 7.30 mV | 6.70 mV        | 7.20 mV | 5.09 mV        | 5.11 mV |
| 1.1 V                    | 8.69 mV        | 9.02 mV | 8.47 mV        | 8.91 mV | 7.79 mV        | 8.20 mV |
| 1.2 V                    | 9.12 mV        | 9.60 mV | 9.00 mV        | 9.48 mV | 8.28 mV        | 8.72 mV |
| 2.0 V                    | 15.4 mV        | 16.4 mV | 12.4 mV        | 12.9 mV | 11.7 mV        | 11.9 mV |
| 3.0 V                    | 19.9 mV        | 22.8 mV | 17.2 mV        | 17.7 mV | 15.3 mV        | 15.5 mV |
| 4.0 V                    | 28.8 mV        | 31.8 mV | 24.4 mV        | 24.9 mV | 21.6 mV        | 21.9 mV |
| 5.0 V                    | 34.3 mV        | 31.8 mV | 28.1 mV        | 28.7 mV | 25.7 mV        | 25.1 mV |
| 6.0 V                    | 39.8 mV        | 43.8 mV | 34.1 mV        | 34.8 mV | 29.7 mV        | 30.1 mV |

**Noise, typical,  $\geq 4$  GHz  $\leq 20$  GHz models**

Without enhanced bandwidth

| Gain setting, full scale | MSO/ DPO 72004C | MSO/ DPO 71604C | MSO/ DPO 71254C | MSO/ DPO 70804C | MSO/ DPO 70604C | MSO/ DPO 70404C |
|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 100 mV                   | 0.87 mV         | 0.87 mV         | 0.67 mV         | 0.58 mV         | 0.53 mV         | 0.50 mV         |
| 150 mV                   | 1.06 mV         | 1.06 mV         | 0.84 mV         | 0.74 mV         | 0.73 mV         | 0.69 mV         |
| 200 mV                   | 1.21 mV         | 1.21 mV         | 0.98 mV         | 0.90 mV         | 0.86 mV         | 0.86 mV         |
| 300 mV                   | 1.82 mV         | 1.82 mV         | 1.49 mV         | 1.34 mV         | 1.25 mV         | 1.25 mV         |
| 400 mV                   | 2.29 mV         | 2.29 mV         | 1.80 mV         | 1.76 mV         | 1.67 mV         | 1.67 mV         |
| 500 mV                   | 2.78 mV         | 2.78 mV         | 2.29 mV         | 2.02 mV         | 2.02 mV         | 2.02 mV         |
| 600 mV                   | 3.35 mV         | 3.35 mV         | 2.78 mV         | 2.52 mV         | 2.46 mV         | 2.46 mV         |
| 700 mV                   | 3.92 mV         | 3.92 mV         | 3.27 mV         | 3.02 mV         | 2.90 mV         | 2.90 mV         |
| 800 mV                   | 4.49 mV         | 4.49 mV         | 3.76 mV         | 3.52 mV         | 3.34 mV         | 3.34 mV         |
| 900 mV                   | 5.14 mV         | 5.14 mV         | 4.25 mV         | 3.87 mV         | 3.78 mV         | 3.78 mV         |
| 1.0 V                    | 6.48 mV         | 6.48 mV         | 4.89 mV         | 4.50 mV         | 4.28 mV         | 4.28 mV         |
| 2.0 V                    | 11.47 mV        | 11.47 mV        | 8.98 mV         | 8.80 mV         | 8.36 mV         | 8.36 mV         |
| 2.5 V                    | 14.04 mV        | 14.04 mV        | 11.43 mV        | 10.81 mV        | 10.34 mV        | 10.34 mV        |
| 3.0 V                    | 16.61 mV        | 16.61 mV        | 13.88 mV        | 12.82 mV        | 12.32 mV        | 12.32 mV        |
| 4.0 V                    | 21.83 mV        | 21.83 mV        | 18.78 mV        | 17.36 mV        | 16.91 mV        | 16.91 mV        |
| 4.5 V                    | 24.41 mV        | 24.41 mV        | 21.30 mV        | 19.44 mV        | 18.97 mV        | 18.97 mV        |
| 5.0 V                    | 26.99 mV        | 26.99 mV        | 23.59 mV        | 21.51 mV        | 21.02 mV        | 21.02 mV        |

Enhanced bandwidth, sample rates less than 100 GS/s.

| MSO/DPO72004C<br>MSO/DPO71604C<br>MSO/DPO71254C<br>where applicable | 20 GHz   | 19 GHz   | 18 GHz   | 17 GHz   | 16 GHz  | 15 GHz  |
|---------------------------------------------------------------------|----------|----------|----------|----------|---------|---------|
| Gain Setting, full scale                                            |          |          |          |          |         |         |
| 100 mV                                                              | NA       | NA       | 1.09 mV  | 0.70 mV  | 0.63 mV | 0.59 mV |
| 150 mV                                                              | NA       | NA       | 1.06 mV  | 0.93 mV  | 0.75 mV | 0.79 mV |
| 200 mV                                                              | 2.08 mV  | 1.67 mV  | 1.34 mV  | 1.09 mV  | 0.88 mV | 0.92 mV |
| 300 mV                                                              | 3.70 mV  | 2.35 mV  | 1.90 mV  | 1.57 mV  | 1.35 mV | 1.31 mV |
| 400 mV                                                              | 4.18 mV  | 3.10 mV  | 2.53 mV  | 2.08 mV  | 1.68 mV | 1.67 mV |
| 500 mV                                                              | 3.55 mV  | 3.10 mV  | 2.61 mV  | 2.29 mV  | 2.04 mV | 2.02 mV |
| 600 mV                                                              | 5.06 mV  | 3.70 mV  | 3.13 mV  | 2.78 mV  | 2.45 mV | 2.46 mV |
| 700 mV                                                              | 6.09 mV  | 4.30 mV  | 3.65 mV  | 3.27 mV  | 2.99 mV | 2.90 mV |
| 800 mV                                                              | 6.62 mV  | 4.90 mV  | 4.16 mV  | 3.76 mV  | 3.40 mV | 3.34 mV |
| 900 mV                                                              | 7.21 mV  | 5.31 mV  | 4.57 mV  | 4.16 mV  | 3.71 mV | 3.59 mV |
| 1.0 V                                                               | 10.52 mV | 8.35 mV  | 7.98 mV  | 5.32 mV  | 4.55 mV | 4.50 mV |
| 2.0 V                                                               | 21.38 mV | 15.54 mV | 12.66 mV | 10.28 mV | 8.33 mV | 8.70 mV |

| <b>MSO/DPO72004C<br/>MSO/DPO71604C<br/>MSO/DPO71254C<br/>where applicable</b> | <b>20 GHz</b> | <b>19 GHz</b> | <b>18 GHz</b>   | <b>17 GHz</b> | <b>16 GHz</b> | <b>15 GHz</b> |
|-------------------------------------------------------------------------------|---------------|---------------|-----------------|---------------|---------------|---------------|
| 2.5 V                                                                         | 17.77 mV      | 17.87 mV      | 14.82 mV        | 12.26 mV      | 9.96 mV       | 10.51 mV      |
| 3.0 V                                                                         | 25.05 mV      | 20.20 mV      | 16.88 mV        | 14.24 mV      | 12.17 mV      | 12.32 mV      |
| 4.0 V                                                                         | 33.34 mV      | 24.86 mV      | 21.17 mV        | 18.26 mV      | 17.07 mV      | 15.98 mV      |
| 4.5 V                                                                         | 35.86 mV      | 27.20 mV      | 23.29 mV        | 20.25 mV      | 18.6 mV       | 17.80 mV      |
| 5.0 V                                                                         | 38.40 mV      | 29.53 mV      | 25.41 mV        | 22.23 mV      | 20.29 mV      | 19.61 mV      |
| <b>MSO/DPO72004C<br/>MSO/DPO71604C<br/>MSO/DPO71254C<br/>where applicable</b> | <b>14 GHz</b> | <b>13 GHz</b> | <b>12.5 GHz</b> | <b>12 GHz</b> | <b>11 GHz</b> | <b>10 GHz</b> |
| Gain Setting, full scale                                                      |               |               |                 |               |               |               |
| 100 mV                                                                        | 0.58 mV       | 0.58 mV       | 0.55 mV         | 0.53 mV       | 0.51 mV       | 0.49 mV       |
| 150 mV                                                                        | 0.77 mV       | 0.73 mV       | 0.72 mV         | 0.71 mV       | 0.68 mV       | 0.65 mV       |
| 200 mV                                                                        | 0.87 mV       | 0.84 mV       | 0.82 mV         | 0.81 mV       | 0.78 mV       | 0.75 mV       |
| 300 mV                                                                        | 1.28 mV       | 1.26 mV       | 1.28 mV         | 1.20 mV       | 1.16 mV       | 1.10 mV       |
| 400 mV                                                                        | 1.63 mV       | 1.59 mV       | 1.67 mV         | 1.49 mV       | 1.43 mV       | 1.39 mV       |
| 500 mV                                                                        | 1.92 mV       | 1.85 mV       | 1.80 mV         | 1.78 mV       | 1.72 mV       | 1.65 mV       |
| 600 mV                                                                        | 2.35 mV       | 2.27 mV       | 2.42 mV         | 2.18 mV       | 2.12 mV       | 1.99 mV       |
| 700 mV                                                                        | 2.79 mV       | 2.69 mV       | 2.94 mV         | 2.58 mV       | 2.51 mV       | 2.34 mV       |
| 800 mV                                                                        | 3.23 mV       | 3.10 mV       | 3.40 mV         | 2.98 mV       | 2.90 mV       | 2.78 mV       |
| 900 mV                                                                        | 3.51 mV       | 3.39 mV       | 3.63 mV         | 3.27 mV       | 3.14 mV       | 3.02 mV       |
| 1.0 V                                                                         | 4.26 mV       | 4.22 mV       | 4.09 mV         | 4.05 mV       | 3.94 mV       | 3.73 mV       |
| 2.0 V                                                                         | 8.23 mV       | 7.96 mV       | 8.39 mV         | 7.47 mV       | 7.16 mV       | 6.93 mV       |
| 2.5 V                                                                         | 9.95 mV       | 9.62 mV       | 9.57 mV         | 9.03 mV       | 8.68 mV       | 8.35 mV       |
| 3.0 V                                                                         | 11.68 mV      | 11.27 mV      | 12.35 mV        | 10.58 mV      | 10.19 mV      | 9.76 mV       |
| 4.0 V                                                                         | 15.19 mV      | 15.34 mV      | 17.26 mV        | 14.79 mV      | 14.29 mV      | 13.60 mV      |
| 4.5 V                                                                         | 16.92 mV      | 17.09 mV      | 18.49 mV        | 16.47 mV      | 15.93 mV      | 15.12 mV      |
| 5.0 V                                                                         | 18.66 mV      | 18.83 mV      | 19.60 mV        | 18.15 mV      | 17.56 mV      | 16.65 mV      |

| MSO/DPO72004C<br>MSO/DPO71604C<br>MSO/DPO71254C<br>where applicable | 9 GHz    | 8 GHz    | 7 GHz    | 6 GHz    | 5 GHz    | 4 GHz    |
|---------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|
| Gain Setting, full scale                                            |          |          |          |          |          |          |
| 100 mV                                                              | 0.46 mV  | 0.45 mV  | 0.43 mV  | 0.40 mV  | 0.37 mV  | 0.34 mV  |
| 150 mV                                                              | 0.63 mV  | 0.60 mV  | 0.57 mV  | 0.54 mV  | 0.51 mV  | 0.48 mV  |
| 200 mV                                                              | 0.71 mV  | 0.67 mV  | 0.63 mV  | 0.60 mV  | 0.57 mV  | 0.53 mV  |
| 300 mV                                                              | 1.03 mV  | 0.99 mV  | 0.95 mV  | 0.89 mV  | 0.84 mV  | 0.77 mV  |
| 400 mV                                                              | 1.33 mV  | 1.27 mV  | 1.18 mV  | 1.10 mV  | 1.06 mV  | 0.98 mV  |
| 500 mV                                                              | 1.57 mV  | 1.48 mV  | 1.41 mV  | 1.31 mV  | 1.22 mV  | 1.10 mV  |
| 600 mV                                                              | 1.89 mV  | 1.79 mV  | 1.71 mV  | 1.60 mV  | 1.49 mV  | 1.35 mV  |
| 700 mV                                                              | 2.21 mV  | 2.11 mV  | 2.01 mV  | 1.88 mV  | 1.76 mV  | 1.59 mV  |
| 800 mV                                                              | 2.21 mV  | 2.11 mV  | 2.01 mV  | 1.88 mV  | 1.76 mV  | 1.59 mV  |
| 900 mV                                                              | 2.86 mV  | 2.74 mV  | 2.61 mV  | 2.45 mV  | 2.29 mV  | 2.08 mV  |
| 1.0 V                                                               | 3.55 mV  | 3.36 mV  | 3.18 mV  | 2.99 mV  | 2.77 mV  | 2.65 mV  |
| 2.0 V                                                               | 6.55 mV  | 6.33 mV  | 5.94 mV  | 5.51 mV  | 5.28 mV  | 4.90 mV  |
| 2.5 V                                                               | 7.92 mV  | 7.63 mV  | 7.20 mV  | 6.68 mV  | 6.34 mV  | 5.83 mV  |
| 3.0 V                                                               | 9.30 mV  | 8.93 mV  | 8.46 mV  | 7.84 mV  | 7.40 mV  | 6.77 mV  |
| 4.0 V                                                               | 13.01 mV | 12.40 mV | 11.81 mV | 11.07 mV | 10.37 mV | 9.51 mV  |
| 4.5 V                                                               | 14.50 mV | 13.80 mV | 13.17 mV | 12.34 mV | 11.53 mV | 10.54 mV |
| 5.0 V                                                               | 15.98 mV | 15.20 mV | 14.53 mV | 13.61 mV | 12.68 mV | 11.57 mV |

| MSO/DPO72004C, MSO/<br>DPO71604C, MSO/<br>DPO71254C where<br>applicable | 3 GHz    | 2 GHz   | 1 GHz   | 500 MHz |
|-------------------------------------------------------------------------|----------|---------|---------|---------|
| Gain Setting, full scale                                                |          |         |         |         |
| 100 mV                                                                  | 0.31 mV  | 0.26 mV | 0.20 mV | 0.17 mV |
| 150 mV                                                                  | 0.44 mV  | 0.39 mV | 0.34 mV | 0.27 mV |
| 200 mV                                                                  | 0.48 mV  | 0.44 mV | 0.37 mV | 0.31 mV |
| 300 mV                                                                  | 0.69 mV  | 0.61 mV | 0.52 mV | 0.44 mV |
| 400 mV                                                                  | 0.88 mV  | 0.78 mV | 0.66 mV | 0.57 mV |
| 500 mV                                                                  | 1.03 mV  | 0.91 mV | 0.76 mV | 0.68 mV |
| 600 mV                                                                  | 1.24 mV  | 1.09 mV | 0.91 mV | 0.82 mV |
| 700 mV                                                                  | 1.45 mV  | 1.27 mV | 1.06 mV | 0.95 mV |
| 800 mV                                                                  | 1.76 mV  | 1.51 mV | 1.10 mV | 1.10 mV |
| 900 mV                                                                  | 1.88 mV  | 1.63 mV | 1.35 mV | 1.22 mV |
| 1.0 V                                                                   | 2.38 mV  | 2.02 mV | 1.57 mV | 1.31 mV |
| 2.0 V                                                                   | 4.43 mV  | 4.12 mV | 3.42 mV | 2.88 mV |
| 2.5 V                                                                   | 4.43 mV  | 4.12 mV | 3.42 mV | 2.88 mV |
| 3.0 V                                                                   | 6.22 mV  | 5.63 mV | 4.72 mV | 4.10 mV |
| 4.0 V                                                                   | 8.83 mV  | 7.86 mV | 6.63 mV | 5.86 mV |
| 4.5 V                                                                   | 9.81 mV  | 8.68 mV | 7.34 mV | 6.53 mV |
| 5.0 V                                                                   | 10.80 mV | 9.51 mV | 8.06 mV | 7.20 mV |

| MSO/<br>DPO70804C,<br>MSO/<br>DPO70604C,<br>MSO/<br>DPO70404C,<br>where applicable | 8 GHz    | 7 GHz    | 6 GHz    | 5 GHz    | 4 GHz    | 3 GHz    |
|------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|
| Gain Setting, full scale                                                           |          |          |          |          |          |          |
| 100 mV                                                                             | 0.54 mV  | 0.51 mV  | 0.48 mV  | 0.45 mV  | 0.42 mV  | 0.40 mV  |
| 150 mV                                                                             | 0.73 mV  | 0.69 mV  | 0.64 mV  | 0.60 mV  | 0.55 mV  | 0.50 mV  |
| 200 mV                                                                             | 0.86 mV  | 0.80 mV  | 0.77 mV  | 0.72 mV  | 0.68 mV  | 0.60 mV  |
| 300 mV                                                                             | 1.34 mV  | 1.25 mV  | 1.16 mV  | 1.07 mV  | 0.98 mV  | 0.89 mV  |
| 400 mV                                                                             | 1.67 mV  | 1.58 mV  | 1.50 mV  | 1.41 mV  | 1.32 mV  | 1.14 mV  |
| 500 mV                                                                             | 1.94 mV  | 1.85 mV  | 1.76 mV  | 1.67 mV  | 1.58 mV  | 1.41 mV  |
| 600 mV                                                                             | 2.41 mV  | 2.29 mV  | 2.17 mV  | 2.04 mV  | 1.91 mV  | 1.70 mV  |
| 700 mV                                                                             | 2.87 mV  | 2.73 mV  | 2.58 mV  | 2.41 mV  | 2.23 mV  | 1.99 mV  |
| 800 mV                                                                             | 3.34 mV  | 3.17 mV  | 2.99 mV  | 2.77 mV  | 2.55 mV  | 2.29 mV  |
| 900 mV                                                                             | 3.70 mV  | 3.56 mV  | 3.34 mV  | 3.12 mV  | 2.90 mV  | 2.55 mV  |
| 1.0 V                                                                              | 4.28 mV  | 3.99 mV  | 3.83 mV  | 3.46 mV  | 3.38 mV  | 3.00 mV  |
| 2.0 V                                                                              | 8.36 mV  | 8.09 mV  | 7.48 mV  | 6.95 mV  | 6.60 mV  | 5.80 mV  |
| 2.5 V                                                                              | 10.23 mV | 9.86 mV  | 9.20 mV  | 8.61 mV  | 8.18 mV  | 7.21 mV  |
| 3.0 V                                                                              | 12.10 mV | 11.62 mV | 10.92 mV | 10.27 mV | 9.75 mV  | 8.62 mV  |
| 4.0 V                                                                              | 16.61 mV | 15.90 mV | 14.99 mV | 14.18 mV | 12.97 mV | 11.50 mV |
| 4.5 V                                                                              | 18.57 mV | 17.75 mV | 16.78 mV | 15.91 mV | 14.55 mV | 12.92 mV |
| 5.0 V                                                                              | 20.53 mV | 19.60 mV | 18.58 mV | 17.65 mV | 16.13 mV | 14.34 mV |

| MSO/DPO70804C, MSO/<br>DPO70604C, MSO/DPO70404C,<br>where applicable | 2 GHz    | 1 GHz    | 500 MHz |
|----------------------------------------------------------------------|----------|----------|---------|
| Gain Setting, full scale                                             |          |          |         |
| 100 mV                                                               | 0.37 mV  | 0.32 mV  | 0.24 mV |
| 150 mV                                                               | 0.46 mV  | 0.39 mV  | 0.32 mV |
| 200 mV                                                               | 0.55 mV  | 0.46 mV  | 0.40 mV |
| 300 mV                                                               | 0.78 mV  | 0.67 mV  | 0.57 mV |
| 400 mV                                                               | 1.01 mV  | 0.88 mV  | 0.76 mV |
| 500 mV                                                               | 1.23 mV  | 1.01 mV  | 0.92 mV |
| 600 mV                                                               | 1.50 mV  | 1.23 mV  | 1.10 mV |
| 700 mV                                                               | 1.76 mV  | 1.44 mV  | 1.28 mV |
| 800 mV                                                               | 2.02 mV  | 1.65 mV  | 1.45 mV |
| 900 mV                                                               | 2.24 mV  | 1.89 mV  | 1.67 mV |
| 1.0 V                                                                | 2.59 mV  | 2.03 mV  | 1.65 mV |
| 2.0 V                                                                | 5.08 mV  | 4.19 mV  | 3.66 mV |
| 2.5 V                                                                | 6.32 mV  | 5.20 mV  | 4.61 mV |
| 3.0 V                                                                | 6.32 mV  | 5.20 mV  | 4.61 mV |
| 4.0 V                                                                | 10.07 mV | 8.28 mV  | 7.50 mV |
| 4.5 V                                                                | 10.07 mV | 8.28 mV  | 7.50 mV |
| 5.0 V                                                                | 12.55 mV | 10.31 mV | 9.41 mV |

Enhanced bandwidth, at 100 GS/s.

| MSO/DPO72004C<br>MSO/DPO71604C<br>MSO/DPO71254C | 20 GHz    | 19 GHz     | 18 GHz     | 17 GHz     | 16 GHz     | 15 GHz           |
|-------------------------------------------------|-----------|------------|------------|------------|------------|------------------|
| Gain Setting, full scale                        |           |            |            |            |            |                  |
| 100 mV                                          | N/A       | N/A        | 0.981 mV   | 0.63 mV    | 0.5706 mV  | 0.531 mV         |
| 150 mV                                          | N/A       | N/A        | 0.954 mV   | 0.837 mV   | 0.729 mV   | 0.711 mV         |
| 200 mV                                          | 1.736 mV  | 1.4195 mV  | 1.139 mV   | 0.9265 mV  | 0.816 mV   | 0.782 mV         |
| 300 mV                                          | 2.92 mV   | 1.9975 mV  | 1.615 mV   | 1.3345 mV  | 1.156 mV   | 1.1135 mV        |
| 400 mV                                          | 3.072 mV  | 2.635 mV   | 2.1506 mV  | 1.768 mV   | 1.53 mV    | 1.4195 mV        |
| 500 mV                                          | 2.944 mV  | 2.635 mV   | 2.2185 mV  | 1.9465 mV  | 1.802 mV   | 1.717 mV1.802 mV |
| 600 mV                                          | 3.784 mV  | 3.145 mV   | 2.6605 mV  | 2.363 mV   | 2.176 mV   | 2.091 mV         |
| 700 mV                                          | 4.424 mV  | 3.655 mV   | 3.1025 mV  | 2.7795 mV  | 2.737 mV   | 2.465 mV         |
| 800 mV                                          | 4.704 mV  | 4.165 mV   | 3.536 mV   | 3.196 mV   | 2.9155 mV  | 2.839 mV         |
| 900 mV                                          | 5.296 mV  | 4.5135 mV  | 3.8845 mV  | 3.536 mV   | 3.196 mV   | 3.0515 mV        |
| 1.0 V                                           | 8.688 mV  | 7.0975 mV  | 6.783 mV   | 4.522 mV   | 4.0545 mV  | 3.825 mV         |
| 2.0 V                                           | 15.352 mV | 13.209 mV  | 10.761 mV  | 8.738 mV   | 7.735 mV   | 7.395 mV         |
| 2.5 V                                           | 17.392 mV | 15.1895 mV | 12.597 mV  | 10.421 mV  | 9.248 mV   | 8.9335 mV        |
| 3.0 V                                           | 19.432 mV | 17.17 mV   | 14.348 mV  | 12.104 mV  | 11.407 mV  | 10.742 mV        |
| 4.0 V                                           | 25.736 mV | 21.131 mV  | 17.9945 mV | 15.521 mV  | 15.2575 mV | 13.583 mV        |
| 4.5 V                                           | 27.52 mV  | 23.12 mV   | 19.7965 mV | 17.2125 mV | 16.184 mV  | 15.13 mV         |
| 5.0 V                                           | 30.064 mV | 25.1005 mV | 21.5985 mV | 18.8955 mV | 18.0795 mV | 16.6685 mV       |

| MSO/DPO72004C<br>MSO/DPO71604C<br>MSO/DPO71254C | 14 GHz     | 13 GHz     | 12.5 GHz   | 12 GHz     | 11 GHz     | 10 GHz     |
|-------------------------------------------------|------------|------------|------------|------------|------------|------------|
| Gain Setting, full scale                        |            |            |            |            |            |            |
| 100 mV                                          | 0.522 mV   | 0.493 mV   | 0.4675 mV  | 0.4505 mV  | 0.4335 mV  | 0.4165 mV  |
| 150 mV                                          | 0.693 mV   | 0.6205 mV  | 0.612 mV   | 0.6035 mV  | 0.578 mV   | 0.5525 mV  |
| 200 mV                                          | 0.7395 mV  | 0.714 mV   | 0.697 mV   | 0.6885 mV  | 0.663 mV   | 0.6375 mV  |
| 300 mV                                          | 1.088 mV   | 1.071 mV   | 1.088 mV   | 1.02 mV    | 0.986 mV   | 0.935 mV   |
| 400 mV                                          | 1.3855 mV  | 1.3515 mV  | 1.4195 mV  | 1.2665 mV  | 1.2155 mV  | 1.1815 mV  |
| 500 mV                                          | 1.632 mV   | 1.5725 mV  | 1.53 mV    | 1.513 mV   | 1.462 mV   | 1.4025 mV  |
| 600 mV                                          | 1.9975 mV  | 1.9295 mV  | 2.057 mV   | 1.853 mV   | 1.802 mV   | 1.6915 mV  |
| 700 mV                                          | 2.3715 mV  | 2.2865 mV  | 2.499 mV   | 2.193 mV   | 2.1335 mV  | 1.989 mV   |
| 800 mV                                          | 2.7455 mV  | 2.635 mV   | 2.89 mV    | 2.533 mV   | 2.465 mV   | 2.363 mV   |
| 900 mV                                          | 2.9835 mV  | 2.8815 mV  | 3.0855 mV  | 2.7795 mV  | 2.669 mV   | 2.567 mV   |
| 1.0 V                                           | 3.621 mV   | 3.587 mV   | 3.4765 mV  | 3.4425 mV  | 3.349 mV   | 3.1705 mV  |
| 2.0 V                                           | 6.9955 mV  | 6.766 mV   | 7.1315 mV  | 6.3495 mV  | 6.086 mV   | 5.8905 mV  |
| 2.5 V                                           | 8.4575 mV  | 8.177 mV   | 8.1345 mV  | 7.6755 mV  | 7.378 mV   | 7.0975 mV  |
| 3.0 V                                           | 9.928 mV   | 9.5795 mV  | 10.4975 mV | 8.993 mV   | 8.6615 mV  | 8.177 mV   |
| 4.0 V                                           | 12.9115 mV | 13.039 mV  | 14.671 mV  | 12.5715 mV | 12.1465 mV | 11.56 mV   |
| 4.5 V                                           | 14.382 mV  | 14.5265 mV | 15.7165 mV | 13.9995 mV | 13.5405 mV | 12.852 mV  |
| 5.0 V                                           | 15.861 mV  | 16.0055 mV | 16.66 mV   | 15.4275 mV | 14.926 mV  | 14.1525 mV |

| <b>MSO/DPO72004C<br/>MSO/DPO71604C<br/>MSO/DPO71254C</b> | <b>9 GHz</b> | <b>8 GHz</b> | <b>7GHz</b> | <b>6 GHz</b> | <b>5 GHz</b> | <b>4 GHz</b> |
|----------------------------------------------------------|--------------|--------------|-------------|--------------|--------------|--------------|
| Gain Setting, full scale                                 |              |              |             |              |              |              |
| 100 mV                                                   | 0.391 mV     | 0.3825 mV    | 0.387 mV    | 0.36 mV      | 0.333 mV     | 0.306 mV     |
| 150 mV                                                   | 0.5355 mV    | 0.51 mV      | 0.513 mV    | 0.486 mV     | 0.459 mV     | 0.432 mV     |
| 200 mV                                                   | 0.6035 mV    | 0.5695 mV    | 0.5355 mV   | 0.51 mV      | 0.4845 mV    | 0.4505 mV    |
| 300 mV                                                   | 0.8755 mV    | 0.8415mV     | 0.8075 mV   | 0.7565mV     | 0.714 mV     | 0.6545 mV    |
| 400 mV                                                   | 1.1305 mV    | 1.0795 mV    | 1.003 mV    | 0.935 mV     | 0.901 mV     | 0.833 mV     |
| 500 mV                                                   | 1.3345 mV    | 1.258 mV     | 1.1985 mV   | 1.1135 mV    | 1.037 mV     | 0.935 mV     |
| 600 mV                                                   | 1.6065 mV    | 1.5215 mV    | 1.4535 mV   | 1.36 mV      | 1.2665 mV    | 1.1475 mV    |
| 700 mV                                                   | 1.8785 mV    | 1.7935 mV    | 1.7085 mV   | 1.598 mV     | 1.496 mV     | 1.3515 mV    |
| 800 mV                                                   | 2.2185 mV    | 2.1165 mV    | 2.0145 mV   | 1.9125 mV    | 1.768 mV     | 1.666 mV     |
| 900 mV                                                   | 2.431 mV     | 2.329 mV     | 2.2185 mV   | 2.0825mV     | 1.9465mV     | 1.768 mV     |
| 1.0 V                                                    | 2.431 mV     | 2.329 mV     | 2.2185 mV   | 2.0825mV     | 1.9465mV     | 1.768 mV     |
| 2.0 V                                                    | 5.5675 mV    | 5.3805 mV    | 5.049 mV    | 4.6835 mV    | 4.488 mV     | 4.165 mV     |
| 2.5 V                                                    | 6.732 mV     | 6.4855 mV    | 6.12 mV     | 5.678 mV     | 5.389 mV     | 4.9555 mV    |
| 3.0 V                                                    | 7.905 mV     | 7.5905 mV    | 7.191 mV    | 6.664 mV     | 6.29 mV      | 5.7545 mV    |
| 4.0 V                                                    | 11.0585mV    | 10.54 mV     | 10.0385 mV  | 9.4095 mV    | 8.8145 mV    | 8.0835 mV    |
| 4.5 V                                                    | 12.325 mV    | 11.73 mV     | 11.1945 mV  | 10.489 mV    | 9.8005 mV    | 8.959 mV     |
| 5.0 V                                                    | 13.583 mV    | 12.92 mV     | 12.3505 mV  | 11.5685 mV   | 10.778 mV    | 9.8345 mV    |

| <b>MSO/DPO72004C MSO/<br/>DPO71604C MSO/<br/>DPO71254C</b> | <b>3 GHz</b> | <b>2 GHz</b> | <b>1GHz</b> | <b>500 MHz</b> |
|------------------------------------------------------------|--------------|--------------|-------------|----------------|
| Gain Setting, full scale                                   |              |              |             |                |
| 100 mV                                                     | 0.279 mV     | 0.234 mV     | 0.18 mV     | 0.153 mV       |
| 150 mV                                                     | 0.396 mV     | 0.351 mV     | 0.306 mV    | 0.243 mV       |
| 200 mV                                                     | 0.408 mV     | 0.374 mV     | 0.3145 mV   | 0.2635 mV      |
| 300 mV                                                     | 0.5865 mV    | 0.5185mV     | 0.442 mV    | 0.374 mV       |
| 400 mV                                                     | 0.748 mV     | 0.663 mV     | 0.561 mV    | 0.4845 mV      |
| 500 mV                                                     | 0.8755 mV    | 0.7735 mV    | 0.646 mV    | 0.578 mV       |
| 600 mV                                                     | 1.054 mV     | 0.9265 mV    | 0.7735 mV   | 0.697 mV       |
| 700 mV                                                     | 1.2325 mV    | 1.0795 mV    | 0.901 mV    | 0.8075 mV      |
| 800 mV                                                     | 1.496 mV     | 1.2835 mV    | 1.037 mV    | 0.935 mV       |
| 900 mV                                                     | 1.598 mV     | 1.3855mV     | 1.1475 mV   | 1.037 mV       |
| 1.0 V                                                      | 1.598 mV     | 1.3855mV     | 1.1475 mV   | 1.037 mV       |
| 2.0 V                                                      | 3.7655 mV    | 3.502 mV     | 2.907 mV    | 2.448 mV       |
| 2.5 V                                                      | 4.5305 mV    | 4.1395 mV    | 3.4595 mV   | 2.9665 mV      |
| 3.0 V                                                      | 5.287 mV     | 4.7855 mV    | 4.012 mV    | 3.485 mV       |
| 4.0 V                                                      | 7.5055 mV    | 6.681 mV     | 5.6355 mV   | 4.981 mV       |
| 4.5 V                                                      | 8.3385 mV    | 7.738 mV     | 6.239 mV    | 5.5505 mV      |

| MSO/DPO72004C MSO/<br>DPO71604C MSO/<br>DPO71254C | 3 GHz   | 2 GHz     | 1GHz     | 500 MHz |
|---------------------------------------------------|---------|-----------|----------|---------|
| 5.0 V                                             | 9.18 mV | 8.0835 mV | 6.851 mV | 6.12 mV |

Noise, typical, <4 GHz models

DPO7354C Enhanced bandwidth

| 40 GS/s    |         |          |          |         |          |          |
|------------|---------|----------|----------|---------|----------|----------|
| Step gain  | 3.5 GHz | 3.0 GHz  | 2.5 GHz  | 2.0 GHz | 1.0 GHz  | 0.5 GHz  |
| 500 mV/div | 23.5 mV | 20.2 mV  | 18.9 mV  | 16.5 mV | 12.2 mV  | 9.7 mV   |
| 200 mV/div | 10.9 mV | 9.2 mV   | 8.1 mV   | 7.05 mV | 5.3 mV   | 4.1 mV   |
| 100 mV/div | 6.6 mV  | 5.4 mV   | 4.9 mV   | 4.2 mV  | 3.05 mV  | 2.35 mV  |
| 50 mV/div  | 2.35 mV | 2.1 mV   | 1.9 mV   | 1.7 mV  | 1.3 mV   | 1.0 mV   |
| 20 mV/div  | 1.03 mV | 0.89 mV  | 0.811 mV | 0.72 mV | 0.53 mV  | 0.43 mV  |
| 10 mV/div  | 0.61 mV | 0.55 mV  | 0.47 mV  | 0.42 mV | 0.3 mV   | 0.23 mV  |
| 5 mV/div   | 0.41 mV | 0.415 mV | 0.41 mV  | 0.4 mV  | 0.21 mV  | 0.16 mV  |
| 2 mV/div   | 0.19 mV | 0.19 mV  | 0.19 mV  | 0.19 mV | 0.185 mV | 0.185 mV |
| 1 mV/div   | 0.12 mV | 0.12 mV  | 0.12 mV  | 0.12 mV | 0.12 mV  | 0.12 mV  |

| 20 GS/s    |          |          |          |          |          |          |
|------------|----------|----------|----------|----------|----------|----------|
| Step gain  | 3.5 GHz  | 3.0 GHz  | 2.5 GHz  | 2.0 GHz  | 1.0 GHz  | 0.5 GHz  |
| 500 mV/div | 24.3 mV  | 21.6 mV  | 19.1 mV  | 16.7 mV  | 12.4 mV  | 9.9 mV   |
| 200 mV/div | 11.1 mV  | 9.3 mV   | 8.4 mV   | 7.1 mV   | 5.35 mV  | 4.2 mV   |
| 100 mV/div | 6.65 mV  | 5.5 mV   | 4.95 mV  | 4.25 mV  | 3.1 mV   | 2.4 mV   |
| 50 mV/div  | 2.45 mV  | 2.2 mV   | 1.95 mV  | 1.8 mV   | 1.35 mV  | 1.1 mV   |
| 20 mV/div  | 1.055 mV | 0.93 mV  | 0.83 mV  | 0.75 mV  | 0.55 mV  | 0.435 mV |
| 10 mV/div  | 0.625 mV | 0.55 mV  | 0.475 mV | 0.425 mV | 0.31 mV  | 0.24 mV  |
| 5 mV/div   | 0.415 mV | 0.415 mV | 0.415 mV | 0.415 mV | 0.215 mV | 0.16 mV  |
| 2 mV/div   | 0.19 mV  | 0.19 mV  | 0.19 mV  | 0.19 mV  | 0.185 mV | 0.185 mV |
| 1 mV/div   | 0.12 mV  | 0.12 mV  | 0.12 mV  | 0.12 mV  | 0.12 mV  | 0.12 mV  |

| 10 GS/s    |          |         |         |         |          |          |
|------------|----------|---------|---------|---------|----------|----------|
| Step gain  | 3.5 GHz  | 3.0 GHz | 2.5 GHz | 2.0 GHz | 1.0 GHz  | 0.5 GHz  |
| 500 mV/div | 25.8 mV  | 22.2 mV | 20.0 mV | 17.7 mV | 13.2 mV  | 10.4 mV  |
| 200 mV/div | 11.7 mV  | 9.9 mV  | 8.7 mV  | 7.5 mV  | 5.5 mV   | 4.3 mV   |
| 100 mV/div | 6.9 mV   | 5.6 mV  | 5.0 mV  | 4.3 mV  | 3.2 mV   | 2.4 mV   |
| 50 mV/div  | 2.6 mV   | 2.3 mV  | 2.05 mV | 1.85 mV | 1.4 mV   | 1.15 mV  |
| 20 mV/div  | 1.11 mV  | 0.99 mV | 0.87 mV | 0.77 mV | 0.58 mV  | 0.45 mV  |
| 10 mV/div  | 0.65 mV  | 0.55 mV | 0.49 mV | 0.43 mV | 0.32 mV  | 0.25 mV  |
| 5 mV/div   | 0.415 mV | 0.42 mV | 0.42 mV | 0.42 mV | 0.22 mV  | 0.16 mV  |
| 2 mV/div   | 0.19 mV  | 0.19 mV | 0.19 mV | 0.19 mV | 0.185 mV | 0.185 mV |
| 1 mV/div   | 0.12 mV  | 0.12 mV | 0.12 mV | 0.12 mV | 0.12 mV  | 0.12 mV  |

DPO7354C Without enhanced bandwidth

| 40 GS/s    |         |         |          |          |
|------------|---------|---------|----------|----------|
| Step gain  | 2.5 GHz | 0.5 GHz | 0.25 GHz | 0.02 GHz |
| 500 mV/div | 23.5 mV | 16.3 mV | 14.5 mV  | 14.0 mV  |
| 200 mV/div | 10.7 mV | 6.9 mV  | 6.1 mV   | 5.8 mV   |

| <b>40 GS/s</b>   |                |                |                 |                 |
|------------------|----------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>0.5 GHz</b> | <b>0.25 GHz</b> | <b>0.02 GHz</b> |
| 100 mV/div       | 6.3 mV         | 3.8 mV         | 3.2 mV          | 3.0 mV          |
| 50 mV/div        | 2.4 mV         | 1.75 mV        | 1.6 mV          | 1.5 mV          |
| 20 mV/div        | 1.07 mV        | 0.7 mV         | 0.63 mV         | 0.595 mV        |
| 10 mV/div        | 0.61 mV        | 0.38 mV        | 0.32 mV         | 0.3 mV          |
| 5 mV/div         | 0.41 mV        | 0.24 mV        | 0.18 mV         | 0.151 mV        |
| 2 mV/div         | 0.19 mV        | 0.18 mV        | 0.115 mV        | 0.065 mV        |
| 1 mV/div         | 0.12 mV        | 0.12 mV        | 0.115 mV        | 0.045 mV        |

| <b>20 GS/s</b>   |                |                |                 |                 |
|------------------|----------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>0.5 GHz</b> | <b>0.25 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 23.0 mV        | 16.3 mV        | 14.5 mV         | 14.0 mV         |
| 200 mV/div       | 10.5 mV        | 6.9 mV         | 6.1 mV          | 5.8 mV          |
| 100 mV/div       | 6.25 mV        | 3.8 mV         | 3.2 mV          | 3.0 mV          |
| 50 mV/div        | 2.4 mV         | 1.75 mV        | 1.6 mV          | 1.5 mV          |
| 20 mV/div        | 1.04 mV        | 0.7 mV         | 0.63 mV         | 0.595 mV        |
| 10 mV/div        | 0.605 mV       | 0.38 mV        | 0.32 mV         | 0.3 mV          |
| 5 mV/div         | 0.4 mV         | 0.24 mV        | 0.18 mV         | 0.151 mV        |
| 2 mV/div         | 0.19 mV        | 0.18 mV        | 0.115 mV        | 0.065 mV        |
| 1 mV/div         | 0.12 mV        | 0.12 mV        | 0.115 mV        | 0.045 mV        |

| <b>10 GS/s</b>   |                |                |                 |                 |
|------------------|----------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>0.5 GHz</b> | <b>0.25 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 22.8 mV        | 16.3 mV        | 14.5 mV         | 14.0 mV         |
| 200 mV/div       | 10.4 mV        | 6.9 mV         | 6.1 mV          | 5.8 mV          |
| 100 mV/div       | 6.15 mV        | 3.8 mV         | 3.2 mV          | 3.0 mV          |
| 50 mV/div        | 2.4 mV         | 1.75 mV        | 1.6 mV          | 1.5 mV          |
| 20 mV/div        | 1.035 mV       | 0.7 mV         | 0.63 mV         | 0.595 mV        |
| 10 mV/div        | 0.59 mV        | 0.38 mV        | 0.32 mV         | 0.3 mV          |
| 5 mV/div         | 0.395 mV       | 0.24 mV        | 0.18 mV         | 0.151 mV        |
| 2 mV/div         | 0.19 mV        | 0.18 mV        | 0.115 mV        | 0.065 mV        |
| 1 mV/div         | 0.12 mV        | 0.12 mV        | 0.115 mV        | 0.045 mV        |

**DPO7254C Enhanced bandwidth**

| <b>40 GS/s</b>   |                |                |                |                |
|------------------|----------------|----------------|----------------|----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>2.0 GHz</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 19.7 mV        | 16.2 mV        | 12.1 mV        | 9.9 mV         |
| 200 mV/div       | 8.71 mV        | 6.97 mV        | 4.97 mV        | 4.0 mV         |
| 100 mV/div       | 5.23 mV        | 4.25 mV        | 2.97 mV        | 2.36 mV        |
| 50 mV/div        | 2.0 mV         | 1.64 mV        | 1.23 mV        | 1.03 mV        |
| 20 mV/div        | 0.866 mV       | 0.707 mV       | 0.528 mV       | 0.431 mV       |
| 10 mV/div        | 0.523 mV       | 0.425 mV       | 0.297 mV       | 0.236 mV       |
| 5 mV/div         | 0.343 mV       | 0.349 mV       | 0.21 mV        | 0.154 mV       |
| 2 mV/div         | 0.135 mV       | 0.135 mV       | 0.135 mV       | 0.135 mV       |
| 1 mV/div         | 0.095 mV       | 0.095 mV       | 0.095 mV       | 0.095 mV       |

| <b>20 GS/s</b>   |                |                |                |                |
|------------------|----------------|----------------|----------------|----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>2.0 GHz</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 19.5 mV        | 16.1 mV        | 12.0 mV        | 9.8 mV         |
| 200 mV/div       | 8.7 mV         | 7.05 mV        | 5.1 mV         | 4.0 mV         |
| 100 mV/div       | 5.15 mV        | 4.2 mV         | 2.95 mV        | 2.35 mV        |
| 50 mV/div        | 2.0 mV         | 1.65 mV        | 1.25 mV        | 1.05 mV        |
| 20 mV/div        | 0.855 mV       | 0.71 mV        | 0.52 mV        | 0.425 mV       |
| 10 mV/div        | 0.515 mV       | 0.42 mV        | 0.295 mV       | 0.235 mV       |
| 5 mV/div         | 0.34 mV        | 0.345 mV       | 0.21 mV        | 0.155 mV       |
| 2 mV/div         | 0.135 mV       | 0.135 mV       | 0.135 mV       | 0.135 mV       |
| 1 mV/div         | 0.095 mV       | 0.095 mV       | 0.095 mV       | 0.095 mV       |

| <b>10 GS/s</b>   |                |                |                |                |
|------------------|----------------|----------------|----------------|----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>2.0 GHz</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 20.2 mV        | 16.7 mV        | 12.5 mV        | 10.3 mV        |
| 200 mV/div       | 8.9 mV         | 7.3 mV         | 5.3 mV         | 4.16 mV        |
| 100 mV/div       | 5.3 mV         | 4.3 mV         | 3.05 mV        | 2.4 mV         |
| 50 mV/div        | 2.1 mV         | 1.7 mV         | 1.3 mV         | 1.1 mV         |
| 20 mV/div        | 0.88 mV        | 0.74 mV        | 0.55 mV        | 0.435 mV       |
| 10 mV/div        | 0.52 mV        | 0.43 mV        | 0.3 mV         | 0.24 mV        |
| 5 mV/div         | 0.345 mV       | 0.33 mV        | 0.21 mV        | 0.155 mV       |
| 2 mV/div         | 0.135 mV       | 0.135 mV       | 0.135 mV       | 0.135 mV       |
| 1 mV/div         | 0.095 mV       | 0.095 mV       | 0.095 mV       | 0.095 mV       |

**DPO7254C Without enhanced  
bandwidth**

| <b>40 GS/s</b>   |                |                |                 |                 |
|------------------|----------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>0.5 GHz</b> | <b>0.25 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 22.7 mV        | 16.4 mV        | 15.0 mV         | 14.5 mV         |
| 200 mV/div       | 9.84 mV        | 6.97 mV        | 6.2 mV          | 5.8 mV          |
| 100 mV/div       | 5.89 mV        | 3.74 mV        | 3.2 mV          | 2.9 mV          |
| 50 mV/div        | 2.31 mV        | 1.69 mV        | 1.55 mV         | 1.45 mV         |
| 20 mV/div        | 0.964 mV       | 0.697 mV       | 0.63 mV         | 0.59 mV         |
| 10 mV/div        | 0.574 mV       | 0.379 mV       | 0.325 mV        | 0.295 mV        |
| 5 mV/div         | 0.4 mV         | 0.231 mV       | 0.175 mV        | 0.145 mV        |
| 2 mV/div         | 0.19 mV        | 0.195 mV       | 0.12 mV         | 0.065 mV        |
| 1 mV/div         | 0.12 mV        | 0.12 mV        | 0.12 mV         | 0.045 mV        |

| <b>20 GS/s</b>   |                |                |                 |                 |
|------------------|----------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>0.5 GHz</b> | <b>0.25 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 21.8 mV        | 16.0 mV        | 15.0 mV         | 14.5 mV         |
| 200 mV/div       | 9.6 mV         | 6.8 mV         | 6.2 mV          | 5.8 mV          |
| 100 mV/div       | 5.7 mV         | 3.65 mV        | 3.2 mV          | 2.9 mV          |
| 50 mV/div        | 2.25 mV        | 1.65 mV        | 1.55 mV         | 1.45 mV         |
| 20 mV/div        | 0.94 mV        | 0.68 mV        | 0.63 mV         | 0.49 mV         |
| 10 mV/div        | 0.56 mV        | 0.37 mV        | 0.325 mV        | 0.295 mV        |
| 5 mV/div         | 0.38 mV        | 0.225 mV       | 0.175 mV        | 0.145 mV        |
| 2 mV/div         | 0.19 mV        | 0.195 mV       | 0.12 mV         | 0.065 mV        |
| 1 mV/div         | 0.12 mV        | 0.12 mV        | 0.12 mV         | 0.045 mV        |

| <b>10 GS/s</b>   |                |                |                 |                 |
|------------------|----------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>2.5 GHz</b> | <b>0.5 GHz</b> | <b>0.25 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 21.8 mV        | 16.0 mV        | 15.0 mV         | 15.5 mV         |
| 200 mV/div       | 9.6 mV         | 6.8 mV         | 6.2 mV          | 5.8 mV          |
| 100 mV/div       | 5.65 mV        | 3.65 mV        | 3.2 mV          | 2.9 mV          |
| 50 mV/div        | 2.2 mV         | 1.65 mV        | 1.55 mV         | 1.45 mV         |
| 20 mV/div        | 0.94 mV        | 0.68 mV        | 0.63 mV         | 0.59 mV         |
| 10 mV/div        | 0.56 mV        | 0.37 mV        | 0.325 mV        | 0.295 mV        |
| 5 mV/div         | 0.37 mV        | 0.225 mV       | 0.175 mV        | 0.145 mV        |
| 2 mV/div         | 0.19 mV        | 0.195 mV       | 0.12 mV         | 0.065 mV        |
| 1 mV/div         | 0.12 mV        | 0.12 mV        | 0.12 mV         | 0.045 mV        |

**DPO7104C Enhanced bandwidth**

| <b>20 GS/s</b>   |                |                |
|------------------|----------------|----------------|
| <b>Step gain</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 13.2 mV        | 9.7 mV         |
| 200 mV/div       | 5.57 mV        | 3.93 mV        |
| 100 mV/div       | 3.27 mV        | 2.24 mV        |
| 50 mV/div        | 1.36 mV        | 0.98 mV        |
| 20 mV/div        | 0.574 mV       | 0.408 mV       |
| 10 mV/div        | 0.328 mV       | 0.232 mV       |
| 5 mV/div         | 0.229 mV       | 0.16 mV        |
| 2 mV/div         | 0.135 mV       | 0.135 mV       |
| 1 mV/div         | 0.095 mV       | 0.095 mV       |

| <b>10 GS/s</b>   |                |                |
|------------------|----------------|----------------|
| <b>Step gain</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 14.7 mV        | 10.3 mV        |
| 200 mV/div       | 6.09 mV        | 4.34 mV        |
| 100 mV/div       | 3.55 mV        | 2.38 mV        |
| 50 mV/div        | 1.53 mV        | 1.05 mV        |
| 20 mV/div        | 0.625 mV       | 0.441 mV       |
| 10 mV/div        | 0.350 mV       | 0.24 mV        |
| 5 mV/div         | 0.236 mV       | 0.16 mV        |
| 2 mV/div         | 0.135 mV       | 0.135 mV       |
| 1 mV/div         | 0.095 mV       | 0.095 mV       |

| <b>5 GS/s</b>    |                |                |
|------------------|----------------|----------------|
| <b>Step gain</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 15.9 mV        | 10.7 mV        |
| 200 mV/div       | 6.71 mV        | 4.48 mV        |
| 100 mV/div       | 3.74 mV        | 2.46 mV        |
| 50 mV/div        | 1.68 mV        | 1.1 mV         |
| 20 mV/div        | 0.682 mV       | 0.454 mV       |
| 10 mV/div        | 0.378 mV       | 0.247 mV       |
| 5 mV/div         | 0.241 mV       | 0.16 mV        |
| 2 mV/div         | 0.135 mV       | 0.135 mV       |
| 1 mV/div         | 0.095 mV       | 0.095 mV       |

**DPO7104C Without enhanced  
bandwidth**

| <b>20 GS/s</b>   |                |                |                  |                 |
|------------------|----------------|----------------|------------------|-----------------|
| <b>Step gain</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> | <b>0.025 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 16.2 mV        | 15.2 mV        | 14.0 mV          | 13.3 mV         |
| 200 mV/div       | 6.8 mV         | 6.3 mV         | 5.7 mV           | 5.3 mV          |
| 100 mV/div       | 3.7 mV         | 3.4 mV         | 3.0 mV           | 2.8 mV          |
| 50 mV/div        | 1.7 mV         | 1.6 mV         | 1.45 mV          | 1.4 mV          |
| 20 mV/div        | 0.7 mV         | 0.64 mV        | 0.58 mV          | 0.55 mV         |
| 10 mV/div        | 0.38 mV        | 0.35 mV        | 0.3 mV           | 0.285 mV        |
| 5 mV/div         | 0.25 mV        | 0.21 mV        | 0.17 mV          | 0.14 mV         |
| 2 mV/div         | 0.15 mV        | 0.15 mV        | 0.1 mV           | 0.065 mV        |
| 1 mV/div         | 0.11 mV        | 0.11 mV        | 0.11 mV          | 0.04 mV         |

| <b>10 GS/s</b>   |                |                |                  |                 |
|------------------|----------------|----------------|------------------|-----------------|
| <b>Step gain</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> | <b>0.025 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 16.2 mV        | 15.2 mV        | 14.0 mV          | 13.3 mV         |
| 200 mV/div       | 6.8 mV         | 6.3 mV         | 5.7 mV           | 5.3 mV          |
| 100 mV/div       | 3.7 mV         | 3.4 mV         | 3.0 mV           | 2.8 mV          |
| 50 mV/div        | 1.7 mV         | 1.6 mV         | 1.45 mV          | 1.4 mV          |
| 20 mV/div        | 0.7 mV         | 0.64 mV        | 0.58 mV          | 0.55 mV         |
| 10 mV/div        | 0.38 mV        | 0.35 mV        | 0.3 mV           | 0.285 mV        |
| 5 mV/div         | 0.25 mV        | 0.21 mV        | 0.17 mV          | 0.14 mV         |
| 2 mV/div         | 0.15 mV        | 0.15 mV        | 0.1 mV           | 0.065 mV        |
| 1 mV/div         | 0.11 mV        | 0.11 mV        | 0.11 mV          | 0.04 mV         |

| <b>5 GS/s</b>    |                |                |                  |                 |
|------------------|----------------|----------------|------------------|-----------------|
| <b>Step gain</b> | <b>1.0 GHz</b> | <b>0.5 GHz</b> | <b>0.025 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 16.2 mV        | 16.2 mV        | 14.0 mV          | 13.3 mV         |
| 200 mV/div       | 6.8 mV         | 6.3 mV         | 5.7 mV           | 5.3 mV          |
| 100 mV/div       | 3.7 mV         | 3.4 mV         | 3.0 mV           | 2.8 mV          |
| 50 mV/div        | 1.7 mV         | 1.6 mV         | 1.45 mV          | 1.4 mV          |
| 20 mV/div        | 0.7 mV         | 0.64 mV        | 0.58 mV          | 0.550 mV        |
| 10 mV/div        | 0.38 mV        | 0.35 mV        | 0.3 mV           | 0.285 mV        |
| 5 mV/div         | 0.25 mV        | 0.21 mV        | 0.17 mV          | 0.14 mV         |
| 2 mV/div         | 0.15 mV        | 0.15 mV        | 0.1 mV           | 0.065 mV        |
| 1 mV/div         | 0.11 mV        | 0.11 mV        | 0.11 mV          | 0.04 mV         |

**DPO7054C Enhanced bandwidth**

| <b>10 GS/s</b>   |                |
|------------------|----------------|
| <b>Step gain</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 11.9 mV        |
| 200 mV/div       | 5.0 mV         |
| 100 mV/div       | 2.75 mV        |
| 50 mV/div        | 1.2 mV         |
| 20 mV/div        | 0.5 mV         |
| 10 mV/div        | 0.28 mV        |
| 5 mV/div         | 0.185 mV       |
| 2 mV/div         | 0.11 mV        |
| 1 mV/div         | 0.09 mV        |

| <b>5 GS/s</b>    |                |
|------------------|----------------|
| <b>Step gain</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 13.0 mV        |
| 200 mV/div       | 5.35 mV        |
| 100 mV/div       | 2.95 mV        |
| 50 mV/div        | 1.35 mV        |
| 20 mV/div        | 0.54 mV        |
| 10 mV/div        | 0.3 mV         |
| 5 mV/div         | 0.19 mV        |
| 2 mV/div         | 0.11 mV        |
| 1 mV/div         | 0.09 mV        |

| <b>2.5 GS/s</b>  |                |
|------------------|----------------|
| <b>Step gain</b> | <b>0.5 GHz</b> |
| 500 mV/div       | 15.0 mV        |
| 200 mV/div       | 6.2 mV         |
| 100 mV/div       | 3.35 mV        |
| 50 mV/div        | 1.56 mV        |
| 20 mV/div        | 0.63 mV        |
| 10 mV/div        | 0.375 mV       |
| 5 mV/div         | 0.205 mV       |
| 2 mV/div         | 0.11 mV        |
| 1 mV/div         | 0.09 mV        |

**DPO7054C Without enhanced bandwidth**

| <b>10 GS/s</b>   |                |                  |                 |
|------------------|----------------|------------------|-----------------|
| <b>Step gain</b> | <b>0.5 GHz</b> | <b>0.025 GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 15.1 mV        | 14.0 mV          | 13.2 mV         |
| 200 mV/div       | 6.35 mV        | 5.7 mV           | 5.4 mV          |
| 100 mV/div       | 3.4 mV         | 2.95 mV          | 2.75 mV         |

| <b>10 GS/s</b>   |                |                  |                 |
|------------------|----------------|------------------|-----------------|
| <b>Step gain</b> | <b>0.5 GHz</b> | <b>0.025 GHz</b> | <b>0.02 GHz</b> |
| 50 mV/div        | 1.6 mV         | 1.45 mV          | 1.38 mV         |
| 20 mV/div        | 0.645 mV       | 0.58 mV          | 0.55 mV         |
| 10 mV/div        | 0.34 mV        | 0.3 mV           | 0.277 mV        |
| 5 mV/div         | 0.21 mV        | 0.165 mV         | 0.141 mV        |
| 2 mV/div         | 0.13 mV        | 0.1 mV           | 0.062 mV        |
| 1 mV/div         | 0.096 mV       | 0.097 mV         | 0.04 mV         |

| <b>5 GS/s</b>    |                |                 |                 |
|------------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>0.5 GHz</b> | <b>0.025GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 15.1 mV        | 14.0 mV         | 13.2 mV         |
| 200 mV/div       | 6.35 mV        | 5.7 mV          | 5.4 mV          |
| 100 mV/div       | 3.4 mV         | 2.95 mV         | 2.75 mV         |
| 50 mV/div        | 1.6 mV         | 1.45 mV         | 1.38 mV         |
| 20 mV/div        | 0.645 mV       | 0.58 mV         | 0.55 mV         |
| 10 mV/div        | 0.34 mV        | 0.3 mV          | 0.277 mV        |
| 5 mV/div         | 0.21 mV        | 0.165 mV        | 0.141 mV        |
| 2 mV/div         | 0.13 mV        | 0.1 mV          | 0.062 mV        |
| 1 mV/div         | 0.096 mV       | 0.097 mV        | 0.04 mV         |

| <b>2.5 GS/s</b>  |                |                 |                 |
|------------------|----------------|-----------------|-----------------|
| <b>Step gain</b> | <b>0.5 GHz</b> | <b>0.025GHz</b> | <b>0.02 GHz</b> |
| 500 mV/div       | 15.1 mV        | 14.0 mV         | 13.2 mV         |
| 200 mV/div       | 6.35 mV        | 5.7 mV          | 5.4 mV          |
| 100 mV/div       | 3.4 mV         | 2.95 mV         | 2.75 mV         |
| 50 mV/div        | 1.6 mV         | 1.45 mV         | 1.38 mV         |
| 20 mV/div        | 0.645 mV       | 0.58 mV         | 0.55 mV         |
| 10 mV/div        | 0.34 mV        | 0.3 mV          | 0.277 mV        |
| 5 mV/div         | 0.21 mV        | 0.165 mV        | 0.141 mV        |
| 2 mV/div         | 0.13 mV        | 0.1 mV          | 0.062 mV        |
| 1 mV/div         | 0.096 mV       | 0.097 mV        | 0.04 mV         |

**Channel-to-channel crosstalk (channel isolation)**

**>20 GHz models, typical**

Input frequency range (up to the rated bandwidth). Assumes two channels with the same scale and bandwidth settings.

|               |                   |
|---------------|-------------------|
| 0 to 9 GHz    | ≥ 120:1 isolation |
| >9 to 12 GHz  | ≥ 80:1 isolation  |
| >12 to 15 GHz | ≥ 50:1 isolation  |
| >15 to 20 GHz | ≥ 25:1 isolation  |
| >20 to 33 GHz | ≥ 20:1 isolation  |

**≥ 4 GHz, ≤20 GHz models, typical**

Input frequency range (up to the rated bandwidth). Assumes two channels with the same scale and bandwidth settings.

|                   |                   |
|-------------------|-------------------|
| 0 to 10 GHz       | ≥ 120:1 isolation |
| >10 GHz to 12 GHz | ≥ 80:1 isolation  |
| >12 GHz to 15 GHz | ≥ 50:1 isolation  |
| >15 GHz to 20 GHz | ≥ 25:1 isolation  |

**<4 GHz models, typical**

RMS voltage ratio of ≥ 100:1 at ≤ 100 MHz and ≥ 30:1 at > 100 MHz up to 2.5 GHz, and ≥20:1 above 2.5 GHz

**Delay between channels, BWE, typical**

**>20 GHz models**

≤ 1 ps between any two channels at any gain setting at 25 °C ±5 °C. Derate linearly to ≤ 3 ps at 5 °C and 45 °C.

**Delay between channels, full bandwidth, equivalent time, typical**

**>20 GHz models**

≤ 3 ps between any two channels at any gain setting at 25 °C.

≤ 10 ps for any two channels at any gain setting over temperature.

**≥ 4 GHz, ≤20 GHz models**

≤ 10 ps between any two channels with equal volts/div and coupling settings.

≤ 10 ps delay change when enabling and disabling Channel Equalization (DSP matching).

**Delay between channels, typical <4 GHz models**

≤ 100 ps between any two channels with the same scale and coupling settings with input impedance set to 50 Ω, DC coupling and scale set at or above 10 mV/div.

**Internal probe power <4 GHz models**

50 W maximum

**Probe power per probe, <4 GHz models**

| Voltage | Maximum Amperage | Voltage Tolerance |
|---------|------------------|-------------------|
| 5 V     | 50 mA            | ± 5%              |
| 12 V    | 1 A              | ±10%              |

## Horizontal and acquisition system

### Real-time sample rate range

|                                                                                                       | Number of channels acquired | Sample rate, maximum |              |
|-------------------------------------------------------------------------------------------------------|-----------------------------|----------------------|--------------|
|                                                                                                       |                             | (Standard)           | (Option 2SR) |
| MSO/DPO70804C<br>MSO/DPO70604C<br>MSO/DPO70404C                                                       | All channels                | Up to 25 GS/s        |              |
| MSO/DPO73304DX<br>MSO/DPO72504DX<br>MSO/DPO72304DX<br>MSO/DPO72004C<br>MSO/DPO71604C<br>MSO/DPO71254C | All channels                | Up to 50 GS/s        |              |
|                                                                                                       | Two channels                | Up to 100 GS         |              |
| DPO7354C and<br>DPO7254C                                                                              | 1                           | 40 GS/s              |              |
|                                                                                                       | 2                           | 20 GS/s              |              |
|                                                                                                       | 3 or 4                      | 10 GS/s              |              |
| DPO7104C                                                                                              | 1                           | 20 GS/s              | 40 GS/s      |
|                                                                                                       | 2                           | 10 GS/s              | 20 GS/s      |
|                                                                                                       | 3 or 4                      | 5 GS/s               | 10 GS/s      |
| DPO7054C                                                                                              | 1                           | 20 GS/s              |              |
|                                                                                                       | 2                           | 10 GS/s              |              |
|                                                                                                       | 3 or 4                      | 5 GS/s               |              |

### Equivalent-time sample rate or interpolated waveform rate range

≥4 GHz models

<4 GHz models

Equivalent-time acquisition can be enabled or disabled. When disabled, waveforms are interpolated at the fastest time base settings.

Up to 5 TS/s and 0.2 ps trigger placement resolution

Up to 4 TS/s

### Maximum record length, sample mode, ≥4 GHz models

The maximum record length depends on the installed record length options. Maximum record length is less in serial trigger mode, hi-res mode, or when using the FIR filter.

|                                                           |                                                                                                                                          |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Option 2XL installed<br>(standard on DPO70000C/DX Series) | 31,250,000 points                                                                                                                        |
| Option 5XL installed<br>(standard on MSO70000C/DX Series) | 62,500,000 points (all channels)                                                                                                         |
| Option 10XL installed                                     | 125,000,000 points (all channels)                                                                                                        |
| Option 20XL installed                                     | 250,000,000 points (all channels)                                                                                                        |
| Option 50XL installed (DX models only)                    | 500,000,000 points (all channels), 1 G on 1–2 channels at 50 GS/s and 100 GS/s sample rates or greater (interpolated or equivalent time) |

**Maximum record length, sample mode <4 GHz models**

The maximum record length depends on the number of active channels and the record length options installed. Maximum record length is less in serial trigger mode, hi-res mode or when using the FIR filter.

|                                                     |                 |                                      |
|-----------------------------------------------------|-----------------|--------------------------------------|
| <b>Standard, DPO7354C and DPO7254C</b>              | 10 GS/s         | 12,500,000 points (3 or 4 channels)  |
|                                                     | 20 GS/s or less | 25,000,000 points (2 channels)       |
|                                                     | 40 GS/s or less | 50,000,000 points (1 channel)        |
| <b>DPO7104C</b>                                     | 5 GS/s          | 12,500,000 points (3 or 4 channels)  |
|                                                     | 10 GS/s or less | 25,000,000 points (2 channels)       |
|                                                     | 20 GS/s or less | 50,000,000 points (1 channel)        |
| <b>DPO7054C</b>                                     | 2.5 GS/s        | 12,500,000 points (3 or 4 channels)  |
|                                                     | 5 GS/s or less  | 25,000,000 points (2 channels)       |
|                                                     | 10 GS/s or less | 50,000,000 points (1 channel)        |
| <b>Option 2RL installed, DPO7354C and DPO7254C</b>  | 10 GS/s         | 25,000,000 points (3 or 4 channels)  |
|                                                     | 20 GS/s or less | 50,000,000 points (2 channels only)  |
|                                                     | 40 GS/s or less | 125,000,000 points (1 channel only)  |
| <b>DPO7104C</b>                                     | 5 GS/s          | 25,000,000 points (3 or 4 channels)  |
|                                                     | 10 GS/s or less | 50,000,000 points (2 channels only)  |
|                                                     | 20 GS/s or less | 125,000,000 points (1 channel only)  |
| <b>DPO7054C</b>                                     | 2.5 GS/s        | 25,000,000 points (3 or 4 channels)  |
|                                                     | 5 GS/s or less  | 50,000,000 points (2 channels only)  |
|                                                     | 10 GS/s or less | 125,000,000 points (1 channel only)  |
| <b>Option 5RL installed, DPO7354C and DPO7254C</b>  | 10 GS/s         | 50,000,000 points (3 or 4 channels)  |
|                                                     | 20 GS/s or less | 125,000,000 points (2 channels only) |
|                                                     | 40 GS/s or less | 250,000,000 points (1 channel only)  |
| <b>DPO7104C</b>                                     | 5 GS/s          | 50,000,000 points (3 or 4 channels)  |
|                                                     | 10 GS/s or less | 125,000,000 points (2 channels only) |
|                                                     | 20 GS/s or less | 250,000,000 points (1 channel only)  |
| <b>DPO7054C</b>                                     | 2.5 GS/s        | 50,000,000 points (3 or 4 channels)  |
|                                                     | 5 GS/s or less  | 125,000,000 points (2 channels only) |
|                                                     | 10 GS/s or less | 250,000,000 points (1 channel only)  |
| <b>Option 10RL installed, DPO7354C and DPO7254C</b> | 10 GS/s         | 125,000,000 points (3 or 4 channels) |
|                                                     | 20 GS/s or less | 250,000,000 points (2 channels only) |
|                                                     | 40 GS/s or less | 500,000,000 points (1 channel only)  |

**Maximum record length, HiRes mode**

Half the record length of sample mode

**Seconds division range**

≥4 GHz models, Fastest sweep speed is 20 ps per division

**<4 GHz models**

| <b>DPO7354 C,<br/>DPO7254 C</b> | <b>Record Length</b> |                |              |               |                 |               |                   |
|---------------------------------|----------------------|----------------|--------------|---------------|-----------------|---------------|-------------------|
| <b>Horizontal mode</b>          | <b>1 K</b>           | <b>10 K</b>    | <b>100 K</b> | <b>1 M</b>    | <b>10 M</b>     | <b>100 M</b>  | <b>400/500 M</b>  |
| Automatic                       | 25 ps - 20 s         | 250 ps - 200 s | 2.5 ns - 1ks | 50 ns - 1 ks  | 500 ns - 1 ks   | 5 us - 1 ks   | 5 us - 1 ks       |
| Constant SR                     | 25 ps - 20 s         | 250 ps - 200 s | 2.5 ns - 1ks | 50 ns - 1 ks  | 500 ns - 1 ks   | 5 us - 1 ks   | 10 us - 1 ks      |
| Manual                          | 25 ps - 40 s         | 250 ps - 400 s | 2.5 ns - 4ks | 25 ns - 40 ks | 250 ns - 400 ks | 2.5 us - 4 Ms | 12.5 us - 8.19 Ms |

| <b>DPO7104 C,<br/>DPO7054 C</b> | <b>Record Length</b> |                |              |               |                 |              |                  |
|---------------------------------|----------------------|----------------|--------------|---------------|-----------------|--------------|------------------|
| <b>Horizontal mode</b>          | <b>1 K</b>           | <b>10 K</b>    | <b>100 K</b> | <b>1 M</b>    | <b>10 M</b>     | <b>100 M</b> | <b>200/250 M</b> |
| Automatic                       | 25 ps - 20 s         | 250 ps - 200 s | 2.5 ns - 1ks | 50 ns - 1 ks  | 500 ns - 1 ks   | 5 us - 1 ks  | 5 us - 1 ks      |
| Constant SR                     | 25 ps - 20 s         | 250 ps - 200 s | 2.5 ns - 1ks | 50 ns - 1 ks  | 500 ns - 1 ks   | 5 us - 1 ks  | 10 us - 1 ks     |
| Manual                          | 25 ps - 40 s         | 250 ps - 400 s | 2.5 ns - 4ks | 25 ns - 40 ks | 250 ns - 400 ks | 2.5 us - 4Ms | 5 us - 8 Ms      |

**Acquisition update rate, typical**

**≥4 GHz models**

Fast Acquisition on: 300,000 waveforms per second maximum

**<4 GHz models**

Fast Acquisition on: 250,000 waveforms per second maximum

**Time base delay time range**

5 ns to 250 s

**Internal time-base reference frequency**

10 MHz

Electronically adjustable over about ±5 ppm.

**Long term sample rate accuracy**

**<4 GHz models**

± 2.5 ppm initial accuracy. Aging < 1 ppm per year. Applies only when using the internal reference.

**≥4 GHz models**

± 1.5 ppm initial accuracy. Aging < 1 ppm per year. Applies only when using the internal reference.

**Timing jitter (aperture uncertainty), typical**

**>20 GHz models**

Measured at the maximum sample rate.

**External Reference Low with ~0 dBm input drive at 10 MHz**

<250 fs rms for record durations less than 10  $\mu$ s

<350 fs rms for record durations less than 100  $\mu$ s

<400 fs rms for record durations less than 10 ms

<600 fs rms for record durations less than 10 s

**External Reference Hi with ~0 dBm input drive at 10 MHz**

<250 fs rms for record durations less than 2  $\mu$ s

<700 fs rms for record durations less than 10 s

For external reference in high (tracking) mode, the input reference must be low noise and the edge slew rate must exceed 1.5 V/ns to achieve the typical jitter results.

**Internal Reference**

<250 fs rms for record durations less than 10  $\mu$ s

<350 fs rms for record durations less than 100  $\mu$ s

<400 fs rms for record durations less than 5 ms

In high (tracking) mode, the input reference must be low noise and the edge slew rate must exceed 1.5 V/ns.

For internal reference, specification assumes no signal attached to the external reference input.

**$\geq 4$  GHz,  $\leq 20$  GHz models**

**Measured at the maximum BWE enabled bandwidth.**

Total:

<250 fs rms for record durations less than 10  $\mu$ s

<350 fs rms for record durations less than 100  $\mu$ s

<650 fs rms for record durations less than 1 ms

<15 parts/trillion for record durations less than 60 s

<2 ps peak-to-peak for record durations less than 10  $\mu$ s

<3 ps peak-to-peak for record durations less than 100  $\mu$ s

<4 ps peak-to-peak for record durations less than 1 ms

This assumes either internal reference, or external reference in low (stable) mode. For external reference in high (tracking) mode, the input reference must be low noise, and the edge slew rate must exceed 1.5 V/ns to achieve the above approximate jitter results. For the general case, external reference in high (tracking) mode, the specification is:

<250 fs rms for record durations less than 2  $\mu$ s

You can approach the performance of internal reference using a clean reference signal with input slew rate exceeding 1.5 V/ns. This is most easily achieved either with a square wave meeting that slew rate or using a 100 MHz sine wave ( $\approx 2$  Vp-p). This is required for the best possible performance in synchronous sampling applications.

**<4 GHz models**

Total:

<1 ps rms for record durations less than 10  $\mu$ s.

<2.5 ps rms for record durations less than 30 ms.

<65 parts/trillion for record durations less than 10 s.

**Jitter noise floor, typical,  $\geq 4$  GHz models**

Applies to time periods as long as 10.0  $\mu$ s. Typical jitter noise floor is measured at the maximum, BWE enabled bandwidth:

**MSO/DPO70000DX models**

|                |         |
|----------------|---------|
| MSO/DPO73304DX | <323 fs |
| MSO/DPO72504DX | <364 fs |
| MSO/DPO72304DX | <378 fs |

Calculate the jitter noise floor (JNF) for a given instrument setting using the following formula:

$N_{typ}$  = typical input-referred noise spec (volts rms)

$F_N$  = 1.3 for instrument bandwidth  $\leq 9$  GHz; 1.5 for instrument bandwidth  $\geq 10$  GHz

$SR$  = slew rate around the measurement

$FI = (1.7 \times 10^{-2})/\sqrt{2} = 1.2 \times 10^{-2}$

$t_r$  = rise time of the measurement edge

$t_j$  = timebase jitter or aperture uncertainty

$TBA$  = timebase accuracy (2 ppm)

$$JNF_{RMS} = \sqrt{(N_{typ} \times F_N)^2 \times \left(\frac{1}{SR}\right)^2 + F_I^2 \times t_r^2 + t_j^2} \text{ seconds}_{RMS}$$

The interpolated sample rate of the waveform must be at least 25 times the bandwidth of the signal being measured.

**MSO/DPO70000C models**

|                                                 |        |
|-------------------------------------------------|--------|
| MSO/DPO72004C at 20 GHz                         | 400 fs |
| MSO/DPO72004C,<br>MSO/DPO71604C<br>at 16 GHz    | 300 fs |
| MSO/DPO71254C at 12.5 GHz                       | 300 fs |
| MSO/DPO70804C<br>MSO/DPO70604C<br>MSO/DPO70404C | 450 fs |

Calculate the jitter noise floor (JNF) for a given instrument setting using the following formula:

$FS$  = full-scale setting (volts)

$A$  = signal amplitude as a fraction of full-scale

$t_{rm}$  = 10 - 90% displayed (or measured) rise time (seconds)

$N$  = input-referred noise (volts rms)

$t_j$  = short term timing jitter (seconds rms)

$$JNF_{RMS} = \sqrt{\left[\frac{N}{FS \times A} \times t_{rm}\right]^2 + t_j^2} \text{ seconds}_{RMS}$$

|                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Timebase stability (sample rate jitter or jitter noise floor), typical</b><br><b>&lt;4 GHz models</b>                                    | <b>Total:</b><br><br><1.0 ps rms for record durations less than 10 $\mu$ s<br><2.5 ps rms for record durations less than 30 ms<br><65 parts/trillion for record durations less than 10 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Timebase jitter with external reference, typical, <math>\geq 4</math> GHz models</b>                                                     | $\leq 3$ ps <sub>RMS</sub> at 100 ms delay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|  <b>Delta time measurement accuracy, &gt;20 GHz models</b> | <p>The formula to calculate the maximum delta-time measurement accuracy (DTA<sub>max</sub>) for a given instrument setting and input signal is given below (assumes insignificant signal content above Nyquist and insignificant error due to aliasing, overdrive recovery and overdrive interpolation):</p> <p><math>N_{typ}</math> = typical input-referred noise spec (volts rms)<br/> <math>F_N</math> = 1.3 for instrument bandwidth <math>\leq 9</math> GHz; 1.5 for instrument bandwidth <math>\geq 10</math> GHz<br/> <math>SR_1</math> = slew rate around 1st point in measurement (1st edge)<br/> <math>SR_2</math> = slew rate around 2nd point in measurement (2nd edge)<br/> TBA = timebase accuracy (2 ppm)<br/> <math>F_1 = 1.2 \times 10^{-2}</math><br/> <math>t_r^1</math> = rise time of first edge<br/> <math>t_r^2</math> = rise time of second edge<br/> <math>t_j</math> = sample jitter/aperture uncertainty (about 250 fs for time durations less than 10 <math>\mu</math>s)<br/> <math>t_{reading}</math> = delta-time measurement (seconds)<br/> Peak-peak based on statistical accumulation of 1000 waveforms.</p> $DTA_{MAX_{pk-pk}} = 10 \times \sqrt{(N_{typ} \times F_N)^2 \left[ \left( \frac{1}{SR_1} \right)^2 + \left( \frac{1}{SR_2} \right)^2 \right] + F_1^2 \times (t_{r1}^2 + t_{r2}^2) + (2 \times t_j)^2} + TBA \times t_{reading} \text{ seconds}_{pk-pk}$ <p>RMS is guaranteed regardless of data-gathering duration.</p> $DTA_{MAX_{RMS}} = 10 \times \sqrt{(N_{typ} \times F_N)^2 \left[ \left( \frac{1}{SR_1} \right)^2 + \left( \frac{1}{SR_2} \right)^2 \right] + F_1^2 \times (t_{r1}^2 + t_{r2}^2) + (2 \times t_j)^2} + TBA \times t_{reading} \text{ seconds}_{RMS}$ <p>The term under the square-root sign is the stability and is due to time interval error (TIE). 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). The observation interval may not exceed 1 year.</p> <p>Test at maximum bandwidth.</p> |

|                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                   | Test at 62.5 mVFS, 50 mVFS, 100 mVFS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>MSO/DPO73304DX at 100 GS/s, BWE on</b>                                                                                                         | 6.25 mV/div, <10 ns measurement interval, 19.49 GHz, amplitude = 80% FS, 0.803 ps rms, 8.03 ps <sub>pk-pk</sub><br>50 mV/div, <10 ns measurement interval, 19.49 GHz, amplitude = 80% FS, 0.564 ps rms, 5.64 ps <sub>pk-pk</sub><br>100 mV/div, <10 ns measurement interval, 19.49 GHz, amplitude = 80% FS, 0.555 ps rms, 5.55 ps <sub>pk-pk</sub>                                                                                                                                                               |
| <b>MSO/DPO72504DX at 100 GS/s, BWE on</b>                                                                                                         | 6.25 mV/div, <10 ns measurement interval, 15.53 GHz, amplitude = 80% FS, 0.881 ps rms, 8.81 ps <sub>pk-pk</sub><br>50 mV/div, <10 ns measurement interval, 15.53 GHz, amplitude = 80% FS, 0.639 ps rms, 6.39 ps <sub>pk-pk</sub><br>100 mV/div, <10 ns measurement interval, 15.53 GHz, amplitude = 80% FS, 0.639 ps rms, 6.39 ps <sub>pk-pk</sub>                                                                                                                                                               |
| <b>MSO/DPO72304DX at 100 GS/s, BWE on</b>                                                                                                         | 6.25 mV/div, <10 ns measurement interval, 14.28 GHz, amplitude = 80% FS, 0.889 ps rms, 8.89 ps <sub>pk-pk</sub><br>50 mV/div, <10 ns measurement interval, 14.28 GHz, amplitude = 80% FS, 0.666 ps rms, 6.66 ps <sub>pk-pk</sub><br>100 mV/div, <10 ns measurement interval, 14.28 GHz, amplitude = 80% FS, 0.677 ps rms, 6.77 ps <sub>pk-pk</sub>                                                                                                                                                               |
| <b>MSO/DPO73304DX at 100 GS/s, BWE off, typical</b>                                                                                               | 6.25 mV/div, <10 ns measurement interval, 19.49 GHz, amplitude = 80% FS, 0.888 ps rms, 8.88 ps <sub>pk-pk</sub><br>50 mV/div, <10 ns measurement interval, 19.49 GHz, amplitude = 80% FS, 0.577 ps rms, 5.77 ps <sub>pk-pk</sub><br>100 mV/div, <10 ns measurement interval, 19.49 GHz, amplitude = 80% FS, 0.577 ps rms, 5.77 ps <sub>pk-pk</sub>                                                                                                                                                               |
| <b>MSO/DPO72504DX at 100 GS/s, BWE off, typical</b>                                                                                               | 6.25 mV/div, <10 ns measurement interval, 15.53 GHz, amplitude = 80% FS, 0.108 ps rms, 1.08 ps <sub>pk-pk</sub><br>50 mV/div, <10 ns measurement interval, 15.53 GHz, amplitude = 80% FS, 0.673 ps rms, 6.73 ps <sub>pk-pk</sub><br>100 mV/div, <10 ns measurement interval, 15.53 GHz, amplitude = 80% FS, 0.673 ps rms, 6.73 ps <sub>pk-pk</sub>                                                                                                                                                               |
| <b>MSO/DPO72304DX at 100 GS/s, BWE off, typical</b>                                                                                               | 6.25 mV/div, <10 ns measurement interval, 14.28 GHz, amplitude = 80% FS, 0.109 ps rms, 1.09 ps <sub>pk-pk</sub><br>50 mV/div, <10 ns measurement interval, 14.28 GHz, amplitude = 80% FS, 0.701 ps rms, 7.01 ps <sub>pk-pk</sub><br>100 mV/div, <10 ns measurement interval, 14.28 GHz, amplitude = 80% FS, 0.713 ps rms, 7.13 ps <sub>pk-pk</sub>                                                                                                                                                               |
|  <b>Delta time measurement accuracy ≥4 GHz, ≤20 GHz models</b> | The formula to calculate the maximum delta-time measurement accuracy (DTAmax) for a given instrument setting and input signal is given below (assumes insignificant signal content above Nyquist and insignificant error due to aliasing, overdrive recovery and overdrive interpolation):<br><br>SR1 = slew rate around 1st point in measurement (1st edge)<br>SR2 = slew rate around 2nd point in measurement (2nd edge)<br><br>FN = 1.3 for instrument bandwidth ≤9 GHz; 1.5 for instrument bandwidth ≥10 GHz |

N<sub>typ</sub> = typical input-referred noise spec (volts rms)

TBA = timebase accuracy (1.5 ppm)

t<sub>reading</sub> = delta-time measurement (seconds)

Peak-peak based on statistical accumulation of 1000 waveforms.

$$DTA_{MAX_{pk-pk}} = 10 \times \sqrt{(N_{typ} \times F_N)^2 \left[ \left( \frac{1}{SR_1} \right)^2 + \left( \frac{1}{SR_2} \right)^2 \right] + 1ps^2 + (2 \times 10^{-9} \times t_{reading})^2} + TBA \times t_{reading} \text{seconds}_{pk-pk}$$

RMS is guaranteed regardless of data-gathering duration.

$$DTA_{MAX_{RMS}} = \sqrt{(N_{typ} \times F_N)^2 \left[ \left( \frac{1}{SR_1} \right)^2 + \left( \frac{1}{SR_2} \right)^2 \right] + 1ps^2 + (2 \times 10^{-9} \times t_{reading})^2} + TBA \times t_{reading} \text{seconds}_{RMS}$$

The term under the square-root sign is the stability and is due to time interval error (TIE). 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). The observation interval may not exceed 1 year.

Test at maximum bandwidth. Test at 10 mV, 50 mV, 100 mV.

**MSO/DPO72004C at 500 GS/s (IT mode), BWE off**

10 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.280 ps rms, 12.80 ps<sub>pk-pk</sub>

50 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.172 ps rms, 11.72 ps<sub>pk-pk</sub>

100 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.186 ps rms, 11.86 ps<sub>pk-pk</sub>

**MSO/DPO71604C at 500 GS/s (IT mode), BWE off**

10 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.280 ps rms, 12.80 ps<sub>pk-pk</sub>

50 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.172 ps rms, 11.72 ps<sub>pk-pk</sub>

100 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.186 ps rms, 11.86 ps<sub>pk-pk</sub>

**MSO/DPO71254C at 500 GS/s (IT mode), BWE off**

10 mV/div, <10 ns measurement interval, 7.76 GHz, amplitude = 80% FS, 1.304 ps rms, 13.04 ps<sub>pk-pk</sub>

50 mV/div, <10 ns measurement interval, 7.76 GHz, amplitude = 80% FS, 1.201 ps rms, 12.01 ps<sub>pk-pk</sub>

100 mV/div, <10 ns measurement interval, 7.76 GHz, amplitude = 80% FS, 1.205 ps rms, 12.05 ps<sub>pk-pk</sub>

**MSO/DPO70804C at 500 GS/s (IT mode), BWE off**

10 mV/div, <10 ns measurement interval, 4.97 GHz, amplitude = 80% FS, 1.462 ps rms, 14.62 ps<sub>pk-pk</sub>

50 mV/div, <10 ns measurement interval, 4.97 GHz, amplitude = 80% FS, 1.295 ps rms, 12.95 ps<sub>pk-pk</sub>

100 mV/div, <10 ns measurement interval, 4.97 GHz, amplitude = 80% FS, 1.336 ps rms, 13.36 ps<sub>pk-pk</sub>

|                                                                                            |                                                                                                                 |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>MSO/DPO70604C at 500 GS/s (IT mode), BWE off</b>                                        | 10 mV/div, <10 ns measurement interval, 3.73 GHz, amplitude = 80% FS, 1.625 ps rms, 16.25 ps <sub>pk-pk</sub>   |
|                                                                                            | 50 mV/div, <10 ns measurement interval, 3.73 GHz, amplitude = 80% FS, 1.427 ps rms, 14.27 ps <sub>pk-pk</sub>   |
|                                                                                            | 100 mV/div, <10 ns measurement interval, 3.73 GHz, amplitude = 80% FS, 1.463 ps rms, 14.63 ps <sub>pk-pk</sub>  |
| <b>MSO/DPO70404C at 500 GS/s (IT mode), BWE off</b>                                        | 10 mV/div, <10 ns measurement interval, 2.48 GHz, amplitude = 80% FS, 2.022 ps rms, 20.22 ps <sub>pk-pk</sub>   |
|                                                                                            | 50 mV/div, <10 ns measurement interval, 2.48 GHz, amplitude = 80% FS, 1.762 ps rms, 17.62 ps <sub>pk-pk</sub>   |
|                                                                                            | 100 mV/div, <10 ns measurement interval, 2.48 GHz, amplitude = 80% FS, 1.821 ps rms, 18.21 ps <sub>pk-pk</sub>  |
| <b>MSO/DPO72004C at 500 GS/s (IT mode), 20 GHz, BWE on</b>                                 | 50 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.260 ps rms, 12.60 ps <sub>pk-pk</sub>   |
|                                                                                            | 100 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.432 ps rms, 14.32 ps <sub>pk-pk</sub>  |
| <b>MSO/DPO72004C at 500 GS/s (IT mode), 18 GHz, BWE on</b>                                 | 10 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.336 ps rms, 13.36 ps <sub>pk-pk</sub>   |
|                                                                                            | 50 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.182 ps rms, 11.82 ps <sub>pk-pk</sub>   |
|                                                                                            | 100 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.234 ps rms, 12.34 ps <sub>pk-pk</sub>  |
| <b>MSO/DPO72004C, MSO/DPO71654C at 500 GS/s (IT mode), 16 GHz, BWE on</b>                  | 10 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.219 ps rms, 12.19 ps <sub>pk-pk</sub>   |
|                                                                                            | 50 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.154 ps rms, 11.54 ps <sub>pk-pk</sub>   |
|                                                                                            | 100 mV/div, <10 ns measurement interval, 9.94 GHz, amplitude = 80% FS, 1.159 ps rms, 11.59 ps <sub>pk-pk</sub>  |
| <b>MSO/DPO72004C, MSO/DPO71654C, MSO/DPO71254C at 500 GS/s (IT mode), 12.5 GHz, BWE on</b> | 10 mV/div, <10 ns measurement interval, 7.45 GHz, amplitude = 80% FS, 1.333 ps rms, 13.33 ps <sub>pk-pk</sub>   |
|                                                                                            | 50 mV/div, <10 ns measurement interval, 7.45 GHz, amplitude = 80% FS, 1.212 ps rms, 12.12 ps <sub>pk-pk</sub>   |
|                                                                                            | 100 mV/div, <10 ns measurement interval, 7.45 GHz, amplitude = 80% FS, 1.228 ps rms, 12.287 ps <sub>pk-pk</sub> |
| <b>MSO/DPO70804C at 500 GS/s (IT mode), 8 GHz, BWE on</b>                                  | 10 mV/div, <10 ns measurement interval, 4.97 GHz, amplitude = 80% FS, 1.354 ps rms, 13.54 ps <sub>pk-pk</sub>   |
|                                                                                            | 50 mV/div, <10 ns measurement interval, 4.97 GHz, amplitude = 80% FS, 1.235 ps rms, 12.35 ps <sub>pk-pk</sub>   |
|                                                                                            | 100 mV/div, <10 ns measurement interval, 4.97 GHz, amplitude = 80% FS, 1.241 ps rms, 12.41 ps <sub>pk-pk</sub>  |

|                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                         |                                              |                                                                                                           |                                                       |                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------|
| <b>MSO/DPO70804C, MSO/DPO70604C at 500 GS/s (IT mode), 6 GHz, BWE on</b>                                                                                                                                                                                                                                                          | 10 mV/div, <10 ns measurement interval, 3.73 GHz, amplitude = 80% FS, 1.445 ps rms, 14.45 ps <sub>pk-pk</sub>                                                                                                                                                                                                                                                                           |                                              |                                                                                                           |                                                       |                                  |
|                                                                                                                                                                                                                                                                                                                                   | 50 mV/div, <10 ns measurement interval, 3.73 GHz, amplitude = 80% FS, 1.295 ps rms, 12.95 ps <sub>pk-pk</sub>                                                                                                                                                                                                                                                                           |                                              |                                                                                                           |                                                       |                                  |
|                                                                                                                                                                                                                                                                                                                                   | 100 mV/div, <10 ns measurement interval, 3.73 GHz, amplitude = 80% FS, 1.329 ps rms, 13.29 ps <sub>pk-pk</sub>                                                                                                                                                                                                                                                                          |                                              |                                                                                                           |                                                       |                                  |
| <b>MSO/DPO70804C, MSO/DPO70604C, MSO/DPO70404C at 500 GS/s (IT mode), 4 GHz, BWE on</b>                                                                                                                                                                                                                                           | 10 mV/div, <10 ns measurement interval, 2.48 GHz, amplitude = 80% FS, 1.674 ps rms, 16.74 ps <sub>pk-pk</sub>                                                                                                                                                                                                                                                                           |                                              |                                                                                                           |                                                       |                                  |
|                                                                                                                                                                                                                                                                                                                                   | 50 mV/div, <10 ns measurement interval, 2.48 GHz, amplitude = 80% FS, 1.437 ps rms, 14.37 ps <sub>pk-pk</sub>                                                                                                                                                                                                                                                                           |                                              |                                                                                                           |                                                       |                                  |
|                                                                                                                                                                                                                                                                                                                                   | 100 mV/div, <10 ns measurement interval, 2.48 GHz, amplitude = 80% FS, 1.478 ps rms, 14.78 ps <sub>pk-pk</sub>                                                                                                                                                                                                                                                                          |                                              |                                                                                                           |                                                       |                                  |
| <hr/>                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                         |                                              |                                                                                                           |                                                       |                                  |
| <b>Delta time measurement accuracy &lt;4 GHz models</b>                                                                                                                                                                                                                                                                           | For signals having amplitude greater than 5 divisions, reference level = 50%, filter set to sin(x)/x, acquired at 10 mV/div or greater. The displayed risetime/sample interval must be greater than 1.4 but less than 4. Extra error will occur for two channel measurements due to channel to channel skew. Peak specification is based on statistical accumulation of 1000 waveforms. |                                              |                                                                                                           |                                                       |                                  |
| <hr/>                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                         |                                              |                                                                                                           |                                                       |                                  |
| <table border="1"> <tr> <td>Single shot, sample or HiRes, full bandwidth</td><td>(0.06/sample rate + 2.5 ppm x   reading  )RMS<br/>± (0.30/(sample rate) + (2.5 ppm x   reading  ))<br/>peak</td></tr> <tr> <td>Average Mode, ≥100 averages, full bandwidth selected.</td><td>± (2.5 ppm x   reading   + 4 ps)</td></tr> </table> |                                                                                                                                                                                                                                                                                                                                                                                         | Single shot, sample or HiRes, full bandwidth | (0.06/sample rate + 2.5 ppm x   reading  )RMS<br>± (0.30/(sample rate) + (2.5 ppm x   reading  ))<br>peak | Average Mode, ≥100 averages, full bandwidth selected. | ± (2.5 ppm x   reading   + 4 ps) |
| Single shot, sample or HiRes, full bandwidth                                                                                                                                                                                                                                                                                      | (0.06/sample rate + 2.5 ppm x   reading  )RMS<br>± (0.30/(sample rate) + (2.5 ppm x   reading  ))<br>peak                                                                                                                                                                                                                                                                               |                                              |                                                                                                           |                                                       |                                  |
| Average Mode, ≥100 averages, full bandwidth selected.                                                                                                                                                                                                                                                                             | ± (2.5 ppm x   reading   + 4 ps)                                                                                                                                                                                                                                                                                                                                                        |                                              |                                                                                                           |                                                       |                                  |
| <hr/>                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                         |                                              |                                                                                                           |                                                       |                                  |

## Trigger specifications

### Trigger jitter DC coupled A edge random holdoff, typical

|               |                                                                                                            |
|---------------|------------------------------------------------------------------------------------------------------------|
| ≥4 GHz models | 100 fs using enhanced trigger placement.                                                                   |
|               | 1 ps rms for low frequency, fast rise time signal, A edge, time holdoff = 30 $\mu$ s                       |
| <4 GHz models | 1.5 ps rms for low frequency, fast rise time signal<br>(DPO7104C and DPO7054C: 3 ps total trigger jitter.) |

### Edge trigger sensitivity DC coupled, typical

All sources, positive or negative edge, for vertical scale settings  $\geq 10$  mV/div and  $\leq 1$  V/div

#### ≥4 GHz models

| Trigger Source  | Sensitivity                                                                                                                                                                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A Event trigger | $\leq 4\%$ FS from DC to 50 MHz<br>$\leq 10\%$ FS at 4 GHz<br>$\leq 15\%$ FS at 6 GHz<br>$\leq 20\%$ FS at 8 GHz<br>$\leq 50\%$ FS at 11 GHz<br>20%FS from DC to instrument bandwidth<br>(typical, enhanced trigger on, auto mode only for frequencies above 8 GHz) |
| B Event trigger | $\leq 4\%$ FS from DC to 50 MHz<br>$\leq 10\%$ FS at 4 GHz<br>$\leq 15\%$ FS at 6 GHz<br>$\leq 50\%$ FS at 9 GHz<br>20%FS from DC to instrument bandwidth<br>(typical, enhanced trigger on, auto mode only for frequencies above 6 GHz)                             |
| Auxiliary input | 250 mV from DC to 50 MHz, increasing to 350 mV at 1 GHz                                                                                                                                                                                                             |

#### <4 GHz models

| Trigger Source           | Sensitivity                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Main and Delayed trigger | $\leq 0.7$ div from DC to 50 MHz<br>$\leq 1.2$ div at 2.5 GHz<br>$\leq 2.5$ div at 3.5 GHz with BWE on                                              |
| Auxiliary input          | 1 M $\Omega$ : 250 mV from DC to 50 MHz, increasing to 350 mV at 250 MHz<br>50 $\Omega$ : 150 mV from DC to 50 MHz, increasing to 200 mV at 1.8 GHz |
| Video trigger, Ch1 - Ch4 | 0.6 to 2.5 divisions of video sync tip                                                                                                              |

### Trigger sensitivity TPC, typical

The minimum signal levels required for stable triggering of a waveform when the hardware is incapable of doing so (excessive frequency, small input).

#### >20 GHz models

| Trigger Source             | Sensitivity                                     |
|----------------------------|-------------------------------------------------|
| A Event trigger, Ch1 – Ch4 | 20% $\times$ FS from DC to instrument bandwidth |
| B Event trigger, Ch1 – Ch4 | 20% $\times$ FS from DC to instrument bandwidth |

**Edge trigger sensitivity not DC coupled, typical**All sources, positive or negative edge, for vertical scale settings  $\geq 10$  mV/div and  $\leq 1$  V/div **$\geq 4$  GHz models**

| Trigger Coupling | Sensitivity                                                                           |
|------------------|---------------------------------------------------------------------------------------|
| NOISE REJ        | 15%FS from DC to 50 MHz<br>35%FS at 3 GHz<br>50%FS at 5 GHz                           |
| AC               | Same as DC-coupled limits for frequencies $> 100$ Hz, attenuates signals $< 100$ Hz   |
| HF REJ           | Same as DC-coupled limits for frequencies $< 20$ kHz, attenuates signals $> 20$ kHz   |
| LF REJ           | Same as DC-coupled limits for frequencies $> 200$ kHz, attenuates signals $< 200$ kHz |

 **$< 4$  GHz models**

| Trigger coupling | Sensitivity                                                                           |
|------------------|---------------------------------------------------------------------------------------|
| NOISE REJ        | 3 times the DC-coupled limits                                                         |
| AC               | Same as DC-coupled limits for frequencies $> 100$ Hz, attenuates signals $< 100$ Hz   |
| HF REJ           | Same as DC-coupled limits for frequencies $< 20$ kHz, attenuates signals $> 20$ kHz   |
| LF REJ           | Same as DC-coupled limits for frequencies $> 200$ kHz, attenuates signals $< 200$ kHz |

**Trigger level or threshold range** **$> 20$  GHz models**

| Trigger Source  | Range                                |
|-----------------|--------------------------------------|
| Any channel     | $\pm 100\%$ FS from center of screen |
| Auxiliary input | $\pm 4.0$ V                          |
| Line            | 0 V, Not settable                    |

 **$\geq 4$  GHz,  $\leq 20$  GHz models**

| Trigger Source  | Range                                |
|-----------------|--------------------------------------|
| Any channel     | $\pm 120\%$ FS from center of screen |
| Auxiliary input | $\pm 4.0$ V                          |
| Line            | 0 V, Not settable                    |

 **$< 4$  GHz models**

| Trigger Source  | Range                                    |
|-----------------|------------------------------------------|
| Any channel     | $\pm 12$ divisions from center of screen |
| Auxiliary input | $\pm 5$ V                                |
| Line            | Not settable                             |

**Trigger level or threshold accuracy, typical**

Edge trigger, DC coupled

**≥4 GHz models**

| Trigger Source        | Accuracy                                                                                                 |
|-----------------------|----------------------------------------------------------------------------------------------------------|
| Channel 1, 2, 3, or 4 | $\pm [(2\%   \text{trigger level} - \text{net offset}  ) + (3.5\% \text{ FS}) + \text{offset accuracy}]$ |
| Auxiliary             | Not specified                                                                                            |

**<4 GHz models**

| Trigger Source        | Accuracy                                                           |
|-----------------------|--------------------------------------------------------------------|
| Channel 1, 2, 3, or 4 | $\pm [(2\%   \text{deflection}  ) + (0.7 \text{ divisions} \times$ |
| Auxiliary             | Not specified                                                      |

**Trigger position error, typical**Edge trigger, DC coupling, for signals having a slew rate at the trigger point of  $\geq 0.5$  divisions/ns**≥4 GHz models**

| Acquisition mode      | Trigger Position Error                               |
|-----------------------|------------------------------------------------------|
| Sample, Average       | $\pm (1 \text{ waveform interval} + 50 \text{ ps})$  |
| Peak Detect, Envelope | $\pm (2 \text{ waveform intervals} + 50 \text{ ps})$ |

**<4 GHz models**

| Acquisition mode      | Trigger Position Error                                |
|-----------------------|-------------------------------------------------------|
| Sample, Average       | $\pm (1 \text{ waveform interval} + 200 \text{ ps})$  |
| Peak Detect, Envelope | $\pm (2 \text{ waveform intervals} + 200 \text{ ps})$ |

**Time range for time-qualified triggers****≥4 GHz models**

|                                   |                   |                    |
|-----------------------------------|-------------------|--------------------|
| Setup/Hold Violation              |                   |                    |
|                                   | Setup time        | -100 ns to +100 ns |
|                                   | Hold time         | -1 ns to +100 ns   |
|                                   | Setup + hold time | 500 ps minimum     |
| Timeout                           |                   | 400 ps to 1 s      |
| Time qualified window, outside >t |                   | 600 ps to 1 s      |
| All other types                   |                   | 300 ps to 1 s      |

**<4 GHz models**

300 ps to 1 s

**Time-qualified trigger timer accuracy**

For Glitch, Width, Time qualified runt, Transition, or Setup/hold violation types

**≥4 GHz models**

| Time range                                             | Accuracy                                       |
|--------------------------------------------------------|------------------------------------------------|
| Glitch and width triggering (300 ps to 1.0 ns typical) |                                                |
| <300 ns to 1.01 $\mu$ s                                | $\pm(3\% \text{ of setting} + 80 \text{ ps})$  |
| 1.02 $\mu$ s to 1 s                                    | $\pm(\text{TB accuracy} + 100 \text{ ns})$     |
| Other time-qualified types (300 ps to 1.0 ns typical)  |                                                |
| <300 ps to 1.01 $\mu$ s                                | $\pm(5\% \text{ of setting} + 200 \text{ ps})$ |
| 1.02 $\mu$ s to 1 s                                    | $\pm(\text{TB accuracy} + 20 \text{ ns})$      |

**<4 GHz models**

| Time range                 | Accuracy                                          |
|----------------------------|---------------------------------------------------|
| <1 $\mu$ s (<2 ns typical) | $\pm(20\% \text{ of setting} + 0.5 \text{ ns})$   |
| 1 $\mu$ s to 1 s           | $\pm(0.01\% \text{ of setting} + 100 \text{ ns})$ |

**Width and glitch trigger sensitivity, typical**

|                         |                                                                                                                                                                 |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b>    | 15% x FS from DC to 1 GHz, not violating the minimum timing requirements for each type (for vertical settings from 10 mV/div to 1 V/div at the input connector) |
| <b>&lt;4 GHz models</b> | 1.0 division from DC to 1 GHz (at input connector)                                                                                                              |

**Width and glitch trigger minimum timing requirements**

For vertical scale settings 10 mV/div and 1 V/div

**≥4 GHz models**

|                                        | Minimum pulse width | Minimum rearm time | Setup time | Hold time |
|----------------------------------------|---------------------|--------------------|------------|-----------|
| Width and glitch types                 | 150 ps              | 300 ps             | N.A.       | N.A.      |
| Logic qualified width and glitch types | 150 ps              | 300 ps             | 20 ps      | 40 ps     |

**<4 GHz models**

|                             | Minimum pulse width | Minimum rearm time | Setup time | Hold time |
|-----------------------------|---------------------|--------------------|------------|-----------|
| Width type                  | 225 ps              | 250 ps             | N.A.       | N.A.      |
| Logic qualified width type  | 190 ps              | 250 ps             | 40 ps      | 175 ps    |
| Glitch type                 | 170 ps              | 250 ps             | N.A.       | N.A.      |
| Logic qualified glitch type | 100 ps              | 250 ps             | 40 ps      | 60 ps     |

**Runt trigger sensitivity, typical**

|                         |                                                                                                                                                                 |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b>    | 15% x FS from DC to 1 GHz, not violating the minimum timing requirements for each type (for vertical settings from 10 mV/div to 1 V/div at the input connector) |
| <b>&lt;4 GHz models</b> | 1.0 division (at input connector)                                                                                                                               |

**Runt trigger, minimum timing requirements**

A runt event occurs at the end of the runt whether or not the runt was time qualified. Logic qualified runt triggers require that the logic condition be true during the entire duration of the runt plus some minimum amount of time after the runt event occurred.

**≥4 GHz models**

|                                    | Minimum pulse time | Minimum rearm time | Setup time | Hold time |
|------------------------------------|--------------------|--------------------|------------|-----------|
| Runt type                          | 200 ps             | 300 ps             |            |           |
| Logic qualified runt type          | 200 ps             | 300 ps             | 300 ps     | 300 ps    |
| Time qualified runt type           | 476 ps             | 510 ps             | N.A.       | N.A.      |
| Time and logic qualified runt type | 520 ps             | 360 ps             | 160 ps     | 105 ps    |

**<4 GHz models**

|                                    | Minimum pulse time  | Minimum rearm time | Setup time | Hold time |
|------------------------------------|---------------------|--------------------|------------|-----------|
| Runt type                          | 225 ps              | 250 ps             | N.A.       | N.A.      |
| Time qualified runt type           | 360 ps              | 450 ps             | N.A.       | N.A.      |
| Logic qualified runt type          | Runt width + 150 ps | 250 ps             | 160 ps     | -16 ps    |
| Time and logic qualified runt type | Runt width + 330 ps | 250 ps             | 160 ps     | 175 ps    |

**Pattern and state trigger sensitivity DC coupled, typical,  $\geq 4$  GHz models** 15% x FS from DC to 1 GHz, not violating the minimum timing requirements for each type (for vertical settings from 10 mV/div to 1 V/div at input connector)

**Logic and state trigger sensitivity DC coupled, typical,  $< 4$  GHz models** 1.0 division from DC to 1 GHz (for vertical settings from 10 mV/div to 1 V/div at input connector)

**Logic and state trigger minimum timing requirements, typical,  $< 4$  GHz models** Minimum duration of logic state: 100 ps (10 GB/s). The minimum duration of the logic pattern includes delay mismatch between channels.

|                           | Minimum pulse width | Rearm time |
|---------------------------|---------------------|------------|
| Logic type                | 100 ps (10 GB/s)    | 100 ps     |
| State type                | 500 ps              | 500 ps     |
| Time qualified logic type | 300 ps              | 500 ps     |

**Video-type trigger formats and field rates,  $< 4$  GHz models** Triggers from negative sync composite video, field 1 or field 2 for interlaced systems, any field, specific line, or any line for interlaced or non-interlaced systems. Supported systems include NTSC, PAL, SECAM, and HDTV 1080/24sF, 1080p/25, 1080i/50, 1080i/60, 1080p/24, 720p/60, 480p/60.

**Timeout trigger minimum timing requirements** Timeout event occurs after the signal has stayed in some state the minimum amount of time. Setup and hold times are how long before and after the timeout event the logic level must remain valid in order to generate a trigger.

**$\geq 4$  GHz models**

|                              | Minimum pulse width | Minimum rearm time   | Setup time | Hold time |
|------------------------------|---------------------|----------------------|------------|-----------|
| Timeout type                 | N.A.                | 300 ps + pulse width | N.A.       | N.A.      |
| Logic qualified timeout type | N.A.                | 300 ps + pulse width | 50 ps      | 50 ps     |

**$< 4$  GHz models**

|                              | Minimum pulse width | Minimum rearm time   | Setup time | Hold time |
|------------------------------|---------------------|----------------------|------------|-----------|
| Timeout type                 | 300 ps              | 500 ps + pulse width | N.A.       | N.A.      |
| Logic qualified timeout type | 300 ps              | 500 ps + pulse width | 200 ps     | 200 ps    |

**Window trigger minimum timing requirements****≥4 GHz models**

|                               | Minimum pulse width | Minimum rearm time | Setup time | Hold time |
|-------------------------------|---------------------|--------------------|------------|-----------|
| Window enters                 | 150 ps              | 500 ps             | N.A.       | N.A.      |
| Window exits                  | 500 ps              | 150 ps             | N.A.       | N.A.      |
| Logic qualified window enters | 150 ps              | 500 ps             | N.A.       | N.A.      |
| Logic qualified window exits  | 500 ps              | 150 ps             | N.A.       | N.A.      |
| Window inside >t              | N.A.                | 500 ps             | N.A.       | N.A.      |
| Window outside >t             | N.A.                | 150 ps             | N.A.       | N.A.      |

**<4 GHz models**

|                        | Minimum pulse width | Minimum rearm time | Setup time | Hold time |
|------------------------|---------------------|--------------------|------------|-----------|
| Window                 | 225 ps              | 300 ps             | N.A.       | N.A.      |
| Logic qualified window | 190 ps              | 300 ps             | -20 ps     | 0 ps      |

**Transition trigger, minimum timing requirements**

The transition trigger event occurs at the end of the transition. The logic condition must be valid at the moment the transition event occurs minus the setup time plus the hold time. Rearm time is the time below the lower threshold and the time above the upper threshold. Neither time can be violated.

**≥4 GHz models**

|                                 | Minimum pulse width | Minimum rearm time | Setup time | Hold time |
|---------------------------------|---------------------|--------------------|------------|-----------|
| Transition type                 | 0 ps                | 500 ps             | N.A.       | N.A.      |
| Logic qualified transition type | 0 ps                | 500 ps             | 50 ps      | 50 ps     |

**<4 GHz models**

|                                 | Minimum pulse width | Minimum rearm time | Setup time | Hold time |
|---------------------------------|---------------------|--------------------|------------|-----------|
| Transition type                 | 0 ps                | 225 ps             | N.A.       | N.A.      |
| Logic qualified transition type | 330 ps              | 225 ps             | 225 ps     | 175 ps    |

**Transition trigger delta time range** 1 ns to 1 s

**Setup-Hold violation trigger, setup and hold time ranges**

|                   | Minimum | Maximum |
|-------------------|---------|---------|
| Setup time        | -100 ns | 100 ns  |
| Hold time         | -1 ns   | 102 ns  |
| Setup + hold time | 500 ps  |         |

**Setup-hold time violation trigger, minimum clock pulse widths, typical****≥4 GHz models**

| Minimum time from active clock edge to inactive edge | Minimum time from inactive clock edge to active edge |
|------------------------------------------------------|------------------------------------------------------|
| Hold times ≥ 0: Hold time + 550 ps                   | 500 ps                                               |
| Hold times <0: Hold time + 1.6 ns                    | 500 ps                                               |

**<4 GHz models**

| Minimum time from active clock edge to inactive edge | Minimum time from inactive clock edge to active edge |
|------------------------------------------------------|------------------------------------------------------|
| Hold times ≥ 0: Hold time + 500 ps                   | 500 ps                                               |
| Hold times <0: Hold time + 1.5 ns                    |                                                      |

**Pattern and state trigger, minimum timing requirements, typical, ≥4 GHz models**

The transition trigger event occurs at the end of the transition. The logic condition must be valid at the moment the transition event occurs minus the setup time plus the hold time.

|                             | Minimum pulse width | Minimum rearm time | Setup time | Hold time |
|-----------------------------|---------------------|--------------------|------------|-----------|
| Pattern type                | 150 ps              | 200 ps             | N.A.       | N.A.      |
| Time qualified pattern type | 150 ps              | 300 ps             | N.A.       | N.A.      |
| State type                  | 1.7 GHz             | N.A.               | 25 ps      | 100 ps    |

**Period trigger sensitivity, typical****≥4 GHz models**

1.5 divisions (at input connector)

**<4 GHz models**

1.0 division (at input connector)

**B trigger after events minimum timing requirements, typical****≥4 GHz models**

| Minimum pulse width | Maximum counting frequency | Minimum time between channels |
|---------------------|----------------------------|-------------------------------|
| 140 ps              | 3.5 GHz                    | 1 ns                          |

**<4 GHz models**

| Minimum pulse width | Maximum counting frequency | Minimum time between channels |
|---------------------|----------------------------|-------------------------------|
| 200 ps              |                            | 1 ns                          |

**B trigger after events, event counter range****≥4 GHz models**

1 to 2,000,000,000

**<4 GHz models**

1 to 10,000,000

**B trigger after time, time delay range****≥4 GHz models**

3.2 ns to 3 Ms

**<4 GHz models**

5 ns to 250 s

|                                                                  |                                                                                                                                       |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Variable A event trigger holdoff range</b>                    | 250 ns to 12 s + random holdoff                                                                                                       |
| <b>Lowest frequency for successful set level to 50%, typical</b> | 50 Hz                                                                                                                                 |
| <b>Trigger jitter (RMS)</b>                                      |                                                                                                                                       |
| <b>≥4 GHz models</b>                                             | 100 fs using enhanced Trigger placement. 1.0 ps RMS (typical) for low frequency, fast rise time signal, A edge, time holdoff = 30 μs. |
| <b>&lt;4 GHz models</b>                                          | 1.5 ps RMS (typical)                                                                                                                  |

## Serial trigger specifications

### Low speed serial trigger, ≥4 GHz models

|                         |            |
|-------------------------|------------|
| <b>Number of bits</b>   | 128 bits   |
| <b>Baud rate limits</b> | 10 Mbits/s |

### High speed serial trigger number of bits

|                         |                                                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b>    | 64 bits for NRZ data rates ≤ 1.25 GBaud<br>40 bits for 8b/10b data rates between 1.25 GBd and 6.25 GBd |
| <b>&lt;4 GHz models</b> | 64 bits                                                                                                |

**High speed serial trigger, serial word recognizer position accuracy**

≥4 GHz models      ± 200 ps

| <4 GHz models | Acquisition mode      |                                   |
|---------------|-----------------------|-----------------------------------|
|               | Sample, Average       | ± (1 waveform interval + 200 ps)  |
|               | Peak Detect, Envelope | ± (2 waveform intervals + 200 ps) |

**Serial trigger decoding types**

|               |                                |       |
|---------------|--------------------------------|-------|
| ≥4 GHz models | ≤ 1.25 GB:                     | NRZ   |
|               | ≤ 1.25 GB: 1.25 GB to 6.25 GB: | 8B10B |

<4 GHz models      NRZ

**Serial trigger baud rate limits**

|               |                |                                                                                                                                                                                                                                                                              |
|---------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ≥4 GHz models | ■ NRZ          | Up to 1.25 GBd                                                                                                                                                                                                                                                               |
|               | 8B10B, typical | NRZ 8B10B encoded data at the following bit rates:<br>1.25 GBd,<br>1.50 GBd,<br>1.57 GBd,<br>1.62 GBd,<br>1.65 GBd,<br>2.00 GBd,<br>2.50 GBd,<br>2.7 GBd,<br>3.00 GBd,<br>3.125 GBd,<br>3.2 GBd,<br>4.25 GBd,<br>4.80 GBd,<br>5.00 GBd,<br>5.4 GBd,<br>6.00 GBd,<br>6.25 GBd |

■ **Serial trigger baud rate limits, <4 GHz models**      Up to 1.25 GBd (Option PTM adds protocol trigger to DPO7000C Series)

**Error detection jitter tolerance**      ≤ 0.4 UI of total jitter on the signal.

**Clock recovery frequency range**

≥4 GHz models, typical      1.5 MBaud to 3.125 GBaud. Above 1250 MHz, the clock is only available internally as a trigger source. Below 1250 MHz, the clock is also available at the recovered clock output along with regenerated data.

■ <4 GHz models      1.5 MBaud to 1.25 GBaud.

**Clock recovery jitter, typical****≥4 GHz models**

&lt; 0.25% bit period + 2 ps rms for PRBS data patterns with 50% transition density.

&lt; 0.25% bit period + 1.5 ps rms for repeating 0011 data patterns.

| Bit rate  | Pattern  | Jitter (ps rms) |        |
|-----------|----------|-----------------|--------|
|           |          | PRBS            | 0011   |
| 3.125 GBd | 00110011 | 2.8 ps          | 2.3 ps |
| 2.74 GBd  | 00110011 | 2.9 ps          | 2.4 ps |
| 2.35 GBd  | 00110011 | 3.1 ps          | 2.6 ps |
| 2.34 GBd  | 00110011 | 3.1 ps          | 2.6 ps |
| 1.95 GBd  | 00110011 | 3.3 ps          | 2.8 ps |
| 1.57 GBd  | 00110011 | 3.6 ps          | 3.1 ps |
| 100 MBd   | 00110011 | 27 ps           | 27 ps  |
| 10 MBd    | 00110011 | 252 ps          | 252 ps |

**<4 GHz models**20 ps<sub>RMS</sub> + 1.25% Unit interval RMS for PRBS data patterns.20 ps<sub>RMS</sub> + 1.25% Unit interval RMS for repeating 0011 data patterns. (Transition density of 50%).

Jitter increases by 1.4 every time the transition density is reduced by half.

28 ps<sub>RMS</sub> + 1.25% Unit interval RMS for 25% transition density.30 ps<sub>RMS</sub> + 1.25% Unit interval RMS for 12.5% transition density.**Clock recovery tracking  
acquisition range****≥4 GHz models**

± 2% of requested baud, data rates below 1.25 GBaud.

± 0.25% of requested baud, data rates above 1.25 GBaud.

**<4 GHz models**

± 5% of requested baud

**Minimum signal amplitude needed  
for clock recovery, typical****≥4 GHz models**

1 division peak-peak up to 1.25 GBd

1.5 divisions peak-peak above 1.25 GBd

Tri-level signals need 50% more pk-pk amplitude

**<4 GHz models**

1 division peak-peak up to 1.25 GBd

50% more peak-to-peak amplitude is required for tri-level signals.

**Serial interface triggering  
standards supported****<4 GHz models**I<sup>2</sup>C, CAN, SPI, USB1.1, RS232/422/485/UART

## Digital acquisition specifications

### Minimum signal amplitude

300 mV p-p; logic threshold centered in dynamic range of signal;  
 $f \leq 1.5$  GHz for P6780  
 $f \leq 350$  MHz for P6717A

### Minimum detectable pulse width (mainframe and logic probe), typical

<400 ps

### Number of probe channels

17

### Number of digital acquisition channels

16

### Digital channel resolution

1 bit, either a 0 or a 1

### Logic threshold range

-2 V to +5 V

#### with P6780 probe

-2 V to +4.5 V

#### with P6717A probe

-1.5 V to +4.0 V

### Logic threshold resolution

5 mV

### Logic threshold accuracy (with probe attached), typical

$\leq 3\%$  of threshold setting  $\pm 75$  mV

### Single acquisition displayed timing uncertainty between digital channels with P6780 probe, typical

#### Without deskew

160 ps

#### After deskew

80 ps

### Number of digital channels available for analog acquisition

4. Any of the 16 acquisition channels + clock qualifier channel can be displayed in place of any analog channel on the instrument

### iCapture bandwidth with general purpose probe, typical

>300 MHz

### iCapture bandwidth with solder-in differential probe, typical

>2.5 GHz

### iCapture rise time with solder-in differential probe, typical

$\leq 200$  ps

### Position range of analog iCapture channels

$\pm 5$  divisions

|                                                             |                                                                                                                                                                                                                  |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>iCapture DC analog accuracy (mainframe and probe)</b>    | ±(5% of reading +0.2 division)                                                                                                                                                                                   |
| <b>Gain ranges of analog channels with probe</b>            | 250 mV/div, 375 mV/div, 750 mV/div, 1.25 V/div, 1.88 V/div, 3.75 V/div                                                                                                                                           |
| <b>Digital channel comparison values</b>                    | 0, 1, or don't care                                                                                                                                                                                              |
| <b>Word recognizer trigger functions</b>                    |                                                                                                                                                                                                                  |
| <b>Combinational trigger</b>                                | AND, NAND, OR, NOR                                                                                                                                                                                               |
| <b>Edge qualified combinational trigger</b>                 | AND, NAND, OR, NOR qualified on the rising or falling edge, or either edge of CQ, the qualifying channel                                                                                                         |
| <b>Trigger toggle rate, typical</b>                         | ≥1.5 GHz                                                                                                                                                                                                         |
| <b>Single channel trigger jitter, typical</b>               | 5 ps rms for A event edge trigger using low frequency, fast rise time signal                                                                                                                                     |
| <b>iCapture trigger level range</b>                         | ± Full scale                                                                                                                                                                                                     |
| <b>iCapture trigger level accuracy</b>                      | 6% of trigger level +0.4 divisions                                                                                                                                                                               |
| <b>iCapture trigger sensitivity</b>                         | 5% of FS from DC to 0.5 GHz<br>6% of FS from 0.15 GHz to 1 GHz<br>8% of FS from 1.01 GHz to 1.5 GHz<br>9% of FS from 1.51 GHz to 2.0 GHz<br>13% of FS from 2.0 GHz to 2.5 GHz                                    |
| <b>Low speed serial trigger threshold accuracy, typical</b> | ±(3% of setting ±125 mV) relative to the probe tip input<br>+20 mV/°C from the operating temperature at which SPC was run                                                                                        |
| <b>Low speed serial trigger threshold range</b>             | -2 to +4.5 V with DI probe<br>-1.5 to +4 V with GP probe                                                                                                                                                         |
| <b>Maximum low speed serial trigger toggle rate</b>         | I <sup>2</sup> C: 3.4 MHz<br>SPI: 4.25 MHz                                                                                                                                                                       |
| <b>Maximum digital acquisition sample rate</b>              | 12.5 GS/s                                                                                                                                                                                                        |
| <b>Maximum record length, sample mode</b>                   | The maximum record length depends on the number of active channels and the installed record length options. The maximum record length is less in serial trigger mode, hi-res mode, or when using the FIR filter. |
| <b>Standard</b>                                             | 12.5 GS/s or less 10,000,000 points (all channels)                                                                                                                                                               |
| <b>Option 2XL installed</b>                                 | 12.5 GS/s or less 20,000,000 points (all channels)                                                                                                                                                               |
| <b>Option 5XL installed</b>                                 | 12.5 GS/s or less 50,000,000 points (all channels)                                                                                                                                                               |
| <b>Option 10XL installed</b>                                | 12.5 GS/s or less 125,000,000 points (all channels)                                                                                                                                                              |
| <b>Option 20XL installed</b>                                | 12.5 GS/s or less 250,000,000 points (all channels)                                                                                                                                                              |

## Input-output port specifications

### Auxiliary trigger input characteristics and range

|                         |                                                                                        |
|-------------------------|----------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b>    | 50 $\Omega$ , $\pm 4$ V (DC plus peak AC)                                              |
|                         | MSO/DPO70000DX: 50 $\Omega$ , $\pm 5$ V (DC plus peak AC)                              |
| <b>&lt;4 GHz models</b> | 50 $\Omega$ , $\pm 5\%$ ; maximum input voltage $\pm 5$ V (DC + peak AC)               |
|                         | 1 M $\Omega$ , $\pm 5\%$ , 150 V CAT1. Derate at 20 dB/decade to 9 V RMS above 200 kHz |

### Auxiliary output logic polarity and functionality

Default output is A trigger low true (a negative edge when the A trigger event occurs). You can also program the output to A trigger high true, B trigger low or high true, disabled, force high, and force low.

### Auxiliary output logic levels

| <b>V<sub>out</sub> high</b>                                              | <b>V<sub>out</sub> low (true)</b>                                        |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------|
| ≥2.5 V into 1 M $\Omega$ load,<br>≥1.0 V into 50 $\Omega$ load to ground | ≤0.7 V into 1 M $\Omega$ load<br>≤0.25 V into 50 $\Omega$ load to ground |

### CH3 output voltage typical < 4 GHz models

50 mV/div  $\pm 20\%$  into a 1 M $\Omega$  load  
25 mV/div  $\pm 20\%$  into a 50  $\Omega$  load

### High speed serial data output baud rate range

|                       |                                                                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>≥ 4 GHz models</b> | F <sub>baud</sub> ≤ 1250 MB. Output swing of 1010 repeating pattern at this baud will be at least 200 mV into 50 $\Omega$ . |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------|

### High speed serial clock output frequency range

|                      |                                                                                                                                                                                                                                                                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b> | Peak-to-peak output swing at 625 MHz is at least 200 mV p-p into 50 $\Omega$ . Higher frequencies are further attenuated by approximately 6 dB per octave above 625 MHz.<br><br>Use AC or DC coupled 50 $\Omega$ termination; AC coupling the clock provides about 10% more amplitude. |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### High speed serial data and clock output voltages, typical

|                      |                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b> | V <sub>oh</sub> = -1.0 V<br><br>V <sub>ol</sub> = -1.7 V<br><br>Assumes a load impedance greater than 1 k $\Omega$ . (50 $\Omega$ source termination.)<br><br>If a 50 $\Omega$ or 75 $\Omega$ load is used, either use a DC blocking capacitor in series with the signal or reference the termination to about -1.3 V. The signal amplitude will be correspondingly reduced. |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### High speed serial data output latency, typical

|                      |                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b> | 11 ns ± 4 ns, plus the following synchronous latency depending on the data encoding:<br>35.5 clock cycles for NRZ, CMI, Manchester, and B-0-V decoded data.<br>36.5 clock cycles for NRZI decoded data.<br>39.5 clock cycles for B3ZS decoded data.<br>40.5 clock cycles for B4ZS decoded data.<br>42.5 clock cycles for B6ZS decoded data.<br>44.5 clock cycles for B8ZS decoded data. |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Probe compensation output step amplitude and offset

|                               |                                                                                                                                                                   |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>&gt;20 GHz models</b>      | 440 mV ± 22% into a 50 Ω load (Vol = -0.14 V, Voh = 0.3 V, typical)<br>810 mV ± 22% into a ≥10 kΩ load, (Vol = -0.25 V, Voh = 0.56 V, typical)                    |
| <b>≥4 GHz, ≤20 GHz models</b> | 440 mV ± 22% into a 50 Ω load (Vol = -0.2 V to 0 V, Voh = 0.2 V to 0.4 V, typical)<br>810 mV ± 22% into a 10 kΩ load, (Vol = -0.4 V to 0 V, Voh = 0.4 V to 0.8 V) |
| <b>&lt;4 GHz models</b>       | 1 V ± 1.5% into a ≥ 100 kΩ load (Vol = -1.0 V, Voh = 0 V typical)<br>Add 0.05%/°C for temperatures greater than or less than 25 °C                                |

### Probe compensation output step frequency

|                         |             |
|-------------------------|-------------|
| <b>≥4 GHz models</b>    | 1 kHz ± 20% |
| <b>&lt;4 GHz models</b> | 1 kHz ± 5%  |

### Probe calibration output step rise time

|                         |                                                                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>≥4 GHz models</b>    | 300 ps (10% to 90%) directly into an input channel. To deskew a probe, use a 50 Ω terminator in series with the deskew fixture to minimize HF aberrations.                                           |
| <b>&lt;4 GHz models</b> | ≤350 ps at 1 V, into a ≥20 KΩ load to ground.<br>≤1 ns at 2 V, into a 50 Ω load to ground.<br>To deskew a probe, use a 50 Ω terminator in series with the deskew fixture to minimize HF aberrations. |

|                                                  |                                                                                                                                                                            |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Probe calibration output step aberrations</b> | ≤ ± 1% after the first 500 ns following the square wave transition. To deskew a probe, use a 50 Ω terminator in series with the deskew fixture to minimize HF aberrations. |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                     |          |
|-----------------------------------------------------|----------|
| <b>Jitter of internal probe calibration trigger</b> | 5 ps RMS |
|-----------------------------------------------------|----------|

|                                                    |                                                                                                                                                       |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>External reference input frequency, typical</b> | Run SPC whenever the external reference is more than 0.1% (1000 ppm) different than the nominal reference or the reference at which SPC was last run. |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                 |  |                                                                                                                                                                             |                                                             |
|-----------------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
|                                                                 |  | The timebase changes in correspondence to the fluctuations in the external reference.                                                                                       |                                                             |
| ≥4 GHz models                                                   |  | 10 MHz, 100 MHz                                                                                                                                                             |                                                             |
|                                                                 |  | The instrument scans for either 10 MHz or 100 MHz.                                                                                                                          |                                                             |
| <4 GHz models                                                   |  | 10 MHz                                                                                                                                                                      |                                                             |
| External reference input sensitivity, typical                   |  |                                                                                                                                                                             |                                                             |
| ≥4 GHz models                                                   |  | ≥ 200 mV <sub>p-p</sub>                                                                                                                                                     |                                                             |
| <4 GHz models                                                   |  | ≥ 1.5 V <sub>p-p</sub>                                                                                                                                                      |                                                             |
| External reference input voltage, maximum, typical              |  | > 20 GHz models: 4 V <sub>p-p</sub><br>≤20 GHz models: 7 V <sub>p-p</sub>                                                                                                   |                                                             |
| External reference input impedance, typical                     |  |                                                                                                                                                                             |                                                             |
| >20 GHz models                                                  |  | R <sub>in</sub> = 50 Ω                                                                                                                                                      |                                                             |
| ≥4 GHz, ≤20 GHz models                                          |  | R <sub>in</sub> = 1.5 kΩ, C <sub>in</sub> = 40 pF, measured at >100 kHz                                                                                                     |                                                             |
| <4 GHz models                                                   |  | 385 Ω, C <sub>in</sub> = 137 pF, measured at 10 MHz                                                                                                                         |                                                             |
| External reference input frequency variation tolerance, typical |  |                                                                                                                                                                             |                                                             |
| >20 GHz models                                                  |  | Low (stable) jitter mode: ± 10 ppm<br>High (tracking) mode: ± 1%                                                                                                            |                                                             |
| ≥4 GHz, ≤20 GHz models                                          |  | Low (stable) jitter mode: ± 100 ppm<br>High (tracking) mode: ± 1%                                                                                                           |                                                             |
|                                                                 |  | Running SPC is required whenever the external reference is more than 0.1% (1000 ppm) different from the nominal reference frequency or reference at which SPC was last run. |                                                             |
| <4 GHz models                                                   |  | 9.8 MHz to 10.2 MHz                                                                                                                                                         |                                                             |
| Internal reference output frequency                             |  |                                                                                                                                                                             |                                                             |
| ≥4 GHz models                                                   |  | 10 MHz                                                                                                                                                                      |                                                             |
| <4 GHz models                                                   |  | 10 MHz available at AUXOUT                                                                                                                                                  |                                                             |
| Internal reference output voltage, typical                      |  |                                                                                                                                                                             |                                                             |
| ≥4 GHz models                                                   |  | > 750 mV peak-peak into 50 Ω<br><br>> 1.5 V peak-peak into 1 MΩ (internally AC coupled).                                                                                    |                                                             |
| <4 GHz models                                                   |  | V <sub>out</sub> high                                                                                                                                                       | V <sub>out</sub> low (true)                                 |
|                                                                 |  | ≥2.5 V into open circuit,<br>≥1.0 V into 50 Ω load to ground                                                                                                                | ≤0.7 V with ≤4 mA sink,<br>≤0.25 V into 50 Ω load to ground |

#### Input and output ports

|                                   |                                                                                                                                                                                                                          |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DVI Video port</b>             | >20 GHz models: A female Digital Visual Interface (DVI-D) compatible port<br>≤20 GHz models: A female Digital Visual Interface (DVI-I) compatible port                                                                   |
| <b>VGA port, DX models only</b>   | A female Video Graphics Array (VGA) compatible port                                                                                                                                                                      |
| <b>Passive eSATA Port</b>         | Instrument must be powered down to make connection                                                                                                                                                                       |
| <b>COM1 and COM2 serial ports</b> | 9 pin D-Sub ports, use NS16C550-compatible UARTS, transfer speeds up to 115.2 kb/s.<br>DX models have only COM1.                                                                                                         |
| <b>Keyboard and Mouse ports</b>   | PS-2 compatible, instrument must be powered down to make connection                                                                                                                                                      |
| <b>LAN port</b>                   | RJ-45 connector, supports 10 base-T, 100 base-T, and Gigabit Ethernet                                                                                                                                                    |
| <b>External audio ports</b>       | External audio jacks for microphone input and line output                                                                                                                                                                |
| <b>USB ports</b>                  | >20 GHz models: Four rear panel and 2 front panel USB 2.0 connectors. On DX models, two of the rear panel connectors are USB 3.0/USB 2.0<br>≤20 GHz models: Four side or rear panel and 1 front panel USB 2.0 connectors |
| <b>GPIO port</b>                  | IEEE 488.2 standard interface, listener or controller                                                                                                                                                                    |

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## Data storage specifications

#### Hard disk

|                          |                                                                                                                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>&gt;20 GHz models</b> | Waveforms and setups are stored on the hard disk.<br>2.5-inch SATA hard disk, drive capacity is ≥300 GB. DX models use a ≥300 GB solid state drive. C models use a ≥500 GB hard disk drive. |
| <b>≤20 GHz models</b>    | 2.5-inch SATA hard disk, drive capacity is ≥160 GB.                                                                                                                                         |

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## Power source specification

### Power consumption

|               |                   |
|---------------|-------------------|
| ≥4 GHz models | <1200 VA          |
| <4 GHz models | 550 Watts maximum |

### Source voltage and frequency

|               |                                                                                |
|---------------|--------------------------------------------------------------------------------|
| ≥4 GHz models | 100 to 240 V <sub>RMS</sub> , 50 Hz to 60 Hz,<br>115 V ± 10%, 400 Hz<br>CAT II |
| <4 GHz models | 100 V to 240 V <sub>RMS</sub> ± 10%, 47 Hz to 63 Hz<br>115 V ± 10%, 400 Hz     |

|                                                      |                                                                                                                                  |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Value probe interface (VPI), &lt;4 GHz models</b> | Probe interface allows installing, powering, compensating and controlling a wide range of probes offering a variety of features. |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|

## Mechanical specifications

### Weight

|                                                      |                                                                                          |
|------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>&lt;4 GHz models Benchtop configuration</b>       | 14.0 kg (31 lbs) instrument only<br>21.8 kg (48 lbs) when packaged for domestic shipment |
| <b>Rackmount kit</b>                                 | 0.9 kg (2 lbs)<br>2.2 kg (5 lbs) kit packaged for domestic shipment                      |
| <b>≥4 GHz non-MSO models, Benchtop configuration</b> | 23 kg (50.6 lbs) oscilloscope only<br>37 kg (81.4 lbs) packaged for domestic shipment    |
| <b>MSO70000C Series, Benchtop configuration</b>      | 25.0 kg (55 lbs) instrument only<br>39 kg (86 lbs) when packaged for domestic shipment   |
| <b>MSO70000DX Series, Benchtop configuration</b>     | 25.0 kg (55 lbs) instrument only<br>39 kg (86 lbs) when packaged for domestic shipment   |
| <b>Rackmount kit, ≥4 GHz models</b>                  | 2.04 kg (4.5 lbs) rackmount kit<br>3.4 kg (7.5 lbs) kit packaged for domestic shipment   |

**Dimensions****<4 GHz models, Benchtop configuration**

| With front cover and feet                                                           | Without front cover and feet                                                       |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 295.4 mm (11.6 in) height<br>468.6 mm (18.4 in) width<br>318 mm (12.5 in) depth     | 278 mm (10.95 in) height<br>450.8 mm (17.75 in) width<br>308.6 mm (12.15 in) depth |
| 311.15 mm (12.25 in) height<br>482.6 mm (19.0 in) width<br>520.7 mm (20.5 in) depth |                                                                                    |

**<4 GHz models, Rackmount configuration**

| With front cover and feet                                                           | Without front cover and feet |
|-------------------------------------------------------------------------------------|------------------------------|
| 311.15 mm (12.25 in) height<br>482.6 mm (19.0 in) width<br>520.7 mm (20.5 in) depth |                              |

**≥4 GHz models, Benchtop configuration**

| With front cover                                                                                                   | Without front cover                                                                                                |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 278 mm (10.95 in) height<br>330 mm (13 in) with feet extended<br>451 mm (17.75 in) width<br>442 mm (17.4 in) depth | 277 mm (10.9 in) height<br>330 mm (13 in) with feet extended<br>451 mm (17.75 in) width<br>432 mm (17.02 in) depth |

**≥4 GHz models, Rackmount configuration**

| With rack handles                                                            | Without rack handles                                                      |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 267 mm (10.5 in) height<br>502 mm (19.75 in) width<br>489 mm (19.4 in) depth | 267 mm (10.5 in) height<br>482 mm (19 in) width<br>442 mm (17.4 in) depth |

**Cooling****Required clearances**

| Fan-forced air circulation with no air filter |                                                                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------|
| Top                                           | 0 mm (0 in)                                                                      |
| Bottom                                        | 6.35 mm (0.25 in) minimum or 0 mm (0 in) when standing on feet, flip stands down |
| Left side                                     | 76 mm (3 in)                                                                     |
| Right side                                    | 76 mm (3 in) ≥4 GHz models<br>0 mm (0 in) < 4 GHz models                         |
| Rear                                          | 0 mm (0 in) on rear feet                                                         |

**Construction material**

Chassis parts are constructed of aluminum alloy, front panel is constructed of plastic laminate, circuit boards are constructed of glass laminate

## Environmental specifications

### Temperature <4 GHz models

|                     |                                                                                                                     |
|---------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Operating</b>    | +5 °C to +45 °C (41 °F to +113 °F), with noncondensing conditions                                                   |
| <b>Nonoperating</b> | -40 °C to +71 °C (-40 °F to +160 °F), with 15 °C/hour maximum gradient, without disk media installed in disk drives |

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### Temperature ≥4 GHz models

|                     |                                                                                                                                                                              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating</b>    | +5 °C to +45 °C (41 °F to +113 °F), with 11 °C per hour maximum gradient, noncondensing, derated 1 °C per 300 meters (984.25 feet) above 1500 meters (4921.25 feet) altitude |
| <b>Nonoperating</b> | -20 °C to +60 °C (-4 °F to +140 °F), with 20 °C/hour maximum gradient, without disk media installed in disk drives                                                           |

---

### Humidity >4 GHz models

|                     |                                                                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating</b>    | 8% to 80% relative humidity with a maximum wet-bulb temperature of +29 °C (84 °F) at or below +45 °C (113 °F), noncondensing<br><br>Upper limit derated to 30% relative humidity at +45 °C (+113 °F) |
| <b>Nonoperating</b> | 5% to 90% relative humidity with a maximum wet-bulb temperature of +29 °C (84 °F) at or below +60 °C (140 °F), noncondensing<br><br>Upper limit derated to 20% relative humidity at +60 °C (+140 °F) |

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### Humidity ≥4 GHz models

|                     |                                                                                                                                                                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating</b>    | 8% to 80% relative humidity at up to +32 °C (+90 °F)<br><br>5% to 45% relative humidity above +32 °C (+90 °F) up to +45 °C (+113 °F), noncondensing, and is limited by a maximum wet-bulb temperature of +29.4 °C (+85 °F) (derates relative humidity to 32% at +45 °C (+113 °F))   |
| <b>Nonoperating</b> | 5% to 95% relative humidity at up to +30 °C (+86 °F),<br><br>5% to 45% relative humidity above +30 °C (+86 °F), up to +60 °C (+140 °F), noncondensing, and is limited by a maximum wet-bulb temperature of +29.4 °C (+85 °F) (derates relative humidity to 11% at +60 °C (+140 °F)) |

---

### Altitude <4 GHz models

|                     |                                   |
|---------------------|-----------------------------------|
| <b>Operating</b>    | Up to 3,000 meters (9,843 feet)   |
| <b>Nonoperating</b> | Up to 12,192 meters (40,000 feet) |

---

### Altitude ≥4 GHz models

|                     |                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating</b>    | Up to 3,000 meters (9,843 feet), derate maximum operating temperature by 1 °C per 300 meters (984.25 feet) above 1500 meters (4921.25 feet) altitude |
| <b>Nonoperating</b> | Up to 12,000 meters (39,370 feet)                                                                                                                    |

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# Specifications (MSO/DPO5000/B Series)

This chapter contains specifications for the MSO5000/B and DPO5000/B series oscilloscopes. 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 MSO5000/B and DPO5000/B 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 before evaluating the instrument's performance to the specifications. (See page 4-32, Self Test.) If the operating temperature changes by more than 10 °C (18 °F), perform the SPC operation again.

## Analog channel input and vertical specification

|                                                                                                                |                                                                                        |                                               |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------|
| Number of input channels                                                                                       | 4 analog channels, digitized simultaneously                                            |                                               |
| Input coupling                                                                                                 | DC or AC                                                                               |                                               |
| Input resistance selection                                                                                     | 1 M $\Omega$ or 50 $\Omega$<br>250 k $\Omega$ selectable for performance verification. |                                               |
|  Input impedance DC coupled |                                                                                        |                                               |
| 1 M $\Omega$                                                                                                   | 1 M $\Omega$ $\pm$ 1%                                                                  |                                               |
| 50 $\Omega$                                                                                                    | 50 $\Omega$ $\pm$ 1%                                                                   |                                               |
|                                                                                                                | MSO5204/B,<br>DPO5204/B                                                                | VSWR $\leq$ 1.5:1 from DC to 2 GHz, typical   |
|                                                                                                                | MSO5104/B,<br>DPO5104/B                                                                | VSWR $\leq$ 1.5:1 from DC to 1 GHz, typical   |
|                                                                                                                | MSO5054/B,<br>DPO5054B                                                                 | VSWR $\leq$ 1.5:1 from DC to 500 MHz, typical |
|                                                                                                                | MSO5034/B,<br>DPO5034/B                                                                | VSWR $\leq$ 1.5:1 from DC to 350 MHz, typical |
| Input capacitance 1M $\Omega$ DC coupled                                                                       | 13 pF $\pm$ 2 pF                                                                       |                                               |

**Maximum input voltage****1 M $\Omega$** 300 VRMS with peaks  $\leq \pm 425$  V at the BNC

CAT II

For  $< 100$  mV/div, derate at 20 dB/decade above 100 kHz to 30 VRMS at 1 MHz, 10 dB/decade above 1 MHzFor  $\geq 100$  mV/div, derate at 20 dB/decade above 3 MHz to 30 VRMS at 30 MHz, 10 dB/decade above 30 MHz**50  $\Omega$** 5 VRMS with peaks  $\leq \pm 20$  V (DF  $\leq 6.25\%$ )

Overvoltage trip is intended to protect against overloads that might damage termination resistors. A sufficiently large impulse might cause damage regardless of the overvoltage protection circuitry because of the finite time required to detect and respond.

 **DC balance**0.1 div with the input DC 50  $\Omega$  coupled and 50  $\Omega$  terminated0.2 div at 1 mV/div with the input DC 50  $\Omega$  coupled and 50  $\Omega$  terminated0.2 div with the input DC 1 M $\Omega$  coupled and 50  $\Omega$  terminated**Number of digitized bits**

8 bits

Displayed vertically with 25 digitization levels (DL) per division, 10.24 divisions dynamic range.

"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 the LSB (least significant bit).

**Sensitivity range (coarse)****1 M $\Omega$** 

1 mV/div to 10 V/div in a 1-2-5 sequence

**50  $\Omega$** 

1 mV/div to 1 V/div in a 1-2-5 sequence

**Sensitivity range (fine)****1 M $\Omega$** 

|                     |                                            |
|---------------------|--------------------------------------------|
| 1 mV/div to 5 V/div | $< -50\%$ to $> +50\%$ of selected setting |
| 10 V/div            | $< -50\%$ to 0%                            |

**50  $\Omega$** 

|                                                        |                                                       |
|--------------------------------------------------------|-------------------------------------------------------|
| 1 mV/div to 500 mV/div                                 | $< -50\%$ to $> +50\%$ of selected setting            |
| 1 V/div                                                | $< -50\%$ to 0%                                       |
| Allows continuous adjustment from 1 mV/div to 10 V/div | Allows continuous adjustment from 1 mV/div to 1 V/div |

**Sensitivity resolution (fine)** $\leq 1\%$  of current setting **DC gain accuracy**For 50  $\Omega$ , 1 M $\Omega$ , TPP0500, and TPP1000 path: $\pm 1.5\%$ , derated at 0.100%/°C above 30 °C $\pm 2.0\%$ , derated at 0.100%/°C above 30 °C, 1 mV/Div setting, typical $\pm 3.0\%$  variable gain, derated at 0.100%/°C above 30 °C

**Offset ranges, minimum**

| Volts/div setting          | Offset range       |                   |
|----------------------------|--------------------|-------------------|
|                            | 1 M $\Omega$ input | 50 $\Omega$ input |
| 1 mV/div to 50 mV/div      | $\pm 1$ V          | $\pm 1$ V         |
| 50.5 mV/div to 99.5 mV/div | $\pm 0.5$ V        | $\pm 0.5$ V       |
| 100 mV/div to 500 mV/div   | $\pm 10$ V         | $\pm 10$ V        |
| 505 mV/div to 995 mV/div   | $\pm 5$ V          | $\pm 5$ V         |
| 1 V/div to 5 V/div         | $\pm 100$ V        | $\pm 5$ V         |
| 5.05 V/div to 10 V/div     | $\pm 50$ V         | Not applicable    |

For 50  $\Omega$  path, 1 V/div is the maximum vertical setting.

The input signal cannot exceed Max Input Voltage for the 50  $\Omega$  input path. Refer to the Max Input Voltage specification for more information.

**Position range**

$\pm 5$  divisions

**Offset accuracy**

$\pm [0.005 \times |\text{offset} - \text{position}| + \text{DC Balance}]$

Both the position and constant offset term must be converted to volts by multiplying by the appropriate volts/div term.

**Number of waveforms for average acquisition mode**

2 to 10,000 waveforms

Default of 16 waveforms

**DC voltage measurement accuracy average acquisition mode**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Average of $\geq 16$ waveforms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | $\pm [\text{DC Gain Accuracy} \times \text{reading} - (\text{offset} - \text{position}) + \text{offset accuracy} + 0.1 \text{ division}]$<br>Refer to DC Gain Accuracy for temperature derating information. |
| Delta Volts between any two averages of $\geq 16$ waveforms acquired with the same oscilloscope setup and ambient conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm [\text{DC gain accuracy} \times \text{reading} + 0.05 \text{ div}]$<br>Refer to DC Gain Accuracy for temperature derating information.                                                                  |
| <p>Note: Offset, position, and the constant offset term must be converted to volts by multiplying by the appropriate volts/div term.</p> <p>The basic accuracy specification applies directly to any sample and to the following measurements: High, Low, Max, Min, Mean, Cycle Mean, RMS, and Cycle RMS. The delta volt accuracy specification applies to subtractive calculations involving two of these measurements. The delta volts (difference voltage) accuracy specification applies directly to the following measurements: Positive Overshoot, Negative Overshoot, Peak-to-Peak, and Amplitude.</p> |                                                                                                                                                                                                              |

**DC voltage measurement accuracy, sample acquisition mode, typical**

| Measurement type                                                                                     | DC Accuracy (in volts)                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Any sample                                                                                           | $\pm[\text{DC gain accuracy} \times  \text{reading} - (\text{offset} - \text{position})  + \text{offset accuracy} + 0.15 \text{ div} + 0.6 \text{ mV}]$<br>Refer to DC Gain Accuracy for temperature derating information. |
| Delta volts between any two samples acquired with the same oscilloscope setup and ambient conditions | $\pm[\text{DC gain accuracy} \times  \text{reading}  + 0.15 \text{ div} + 1.2 \text{ mV}]$<br>Refer to DC Gain Accuracy for temperature derating information.                                                              |

Offset, position, and the constant offset term must be converted to volts by multiplying by the appropriate volts/div term.

#### Analog bandwidth 50 $\Omega$ DC coupled

Full bandwidth, with amplitude tolerance of -3 dB and operating temperatures of  $\leq 30^\circ\text{C}$  ( $86^\circ\text{F}$ ). Reduce the bandwidth by 1% for each  $^\circ\text{C}$  above  $30^\circ\text{C}$ .

| Instrument              | SCALE range                                                                                       | Bandwidth                                                          |
|-------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| MSO5204/B,<br>DPO5204/B | 10 mV/div — 1 V/div<br>5 mV/div — 9.98 mV/div<br>2 mV/div — 4.98 mV/div<br>1 mV/div — 1.99 mV/div | DC to 2.00 GHz<br>DC to 1.50 GHz<br>DC to 350 MHz<br>DC to 175 MHz |
| MSO5104/B,<br>DPO5104/B | 5 mV/div — 9.98 mV/div<br>2 mV/div — 4.98 mV/div<br>1 mV/div — 1.99 mV/div                        | DC to 1.00 GHz<br>DC to 350 MHz<br>DC to 175 MHz                   |
| MSO5054/B,<br>DPO5054/B | 5 mV/div — 9.98 mV/div<br>2 mV/div — 4.98 mV/div<br>1 mV/div — 1.99 mV/div                        | DC to 500 MHz<br>DC to 350 MHz<br>DC to 175 MHz                    |
| MSO5034/B,<br>DPO5034/B | 2 mV/div — 4.98 mV/div<br>1 mV/div — 1.99 mV/div                                                  | DC to 350 MHz<br>DC to 175 MHz                                     |

#### Analog bandwidth 1 M $\Omega$ DC coupled

Full bandwidth, with amplitude tolerance of -3 dB and operating temperatures of  $\leq 30^\circ\text{C}$  ( $86^\circ\text{F}$ ). Reduce the bandwidth by 1% for each  $^\circ\text{C}$  above  $30^\circ\text{C}$ .

| Instrument                                                                                                                                                                                                                                                                                                                                                                                          | SCALE range            | Bandwidth     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------|
|  MSO5204/B,<br> DPO5204/B,<br> MSO5104/B,<br> DPO5104/B | 5 mV/div — 10 V/div    | DC to 500 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                     | 2 mV/div — 4.98 mV/div | DC to 350 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                     | 1 mV/div — 1.99 mV/div | DC to 175 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                     |                        |               |
| MSO5054/B,<br>DPO5054/B                                                                                                                                                                                                                                                                                                                                                                             | 5 mV/div — 10 V/div    | DC to 500 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                     | 2 mV/div — 4.98 mV/div | DC to 350 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                     | 1 mV/div — 1.99 mV/div | DC to 175 MHz |
| MSO5034/B,<br>DPO5034/B                                                                                                                                                                                                                                                                                                                                                                             | 5 mV/div — 10 V/div    | DC to 350 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                     | 2 mV/div — 4.98 mV/div | DC to 350 MHz |
|                                                                                                                                                                                                                                                                                                                                                                                                     | 1 mV/div — 1.99 mV/div | DC to 175 MHz |

The MSO/DPO5204/B and MSO/DPO5104/B models have separate 50  $\Omega$  and 1 M $\Omega$  analog paths, so they must be tested at both settings. All other models have one analog path, so the analog path is fully tested with the 50  $\Omega$  termination.

**Analog bandwidth with TPP0500 and TPP1000 probe, typical**

Full bandwidth, with amplitude tolerance of -3 dB and operating temperatures of  $\leq 30$  °C (86 °F). Reduce the bandwidth by 1% for each °C above 30 °C.

| Instrument                                          | SCALE range             | Bandwidth                                                    |
|-----------------------------------------------------|-------------------------|--------------------------------------------------------------|
| MSO5204/B,<br>DPO5204/B,<br>MSO5104/B,<br>DPO5104/B | 50 mV/div — 100 V/div   | DC to 1 GHz (TPP1000 probe)<br>DC to 500 MHz (TPP0500 probe) |
|                                                     | 20 mV/div — 49.8 mV/div | DC to 350 MHz                                                |
|                                                     | 10 mV/div — 19.9 mV/div | DC to 175 MHz                                                |
| MSO5054/B,<br>DPO5054/B                             | 50 mV/div — 100 V/div   | DC to 500 MHz                                                |
|                                                     | 20 mV/div — 49.8 mV/div | DC to 350 MHz                                                |
|                                                     | 10 mV/div — 19.9 mV/div | DC to 175 MHz                                                |
| MSO5034/B,<br>DPO5034/B                             | 50 mV/div — 100 V/div   | DC to 350 MHz                                                |
|                                                     | 20 mV/div — 49.8 mV/div | DC to 350 MHz                                                |
|                                                     | 10 mV/div — 19.9 mV/div | DC to 175 MHz                                                |

**Lower frequency limit, AC coupled, typical**

< 10 Hz when AC, 1 M $\Omega$  coupled

The AC coupled lower frequency limits are reduced by a factor of 10 when 10X passive probes are used.

**Upper frequency limit, 250 MHz bandwidth limited, typical**

250 MHz,  $\pm 20\%$

**Upper frequency limit, 20 MHz bandwidth limited, typical**

20 MHz,  $\pm 20\%$

**Calculated rise time, typical**

Calculated Rise Time at 350/BW (MHz). The formula is calculated by measuring -3 dB bandwidth of the oscilloscope. The formula accounts for the rise time contribution of the oscilloscope independent of the rise time of the signal source.

| Instrument              | 50 $\Omega$<br>10 mV/div to 1 V/<br>div | 50 $\Omega$<br>5 mV/div to<br>9.98 mV/div | 50 $\Omega$<br>2 mV/div to<br>4.99 mV/div | 50 $\Omega$<br>1 mV/div to<br>1.99 mV/div |
|-------------------------|-----------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| MSO5204/B,<br>DPO5204/B | 175 ps                                  | 233 ps                                    | 1 ns                                      | 2 ns                                      |

| Instrument           | 50 $\Omega$<br>5 mV/div to 1 V/<br>div | 50 $\Omega$<br>2 mV/div to<br>4.99 mV/div | 50 $\Omega$<br>1 mV/div to<br>1.99 mV/div |
|----------------------|----------------------------------------|-------------------------------------------|-------------------------------------------|
| MSO5104/B, DPO5104/B | 350 ps                                 | 1 ns                                      | 2 ns                                      |
| MSO5054/B, DPO5054/B | 700 ps                                 | 1 ns                                      | 2 ns                                      |
| MSO5034/B, DPO5034/B | 1 ns                                   | 1 ns                                      | 2 ns                                      |

| Instrument           | TPP1000 probe<br>50 mV/div to<br>100 mV/div | TP1000 probe<br>20 mV/div to<br>49.8 mV/div | TPP1000 probe<br>10 mV/div to<br>19.9 mV/div |
|----------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------|
| MSO5204/B, DPO5204/B | 350 ps                                      | 1 ns                                        | 2 ns                                         |
| MSO5104/B, DPO5104/B | 350 ps                                      | 1 ns                                        | 2 ns                                         |
| MSO5054/B, DPO5054/B | 700 ps                                      | 1 ns                                        | 2 ns                                         |
| MSO5034/B, DPO5034/B | 1 ns                                        | 1 ns                                        | 2 ns                                         |

| Instrument           | TPP0500 probe<br>50 mV/div to<br>10 V/div | TPP0500 probe<br>20 mV/div to<br>49.8 mV/div | TPP0500 probe<br>10 mV/div to<br>19.9 mV/div |
|----------------------|-------------------------------------------|----------------------------------------------|----------------------------------------------|
| MSO5204/B, DPO5204/B | 700 ps                                    | 1 ns                                         | 2 ns                                         |
| MSO5104/B, DPO5104/B | 700 ps                                    | 1 ns                                         | 2 ns                                         |
| MSO5054/B, DPO5054/B | 700 ps                                    | 1 ns                                         | 2 ns                                         |
| MSO5034/B, DPO5034/B | 1 ns                                      | 1 ns                                         | 2 ns                                         |

 **Peak detect or envelope mode  
pulse response, typical**

| Instrument<br>(Sample Rate Maximum)           | Minimum pulse width |
|-----------------------------------------------|---------------------|
| MSO5204/B, DPO5204/B,<br>MSO5104/B, DPO5104/B | >100 ps             |
| MSO5054/B, DPO5054/B,<br>MSO5034/B, DPO5034/B | >200 ps             |

**Effective bits, typical**

Specifications are valid at maximum per channel sample rate and at 1k record length.

| Model                   | Input frequency | Effective bits |
|-------------------------|-----------------|----------------|
| MSO5204/B,<br>DPO5204/B | 4.9 MHz         | 6.0 bits       |
|                         | 2 GHz           | 6.0 bits       |
| MSO5104/B,<br>DPO5104/B | 4.9 MHz         | 6.0 bits       |
|                         | 1 GHz           | 6.0 bits       |
| MSO5054/B,<br>DPO5054/B | 4.9 MHz         | 6.0 bits       |
|                         | 500 MHz         | 6.0 bits       |
| MSO5034/B,<br>DPO5034/B | 4.9 MHz         | 6.0 bits       |
|                         | 350 MHz         | 6.0 bits       |

 **Random noise, sample acquisition mode**

| Instrument          | Bandwidth limit   | RMS noise                                                    |                                                              |
|---------------------|-------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                     |                   | 1 M $\Omega$                                                 | 50 $\Omega$                                                  |
| MSO5204,<br>DPO5204 | Full Bandwidth    | $\leq(180 \mu\text{V} + 8.0\% \text{ of Volts/div setting})$ | $\leq(150 \mu\text{V} + 6.0\% \text{ of Volts/div setting})$ |
|                     | 250 MHz bandwidth | $\leq(120 \mu\text{V} + 5.0\% \text{ of Volts/div setting})$ | $\leq(75 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$  |
|                     | 20 MHz bandwidth  | $\leq(120 \mu\text{V} + 5.0\% \text{ of Volts/div setting})$ | $\leq(75 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$  |

| Instrument          | Bandwidth limit   | RMS noise                                                    |                                                             |
|---------------------|-------------------|--------------------------------------------------------------|-------------------------------------------------------------|
|                     |                   | 1 M $\Omega$                                                 | 50 $\Omega$                                                 |
| MSO5104,<br>DPO5104 | Full Bandwidth    | $\leq(150 \mu\text{V} + 8.0\% \text{ of Volts/div setting})$ | $\leq(75 \mu\text{V} + 6.0\% \text{ of Volts/div setting})$ |
|                     | 250 MHz bandwidth | $\leq(100 \mu\text{V} + 5.0\% \text{ of Volts/div setting})$ | $\leq(50 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$ |
|                     | 20 MHz bandwidth  | $\leq(100 \mu\text{V} + 5.0\% \text{ of Volts/div setting})$ | $\leq(50 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$ |

| Instrument          | Bandwidth limit   | RMS noise                                                    |                                                              |
|---------------------|-------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                     |                   | 1 M $\Omega$                                                 | 50 $\Omega$                                                  |
| MSO5054,<br>DPO5054 | Full Bandwidth    | $\leq(130 \mu\text{V} + 8.0\% \text{ of Volts/div setting})$ | $\leq(130 \mu\text{V} + 8.0\% \text{ of Volts/div setting})$ |
|                     | 250 MHz bandwidth | $\leq(100 \mu\text{V} + 6.0\% \text{ of Volts/div setting})$ | $\leq(100 \mu\text{V} + 6.0\% \text{ of Volts/div setting})$ |
|                     | 20 MHz bandwidth  | $\leq(100 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$ | $\leq(100 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$ |

| Instrument          | Bandwidth limit   | RMS noise                                                    |                                                              |
|---------------------|-------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                     |                   | 1 M $\Omega$                                                 | 50 $\Omega$                                                  |
| MSO5034,<br>DPO5034 | Full Bandwidth    | $\leq(130 \mu\text{V} + 8.0\% \text{ of Volts/div setting})$ | $\leq(130 \mu\text{V} + 8.0\% \text{ of Volts/div setting})$ |
|                     | 250 MHz bandwidth | $\leq(100 \mu\text{V} + 6.0\% \text{ of Volts/div setting})$ | $\leq(100 \mu\text{V} + 6.0\% \text{ of Volts/div setting})$ |
|                     | 20 MHz bandwidth  | $\leq(100 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$ | $\leq(100 \mu\text{V} + 4.0\% \text{ of Volts/div setting})$ |

| MSO/DPO5204B     | 50 $\Omega$ termination |            |           | 1 M $\Omega$ termination |            |           |
|------------------|-------------------------|------------|-----------|--------------------------|------------|-----------|
| Vertical Setting | Full BW                 | 250 MHz BW | 20 MHz BW | Full BW                  | 250 MHz BW | 20 MHz BW |
| 1 mV/div         | 0.09                    |            | 0.07      | 0.20                     |            | 0.11      |
| 2 mV/div         | 0.20                    | 0.12       | 0.10      | 0.45                     | 0.21       | 0.13      |
| 5 mV/div         | 0.40                    | 0.21       | 0.20      | 0.70                     | 0.28       | 0.24      |

| <b>MSO/DPO5204B</b>     | <b>50 <math>\Omega</math> termination</b> |                   |                  | <b>1 M<math>\Omega</math> termination</b> |                   |                  |
|-------------------------|-------------------------------------------|-------------------|------------------|-------------------------------------------|-------------------|------------------|
| <b>Vertical Setting</b> | <b>Full BW</b>                            | <b>250 MHz BW</b> | <b>20 MHz BW</b> | <b>Full BW</b>                            | <b>250 MHz BW</b> | <b>20 MHz BW</b> |
| 10 mV/div               | 0.65                                      | 0.37              | 0.33             | 0.85                                      | 0.45              | 0.45             |
| 20 mV/div               | 1.10                                      | 0.75              | 0.60             | 1.10                                      | 0.80              | 0.80             |
| 50 mV/div               | 2.50                                      | 1.90              | 1.50             | 2.30                                      | 2.00              | 1.90             |
| 100 mV/div              | 6.1                                       | 3.7               | 3.1              | 5.0                                       | 3.8               | 4.0              |
| 1 V/div                 | 43.0                                      | 38.0              | 30.5             | 50.0                                      | 37.5              | 35.0             |

| <b>MSO/DPO5104B</b>     | <b>50 <math>\Omega</math> termination</b> |                   |                  | <b>1 M<math>\Omega</math> termination</b> |                   |                  |
|-------------------------|-------------------------------------------|-------------------|------------------|-------------------------------------------|-------------------|------------------|
| <b>Vertical Setting</b> | <b>Full BW</b>                            | <b>250 MHz BW</b> | <b>20 MHz BW</b> | <b>Full BW</b>                            | <b>250 MHz BW</b> | <b>20 MHz BW</b> |
| 1 mV/div                | 0.09                                      |                   | 0.07             | 0.21                                      |                   | 0.11             |
| 2 mV/div                | 0.17                                      | 0.12              | 0.10             | 0.38                                      | 0.20              | 0.13             |
| 5 mV/div                | 0.28                                      | 0.20              | 0.18             | 0.55                                      | 0.28              | 0.23             |
| 10 mV/div               | 0.45                                      | 0.37              | 0.33             | 0.65                                      | 0.45              | 0.40             |
| 20 mV/div               | 0.80                                      | 0.75              | 0.60             | 1.00                                      | 0.80              | 0.80             |
| 50 mV/div               | 2.00                                      | 1.90              | 1.50             | 2.30                                      | 2.00              | 1.90             |
| 100 mV/div              | 4.5                                       | 3.7               | 3.0              | 4.5                                       | 3.8               | 4.0              |
| 1 V/div                 | 40.0                                      | 38.0              | 30.0             | 45.0                                      | 37.5              | 35.0             |

| <b>MSO/DPO5054B</b>     | <b>50 <math>\Omega</math> termination</b> |                   |                  |
|-------------------------|-------------------------------------------|-------------------|------------------|
| <b>Vertical Setting</b> | <b>Full BW</b>                            | <b>250 MHz BW</b> | <b>20 MHz BW</b> |
| 1 mV/div                | 0.20                                      |                   | 0.11             |
| 2 mV/div                | 0.27                                      | 0.21              | 0.13             |
| 5 mV/div                | 0.38                                      | 0.30              | 0.22             |
| 10 mV/div               | 0.55                                      | 0.55              | 0.45             |
| 20 mV/div               | 1.10                                      | 1.00              | 0.80             |
| 50 mV/div               | 2.50                                      | 2.50              | 1.90             |
| 100 mV/div              | 5.0                                       | 4.75              | 4.0              |
| 1 V/div                 | 50.0                                      | 50.0              | 40.0             |

| <b>MSO/DPO5054B</b>     | <b>50 <math>\Omega</math> termination</b> |                   |                  |
|-------------------------|-------------------------------------------|-------------------|------------------|
| <b>Vertical Setting</b> | <b>Full BW</b>                            | <b>250 MHz BW</b> | <b>20 MHz BW</b> |
| 1 mV/div                | 0.20                                      |                   | 0.11             |
| 2 mV/div                | 0.27                                      | 0.21              | 0.13             |
| 5 mV/div                | 0.38                                      | 0.30              | 0.22             |
| 10 mV/div               | 0.55                                      | 0.55              | 0.45             |
| 20 mV/div               | 1.10                                      | 1.00              | 0.80             |
| 50 mV/div               | 2.50                                      | 2.50              | 1.90             |
| 100 mV/div              | 5.0                                       | 4.75              | 4.0              |

| MSO/DPO5054B     | 50 $\Omega$ termination |            |           |
|------------------|-------------------------|------------|-----------|
| Vertical Setting | Full BW                 | 250 MHz BW | 20 MHz BW |
| 1 V/div          | 50.0                    | 50.0       | 40.0      |

**Delay between channels, full bandwidth, typical**

$\leq 100$  ps between any two channels with input impedance set to 50  $\Omega$ , DC coupling, with equal volts/division setting or above 10 mV/div

All settings in the instrument can be manually time aligned using the Probe Deskew function

**Deskew range**

-75 ns to +75 ns

**Crosstalk channel isolation**

$\geq 100:1$  at  $\leq 100$  MHz and  $\geq 30:1$  at  $> 100$  MHz up to the rated bandwidth for any two channels having equal Volts/Div settings

**TekVPI interface**

The probe interface allows installing, powering, compensating, and controlling a wide range of probes offering a variety of features.

The interface is available on all front panel inputs including Aux In. Aux In only provides 1 M $\Omega$  input impedance and does not offer 50  $\Omega$  as the other input channels do.

**Total probe power**

Five TekVPI-compliant probe interfaces (one per channel)

15 W maximum internal probe power (12 W maximum with firmware versions  $< 6.4.0$ )

Provision for 50 W probe power with 119-7465-00 TekVPI External Power Supply

**Probe power per channel**

| Voltage | Max Amperage   | Voltage Tolerance |
|---------|----------------|-------------------|
| 5 V     | 50 mA (250 mW) | $\pm 5\%$         |
| 12 V    | 2 A (24 W)     | $\pm 10\%$        |

## Horizontal and acquisition system specifications

### Sample rate

| Instrument                                    | Maximum sample rate | Number of channels |
|-----------------------------------------------|---------------------|--------------------|
| MSO5204/B, DPO5204/B,<br>MSO5104/B, DPO5104/B | 10 GS/s             | 1 or 2             |
|                                               | 5 GS/s              | 3 or 4             |
| MSO5054/B, DPO5054/B,<br>MSO5034/B, DPO5034/B | 5 GS/s              | 1 – 4              |

### Record length, analog channels

| Option                                                                  | Number of Channels | 2 GHz  | 1 GHz  | 500 MHz | 350 MHz |
|-------------------------------------------------------------------------|--------------------|--------|--------|---------|---------|
| Standard (MSO/DPO5000 Series)                                           | 3 or 4             | 12.5 M | 12.5 M | 12.5 M  | 12.5 M  |
|                                                                         | 1 or 2             | 25 M   | 25 M   | 12.5 M  | 12.5 M  |
| Option 2RL<br>(MSO/DPO5000 Series)<br>Standard<br>(MSO/DPO5000B Series) | 3 or 4             | 25 M   | 25 M   | 25 M    | 25 M    |
|                                                                         | 1 or 2             | 50 M   | 50 M   | 25 M    | 25 M    |
| Option 5RL                                                              | 3 or 4             | 50 M   | 50 M   | 50 M    | 50 M    |
|                                                                         | 1 or 2             | 125 M  | 125 M  | 50 M    | 50 M    |
| Option 10RL                                                             | 3 or 4             | 125 M  | 125 M  | 125 M   | 125 M   |
|                                                                         | 1 or 2             | 250 M  | 250 M  | 125 M   | 125 M   |

### Record length, digital channels

The record length ranges for a standard instrument are the same as for the analog channel specification table (above).

The record length ranges for an instrument with an option are the same as for the analog channel specifications, up to 40M.

## Seconds/Division range

| MSO5204B,<br>DPO5204B,<br>MSO5104B,<br>DPO5104B | Record<br>Length |                   |                 |                   |                    |                 |                 |
|-------------------------------------------------|------------------|-------------------|-----------------|-------------------|--------------------|-----------------|-----------------|
| Horizontal Mode                                 | 1 K              | 10 K              | 100 K           | 1 M               | 10 M               | 100 M           | 200/250<br>M    |
| Automatic                                       | 250 ps -<br>20 s | 2.5 ns -<br>200 s | 50 ns -<br>1 ks | 500 ns -<br>1 ks  | 5 us - 1 ks        | 50 us -<br>1 ks | 50 us -<br>1 ks |
| Constant SR                                     | 250 ps -<br>20 s | 2.5 ns -<br>200 s | 50 ns -<br>1 ks | 500 ns -<br>1 ks  | 5 us - 1 ks        | 50 us -<br>1 ks | 50 us -<br>1 ks |
| Manual                                          | 250 ps -<br>40 s | 2.5 ns -<br>400 s | 25 ns -<br>4 ks | 250 ns -<br>40 ks | 2.5 us -<br>400 ks | 25 us -<br>4 Ms | 50 us -<br>8 Ms |

| MSO5054B,<br>DPO5054B,<br>MSO5034B,<br>DPO5034B | Record<br>Length |                   |              |                   |                    |                 |
|-------------------------------------------------|------------------|-------------------|--------------|-------------------|--------------------|-----------------|
| Horizontal Mode                                 | 1 K              | 10 K              | 100 K        | 1 M               | 10 M               | 100 M           |
| Automatic                                       | 250 ps -<br>20 s | 2.5 ns -<br>200 s | 50 ns - 1 ks | 500 ns -<br>1 ks  | 5 us - 1 ks        | 50 us - 1 ks    |
| Constant SR                                     | 250 ps -<br>20 s | 2.5 ns -<br>200 s | 50 ns - 1 ks | 500 ns -<br>1 ks  | 5 us - 1 ks        | 50 us - 1 ks    |
| Manual                                          | 250 ps -<br>40 s | 2.5 ns -<br>400 s | 25 ns - 4 ks | 250 ns -<br>40 ks | 2.5 us -<br>400 ks | 25 us -<br>4 Ms |

## Maximum update rate

Maximum triggered acquisition rate: &gt;250,000 wfms/s

## Aperture uncertainty

 $\leq (3 \text{ ps} + 0.1 \text{ ppm} \times \text{record duration}) \text{RMS}$ , for records having  $\leq 1$  minute duration
 Long-term sample rate and  
delay time accuracy
 $\pm 5$  ppm over any  $\geq 1$  ms time interval
 Delta-time measurement  
accuracy

The formula to calculate the delta-time measurement accuracy (DTA<sub>max</sub>) for a given instrument setting and input signal is given below (assumes insignificant signal content above Nyquist and insignificant error due to aliasing):

SR1 = slew rate around 1st point in measurement (1st edge)

SR2 = slew rate around 2nd point in measurement (2nd edge)

N = input-referred noise (VRMS)

TBA = time base accuracy (5 ppm)

tp = delta-time measurement duration (seconds)

RD = (record length)/(sample rate)

tsr = 1/(sample rate)

assume edge shape that results from Gaussian filter response

$$DTA_{pk-pk} = \pm 5 \times \sqrt{2 \left[ \frac{N}{SR_1} \right]^2 + 2 \left[ \frac{N}{SR_2} \right]^2 + (3ps + 1 \times 10^{-7} \times RD)^2} + 2t_{sr}TBA \times t_p$$

$$DTA_{RMS} = \sqrt{2 \left[ \frac{N}{SR_1} \right]^2 + 2 \left[ \frac{N}{SR_2} \right]^2 + (3ps + 1 \times 10^{-7} \times RD)^2 + \left( \frac{2 \times t_{sr}}{\sqrt{12}} \right)^2} + TBA \times t_p$$

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 time base 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).

The observation interval may not exceed 1 year. Peak-to-peak delta time accuracy is typical and is specified over 500 acquisitions.

## Trigger specifications

**Aux in external trigger input impedance, typical** 1 M  $\Omega$   $\pm$ 1% in parallel with 13 pF  $\pm$ 2 pF

**Aux in (external) trigger maximum input voltage** The maximum input voltage at the BNC 300 VRMS  
Installation Category II  
Derate at 20 dB/decade above 3 MHz to 30 VRMS at 30 MHz, 10 dB/decade above 30 MHz.

**Aux in external trigger bandwidth, typical** 250 MHz  $\pm$ 20%

|                                         |                              |         |
|-----------------------------------------|------------------------------|---------|
| <b>Trigger bandwidth, edge, typical</b> | MSO5204/B, DPO5204/B         | 2 GHz   |
|                                         | MSO5104/B, DPO5104/B         | 1 GHz   |
|                                         | MSO5054/B, DPO5054/B         | 500 MHz |
|                                         | MSO5034/B, DPO5034/B 350 MHz | 350 MHz |

|                                                    |                      |         |
|----------------------------------------------------|----------------------|---------|
| <b>Trigger bandwidth, pulse and logic, typical</b> | MSO5204/B, DPO5204/B | 1 GHz   |
|                                                    | MSO5104/B, DPO5104/B | 1 GHz   |
|                                                    | MSO5054/B, DPO5054/B | 500 MHz |
|                                                    | MSO5034/B, DPO5034/B | 350 MHz |

**Edge-type trigger sensitivity, DC coupled, typical**

| Models                                       | Trigger Source    | Sensitivity                                                                                                                                                                                                                               |
|----------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MSO5204/B, DPO5204/B<br>MSO5104/B, DPO5104/B | Any input channel | 50 $\Omega$ path:<br>0.40 div from DC to 50 MHz,<br>increasing to 1 div at<br>oscilloscope bandwidth                                                                                                                                      |
| MSO5054/B, DPO5054/B<br>MSO5034/B, DPO5034/B | Any input channel | 50 $\Omega$ path:<br>1 mV/div to 4.98 mV/div –<br>0.75 div from DC to 50 MHz,<br>increasing to 1.3 div at<br>oscilloscope bandwidth.<br>$\geq 5$ mV/div 0.40 div from DC to<br>50 MHz, increasing to 1 div at<br>oscilloscope bandwidth.  |
| All models                                   | Any input channel | 1 M $\Omega$ path:<br>1 mV/div to 4.98 mV/div –<br>0.75 div from DC to 50 MHz,<br>increasing to 1.3 div at<br>oscilloscope bandwidth.<br>$\geq 5$ mV/div 0.40 div from DC to<br>50 MHz, increasing to 1 div at<br>oscilloscope bandwidth. |
| All models                                   | Aux in (External) | 200 mV from DC to 50 MHz,<br>increasing to 500 mV at<br>250 MHz                                                                                                                                                                           |
| All models                                   | Line              | Fixed                                                                                                                                                                                                                                     |

**Trigger jitter**

100 fs using enhanced trigger placement. 1 ps rms for low frequency, fast rise time signal, A edge, time holdoff = 30  $\mu$ s

$\leq 100$  psRMS for non edge-type trigger modes

**Edge-type trigger sensitivity, not DC coupled, typical**

| Trigger Coupling | Typical Sensitivity                                                                           |
|------------------|-----------------------------------------------------------------------------------------------|
| AC Coupling      | 1 div for frequencies above 45 Hz.<br>Attenuates signals below 45 Hz.                         |
| NOISE REJ        | 2.5 times the DC-coupled limits                                                               |
| HF REJ           | 1.0 times the DC-coupled limit from DC to 50 kHz.<br>Attenuates signals above 50 kHz          |
| LF REJ           | 1.5 times the DC-coupled limits for frequencies above 50 kHz. Attenuates signals below 50 kHz |

**Video-type trigger formats and field rates**

Triggers from negative sync composite video, field 1 or field 2 for interlaced systems, on any field, specific line, or any line for interlaced or non-interlaced systems. Supported systems include NTSC, PAL, and SECAM.

**Video-type trigger sensitivity, typical**

| Delayed and main trigger |                                                     |
|--------------------------|-----------------------------------------------------|
| Source                   | Sensitivity                                         |
| Any input channel        | 0.6 to 2.5 divisions of video sync tip              |
| Aux In (External)        | Video not supported through Aux In (External) input |

**Lowest frequency for successful operation of set level to 50 function, typical** 45 Hz

**Logic-type or logic qualified trigger or events-delay sensitivities, DC coupled, typical** 1.0 division from DC to maximum bandwidth

**Pulse-type runt trigger sensitivities, typical** 1.0 division from DC to maximum bandwidth

**Pulse-type trigger width and glitch sensitivities, typical** 1.0 division

**Logic-type triggering, minimum logic or rearm time, typical** For all vertical settings, the minimums are:

| Trigger type         | Pulse width    | Re-arm time | Time between channels |
|----------------------|----------------|-------------|-----------------------|
| Logic                | Not applicable | 2 ns        | 1 ns                  |
| Time Qualified Logic | 4 ns           | 2 ns        | 1 ns                  |

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.

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

For all vertical settings

| Clock active            | Clock inactive |
|-------------------------|----------------|
| User hold time + 2.5 ns | 2 ns           |

An active pulse width is the width of the clock pulse from its active edge to its inactive edge. An inactive pulse width is the width of the pulse from its inactive edge to its active edge. The User hold time is the number selected by the user.

**Setup-hold violation trigger setup and hold time ranges**

| Feature           | Min     | Max    |
|-------------------|---------|--------|
| Setup time        | -0.5 ns | 1.0 ms |
| Hold time         | 1 ns    | 1.0 ms |
| Setup + Hold time | 0.5 ns  | 2.0 ms |

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 Hold Time that you programmed.

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

| Pulse class                       | Minimum pulse width | Minimum rearm time                     |
|-----------------------------------|---------------------|----------------------------------------|
| Glitch                            | 4 ns                | 2 ns + 5% of glitch width setting      |
| 2 ns + 5% of glitch width setting | 4 ns                | 2 ns                                   |
| Time-qualified runt               | 4 ns                | 8.5 ns + 5% of width setting           |
| Width                             | 4 ns                | 2 ns + 5% of width upper limit setting |
| Slew rate (transition time)       | 4 ns                | 8.5 ns + 5% of delta time setting      |

For the trigger class width and the trigger class runt, the pulse width refers to the width of the pulse being measured. The 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 the trigger class slew rate, the pulse width refers to the delta time being measured. The rearm time refers to the time it takes the signal to cross the two trigger thresholds again.

**Transition time trigger, delta time range**

4 ns to 8 s

**Time range for glitch, width, timeout, or time-qualified runt**

4 ns to 8 s

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

| Time Range     | Accuracy                                          |
|----------------|---------------------------------------------------|
| 1 ns to 500 ns | $\pm(20\% \text{ of setting} + 0.5 \text{ ns})$   |
| 520 ns to 1 s  | $\pm(0.01\% \text{ of setting} + 100 \text{ ns})$ |

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

4 ns, 500 MHz

**B trigger, minimum time between arm and trigger, typical**

4 ns

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**

4 ns to 8 seconds

**B trigger after events, event range**

1 to 4,000,000 events

**Trigger level ranges**

| Source            | Range                                                                                                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------------|
| Any input channel | $\pm 8$ divisions from center of screen<br>$\pm 8$ divisions from 0 V when vertical LF reject trigger coupling is selected |
| Aux In (External) | $\pm 8$ V                                                                                                                  |
| Line              | Not applicable                                                                                                             |

Line trigger level is fixed at about 50% of the line voltage.

This specification applies to logic and pulse thresholds.

| Trigger level accuracy, DC coupled | Source              | Range                                           |
|------------------------------------|---------------------|-------------------------------------------------|
|                                    | Any input channel   | $\pm 0.20$ div                                  |
|                                    | Aux In (External)   | $\pm (10\% \text{ of setting} + 25 \text{ mV})$ |
|                                    | Line Not applicable | Not applicable                                  |

For signals having rise and fall times  $\geq 10$  ns.

**Trigger holdoff range** 20 ns minimum to 8 s maximum

**Maximum serial trigger bits** 128 bits

#### Standard serial bus interface triggering

##### I<sup>2</sup>C

**Address Triggering:** 7 and 10 bit user specified address, as well as General Call, START byte, HS-mode, EEPROM, and CBUS

**Data Trigger:** 1 to 5 bytes of user specified data

**Trigger On:** Start, Repeated Start, Stop, Missing Ack, Address, Data, or Address and Data

**Maximum Data Rate:** 10 Mbps

##### SPI

**Data Trigger:** 1 to 16 bytes of user-specified data

**Trigger On:** SS Active, MOSI, MISO, or MOSI and MISO

**Maximum Data Rate:** 10 Mbps

##### RS-232

**Bit Rate:** 50 bps to 10 Mbps

**Data Bits:** 7, 8, or 9

**Parity:** None, Odd, or Even

**Trigger On:** Tx Start Bit, Rx Start Bit, Tx End of Packet, Rx End of Packet, Tx Data, Rx Data, Tx Parity Error, or Rx Parity Error

**End of Packet:** 00 (NUL), 0A (LF), 0D (CR), 20 (SP), FF

##### USB

**Data Rates Supported:** HS to 480 Mbps, Full to 12 Mbps, Low to 1.5 Mbps

**Trigger On:** Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error

## Digital acquisition specifications MSO5000/B series

|                                                                                                            |                                                                                                   |
|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Threshold voltage range                                                                                    | -40 V to +40 V                                                                                    |
| Digital channel timing resolution                                                                          | 2 ns main memory, 60.6 ps for MagniVu memory                                                      |
|  Logic threshold accuracy | $\pm(100 \text{ mV} + 3\% \text{ of threshold setting after calibration})$<br>Requires valid SPC. |
| Minimum detectable pulse width                                                                             | 1 ns<br>Using MagniVu memory. Requires the use of 342-1140-00 ground clip per channel.            |

## P6616 digital probe specifications

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of channels             | 16 digital inputs                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Input resistance, typical      | 100 k $\Omega$ to ground                                                                                                                                                                                                                                                                                                                                                                                                              |
| Input capacitance, typical     | 3.0 pF<br>Measured at the podlet input. Requires the use of 342-1140-00 ground clip per channel                                                                                                                                                                                                                                                                                                                                       |
| Minimum input signal swing     | 400 mVp-p<br>Requires the use of 342-1140-00 ground clip per channel                                                                                                                                                                                                                                                                                                                                                                  |
| Maximum input signal swing     | 30 Vp-p for $f_{in} \leq 200 \text{ MHz}$ (centered around the DC threshold voltage) at the P6616 probe tip.<br>10 Vp-p for $f_{in} > 200 \text{ MHz}$ (centered around the DC threshold voltage) at the P6616 probe tip.<br>Failure to meet this input signal requirement will compromise the AC performance of the digital channel. It might also damage the input circuitry. See the Absolute maximum input voltage specification. |
| Maximum input toggle rate      | 500 MHz<br>Maximum frequency sine wave input that can accurately be reproduced as a logic square wave.<br>Requires the use of a 342-1140-00 ground clip on each channel.<br>This is the maximum frequency at the minimum swing amplitude. Higher toggle rates can be achieved with higher amplitudes.                                                                                                                                 |
| Absolute maximum input voltage | $\pm 42 \text{ V}$ peak at the P6616 input (not at the instrument input)<br>Probe input voltages beyond this limit could permanently damage the instrument and the P6616 probe.                                                                                                                                                                                                                                                       |
| Channel-to-channel skew        | 200 ps<br>Digital channel to digital channel only.                                                                                                                                                                                                                                                                                                                                                                                    |

This is the propagation path skew and ignores skew contributions due to threshold inaccuracies (see Threshold accuracy) and sample binning (see Digital channel timing resolution). Factory calibration/deskew is required to achieve this number.

## Display specifications

### Display type

Display area: 210.4 mm (8.28 in) (H) x 157.8 mm (6.21 in) (V), 264 mm (10.4 in) diagonal, 6-bit RGB full color, XGA (1024 x 768) TFT liquid crystal display (LCD).

**Display resolution** 1024 X 768 XGA display resolution

**Luminance, typical** 400 cd/m<sup>2</sup>

**Waveform display color scale** The TFT display can support up to 262,144 colors. A subset of these colors are used for the oscilloscope display, all of which are fixed colors and not changeable by the user.

## Input-Output port specifications

**Ethernet interface** Standard on all models: 10/100/1000 Mbps

**GPIB interface** Available as an optional accessory that connects to the USB Device and USB Host ports with the TEK-USB-488 GPIB to USB Adapter  
The control interface is incorporated into the instrument user interface.

**Video signal output** A 15 pin D-sub, VGA-type connector, supporting a minimum resolution range of 640X480 to 1280X1024.

**USB interface** 1 USB device connector (2.0 Full Speed), on the instrument rear panel.  
6 USB host connectors (2.0 HS), two on the instrument front and four on the rear.

|                                                                |                |                                                      |
|----------------------------------------------------------------|----------------|------------------------------------------------------|
| <b>Probe compensator output voltage and frequency, typical</b> | Output voltage | 0 V to 2.5 V $\pm 1\%$ behind 1 k $\Omega$ $\pm 2\%$ |
|                                                                | Frequency      | 1 kHz $\pm 25\%$                                     |

**Auxiliary output (AUX OUT), trigger out or reference clock out** You can set the Auxiliary output to Trigger Out or Reference Clock Out.  
Reference Clock Out: Outputs the 10 MHz oscilloscope reference clock.  
Trigger Out: A HIGH to LOW transition indicates that the trigger occurred.

| Trigger output logic levels |                                                                   |
|-----------------------------|-------------------------------------------------------------------|
| Characteristic              | Limits                                                            |
| Vout (HI)                   | ≥2.5 V open circuit<br>≥1.0 V into a 50 Ω load to ground          |
| Vout (LO)                   | ≤0.7 V into a load of ≤4 mA<br>≤0.25 V into a 50 Ω load to ground |

|                                                               |                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>External reference nominal input frequency</b>             | 10 MHz<br>You must select either the internal reference (default) or 10 MHz external.                                                                                                                                                                                              |
| <b>External reference input frequency variation tolerance</b> | 9.9 MHz to 10.1 MHz<br>You must run SPC whenever the external reference is more than 0.2% (2000 ppm) different than the nominal reference frequency or reference at which SPC was last run. The time base changes in correspondence to the fluctuations in the external reference. |
| <b>External reference input sensitivity</b>                   | $V_{in} 1.5V_{p-p}$ for input frequencies between 9.9 MHz and 10.1 MHz                                                                                                                                                                                                             |
| <b>External reference input maximum input signal</b>          | 7 $V_{p-p}$                                                                                                                                                                                                                                                                        |
| <b>External reference input impedance</b>                     | $R_{in} = 1.5\text{ k}\Omega \pm 20\%$ in parallel with 15 pF $\pm 5\text{ pF}$ at 10 MHz                                                                                                                                                                                          |
| <b>Keyboard and mouse ports</b>                               | PS-2 compatible, instrument must be powered down to make connection                                                                                                                                                                                                                |
| <b>External audio ports</b>                                   | External audio jacks for microphone input and line output                                                                                                                                                                                                                          |

## Data storage specifications

**Nonvolatile memory retention time,** No time limit for front-panel settings, saved waveforms, setups, and calibration constants typical

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|                        |                                                                                         |
|------------------------|-----------------------------------------------------------------------------------------|
| <b>Real-time clock</b> | A programmable clock providing time in years, months, days, hours, minutes, and seconds |
|------------------------|-----------------------------------------------------------------------------------------|

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|                                                          |                                                                                                                |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Hard disk drive (standard for MSO/DPO5000 Series)</b> | The 2.5-inch SATA hard disk drive capacity is $\geq 160$ GB. Waveforms and setups are stored on the hard disk. |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|

---

|                                                                                                   |                                                                                                                         |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Solid state disk drive (standard for MSO/DPO5000B Series, optional for MSO/DPO5000 Series)</b> | The 2.5-inch solid state disk drive capacity is $\geq 300$ GB. Waveforms and setups are stored on the solid state disk. |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|

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## Power source specifications

---

|                       |                           |
|-----------------------|---------------------------|
| <b>Source voltage</b> | 100 V to 240 V $\pm 10\%$ |
|-----------------------|---------------------------|

---

|                         |                                                                   |
|-------------------------|-------------------------------------------------------------------|
| <b>Source frequency</b> | (85 to 264 V) 45 Hz to 66 Hz<br>(100 V to 132 V) 360 Hz to 440 Hz |
|-------------------------|-------------------------------------------------------------------|

---

|                    |                                                                         |
|--------------------|-------------------------------------------------------------------------|
| <b>Fuse rating</b> | T6.3AH, 250 V <sub>ac</sub><br>The fuse cannot be replaced by the user. |
|--------------------|-------------------------------------------------------------------------|

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## Environmental specifications

### Temperature

|                      |                                     |
|----------------------|-------------------------------------|
| <b>Operating:</b>    | +5 °C to +50 °C (32 °F to +122 °F)  |
| <b>Nonoperating:</b> | -20 °C to +60 °C (-4 °F to +140 °F) |

### Humidity

|                      |                                                                                                                                                                         |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | With hard disk drive                                                                                                                                                    |
| <b>Operating:</b>    | 8% to 90% relative humidity with a maximum wet bulb temperature of 29 °C at or below +50 °C (upper limit derates to 20.6% relative humidity at +50 °C). Non-condensing. |
| <b>Nonoperating:</b> | 5% to 98% relative humidity with a maximum wet bulb temperature of 40 °C at or below +60 °C (upper limit derates to 29.8% relative humidity at +60 °C). Non-condensing. |
|                      | With solid state drive                                                                                                                                                  |
| <b>Operating:</b>    | High: 40 °C to 50 °C (104 °F to 122 °F), 10% to 60% relative humidity<br>Low: 0 °C to 40 °C (32 °F to 104 °F), 10% to 90% relative humidity                             |
| <b>Nonoperating:</b> | High: 40 °C to 60 °C (104 °F to 140 °F), 5% to 60% relative humidity<br>Low: 0 °C to 40 °C (32 °F to 104 °F), 5% to 90% relative humidity                               |

### Altitude

|                      |                      |
|----------------------|----------------------|
| <b>Operating:</b>    | 3,000 m (9,843 ft)   |
| <b>Nonoperating:</b> | 12,000 m (39,370 ft) |

## Mechanical specifications

|                                                |                                                                                                                                                                                                                      |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dimensions</b>                              | Benchtop configuration (oscilloscope only)                                                                                                                                                                           |
| <b>Height:</b>                                 | 9.3 in (236 mm) Feet folded in, handle folded down<br>9.8 in (249 mm) Feet Folded out, handle folded down<br>13.5 in (343 mm) Feet Folded in, handle folded up<br>14.0 in (356 mm) Feet Folded out, handle folded up |
| <b>Width:</b>                                  | 17.3 in (439 mm) from handle hub to handle hub.                                                                                                                                                                      |
| <b>Depth:</b>                                  | 8.0 in (203 mm) from back of feet to front of knobs.<br>8.9 in (226 mm) from back of feet to front of front cover<br>8.5 in (216 mm) from handle back to front of knobs.                                             |
| <b>Box Dimensions:</b>                         | Height: 19.6 in (498 mm)<br>Width: 18.0 in (457 mm)<br>Length: 22.6 in (574 mm)                                                                                                                                      |
| <b>Rackmount configuration (5U Rack Sizes)</b> | Height: 8.6 in ( 218 mm)<br>Width: 19.2 in (488 mm) from outside of handle to outside of handle.<br>Depth: 15.1 in (384 mm) from outside of handle to back of slide.                                                 |
| <b>Weight</b>                                  | 14.9 lbs (6.8 kg), standalone instrument, without front cover<br>22.2 lbs (10.0 kg), instrument with rackmount, without front cover<br>27.5 lbs (12.5kg), when packaged for domestic shipment, without rackmount     |
| <b>Clearance requirements</b>                  |                                                                                                                                                                                                                      |
| <b>Top:</b>                                    | 0 in (0 mm)                                                                                                                                                                                                          |
| <b>Bottom:</b>                                 | 0 in (0 mm), on feet, with flip stands down                                                                                                                                                                          |
| <b>Left side:</b>                              | 2 in (50.8 mm)                                                                                                                                                                                                       |
| <b>Right side:</b>                             | 0 in (0 mm)                                                                                                                                                                                                          |
| <b>Rear:</b>                                   | 2 in (50.8 mm)                                                                                                                                                                                                       |
| <b>Cooling</b>                                 | Fan-forced air circulation with no air filter.                                                                                                                                                                       |
| <b>Construction material</b>                   | Chassis parts are constructed of aluminum alloy, front panel is constructed of plastic laminate, circuit boards are constructed of glass laminate.                                                                   |

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# Performance verification (MSO/DPO70000C, MSO/DPO70000DX, and DPO7000C series)

## Performance verification (MSO/DPO70000C, MSO/DPO70000DX, and DPO7000C series)

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

If you are not familiar with operating this instrument, read the instrument user manual or explore the online help.

- To rapidly confirm that the instrument functions and was adjusted properly, perform only the brief procedures under *Self Tests*.

Advantages. These procedures are quick to do, require no external equipment or signal sources, and perform extensive functional and accuracy testing to provide high confidence that the instrument will perform properly. They can be used as a quick check before making a series of important measurements.

- To further check functionality, first do the *Self Tests* just mentioned; then do the brief procedures under *Functional Tests*.

Advantages. These procedures require minimal additional time to perform, require no additional equipment other than cables and adapters, and these procedures more completely test the internal hardware of the instrument. They can be used to quickly determine if the instrument is suitable for putting into service, such as when it is first received.

- If more extensive confirmation of performance is desired, perform the *Performance Tests* after performing the *Functional* and *Self Tests* mentioned above. [Performance tests \(MSO/DPO70000C, MSO/DPO70000DX, and DPO7000C series\)](#) on page 115

Advantages. These procedures add direct checking of the warranted specifications that are marked with the  symbol. These procedures require specific test equipment. [Equipment required](#) on page 116

## Conventions

Throughout these procedures the following conventions apply:

- Each test procedure uses the following general format:
  - Title of Test
  - Equipment Required
  - Prerequisites
  - Procedure
- Each procedure consists of as many steps, substeps, and subparts as required to do the test. Steps, substeps, and subparts are sequenced as follows:
  1. First Step
    - a. First Substep
      - First Subpart
      - Second Subpart
    - b. Second Substep
  2. Second Step
    - In steps and substeps, the lead-in statement in italics instructs you what to do, while the instructions that follow tell you how to do it, as in the example step below:

*Initialize the instrument:* Push the front-panel **Default Setup** button.

**STOP.** The **STOP** notation at the left is accompanied by information you must read to do the procedure properly.

- The term "toolbar" refers to a row of buttons at the top of the display. The term "menu bar" refers to a row of menus at the top of the display. You can switch between toolbar and menu bar operating modes by using the menu at the top right of the toolbar or menu bar. (See Figure 1: Toolbar and menu bar (< 4 GHz models shown).)
- Item numbers in the equipment required lists refer to the equipment. (See [Equipment required](#) on page 116.)



**Figure 1: Toolbar and menu bar (< 4 GHz models shown)**

- The procedures assume you have connected a mouse to the instrument so you can click on the screen controls. If you have not connected a mouse, you can use the touch screen to operate the screen controls.

## Brief procedures (MSO/DPO70000C, MSO/DPO70000DX, and DPO7000C series)

The *Self Tests* use internal routines to confirm basic functionality and proper adjustment. No test equipment is required to do these test procedures.

The *Functional Tests* utilize the probe-compensation output at the front panel as a test-signal source for further verifying that the instrument functions properly. A BNC cable and an adaptor or a probe, depending on your instrument model are required to do these test procedures.

**Self tests** This procedure uses internal routines to verify that the instrument functions and was adjusted properly. No test equipment or hookups are required.

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

1. *Verify that internal diagnostics pass:* Do the following substeps to verify passing of internal diagnostics.
  - a. *Display the System diagnostics menu:*

If the instrument is in toolbar mode, put the instrument into menu bar mode.

Pull down the **Utilities** menu and select **Instrument Diagnostics. . .**. This displays the diagnostics control window.
  - b. *Run the System Diagnostics:*
    - First disconnect any input signals from all four channels.
    - Click the **Run** button in the diagnostics control window.
  - c. *Wait:* The internal diagnostics do an exhaustive verification of proper instrument function. This verification may take several minutes. When the verification is finished, the resulting status will appear in the diagnostics control window.
  - d. *Verify that no failures are found and reported on-screen.* All tests should pass.
  - e. *Run the signal-path compensation routine:*

Pull down the **Utilities** menu and select **Instrument Calibration. . .**. This displays the instrument calibration control window.

If required because the instrument is in service mode, select the **Signal Path** button under Calibration Area.

Click the **Run SPC (Calibrate** on some instruments) button to start the routine.

- f. *Wait:* Signal-path compensation may take five to fifteen minutes to run.
  - g. *Confirm signal-path compensation returns passed status:* Verify that the word **Pass** appears in the instrument calibration control window.
2. *Return to regular service:* Click the **X** (close) button to exit the instrument calibration control window.

## Functional tests

The purpose of these procedures is to confirm that the instrument functions properly. The only equipment required is a BNC or SMA cable and an adapter or the instrument probe. If you need to store settings during these procedures, access the local C: drive and store them in the TekScope > Setups directory.

**STOP.** These procedures verify functions; that is, they verify that the instrument features operate. They do not verify that they operate within limits.

Therefore, when the instructions in the functional tests that follow call for you to verify that a signal appears on-screen "that is about five divisions in amplitude" or "has a period of about six horizontal divisions," etc., do NOT interpret the quantities given as limits. Operation within limits is checked in Performance Tests. (See [Performance tests \(MSO/DPO70000C, MSO/DPO70000DX, and DPO7000C series\)](#) on page 115.)

**STOP.** DO NOT make changes to the front-panel settings that are not called out in the procedures. Each verification procedure will require you to set the instrument to certain default settings before verifying functions. If you make changes to these settings, other than those called out in the procedure, you may obtain invalid results. In this case, just redo the procedure from step 1.

When you are instructed to press a front-panel or screen button, the button may already be selected (its label will be highlighted). If this is the case, it is not necessary to press the button.

Verify all analog input channels.

| Equipment required                                                                                                                                                                                                       | Prerequisites |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <4 GHz models: One precision 50 $\Omega$ coaxial cable (Item 4)<br><4 GHz models: One BNC to Minigrabber adapter (item 18)<br>$\geq$ 4 GHz models: One SMA cable (item 21)<br>$\geq$ 4 GHz models: One adapter (item 19) | None          |

1. *Initialize the instrument:* Push the front-panel **Default Setup** button.
2. *Hook up the signal source:* Connect the equipment as shown in the following figure to the channel input you want to test (beginning with Ch 1).



Figure 2: Universal test hookup for functional tests - Ch 1 shown

3. *Turn off all channels:* If any of the front-panel channel buttons are lighted, push those buttons to turn off the displayed channels as shown in the following figure.

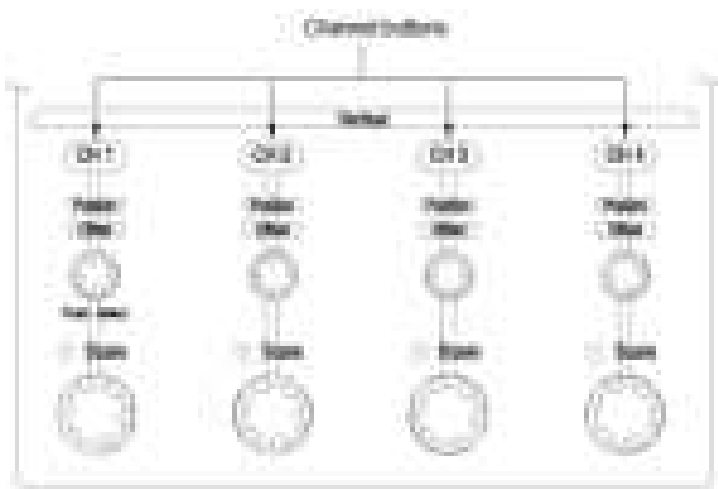


Figure 3: Channel button location

4. *Select the channel to test:* Push the channel button for the channel you are currently testing. The button lights and the channel display comes on.
5. *Set up the instrument:*

---

**NOTE.** *If the AutoSet Undo window appears, click the X.*

---

- Push the front panel **Autoset** button. This sets the horizontal and vertical scale and vertical offset for a usable display and sets the trigger source to the channel you are testing.
  - Pull down the **Vertical** menu, select Vertical Setup. Confirm that the Ch1 Offset is about **0.0 mV** (**120 mV** on >20 GHz models).
6. *Verify that the channel is operational:* Confirm that the following statements are true.
    - Verify that the vertical scale readout and the waveform amplitude for the channel under test. (See [Table 4: Vertical settings](#) on page 105.)

**Table 4: Vertical settings**

| Setting            | <4 GHz models | ≥4 GHz models |
|--------------------|---------------|---------------|
|                    | Without probe | Without probe |
| Scale              | 500 mV        | 100 mV        |
| Waveform amplitude | 2 divisions   | 4 divisions   |

- The front-panel vertical **Position** knob (for the channel you are testing) moves the signal up and down the screen when rotated.
  - Turning the vertical **Scale** knob counterclockwise (for the channel you are testing) decreases the amplitude of the waveform on-screen, turning the knob clockwise increases the amplitude, and returning the knob to the original scale setting returns the original amplitude for that scale setting. (See [Table 4: Vertical settings](#) on page 105.)
7. *Verify that the channel acquires in all acquisition modes:* Pull down the **Horiz/Acq** menu to select **Horizontal/Acquisition Setup**. . . . Click the

**Acquisition** tab in the control window that displays. Click each of the acquisition modes and confirm that the following statements are true.

- Sample mode displays an actively acquiring waveform on-screen. (Note that there is a small amount of noise present on the square wave).
- Peak Detect mode displays an actively acquiring waveform on-screen with the noise present in Sample mode "peak detected".
- Hi Res mode displays an actively acquiring waveform on-screen with the noise that was present in Sample mode reduced.
- Average mode displays an actively acquiring waveform on-screen with the noise reduced.
- Envelope mode displays an actively acquiring waveform on-screen with the noise displayed.

---

**NOTE.** *Default setup enables enhanced triggering. Enhanced triggering can cause a slower acquisition rate that can be noticed in waveform database mode. As waveform database mode acquires 100,000 samples, the display intensity will increase, be cleared, and then the process will start over. When enhanced triggering is turned off, and with the specified settings and input signal, the display reaches full intensity right away.*

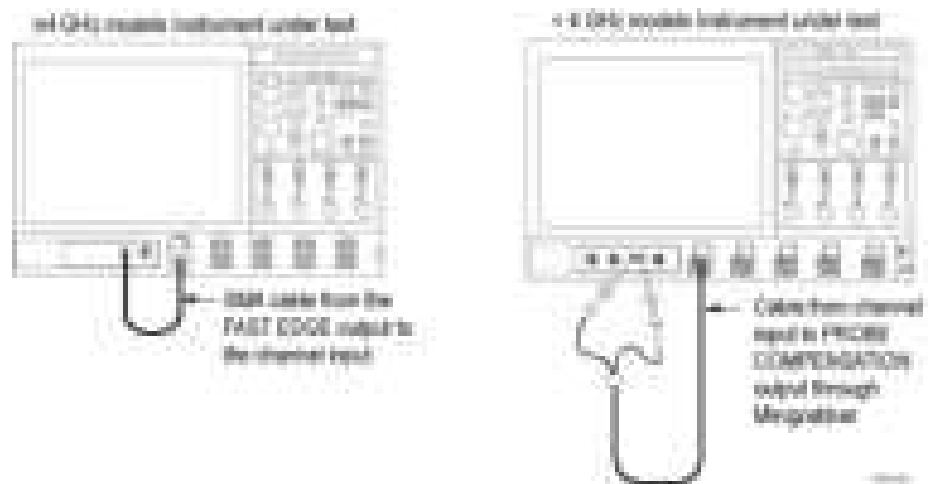
---

- Waveform Database mode displays an actively acquiring waveform on-screen with the noise displayed.
8. *Test all channels:* Repeat steps 2 through 7 until all four input channels are verified.
  9. *Remove the test hookup:* Disconnect the equipment from the instrument.

**Verify the time base.**

| Equipment required                                                                                                                                                                                                       | Prerequisites |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <4 GHz models: One precision 50 $\Omega$ coaxial cable (Item 4)<br><4 GHz models: One BNC to Minigrabber adapter (item 18)<br>$\geq$ 4 GHz models: One SMA cable (item 21)<br>$\geq$ 4 GHz models: One adapter (item 19) | None          |

1. *Initialize the instrument:* Push the front-panel **Default Setup** button.
2. *Hook up the signal source:* Connect the probe compensation or fast edge output to the Ch 1 input as shown in the following figure.

**Figure 4: Setup for time base test**

3. *Set up the instrument:* Push the front panel **Autoset** button.
4. Set the **Vertical Scale** to **200 mV /div** ( $\leq$ 20 GHz models) or **120 mV/div** ( $>$ 20 GHz models).
5. *Set the time base:* Set the horizontal **Scale** to **200  $\mu$ s/div**. The time-base readout is displayed at the bottom of the graticule.
6. *Verify that the time base operates:* Confirm the following statements.
  - One period of the square-wave signal is about five horizontal divisions on-screen for the 200  $\mu$ s/div horizontal scale setting.
  - Rotating the horizontal **Scale** knob clockwise expands the waveform on-screen (more horizontal divisions per waveform period), counterclockwise rotation contracts it, and returning the horizontal scale to 200  $\mu$ s/div returns the period to about five divisions.
  - The horizontal **Position** knob positions the signal left and right on-screen when rotated.

7. *Verify horizontal delay:*

a. *Center a rising edge on screen:*

- Set the horizontal **Position** knob so that the rising edge where the waveform is triggered is lined up with the center horizontal graticule.
- Change the horizontal **Scale** to **20  $\mu$ s/div**. The rising edge of the waveform should remain near the center graticule and the falling edge should be off screen.

b. *Turn on and set horizontal delay:*

- Pull down the **Horiz/Acq** menu to select **Horizontal/Acquisition Setup. . .**
- Click the **Horizontal** tab in the control window that displays.
- Click the **Delay Mode** button to turn delay on.
- Double click the **Horiz Delay** control in the control window to display the pop-up keypad. Click the keypad buttons to set the horizontal delay to **1 ms** and then click the **ENTER** key.

c. *Verify the waveform:* Verify that a rising edge of the waveform is within a few divisions of center screen.

d. *Adjust the horizontal delay:* Rotate the upper multipurpose knob to change the horizontal delay setting. Verify that the rising edge shifts horizontally. Rotate the front-panel horizontal **Position** knob. Verify that this knob has the same effect (it also adjusts delay, but only when delay mode is on).

e. *Verify the delay toggle function:*

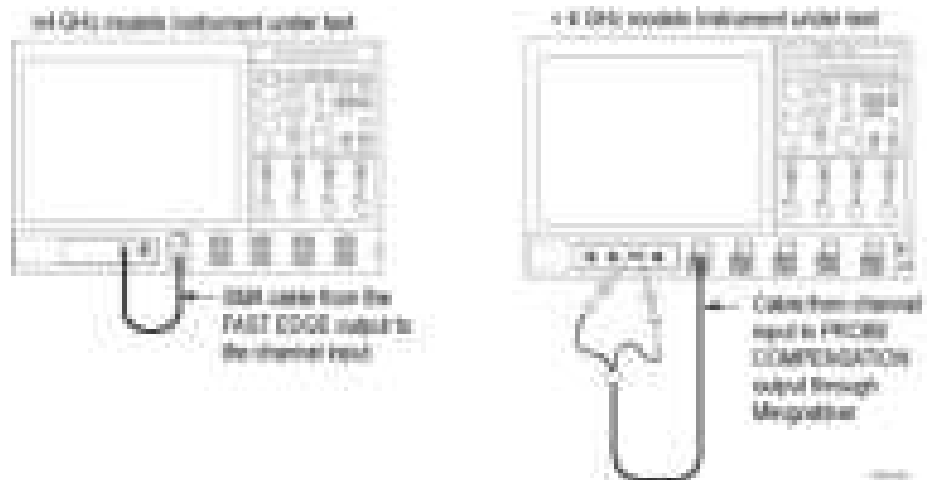
- Rotate the front-panel horizontal **Position** knob to center the rising edge horizontally on the screen.
- Change the horizontal **Scale** to **50 ns/div** (< 4 GHz models) or **40 ns/div** ( $\geq$  4 GHz models). The rising edge of the waveform should remain near the center graticule.
- Readjust the delay setting to position the rising edge 2 divisions to the right of the center graticule line.
- Push the front-panel **Delay** button several times to toggle delay off and on and back off again. Verify that the display switches quickly between two different points in time (the rising edge shifts horizontally on the display).

8. *Remove the test hookup:* Disconnect the test hookup from the instrument.

**Verify the A (Main) and B (Delayed) trigger systems.**

| Equipment required                                                                                                                                                                                                       | Prerequisites |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <4 GHz models: One precision 50 $\Omega$ coaxial cable (Item 4)<br><4 GHz models: One BNC to Minigrabber adapter (item 18)<br>$\geq$ 4 GHz models: One SMA cable (item 21)<br>$\geq$ 4 GHz models: One adapter (item 19) | None          |

1. *Initialize the instrument:* Push the front-panel **Default Setup** button.
2. *Hook up the signal source:* Connect the probe compensation or fast edge output to the Ch 1 input as shown in the following figure.

**Figure 5: Setup for trigger test**

3. *Set up the instrument:* Push the front-panel **Autoset** button.
4. Set the **Vertical Scale** to **200 mV /div** ( $\leq$ 20 GHz models) or **120 mV/div** ( $>$ 20 GHz models).
5. *Verify that the main trigger system operates:* Confirm that the following statements are true.
  - The trigger level readout for the A (main) trigger system changes with the trigger-**Level** knob.
  - The trigger-**Level** knob can trigger and untrigger the square-wave signal as you rotate the knob. (Leave the signal untriggered).
  - Pushing the front-panel trigger **Level** knob sets the trigger level to the 50% amplitude point of the signal and triggers the signal that you just left untriggered. (Leave the signal triggered.)
6. *Verify that the delayed trigger system operates:*
  - a. *Set up the delayed trigger:*

Pull down the **Trig** menu and select **A – B Trigger Sequence**. . . . This displays the A  $\rightarrow$  B Sequence tab of the trigger setup control window.

Click the **Trig After Time** button under A Then B.

Click the **B Trig Level** control in the control window.

Set the front-panel trigger mode to **Norm**.

**b.** *Confirm that the following statements are true:*

- The trigger-level readout for the B trigger system changes as you turn the lower multipurpose knob.
- As you rotate the lower multipurpose knob, the square-wave signal can become triggered and untriggered. (Leave the signal triggered.)

**c.** *Verify the delayed trigger counter:*

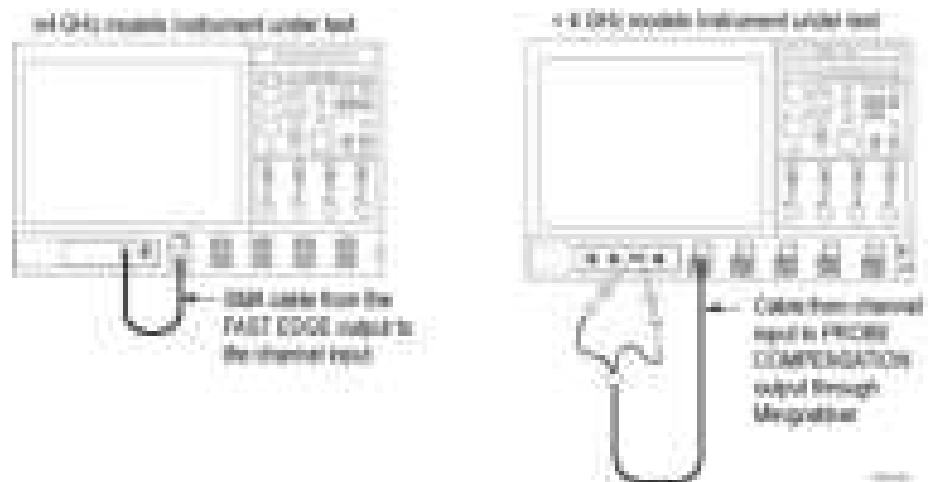
- Double click the **Trig Delay** control to pop up a numeric keypad for that control.
- Click the keypad to enter a trigger delay time of **1 second** (click 1 and None) and then click **Enter**.
- Verify that the trigger **Ready** indicator on the front panel flashes about once every second as the waveform is updated on-screen.

**7.** *Remove the test hookup:* Disconnect the test hookup from the instrument.

**Verify the file system.**

| Equipment required                                                                                                                                                                                                       | Prerequisites |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <4 GHz models: One precision 50 $\Omega$ coaxial cable (Item 4)<br><4 GHz models: One BNC to Minigrabber adapter (item 18)<br>$\geq$ 4 GHz models: One SMA cable (item 21)<br>$\geq$ 4 GHz models: One adapter (item 19) | None          |

1. *Initialize the instrument:* Push the front-panel **Default Setup** button.
2. *Hook up the signal source:* Connect the probe compensation or fast edge output to the Ch 1 input as shown in the following.

**Figure 6: Setup for the file system test**

3. *Set up the instrument:* Push the front panel **Autoset** button.
4. Set the **Vertical Scale** to **200 mV /div** ( $\leq$ 20 GHz models) or **120 mV/div** ( $>$ 20 GHz models).
5. *Set the time base:* Set the horizontal **Scale** to **1 ms/div**. The time-base readout is displayed at the bottom of the graticule.
6. *Save the settings:*
  - a. Pull down the **File** menu to select **Save As...>Setup...**. This displays the instrument Save As control window.
  - b. Note the default location and file name and then click the **Save** button to save the setup to the default file name and location.
7. *Change the settings again:* Set the horizontal **SCALE** to **200 $\mu$ s/div**.
8. *Verify the file system works:*
  - a. Pull down the **File** menu to select **Recall**. This displays the instrument Recall control window.
  - b. Click Recall **What > Setup**.

- c. Locate and then double click the setup file that you previously stored.
  - d. Verify that the instrument retrieved the saved setup. Do this by noticing the horizontal **SCALE** is again 1 ms and the waveform shows ten cycles just as it did when you saved the setup.
- 9. *Remove the test hookup:* Disconnect the test hookup from the instrument.

**Verify the digital channels (MSO70000C/DX series only).**

| Equipment required                                                                                                                                                                                                                                            | Prerequisites |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| MSO70000C/DX Series models: One precision 50 $\Omega$ coaxial cable (item 4)<br>MSO70000C/DX Series models: One probe tip adapter (item 30)<br>MSO70000C/DX Series models: One SMA adapter (item 17)<br>MSO70000C/DX Series models: One logic probe (item 31) | None          |

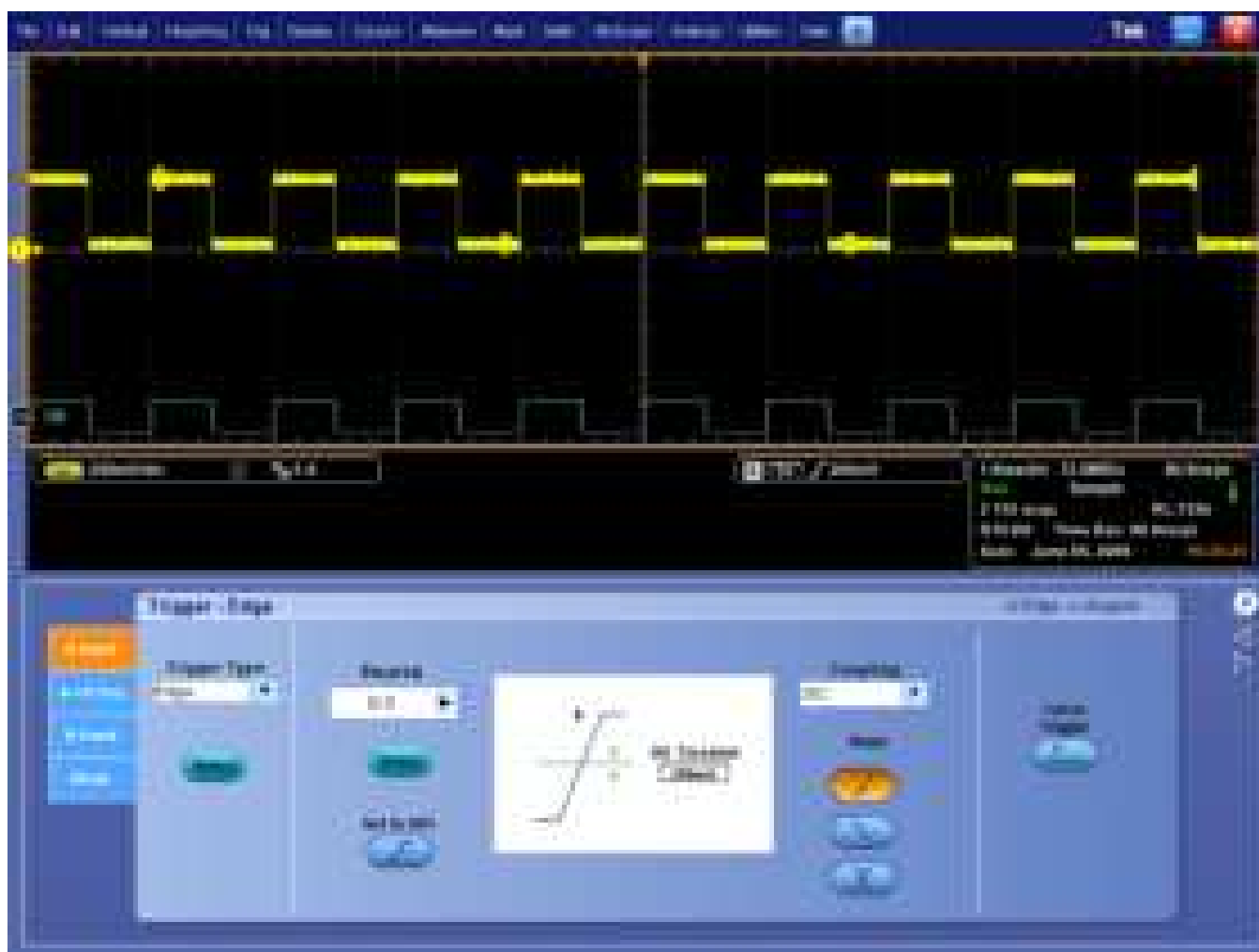
1. *Hook up the signal source:* Connect the probe compensation or fast edge output to the D0 input as shown in the following figure.



**Figure 7: Setup for the digital channels test**

2. *Set up the instrument:* Push the front panel **Default Setup** button.
3. Set the Horizontal Scale to **1 ms/div**.
4. *Initialize the instrument:* Pull down the **Digital** menu and select **Digital Setup**. This displays the instrument Digital Setup control window.
5. Press the **D0** button.

6. Double click **Global Threshold**. Use the keypad to enter **200 mV**.  
Press the **Apply** button.
7. Pull down the **Vertical** menu and select **Vertical Setup**.
8. Press Digital input **iCapture**.
9. From the Digital Source list select **D0**.
10. Pull down the **Trig** menu and select **A Event (Main) Trigger Setup**.
11. From the Source list select **D0**.
12. Verify that the both the iCapture and the digital channel are triggered.



13. Rotate the Vertical **SCALE** knob counter clockwise.
14. Verify that the displayed amplitude of channel 1 is reduced.
15. Rotate the Vertical **SCALE** knob clockwise, back to its original setting.

16. Verify that the displayed amplitude of channel 1 returns to about 1.75 divisions (420 mV).
17. Rotate the Vertical **Position** knob counter clockwise.
18. Verify that the displayed position of channel 1 moves lower on the display.
19. Rotate the Vertical **Position** knob clockwise, back to its original setting.
20. Pull down the **Digital** menu and select **Digital Setup**.
21. Double click the **D0 Position** and enter **-1.66** and press Enter.
22. Verify that the displayed position of digital channel moves up on the display.
23. Repeat steps 1 through 22, replacing D0 with the digital channel number of the next channel you want to verify.
24. *Remove the test hookup:* Disconnect the test hookup from the instrument.

## Performance tests (MSO/DPO70000C, MSO/DPO70000DX, and DPO7000C series)

This section contains a collection of manual procedures for checking that the instrument performs as warranted.

The procedures are arranged in logical groupings: *Signal Acquisition System Checks*, *Time Base System Checks*, *Triggering System Checks*, *Output Ports Checks*, and *Serial Trigger Checks*. They check all the characteristics that are designated as checked in *Specifications*. (The characteristics that are checked appear with a  in *Specifications*).

**STOP.** These procedures extend the confidence level provided by the basic procedures. The basic procedures should be done first, then these procedures performed if desired.



---

### **CAUTION.**

*Using settings not asked for by these procedures could damage the instrument. These procedures operate the instrument near its maximum limits. Using settings similar to, but not the settings called for by the procedures, could damage the input circuitry of the instrument. See the Maximum input voltage specification for the maximum nondestructive input voltage level.*

---

**Prerequisites**

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

- The cabinet must be installed on the instrument.
- You must have performed and passed the procedures under *Self Tests*, and those under *Functional Tests*. (See [Functional tests](#) on page 103.)
- 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 at the time you did the prerequisite *Self Tests*, the temperature was within the limits just stated, 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  $+18^{\circ}\text{C}$  ( $+64^{\circ}\text{F}$ ) and  $+28^{\circ}\text{C}$  ( $+82^{\circ}\text{F}$ ), must have been operating for a warm-up period of at least 20 minutes (60 minutes for the MSO/DPO73304DX instruments if the humidity is  $>60\%$ ), and must be operating at an ambient temperature as listed in the specifications. (See [Environmental specifications](#) on page 76.) (The warm-up requirement is usually met in the course of meeting the Self Tests and Functional Tests prerequisites listed above).
- Support sensor, probe, and adapter setups to avoid stress or torque when connected to the device under test (DUT).

**Equipment required**

The performance verification procedures use external, traceable signal sources to directly check warranted characteristics. The following table lists the required equipment.

**1. Attenuator, 10X (two required)**

| Minimum requirements                                                            | Example                                                                                                         | Purpose                                               |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Ratio: 10X; impedance 50 $\Omega$ ;<br>connectors: female input,<br>male output | BNC $\leq 2$ GHz Tektronix part<br>number 011-0059-03<br>SMA $\leq 18$ GHz Tektronix part<br>number 015-1003-00 | Signal attenuation, bandwidth,<br>trigger sensitivity |

**2. Attenuator, 5X**

| Minimum requirements                                                           | Example                                                                                                         | Purpose                                               |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Ratio: 5X; impedance 50 $\Omega$ ;<br>connectors: female input,<br>male output | BNC $\leq 2$ GHz Tektronix part<br>number 011-0060-02<br>SMA $\leq 18$ GHz Tektronix part<br>number 015-1002-01 | Signal attenuation, bandwidth,<br>trigger sensitivity |

**3. Termination, 50  $\Omega$  (three required)**

|                                                                       |                                           |                                                                |
|-----------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------|
| Impedance 50 $\Omega$ ; connectors: female BNC input, male BNC output | Tektronix part number 011-0049-02 (1 GHz) | Signal termination for channel delay test, trigger sensitivity |
|-----------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------|

**4. Cable, Precision 50  $\Omega$  Coaxial (three required)**

|                                                  |                                   |                                                                                                                                                                                |
|--------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 50 $\Omega$ , 36 in, male-to-male BNC connectors | Tektronix part number 012-0482-00 | Signal interconnection, Trigger out, time qualified trigger, timebase delay time, baud rate limit, bandwidth, input resistance, delta time, clock recovery, generator leveling |
|--------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**5. Connector, Dual-Banana (two required)**

|                           |                                   |                                          |
|---------------------------|-----------------------------------|------------------------------------------|
| Female BNC-to-dual banana | Tektronix part number 103-0090-00 | Various accuracy tests, input resistance |
|---------------------------|-----------------------------------|------------------------------------------|

**6. Generator, DC Calibration**

|                                                                                       |                          |                                                                                                   |
|---------------------------------------------------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------|
| Instrument bandwidth $\leq 20$ GHz: Variable amplitude to $\pm 7$ V; accuracy to 0.1% | Fluke 9500B <sup>1</sup> | Checking DC offset, gain, measurement accuracy, probe compensation out, and maximum input voltage |
| Instrument bandwidth $> 20$ GHz: Variable amplitude to $\pm 7$ V; accuracy to 0.1%    | Keithley 2400            |                                                                                                   |

**7. Generator, Calibration**

|                                                            |                          |                                              |
|------------------------------------------------------------|--------------------------|----------------------------------------------|
| 500 mV square wave calibrator amplitude; accuracy to 0.25% | Fluke 9500B <sup>1</sup> | Checking accuracy of signal out, trigger out |
|------------------------------------------------------------|--------------------------|----------------------------------------------|

**8. Timer-counter**

|                              |                 |                                                        |
|------------------------------|-----------------|--------------------------------------------------------|
| 10 MHz and 100 MHz, 1 s gate | Advantest R5360 | Checking long-term sample rate and delay time accuracy |
|------------------------------|-----------------|--------------------------------------------------------|

<sup>1</sup> Fluke 9500B/1100, 9500B/3200, or 9500B/2200 and an output head (9510 or 9530) appropriate for the bandwidth of the instrument being tested.

**9. Generator, Sine-Wave**

|                                                                                                                                                                              |                                                                                                                                                                                            |                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instrument bandwidth<br>≤3 GHz: 5 kHz to at least the instrument bandwidth.<br>Variable amplitude from 60 mV to 2 V <sub>p-p</sub> into 50 Ω.<br>Frequency error <2.0%       | Fluke 9500B <sup>1</sup>                                                                                                                                                                   | Checking analog bandwidth, trigger sensitivity, sample-rate, external clock, trigger sensitivity, time qualified trigger, baud rate limit, clock recovery, and delay-time accuracy |
| Instrument bandwidth<br>>3 GHz, ≤20 GHz: 50 MHz to at least the instrument bandwidth. Variable amplitude from 60 mV to 2.0 V <sub>p-p</sub> into 50 Ω. Frequency error <2.0% | Anritsu MG3692B or MG3694B Synthesized CW Generator with options 2x (step attenuator), 3 (low noise >2 GHz), 4 (10 MHz to 2 GHz low phase noise), 15 (high power), and 16 (high stability) |                                                                                                                                                                                    |
| Instrument bandwidth<br>>20 GHz: 50 MHz to at least the instrument bandwidth. Variable amplitude from 60 mV to 2.0 V <sub>p-p</sub> into 50 Ω. Frequency error <2.0%         | Anritsu MG3690C RF/Microwave Signal Generator                                                                                                                                              |                                                                                                                                                                                    |

**10. Meter, Level and Power Sensor**

|                                                                                                                    |                                           |                                                   |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------|
| Frequency range: 50 MHz to the instrument bandwidth.<br>Amplitude range: 6 mV <sub>p-p</sub> to 2 V <sub>p-p</sub> | Rohde & Schwarz NRVS and NRV-Z15 (40 GHz) | Checking analog bandwidth and trigger sensitivity |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------|

**11. Splitter, Power**

|                                                                                |                            |                                                   |
|--------------------------------------------------------------------------------|----------------------------|---------------------------------------------------|
| Instrument bandwidth<br>≤3 GHz: Frequency range: DC to 18 GHz. Tracking: <2.0% | Agilent part number 11667A | Checking analog bandwidth and trigger sensitivity |
| Instrument bandwidth<br>>3 GHz: Frequency range: DC to 40 GHz. Tracking: <2.0% | Anritsu K241C (40 GHz)     |                                                   |

**12. Cable**

|                        |                                            |                           |
|------------------------|--------------------------------------------|---------------------------|
| 2.92 mm male-to-female | Gore PhaseFlex cable EL0CQ0CP0360 (40 GHz) | Checking analog bandwidth |
|------------------------|--------------------------------------------|---------------------------|

**13. Adapter**

|                             |               |                           |
|-----------------------------|---------------|---------------------------|
| K male-to-male DC to 40 GHz | Anritsu K220B | Checking analog bandwidth |
|-----------------------------|---------------|---------------------------|

**14. Adapter (four required)**

|                      |                                      |                           |
|----------------------|--------------------------------------|---------------------------|
| Male N-to-female BNC | Tektronix part number<br>103-0045-00 | Checking analog bandwidth |
|----------------------|--------------------------------------|---------------------------|

**15. Adapter**

|                      |                                              |                           |
|----------------------|----------------------------------------------|---------------------------|
| Female N-to-male BNC | Tektronix part number<br>103-0058-00 (4 GHz) | Checking analog bandwidth |
|----------------------|----------------------------------------------|---------------------------|

**16. Adapter (three required)**

|                      |                                               |                              |
|----------------------|-----------------------------------------------|------------------------------|
| SMA female-to-female | Tektronix part number<br>015-1012-00 (18 GHz) | Checking trigger sensitivity |
|----------------------|-----------------------------------------------|------------------------------|

**17. Adapter (three required)**

|                        |                                      |                                                    |
|------------------------|--------------------------------------|----------------------------------------------------|
| SMA male-to-female BNC | Tektronix part number<br>015-1018-00 | Checking the delay between<br>channels, delta time |
|------------------------|--------------------------------------|----------------------------------------------------|

**18. Adapter**

|                    |                                      |                                       |
|--------------------|--------------------------------------|---------------------------------------|
| BNC to Minigrabber | Tektronix part number<br>013-0342-xx | Checking probe compensation<br>output |
|--------------------|--------------------------------------|---------------------------------------|

**19. Adapter (four required)**

|                                                           |                                                                                                                                                  |                                                                                                                                                                                                                                   |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instrument bandwidth<br>≤20 GHz:SMA male-to-BNC<br>female | TCA-BNC or TCA-292mm<br>and, if required, SMA male-to-<br>BNC female adapter<br>(Tektronix part number<br>015-0554-00 (4 GHz) or<br>015-1018-00) | Signal interconnection,<br>measurement accuracy, delay<br>time, time qualified trigger,<br>trigger sensitivity, DC gain,<br>offset, bandwidth, input<br>resistance, probe<br>compensation out, baud rate<br>limit, clock recovery |
| Instrument bandwidth<br>>20 GHz                           | TCA-292D                                                                                                                                         |                                                                                                                                                                                                                                   |

**20. Pulse Generator**

|                                         |                             |                                             |
|-----------------------------------------|-----------------------------|---------------------------------------------|
| 250 MHz, ≤ 150 ps rise time,<br>5 V out | Fluke 9500B <sup>1, 2</sup> | Checking delta time<br>measurement accuracy |
|-----------------------------------------|-----------------------------|---------------------------------------------|

**21. Cable, Coaxial (three required)**

|                                             |                                      |                                                                                                |
|---------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------|
| 50 Ω, 20 in, male-to-male<br>SMA connectors | Tektronix part number<br>174-1427-00 | Checking delta time<br>measurement accuracy, probe<br>compensation out, trigger<br>sensitivity |
|---------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------|

<sup>2</sup> For Delta Time Measurement Accuracy, use a Fluke 9500B or a pulse generator with the rise time specified in the procedure.

## 22. Adapter

|                               |                                            |                                          |
|-------------------------------|--------------------------------------------|------------------------------------------|
| SMA "T", male to 2 SMA female | Tektronix part number 015-1016-00 (18 GHz) | Checking delta time measurement accuracy |
|-------------------------------|--------------------------------------------|------------------------------------------|

## 23. Adapter

|                        |                                           |                                                                      |
|------------------------|-------------------------------------------|----------------------------------------------------------------------|
| SMA female to BNC male | Tektronix part number 015-0572-00 (4 GHz) | Used to test delta time measurement accuracy and trigger sensitivity |
|------------------------|-------------------------------------------|----------------------------------------------------------------------|

## 24. Adapter

|                          |                                   |                                          |
|--------------------------|-----------------------------------|------------------------------------------|
| BNC male to female elbow | Tektronix part number 103-0031-00 | Checking delta time measurement accuracy |
|--------------------------|-----------------------------------|------------------------------------------|

## 25. Termination

|                                      |                                            |                                          |
|--------------------------------------|--------------------------------------------|------------------------------------------|
| Short circuit, SMA connector, female | Tektronix part number 015-1021-00 (18 GHz) | Checking delta time measurement accuracy |
|--------------------------------------|--------------------------------------------|------------------------------------------|

## 26. Attenuator, 2X

|                                                                                  |                                           |                                                                                                                                      |
|----------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Ratio: 2X; impedance 50 $\Omega$ ; connectors: female BNC input, male BNC output | Tektronix part number 011-0069-02 (2 GHz) | Checking delta time measurement accuracy, pulse trigger accuracy, time qualified trigger, trigger sensitivity, and channel isolation |
|----------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|

## 27. Digital Multimeter

|                |               |                          |
|----------------|---------------|--------------------------|
| Ohms: <60 Ohms | Keithley 2700 | Checking input impedance |
|----------------|---------------|--------------------------|

## 28. Cable, coaxial

|                                                                                                                         |                                                                     |                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 50 $\Omega$ , 39.37 in (1.0 m), male-to-male SMA connectors<br>50 $\Omega$ , 60 in (1.5 m), male-to-male SMA connectors | Tektronix part number 174-1341-00 Tektronix part number 174-1428-00 | Checking analog bandwidth and delta time measurement accuracy. Checking $\geq 4$ GHz models serial trigger baud rate limits |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|

## 29. Mouse or keyboard

|  |                                                                          |                               |
|--|--------------------------------------------------------------------------|-------------------------------|
|  | Tektronix part numbers:<br>119-7054-xx (mouse)<br>119-7083-xx (keyboard) | Used to input test selections |
|--|--------------------------------------------------------------------------|-------------------------------|

## 30. Probe tip adapter

|                                               |                                   |                           |
|-----------------------------------------------|-----------------------------------|---------------------------|
| BNC female to square pin adapter, 50 $\Omega$ | Tektronix part number 067-1734-00 | Checking digital channels |
|-----------------------------------------------|-----------------------------------|---------------------------|

**31. Logic probe**

|                            |                               |                           |
|----------------------------|-------------------------------|---------------------------|
| P6717 or P6780 Logic Probe | Tektronix part P6717 or P6780 | Checking digital channels |
|----------------------------|-------------------------------|---------------------------|

**32. Adapter**

|                            |                                   |                                      |
|----------------------------|-----------------------------------|--------------------------------------|
| BNC "T", male to 2 females | Tektronix part number 103-0030-xx | Checking DC gain and offset accuracy |
|----------------------------|-----------------------------------|--------------------------------------|

**33. Attenuator 2X**

|                                                                          |                                                    |                         |
|--------------------------------------------------------------------------|----------------------------------------------------|-------------------------|
| Ratio: 2X; impedance 50 $\Omega$ ; connectors: female input, male output | BNC $\leq$ 2 GHz Tektronix part number 011-0069-xx | Checking output signals |
|--------------------------------------------------------------------------|----------------------------------------------------|-------------------------|

**34. Source measure unit**

|                                   |                                                      |                     |
|-----------------------------------|------------------------------------------------------|---------------------|
| Source and Measure < 1 A and <5 V | Keithley 2400 SourceMeter with Model 8605 test leads | Checking TekProtect |
|-----------------------------------|------------------------------------------------------|---------------------|

**35. Instrument controller**

|                 |                                    |                     |
|-----------------|------------------------------------|---------------------|
| GPIB controller | PC with GPIB or Ethernet interface | Checking TekProtect |
|-----------------|------------------------------------|---------------------|

**Test record** Photocopy the test record tables and use them to record the performance test results for your instrument.

**Table 5: Test information**

| Item                     | Recorded value |
|--------------------------|----------------|
| Instrument Serial Number |                |
| Technician               |                |
| Certificate Number       |                |
| Date of Calibration      |                |
| Temperature              |                |
| RH %                     |                |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |            |
|------------------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum    |
| Ch1 6.25 mV Vert scale setting, 0 Div position setting     |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4012 V   | _____    | _____    | 3.4363 V   |
| +2.4 V offset                                              | 2.4032 V   | _____    | _____    | 2.4343 V   |
| +1.5 V termination                                         |            |          |          |            |
| +2.5 V offset                                              | 2.49345 V  | _____    | _____    | 2.52456 V  |
| +1.5 V offset                                              | 1.49945 V  | _____    | _____    | 1.51856 V  |
| +0.5 V offset                                              | 501.45 mV  | _____    | _____    | 516.56 mV  |
| 0 V termination                                            |            |          |          |            |
| 0 V offset                                                 | 14.76 mV   | _____    | _____    | 22.25 mV   |
| -1 V offset                                                | -1.00056 V | _____    | _____    | -981.45 mV |
| +1 V offset                                                | 999.45 mV  | _____    | _____    | 1.01856 V  |
| -3.5 V termination                                         |            |          |          |            |
| -3.4 V offset                                              | -3.4363 V  | _____    | _____    | -3.4012 V  |
| -2.4 V offset                                              | -2.4343 V  | _____    | _____    | -2.4032 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.52456 V | _____    | _____    | -2.49345 V |
| -1.5 V offset                                              | -1.51856 V | _____    | _____    | -1.49945 V |
| -0.5 V offset                                              | -516.56 mV | _____    | _____    | -501.45 mV |
| Ch1 10 mV Vert scale setting, 0 Div position setting       |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4117 V   | _____    | _____    | 3.4483 V   |
| +2.4 V offset                                              | 2.4137 V   | _____    | _____    | 2.4463 V   |
| 1.5 V termination                                          |            |          |          |            |
| 2.5 V offset                                               | 2.4988 V   | _____    | _____    | 2.5312 V   |
| +1.5 V offset                                              | 1.5195 V   | _____    | _____    | 1.5405 V   |
| +0.5 V offset                                              | 521.5 mV   | _____    | _____    | 538.5 mV   |
| V termination                                              |            |          |          |            |
| 0 V offset                                                 | 25.5 mV    | _____    | _____    | 34.5 mV    |
| -1 V offset                                                | -980.5 mV  | _____    | _____    | -959.5 mV  |
| +1 V offset                                                | 1.0195 V   | _____    | _____    | 1.0405 V   |
| V termination                                              |            |          |          |            |
| -3.4 V offset                                              | -3.4117 V  | _____    | _____    | -3.4483 V  |
| -2.4 V offset                                              | -2.4137 V  | _____    | _____    | -2.4463 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.5312 V  | _____    | _____    | -2.4988 V  |
| -1.5 V offset                                              | -1.5405 V  | _____    | _____    | -1.5195 V  |
| -0.5 V offset                                              | -538.5 mV  | _____    | _____    | -521.5 mV  |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |           |
|------------------------------------------------------------|------------|----------|----------|-----------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum   |
| Ch1 20 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.4397 V   | _____    | _____    | 3.4803 V  |
| +2.4 V offset                                              | 2.4417 V   | _____    | _____    | 2.4783 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.5415 V   | _____    | _____    | 2.5785 V  |
| +1.5 V offset                                              | 1.5475 V   | _____    | _____    | 1.5725 V  |
| +0.5 V offset                                              | 549.5 mV   | _____    | _____    | 570.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 53.5 mV    | _____    | _____    | 66.5 mV   |
| -1 V offset                                                | -952.5 mV  | _____    | _____    | -927.5 mV |
| +1 V offset                                                | 1.0475 V   | _____    | _____    | 1.0725 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.4803 V  | _____    | _____    | -3.4397 V |
| -2.4 V offset                                              | -2.47831 V | _____    | _____    | -2.4417 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.5785 V  | _____    | _____    | -2.5415 V |
| -1.5 V offset                                              | -1.5725 V  | _____    | _____    | -1.5475 V |
| -0.5 V offset                                              | -570.5 mV  | _____    | _____    | -549.5 mV |
| Ch1 50 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.5237 V   | _____    | _____    | 3.5763 V  |
| +2.4 V offset                                              | 2.5257 V   | _____    | _____    | 2.5743 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.6255 V   | _____    | _____    | 2.6745 V  |
| +1.5 V offset                                              | 1.6315 V   | _____    | _____    | 1.6685 V  |
| +0.5 V offset                                              | 633.5 mV   | _____    | _____    | 666.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 137.5 mV   | _____    | _____    | 162.5 mV  |
| -1 V offset                                                | -868.5 mV  | _____    | _____    | -831.5 mV |
| +1 V offset                                                | 1.1315 V   | _____    | _____    | 1.1685 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.5763 V  | _____    | _____    | -3.5237 V |
| -2.4 V offset                                              | -2.5743 V  | _____    | _____    | -2.5257 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.6745 V  | _____    | _____    | -2.6255 V |
| -1.5 V offset                                              | -1.6685 V  | _____    | _____    | -1.6315 V |
| -0.5 V offset                                              | -666.5 mV  | _____    | _____    | -633.5 mV |

| DC voltage measurement accuracy (averaged), >20 GHz models |           |          |          |           |
|------------------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                                | Minimum   | Incoming | Outgoing | Maximum   |
| Ch1 100 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.6637 V  | _____    | _____    | 3.7363 V  |
| +2.4 V offset                                              | 2.6657 V  | _____    | _____    | 2.7343 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.7655 V  | _____    | _____    | 2.8345 V  |
| +1.5 V offset                                              | 1.7715 V  | _____    | _____    | 1.8285 V  |
| +0.5 V offset                                              | 773.5 mV  | _____    | _____    | 826.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 277.5 mV  | _____    | _____    | 322.5 mV  |
| -1 V offset                                                | -728.5 mV | _____    | _____    | -671.5 mV |
| +1 V offset                                                | 1.2715 V  | _____    | _____    | 1.3285 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.7363 V | _____    | _____    | -3.6637 V |
| -2.4 V offset                                              | -2.7343 V | _____    | _____    | -2.6657 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8345 V | _____    | _____    | -2.7655 V |
| -1.5 V offset                                              | -1.8285 V | _____    | _____    | -1.7715 V |
| -0.5 V offset                                              | -826.5 mV | _____    | _____    | -773.5 mV |
| Ch1 120 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.7197 V  | _____    | _____    | 3.8003 V  |
| +2.4 V offset                                              | 2.7217 V  | _____    | _____    | 2.7983 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.8215 V  | _____    | _____    | 2.8985 V  |
| +1.5 V offset                                              | 1.8275 V  | _____    | _____    | 1.8925 V  |
| +0.5 V offset                                              | 829.5 mV  | _____    | _____    | 890.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 333.5 mV  | _____    | _____    | 386.5 mV  |
| -1 V offset                                                | -672.5 mV | _____    | _____    | -607.5 mV |
| +1 V offset                                                | 1.3275 V  | _____    | _____    | 1.3925 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.8003 V | _____    | _____    | -3.7197 V |
| -2.4 V offset                                              | -2.7983 V | _____    | _____    | -2.7217 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8985 V | _____    | _____    | -2.8215 V |
| -1.5 V offset                                              | -1.8925 V | _____    | _____    | -1.8275 V |
| -0.5 V offset                                              | -890.5 mV | _____    | _____    | -829.5 mV |
| Ch1 140 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| 0 V termination                                            |           |          |          |           |
| -1 V offset                                                | -624.5 mV | _____    | _____    | -535.5 mV |
| 0 V offset                                                 | 379.5 mV  | _____    | _____    | 460.5 mV  |
| +1 V offset                                                | 1.3755 V  | _____    | _____    | 1.4645 V  |
| Ch1 200 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| 0 V termination                                            |           |          |          |           |
| -1 V offset                                                | -456.5 mV | _____    | _____    | -343.5 mV |
| 0 V offset                                                 | 547.5 mV  | _____    | _____    | 652.5 mV  |
| +1 V offset                                                | 1.5435 V  | _____    | _____    | 1.6565 V  |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |            |
|------------------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum    |
| Ch1 400 mV Vert scale setting, 0 Div position setting      |            |          |          |            |
| 0 V termination                                            |            |          |          |            |
| -1 V offset                                                | 103.5 mV   | _____    | _____    | 296.5 mV   |
| 0 V offset                                                 | 1.1075 V   | _____    | _____    | 1.2925 V   |
| +1 V offset                                                | 2.1035 V   | _____    | _____    | 2.2965 V   |
| Ch2 6.25 mV Vert scale setting, 0 Div position setting     |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4012 V   | _____    | _____    | 3.4363 V   |
| +2.4 V offset                                              | 2.4032 V   | _____    | _____    | 2.4343 V   |
| +1.5 V termination                                         |            |          |          |            |
| +2.5 V offset                                              | 2.49345 V  | _____    | _____    | 2.52456 V  |
| +1.5 V offset                                              | 1.49945 V  | _____    | _____    | 1.51856 V  |
| +0.5 V offset                                              | 501.45 mV  | _____    | _____    | 516.56 mV  |
| 0 V termination                                            |            |          |          |            |
| 0 V offset                                                 | 14.76 mV   | _____    | _____    | 22.25 mV   |
| -1 V offset                                                | -1.00056 V | _____    | _____    | -981.45 mV |
| +1 V offset                                                | 999.45 mV  | _____    | _____    | 1.01856 V  |
| -3.5 V termination                                         |            |          |          |            |
| -3.4 V offset                                              | -3.4363 V  | _____    | _____    | -3.4012 V  |
| -2.4 V offset                                              | -2.4343 V  | _____    | _____    | -2.4032 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.52456 V | _____    | _____    | -2.49345 V |
| -1.5 V offset                                              | -1.51856 V | _____    | _____    | -1.49945 V |
| -0.5 V offset                                              | -516.56 mV | _____    | _____    | -501.45 mV |
| Ch2 10 mV Vert scale setting, 0 Div position setting       |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4117 V   | _____    | _____    | 3.4483 V   |
| +2.4 V offset                                              | 2.4137 V   | _____    | _____    | 2.4463 V   |
| +1.5 V termination                                         |            |          |          |            |
| +2.5 V offset                                              | 2.4988 V   | _____    | _____    | 2.5312 V   |
| +1.5 V offset                                              | 1.5195 V   | _____    | _____    | 1.5405 V   |
| +0.5 V offset                                              | 521.5 mV   | _____    | _____    | 538.5 mV   |
| 0 V termination                                            |            |          |          |            |
| 0 V offset                                                 | 25.5 mV    | _____    | _____    | 34.5 mV    |
| -1 V offset                                                | -980.5 mV  | _____    | _____    | -959.5 mV  |
| +1 V offset                                                | 1.0195 V   | _____    | _____    | 1.0405 V   |
| -3.5 V termination                                         |            |          |          |            |
| -3.4 V offset                                              | -3.4117 V  | _____    | _____    | -3.4483 V  |
| -2.4 V offset                                              | -2.4137 V  | _____    | _____    | -2.4463 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.5312 V  | _____    | _____    | -2.4988 V  |
| -1.5 V offset                                              | -1.5405 V  | _____    | _____    | -1.5195 V  |
| -0.5 V offset                                              | -538.5 mV  | _____    | _____    | -521.5 mV  |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |           |
|------------------------------------------------------------|------------|----------|----------|-----------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum   |
| Ch2 20 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.4397 V   | _____    | _____    | 3.4803 V  |
| +2.4 V offset                                              | 2.4417 V   | _____    | _____    | 2.4783 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.5415 V   | _____    | _____    | 2.5785 V  |
| +1.5 V offset                                              | 1.5475 V   | _____    | _____    | 1.5725 V  |
| +0.5 V offset                                              | 549.5 mV   | _____    | _____    | 570.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 53.5 mV    | _____    | _____    | 66.5 mV   |
| -1 V offset                                                | -952.5 mV  | _____    | _____    | -927.5 mV |
| +1 V offset                                                | 1.0475 V   | _____    | _____    | 1.0725 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.4803 V  | _____    | _____    | -3.4397 V |
| -2.4 V offset                                              | -2.47831 V | _____    | _____    | -2.4417 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.5785 V  | _____    | _____    | -2.5415 V |
| -1.5 V offset                                              | -1.5725 V  | _____    | _____    | -1.5475 V |
| -0.5 V offset                                              | -570.5 mV  | _____    | _____    | -549.5 mV |
| Ch2 50 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.5237 V   | _____    | _____    | 3.5763 V  |
| +2.4 V offset                                              | 2.5257 V   | _____    | _____    | 2.5743 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.6255 V   | _____    | _____    | 2.6745 V  |
| +1.5 V offset                                              | 1.6315 V   | _____    | _____    | 1.6685 V  |
| +0.5 V offset                                              | 633.5 mV   | _____    | _____    | 666.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 137.5 mV   | _____    | _____    | 162.5 mV  |
| -1 V offset                                                | -868.5 mV  | _____    | _____    | -831.5 mV |
| +1 V offset                                                | 1.1315 V   | _____    | _____    | 1.1685 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.5763 V  | _____    | _____    | -3.5237 V |
| -2.4 V offset                                              | -2.5743 V  | _____    | _____    | -2.5257 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.6745 V  | _____    | _____    | -2.6255 V |
| -1.5 V offset                                              | -1.6685 V  | _____    | _____    | -1.6315 V |
| -0.5 V offset                                              | -666.5 mV  | _____    | _____    | -633.5 mV |

| DC voltage measurement accuracy (averaged), >20 GHz models |           |          |          |           |
|------------------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                                | Minimum   | Incoming | Outgoing | Maximum   |
| Ch2 100 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.6637 V  | _____    | _____    | 3.7363 V  |
| +2.4 V offset                                              | 2.6657 V  | _____    | _____    | 2.7343 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.7655 V  | _____    | _____    | 2.8345 V  |
| +1.5 V offset                                              | 1.7715 V  | _____    | _____    | 1.8285 V  |
| +0.5 V offset                                              | 773.5 mV  | _____    | _____    | 826.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 277.5 mV  | _____    | _____    | 322.5 mV  |
| -1 V offset                                                | -728.5 mV | _____    | _____    | -671.5 mV |
| +1 V offset                                                | 1.2715 V  | _____    | _____    | 1.3285 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.7363 V | _____    | _____    | -3.6637 V |
| -2.4 V offset                                              | -2.7343 V | _____    | _____    | -2.6657 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8345 V | _____    | _____    | -2.7655 V |
| -1.5 V offset                                              | -1.8285 V | _____    | _____    | -1.7715 V |
| -0.5 V offset                                              | -826.5 mV | _____    | _____    | -773.5 mV |
| Ch2 120 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.7197 V  | _____    | _____    | 3.8003 V  |
| +2.4 V offset                                              | 2.7217 V  | _____    | _____    | 2.7983 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.8215 V  | _____    | _____    | 2.8985 V  |
| +1.5 V offset                                              | 1.8275 V  | _____    | _____    | 1.8925 V  |
| +0.5 V offset                                              | 829.5 mV  | _____    | _____    | 890.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 333.5 mV  | _____    | _____    | 386.5 mV  |
| -1 V offset                                                | -672.5 mV | _____    | _____    | -607.5 mV |
| +1 V offset                                                | 1.3275 V  | _____    | _____    | 1.3925 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.8003 V | _____    | _____    | -3.7197 V |
| -2.4 V offset                                              | -2.7983 V | _____    | _____    | -2.7217 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8985 V | _____    | _____    | -2.8215 V |
| -1.5 V offset                                              | -1.8925 V | _____    | _____    | -1.8275 V |
| -0.5 V offset                                              | -890.5 mV | _____    | _____    | -829.5 mV |
| Ch2 140 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| 0 V termination                                            |           |          |          |           |
| -1 V offset                                                | -624.5 mV | _____    | _____    | -535.5 mV |
| 0 V offset                                                 | 379.5 mV  | _____    | _____    | 460.5 mV  |
| +1 V offset                                                | 1.3755 V  | _____    | _____    | 1.4645 V  |
| Ch2 200 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| 0 V termination                                            |           |          |          |           |
| -1 V offset                                                | -456.5 mV | _____    | _____    | -343.5 mV |
| 0 V offset                                                 | 547.5 mV  | _____    | _____    | 652.5 mV  |
| +1 V offset                                                | 1.5435 V  | _____    | _____    | 1.6565 V  |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |            |
|------------------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum    |
| Ch2 400 mV Vert scale setting, 0 Div position setting      |            |          |          |            |
| 0 V termination                                            |            |          |          |            |
| -1 V offset                                                | 103.5 mV   | _____    | _____    | 296.5 mV   |
| 0 V offset                                                 | 1.1075 V   | _____    | _____    | 1.2925 V   |
| +1 V offset                                                | 2.1035 V   | _____    | _____    | 2.2965 V   |
| Ch3 6.25 mV Vert scale setting, 0 Div position setting     |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4012 V   | _____    | _____    | 3.4363 V   |
| +2.4 V offset                                              | 2.4032 V   | _____    | _____    | 2.4343 V   |
| +1.5 V termination                                         |            |          |          |            |
| +2.5 V offset                                              | 2.49345 V  | _____    | _____    | 2.52456 V  |
| +1.5 V offset                                              | 1.49945 V  | _____    | _____    | 1.51856 V  |
| +0.5 V offset                                              | 501.45 mV  | _____    | _____    | 516.56 mV  |
| 0 V termination                                            |            |          |          |            |
| 0 V offset                                                 | 14.76 mV   | _____    | _____    | 22.25 mV   |
| -1 V offset                                                | -1.00056 V | _____    | _____    | -981.45 mV |
| +1 V offset                                                | 999.45 mV  | _____    | _____    | 1.01856 V  |
| -3.5 V termination                                         |            |          |          |            |
| -3.4 V offset                                              | -3.4363 V  | _____    | _____    | -3.4012 V  |
| -2.4 V offset                                              | -2.4343 V  | _____    | _____    | -2.4032 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.52456 V | _____    | _____    | -2.49345 V |
| -1.5 V offset                                              | -1.51856 V | _____    | _____    | -1.49945 V |
| -0.5 V offset                                              | -516.56 mV | _____    | _____    | -501.45 mV |
| Ch3 10 mV Vert scale setting, 0 Div position setting       |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4117 V   | _____    | _____    | 3.4483 V   |
| +2.4 V offset                                              | 2.4137 V   | _____    | _____    | 2.4463 V   |
| +1.5 V termination                                         |            |          |          |            |
| +2.5 V offset                                              | 2.4988 V   | _____    | _____    | 2.5312 V   |
| +1.5 V offset                                              | 1.5195 V   | _____    | _____    | 1.5405 V   |
| +0.5 V offset                                              | 521.5 mV   | _____    | _____    | 538.5 mV   |
| 0 V termination                                            |            |          |          |            |
| 0 V offset                                                 | 25.5 mV    | _____    | _____    | 34.5 mV    |
| -1 V offset                                                | -980.5 mV  | _____    | _____    | -959.5 mV  |
| +1 V offset                                                | 1.0195 V   | _____    | _____    | 1.0405 V   |
| -3.5 V termination                                         |            |          |          |            |
| -3.4 V offset                                              | -3.4117 V  | _____    | _____    | -3.4483 V  |
| -2.4 V offset                                              | -2.4137 V  | _____    | _____    | -2.4463 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.5312 V  | _____    | _____    | -2.4988 V  |
| -1.5 V offset                                              | -1.5405 V  | _____    | _____    | -1.5195 V  |
| -0.5 V offset                                              | -538.5 mV  | _____    | _____    | -521.5 mV  |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |           |
|------------------------------------------------------------|------------|----------|----------|-----------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum   |
| Ch3 20 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.4397 V   | _____    | _____    | 3.4803 V  |
| +2.4 V offset                                              | 2.4417 V   | _____    | _____    | 2.4783 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.5415 V   | _____    | _____    | 2.5785 V  |
| +1.5 V offset                                              | 1.5475 V   | _____    | _____    | 1.5725 V  |
| +0.5 V offset                                              | 549.5 mV   | _____    | _____    | 570.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 53.5 mV    | _____    | _____    | 66.5 mV   |
| -1 V offset                                                | -952.5 mV  | _____    | _____    | -927.5 mV |
| +1 V offset                                                | 1.0475 V   | _____    | _____    | 1.0725 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.4803 V  | _____    | _____    | -3.4397 V |
| -2.4 V offset                                              | -2.47831 V | _____    | _____    | -2.4417 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.5785 V  | _____    | _____    | -2.5415 V |
| -1.5 V offset                                              | -1.5725 V  | _____    | _____    | -1.5475 V |
| -0.5 V offset                                              | -570.5 mV  | _____    | _____    | -549.5 mV |
| Ch3 50 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.5237 V   | _____    | _____    | 3.5763 V  |
| +2.4 V offset                                              | 2.5257 V   | _____    | _____    | 2.5743 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.6255 V   | _____    | _____    | 2.6745 V  |
| +1.5 V offset                                              | 1.6315 V   | _____    | _____    | 1.6685 V  |
| +0.5 V offset                                              | 633.5 mV   | _____    | _____    | 666.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 137.5 mV   | _____    | _____    | 162.5 mV  |
| -1 V offset                                                | -868.5 mV  | _____    | _____    | -831.5 mV |
| +1 V offset                                                | 1.1315 V   | _____    | _____    | 1.1685 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.5763 V  | _____    | _____    | -3.5237 V |
| -2.4 V offset                                              | -2.5743 V  | _____    | _____    | -2.5257 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.6745 V  | _____    | _____    | -2.6255 V |
| -1.5 V offset                                              | -1.6685 V  | _____    | _____    | -1.6315 V |
| -0.5 V offset                                              | -666.5 mV  | _____    | _____    | -633.5 mV |

| DC voltage measurement accuracy (averaged), >20 GHz models |           |          |          |           |
|------------------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                                | Minimum   | Incoming | Outgoing | Maximum   |
| Ch3 100 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.6637 V  | _____    | _____    | 3.7363 V  |
| +2.4 V offset                                              | 2.6657 V  | _____    | _____    | 2.7343 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.7655 V  | _____    | _____    | 2.8345 V  |
| +1.5 V offset                                              | 1.7715 V  | _____    | _____    | 1.8285 V  |
| +0.5 V offset                                              | 773.5 mV  | _____    | _____    | 826.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 277.5 mV  | _____    | _____    | 322.5 mV  |
| -1 V offset                                                | -728.5 mV | _____    | _____    | -671.5 mV |
| +1 V offset                                                | 1.2715 V  | _____    | _____    | 1.3285 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.7363 V | _____    | _____    | -3.6637 V |
| -2.4 V offset                                              | -2.7343 V | _____    | _____    | -2.6657 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8345 V | _____    | _____    | -2.7655 V |
| -1.5 V offset                                              | -1.8285 V | _____    | _____    | -1.7715 V |
| -0.5 V offset                                              | -826.5 mV | _____    | _____    | -773.5 mV |
| Ch3 120 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.7197 V  | _____    | _____    | 3.8003 V  |
| +2.4 V offset                                              | 2.7217 V  | _____    | _____    | 2.7983 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.8215 V  | _____    | _____    | 2.8985 V  |
| +1.5 V offset                                              | 1.8275 V  | _____    | _____    | 1.8925 V  |
| +0.5 V offset                                              | 829.5 mV  | _____    | _____    | 890.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 333.5 mV  | _____    | _____    | 386.5 mV  |
| -1 V offset                                                | -672.5 mV | _____    | _____    | -607.5 mV |
| +1 V offset                                                | 1.3275 V  | _____    | _____    | 1.3925 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.8003 V | _____    | _____    | -3.7197 V |
| -2.4 V offset                                              | -2.7983 V | _____    | _____    | -2.7217 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8985 V | _____    | _____    | -2.8215 V |
| -1.5 V offset                                              | -1.8925 V | _____    | _____    | -1.8275 V |
| -0.5 V offset                                              | -890.5 mV | _____    | _____    | -829.5 mV |
| Ch3 140 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| 0 V termination                                            |           |          |          |           |
| -1 V offset                                                | -624.5 mV | _____    | _____    | -535.5 mV |
| 0 V offset                                                 | 379.5 mV  | _____    | _____    | 460.5 mV  |
| +1 V offset                                                | 1.3755 V  | _____    | _____    | 1.4645 V  |
| Ch3 200 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| 0 V termination                                            |           |          |          |           |
| -1 V offset                                                | -456.5 mV | _____    | _____    | -343.5 mV |
| 0 V offset                                                 | 547.5 mV  | _____    | _____    | 652.5 mV  |
| +1 V offset                                                | 1.5435 V  | _____    | _____    | 1.6565 V  |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |            |
|------------------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum    |
| Ch3 400 mV Vert scale setting, 0 Div position setting      |            |          |          |            |
| 0 V termination                                            |            |          |          |            |
| -1 V offset                                                | 103.5 mV   | _____    | _____    | 296.5 mV   |
| 0 V offset                                                 | 1.1075 V   | _____    | _____    | 1.2925 V   |
| +1 V offset                                                | 2.1035 V   | _____    | _____    | 2.2965 V   |
| Ch4 6.25 mV Vert scale setting, 0 Div position setting     |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4012 V   | _____    | _____    | 3.4363 V   |
| +2.4 V offset                                              | 2.4032 V   | _____    | _____    | 2.4343 V   |
| +1.5 V termination                                         |            |          |          |            |
| +2.5 V offset                                              | 2.49345 V  | _____    | _____    | 2.52456 V  |
| +1.5 V offset                                              | 1.49945 V  | _____    | _____    | 1.51856 V  |
| +0.5 V offset                                              | 501.45 mV  | _____    | _____    | 516.56 mV  |
| 0 V termination                                            |            |          |          |            |
| 0 V offset                                                 | 14.76 mV   | _____    | _____    | 22.25 mV   |
| -1 V offset                                                | -1.00056 V | _____    | _____    | -981.45 mV |
| +1 V offset                                                | 999.45 mV  | _____    | _____    | 1.01856 V  |
| -3.5 V termination                                         |            |          |          |            |
| -3.4 V offset                                              | -3.4363 V  | _____    | _____    | -3.4012 V  |
| -2.4 V offset                                              | -2.4343 V  | _____    | _____    | -2.4032 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.52456 V | _____    | _____    | -2.49345 V |
| -1.5 V offset                                              | -1.51856 V | _____    | _____    | -1.49945 V |
| -0.5 V offset                                              | -516.56 mV | _____    | _____    | -501.45 mV |
| Ch4 10 mV Vert scale setting, 0 Div position setting       |            |          |          |            |
| +3.5 V termination                                         |            |          |          |            |
| +3.4 V offset                                              | 3.4117 V   | _____    | _____    | 3.4483 V   |
| +2.4 V offset                                              | 2.4137 V   | _____    | _____    | 2.4463 V   |
| +1.5 V termination                                         |            |          |          |            |
| +2.5 V offset                                              | 2.4988 V   | _____    | _____    | 2.5312 V   |
| +1.5 V offset                                              | 1.5195 V   | _____    | _____    | 1.5405 V   |
| +0.5 V offset                                              | 521.5 mV   | _____    | _____    | 538.5 mV   |
| 0 V termination                                            |            |          |          |            |
| 0 V offset                                                 | 25.5 mV    | _____    | _____    | 34.5 mV    |
| -1 V offset                                                | -980.5 mV  | _____    | _____    | -959.5 mV  |
| +1 V offset                                                | 1.0195 V   | _____    | _____    | 1.0405 V   |
| -3.5 V termination                                         |            |          |          |            |
| -3.4 V offset                                              | -3.4117 V  | _____    | _____    | -3.4483 V  |
| -2.4 V offset                                              | -2.4137 V  | _____    | _____    | -2.4463 V  |
| -1.5 V termination                                         |            |          |          |            |
| -2.5 V offset                                              | -2.5312 V  | _____    | _____    | -2.4988 V  |
| -1.5 V offset                                              | -1.5405 V  | _____    | _____    | -1.5195 V  |
| -0.5 V offset                                              | -538.5 mV  | _____    | _____    | -521.5 mV  |

| DC voltage measurement accuracy (averaged), >20 GHz models |            |          |          |           |
|------------------------------------------------------------|------------|----------|----------|-----------|
| Instrument performance test                                | Minimum    | Incoming | Outgoing | Maximum   |
| Ch4 20 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.4397 V   | _____    | _____    | 3.4803 V  |
| +2.4 V offset                                              | 2.4417 V   | _____    | _____    | 2.4783 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.5415 V   | _____    | _____    | 2.5785 V  |
| +1.5 V offset                                              | 1.5475 V   | _____    | _____    | 1.5725 V  |
| +0.5 V offset                                              | 549.5 mV   | _____    | _____    | 570.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 53.5 mV    | _____    | _____    | 66.5 mV   |
| -1 V offset                                                | -952.5 mV  | _____    | _____    | -927.5 mV |
| +1 V offset                                                | 1.0475 V   | _____    | _____    | 1.0725 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.4803 V  | _____    | _____    | -3.4397 V |
| -2.4 V offset                                              | -2.47831 V | _____    | _____    | -2.4417 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.5785 V  | _____    | _____    | -2.5415 V |
| -1.5 V offset                                              | -1.5725 V  | _____    | _____    | -1.5475 V |
| -0.5 V offset                                              | -570.5 mV  | _____    | _____    | -549.5 mV |
| Ch4 50 mV Vert scale setting, 0 Div position setting       |            |          |          |           |
| +3.5 V termination                                         |            |          |          |           |
| +3.4 V offset                                              | 3.5237 V   | _____    | _____    | 3.5763 V  |
| +2.4 V offset                                              | 2.5257 V   | _____    | _____    | 2.5743 V  |
| +1.5 V termination                                         |            |          |          |           |
| +2.5 V offset                                              | 2.6255 V   | _____    | _____    | 2.6745 V  |
| +1.5 V offset                                              | 1.6315 V   | _____    | _____    | 1.6685 V  |
| +0.5 V offset                                              | 633.5 mV   | _____    | _____    | 666.5 mV  |
| 0 V termination                                            |            |          |          |           |
| 0 V offset                                                 | 137.5 mV   | _____    | _____    | 162.5 mV  |
| -1 V offset                                                | -868.5 mV  | _____    | _____    | -831.5 mV |
| +1 V offset                                                | 1.1315 V   | _____    | _____    | 1.1685 V  |
| -3.5 V termination                                         |            |          |          |           |
| -3.4 V offset                                              | -3.5763 V  | _____    | _____    | -3.5237 V |
| -2.4 V offset                                              | -2.5743 V  | _____    | _____    | -2.5257 V |
| -1.5 V termination                                         |            |          |          |           |
| -2.5 V offset                                              | -2.6745 V  | _____    | _____    | -2.6255 V |
| -1.5 V offset                                              | -1.6685 V  | _____    | _____    | -1.6315 V |
| -0.5 V offset                                              | -666.5 mV  | _____    | _____    | -633.5 mV |

| DC voltage measurement accuracy (averaged), >20 GHz models |           |          |          |           |
|------------------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                                | Minimum   | Incoming | Outgoing | Maximum   |
| Ch4 100 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.6637 V  | _____    | _____    | 3.7363 V  |
| +2.4 V offset                                              | 2.6657 V  | _____    | _____    | 2.7343 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.7655 V  | _____    | _____    | 2.8345 V  |
| +1.5 V offset                                              | 1.7715 V  | _____    | _____    | 1.8285 V  |
| +0.5 V offset                                              | 773.5 mV  | _____    | _____    | 826.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 277.5 mV  | _____    | _____    | 322.5 mV  |
| -1 V offset                                                | -728.5 mV | _____    | _____    | -671.5 mV |
| +1 V offset                                                | 1.2715 V  | _____    | _____    | 1.3285 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.7363 V | _____    | _____    | -3.6637 V |
| -2.4 V offset                                              | -2.7343 V | _____    | _____    | -2.6657 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8345 V | _____    | _____    | -2.7655 V |
| -1.5 V offset                                              | -1.8285 V | _____    | _____    | -1.7715 V |
| -0.5 V offset                                              | -826.5 mV | _____    | _____    | -773.5 mV |
| Ch4 120 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| +3.5 V termination                                         |           |          |          |           |
| +3.4 V offset                                              | 3.7197 V  | _____    | _____    | 3.8003 V  |
| +2.4 V offset                                              | 2.7217 V  | _____    | _____    | 2.7983 V  |
| +1.5 V termination                                         |           |          |          |           |
| +2.5 V offset                                              | 2.8215 V  | _____    | _____    | 2.8985 V  |
| +1.5 V offset                                              | 1.8275 V  | _____    | _____    | 1.8925 V  |
| +0.5 V offset                                              | 829.5 mV  | _____    | _____    | 890.5 mV  |
| 0 V termination                                            |           |          |          |           |
| 0 V offset                                                 | 333.5 mV  | _____    | _____    | 386.5 mV  |
| -1 V offset                                                | -672.5 mV | _____    | _____    | -607.5 mV |
| +1 V offset                                                | 1.3275 V  | _____    | _____    | 1.3925 V  |
| -3.5 V termination                                         |           |          |          |           |
| -3.4 V offset                                              | -3.8003 V | _____    | _____    | -3.7197 V |
| -2.4 V offset                                              | -2.7983 V | _____    | _____    | -2.7217 V |
| -1.5 V termination                                         |           |          |          |           |
| -2.5 V offset                                              | -2.8985 V | _____    | _____    | -2.8215 V |
| -1.5 V offset                                              | -1.8925 V | _____    | _____    | -1.8275 V |
| -0.5 V offset                                              | -890.5 mV | _____    | _____    | -829.5 mV |
| Ch4 140 mV Vert scale setting, 0 Div position setting      |           |          |          |           |
| 0 V termination                                            |           |          |          |           |
| -1 V offset                                                | -624.5 mV | _____    | _____    | -535.5 mV |
| 0 V offset                                                 | 379.5 mV  | _____    | _____    | 460.5 mV  |
| +1 V offset                                                | 1.3755 V  | _____    | _____    | 1.4645 V  |

| DC voltage measurement accuracy (averaged), >20 GHz models                                                           |                                   |                         |                         |                                   |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------|-------------------------|-----------------------------------|
| Instrument performance test                                                                                          | Minimum                           | Incoming                | Outgoing                | Maximum                           |
| Ch4 200 mV Vert scale setting, 0 Div position setting<br>0 V termination<br>-1 V offset<br>0 V offset<br>+1 V offset | -456.5 mV<br>547.5 mV<br>1.5435 V | _____<br>_____<br>_____ | _____<br>_____<br>_____ | -343.5 mV<br>652.5 mV<br>1.6565 V |
| Ch4 400 mV Vert scale setting, 0 Div position setting<br>0 V termination<br>-1 V offset<br>0 V offset<br>+1 V offset | 103.5 mV<br>1.1075 V<br>2.1035 V  | _____<br>_____<br>_____ | _____<br>_____<br>_____ | 296.5 mV<br>1.2925 V<br>2.2965 V  |

| DC voltage measurement accuracy (averaged), ≥4 GHz, ≤20 GHz models        |             |          |          |             |
|---------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                               | Minimum     | Incoming | Outgoing | Maximum     |
| Ch1 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset  | + 524.75 mV | _____    | _____    | + 535.25 mV |
| Ch1 10 mV Vert scale setting,<br>+5 Div position setting, -0.45 V offset  | - 535.25 mV | _____    | _____    | - 524.75 mV |
| Ch1 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset   | + 552.75 mV | _____    | _____    | + 567.25 mV |
| Ch1 20 mV Vert scale setting,<br>+5 Div position setting, -0.4 V offset   | - 567.25 mV | _____    | _____    | - 552.75 mV |
| Ch1 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset  | + 636.75 mV | _____    | _____    | + 663.25 mV |
| Ch1 50 mV Vert scale setting,<br>+5 Div position setting, -0.25 V offset  | - 663.25 mV | _____    | _____    | - 636.75 mV |
| Ch1 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset  | + 2.764 V   | _____    | _____    | + 2.836 V   |
| Ch1 100 mV Vert scale setting,<br>+5 Div position setting, -2.0 V offset  | - 2.836 V   | _____    | _____    | - 2.764 V   |
| Ch1 200 mV Vert scale setting,<br>-5 Div position setting, +1.25 V offset | + 2.697 V   | _____    | _____    | + 2.803 V   |
| Ch1 200 mV Vert scale setting,<br>+5 Div position setting, -1.25 V offset | - 2.803 V   | _____    | _____    | - 2.697 V   |
| Ch1 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset     | + 3.394 V   | _____    | _____    | + 3.606 V   |
| Ch1 500 mV Vert scale setting,<br>+5 Div position setting, 0 V offset     | - 3.606 V   | _____    | _____    | - 3.394 V   |
| Ch2 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset  | + 524.75 mV | _____    | _____    | + 535.25 mV |
| Ch2 10 mV Vert scale setting,<br>+5 Div position setting, -0.45 V offset  | - 535.25 mV | _____    | _____    | - 524.75 mV |
| Ch2 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset   | + 552.75 mV | _____    | _____    | + 567.25 mV |

| DC voltage measurement accuracy (averaged), $\geq 4$ GHz, $\leq 20$ GHz models |             |          |          |             |
|--------------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                                    | Minimum     | Incoming | Outgoing | Maximum     |
| Ch2 20 mV Vert scale setting,<br>+5 Div position setting, -0.4 V offset        | - 567.25 mV | _____    | _____    | - 552.75 mV |
| Ch2 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset       | + 636.75 mV | _____    | _____    | + 663.25 mV |
| Ch2 50 mV Vert scale setting,<br>+5 Div position setting, -0.25 V offset       | - 663.25 mV | _____    | _____    | - 636.75 mV |
| Ch2 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset       | + 2.764 V   | _____    | _____    | + 2.836 V   |
| Ch2 100 mV Vert scale setting,<br>+5 Div position setting, -2.0 V offset       | - 2.836 V   | _____    | _____    | - 2.764 V   |
| Ch2 200 mV Vert scale setting,<br>-5 Div position setting, +1.25 V offset      | + 2.697 V   | _____    | _____    | + 2.803 V   |
| Ch2 200 mV Vert scale setting,<br>+5 Div position setting, -1.25 V offset      | - 2.803 V   | _____    | _____    | - 2.697 V   |
| Ch2 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset          | + 3.394 V   | _____    | _____    | + 3.606 V   |
| Ch2 500 mV Vert scale setting,<br>+5 Div position setting, 0 V offset          | - 3.606 V   | _____    | _____    | - 3.394 V   |
| Ch3 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset       | + 524.75 mV | _____    | _____    | + 535.25 mV |
| Ch3 10 mV Vert scale setting,<br>+5 Div position setting, -0.45 V offset       | - 535.25 mV | _____    | _____    | - 524.75 mV |
| Ch3 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset        | + 552.75 mV | _____    | _____    | + 567.25 mV |
| Ch3 20 mV Vert scale setting,<br>+5 Div position setting, -0.4 V offset        | - 567.25 mV | _____    | _____    | - 552.75 mV |
| Ch3 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset       | + 636.75 mV | _____    | _____    | + 663.25 mV |
| Ch3 50 mV Vert scale setting,<br>+5 Div position setting, -0.25 V offset       | - 663.25 mV | _____    | _____    | - 636.75 mV |
| Ch3 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset       | + 2.764 V   | _____    | _____    | + 2.836 V   |
| Ch3 100 mV Vert scale setting,<br>+5 Div position setting, -2.0 V offset       | - 2.836 V   | _____    | _____    | - 2.764 V   |
| Ch3 200 mV Vert scale setting,<br>-5 Div position setting, +1.25 V offset      | + 2.697 V   | _____    | _____    | + 2.803 V   |
| Ch3 200 mV Vert scale setting,<br>+5 Div position setting, -1.25 V offset      | - 2.803 V   | _____    | _____    | - 2.697 V   |
| Ch3 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset          | + 3.394 V   | _____    | _____    | + 3.606 V   |
| Ch3 500 mV Vert scale setting,<br>+5 Div position setting, 0 V offset          | - 3.606 V   | _____    | _____    | - 3.394 V   |

| DC voltage measurement accuracy (averaged), $\geq 4$ GHz, $\leq 20$ GHz models |             |          |          |             |
|--------------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                                    | Minimum     | Incoming | Outgoing | Maximum     |
| Ch4 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset       | + 524.75 mV | _____    | _____    | + 535.25 mV |
| Ch4 10 mV Vert scale setting,<br>+5 Div position setting, -0.45 V offset       | - 535.25 mV | _____    | _____    | - 524.75 mV |
| Ch4 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset        | + 552.75 mV | _____    | _____    | + 567.25 mV |
| Ch4 20 mV Vert scale setting,<br>+5 Div position setting, -0.4 V offset        | - 567.25 mV | _____    | _____    | - 552.75 mV |
| Ch4 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset       | + 636.75 mV | _____    | _____    | + 663.25 mV |
| Ch4 50 mV Vert scale setting,<br>+5 Div position setting, -0.25 V offset       | - 663.25 mV | _____    | _____    | - 636.75 mV |
| Ch4 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset       | + 2.764 V   | _____    | _____    | + 2.836 V   |
| Ch4 100 mV Vert scale setting,<br>+5 Div position setting, -2.0 V offset       | - 2.836 V   | _____    | _____    | - 2.764 V   |
| Ch4 200 mV Vert scale setting,<br>-5 Div position setting, +1.25 V offset      | + 2.697 V   | _____    | _____    | + 2.803 V   |
| Ch4 200 mV Vert scale setting,<br>+5 Div position setting, -1.25 V offset      | - 2.803 V   | _____    | _____    | - 2.697 V   |
| Ch4 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset          | + 3.394 V   | _____    | _____    | + 3.606 V   |
| Ch4 500 mV Vert scale setting,<br>+5 Div position setting, 0 V offset          | - 3.606 V   | _____    | _____    | - 3.394 V   |

| DC voltage measurement accuracy (averaged), <4 GHz models, 50 $\Omega$  |             |          |          |             |
|-------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                             | Minimum     | Incoming | Outgoing | Maximum     |
| Ch1 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 504.24 mV | _____    | _____    | + 509.76 mV |
| Ch1 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 509.76 mV | _____    | _____    | - 504.24 mV |
| Ch1 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 512.97 mV | _____    | _____    | + 519.03 mV |
| Ch1 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch1 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 536.26 mV | _____    | _____    | + 543.74 mV |
| Ch1 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 543.74 mV | _____    | _____    | - 536.26 mV |
| Ch1 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset | + 574.19 mV | _____    | _____    | + 585.81 mV |
| Ch1 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset | - 585.81 mV | _____    | _____    | - 574.19 mV |

| DC voltage measurement accuracy (averaged), <4 GHz models, 50 $\Omega$   |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch1 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch1 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch1 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch1 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch1 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch1 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch1 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch1 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch1 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch1 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch1 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch1 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |
| Ch1 1.0 V Vert scale setting,<br>0 Div position setting, +2.0 V offset   | + 4.742 V   | _____    | _____    | + 5.258 V   |
| Ch1 1.0 V Vert scale setting,<br>0 Div position setting, -2.0 V offset   | - 5.258 V   | _____    | _____    | - 4.742 V   |
| Ch2 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 504.24 mV | _____    | _____    | + 509.76 mV |
| Ch2 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 509.76 mV | _____    | _____    | - 504.24 mV |
| Ch2 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 512.97 mV | _____    | _____    | + 519.03 mV |
| Ch2 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch2 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 536.26 mV | _____    | _____    | + 543.74 mV |
| Ch2 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 543.74 mV | _____    | _____    | - 536.26 mV |
| Ch2 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 574.19 mV | _____    | _____    | + 585.81 mV |

| DC voltage measurement accuracy (averaged), <4 GHz models, 50 $\Omega$   |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch2 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 585.81 mV | _____    | _____    | - 574.19 mV |
| Ch2 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch2 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch2 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch2 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch2 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch2 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch2 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch2 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch2 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch2 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch2 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch2 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |
| Ch2 1.0 V Vert scale setting,<br>0 Div position setting, +2.0 V offset   | + 4.742 V   | _____    | _____    | + 5.258 V   |
| Ch2 1.0 V Vert scale setting,<br>0 Div position setting, -2.0 V offset   | - 5.258 V   | _____    | _____    | - 4.742 V   |
| Ch3 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 504.24 mV | _____    | _____    | + 509.76 mV |
| Ch3 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 509.76 mV | _____    | _____    | - 504.24 mV |
| Ch3 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 512.97 mV | _____    | _____    | + 519.03 mV |
| Ch3 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch3 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 536.26 mV | _____    | _____    | + 543.74 mV |
| Ch3 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 543.74 mV | _____    | _____    | - 536.26 mV |

| DC voltage measurement accuracy (averaged), <4 GHz models, 50 $\Omega$   |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch3 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 574.19 mV | _____    | _____    | + 585.81 mV |
| Ch3 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 585.81 mV | _____    | _____    | - 574.19 mV |
| Ch3 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch3 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch3 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch3 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch3 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch3 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch3 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch3 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch3 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch3 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch3 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch3 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |
| Ch3 1.0 V Vert scale setting,<br>0 Div position setting, +2.0 V offset   | + 4.742 V   | _____    | _____    | + 5.258 V   |
| Ch3 1.0 V Vert scale setting,<br>0 Div position setting, -2.0 V offset   | - 5.258 V   | _____    | _____    | - 4.742 V   |
| Ch4 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 504.24 mV | _____    | _____    | + 509.76 mV |
| Ch4 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 509.76 mV | _____    | _____    | - 504.24 mV |
| Ch4 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 512.97 mV | _____    | _____    | + 519.03 mV |
| Ch4 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch4 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 536.26 mV | _____    | _____    | + 543.74 mV |

| DC voltage measurement accuracy (averaged), <4 GHz models, 50 $\Omega$   |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch4 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 543.74 mV | _____    | _____    | - 536.26 mV |
| Ch4 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 574.19 mV | _____    | _____    | + 585.81 mV |
| Ch4 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 585.81 mV | _____    | _____    | - 574.19 mV |
| Ch4 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch4 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch4 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch4 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch4 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch4 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch4 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch4 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch4 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch4 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch4 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch4 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |
| Ch4 1.0 V Vert scale setting,<br>0 Div position setting, +2.0 V offset   | + 4.742 V   | _____    | _____    | + 5.258 V   |
| Ch4 1.0 V Vert scale setting,<br>0 Div position setting, -2.0 V offset   | - 5.258 V   | _____    | _____    | - 4.742 V   |

| DC voltage measurement accuracy (averaged), <4 GHz models, 1 M $\Omega$ |             |          |          |             |
|-------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                             | Minimum     | Incoming | Outgoing | Maximum     |
| Ch1 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 504.24 mV | _____    | _____    | + 509.76 mV |
| Ch1 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 509.76 mV | _____    | _____    | - 504.24 mV |
| Ch1 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 512.97 mV | _____    | _____    | + 519.03 mV |

| DC voltage measurement accuracy (averaged), <4 GHz models, 1 M $\Omega$  |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch1 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch1 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 536.26 mV | _____    | _____    | + 543.74 mV |
| Ch1 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 543.74 mV | _____    | _____    | - 536.26 mV |
| Ch1 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 574.19 mV | _____    | _____    | + 585.81 mV |
| Ch1 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 585.81 mV | _____    | _____    | - 574.19 mV |
| Ch1 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch1 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch1 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch1 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch1 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch1 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch1 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch1 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch1 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch1 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch1 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch1 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |
| Ch1 1.0 V Vert scale setting,<br>0 Div position setting, +96.0 V offset  | + 98.390 V  | _____    | _____    | + 99.610 V  |
| Ch1 1.0 V Vert scale setting,<br>0 Div position setting, -96.0 V offset  | - 99.610 V  | _____    | _____    | - 98.390 V  |
| Ch2 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 504.24 mV | _____    | _____    | + 509.76 mV |
| Ch2 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 509.76 mV | _____    | _____    | - 504.24 mV |

| DC voltage measurement accuracy (averaged), <4 GHz models, 1 M $\Omega$  |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch2 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 512.97 mV | _____    | _____    | + 519.03 mV |
| Ch2 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch2 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 536.26 mV | _____    | _____    | + 543.74 mV |
| Ch2 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 543.74 mV | _____    | _____    | - 536.26 mV |
| Ch2 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 574.19 mV | _____    | _____    | + 585.81 mV |
| Ch2 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 585.81 mV | _____    | _____    | - 574.19 mV |
| Ch2 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch2 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch2 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch2 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch2 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch2 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch2 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch2 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch2 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch2 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch2 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch2 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |
| Ch2 1.0 V Vert scale setting,<br>0 Div position setting, +96.0 V offset  | + 98.390 V  | _____    | _____    | + 99.610 V  |
| Ch2 1.0 V Vert scale setting,<br>0 Div position setting, -96.0 V offset  | - 99.610 V  | _____    | _____    | - 98.390 V  |
| Ch3 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 504.24 mV | _____    | _____    | + 509.76 mV |

| DC voltage measurement accuracy (averaged), <4 GHz models, 1 M $\Omega$  |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch3 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 509.76 mV | _____    | _____    | - 504.24 mV |
| Ch3 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 512.97 mV | _____    | _____    | + 519.03 mV |
| Ch3 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch3 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 536.26 mV | _____    | _____    | + 543.74 mV |
| Ch3 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 543.74 mV | _____    | _____    | - 536.26 mV |
| Ch3 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 574.19 mV | _____    | _____    | + 585.81 mV |
| Ch3 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 585.81 mV | _____    | _____    | - 574.19 mV |
| Ch3 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch3 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch3 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch3 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch3 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch3 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch3 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch3 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch3 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch3 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch3 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch3 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |
| Ch3 1.0 V Vert scale setting,<br>0 Div position setting, +96.0 V offset  | + 98.390 V  | _____    | _____    | + 99.610 V  |
| Ch3 1.0 V Vert scale setting,<br>0 Div position setting, -96.0 V offset  | - 99.610 V  | _____    | _____    | - 98.390 V  |

| DC voltage measurement accuracy (averaged), <4 GHz models, 1 M $\Omega$  |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch4 1 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 504.24 mV | _____    | _____    | + 509.76 mV |
| Ch4 1 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 509.76 mV | _____    | _____    | - 504.24 mV |
| Ch4 2 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 512.97 mV | _____    | _____    | + 519.03 mV |
| Ch4 2 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 519.03 mV | _____    | _____    | - 512.97 mV |
| Ch4 5 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset   | + 536.26 mV | _____    | _____    | + 543.74 mV |
| Ch4 5 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset   | - 543.74 mV | _____    | _____    | - 536.26 mV |
| Ch4 10 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 574.19 mV | _____    | _____    | + 585.81 mV |
| Ch4 10 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 585.81 mV | _____    | _____    | - 574.19 mV |
| Ch4 20 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 651.62 mV | _____    | _____    | + 668.38 mV |
| Ch4 20 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 668.38 mV | _____    | _____    | - 651.62 mV |
| Ch4 50 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 883.81 mV | _____    | _____    | + 916.19 mV |
| Ch4 50 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 916.19 V  | _____    | _____    | - 883.81 mV |
| Ch4 90 mV Vert scale setting,<br>-5 Div position setting, +0.5 V offset  | + 1.192 V   | _____    | _____    | + 1.248 V   |
| Ch4 90 mV Vert scale setting,<br>+5 Div position setting, -0.5 V offset  | - 1.248 V   | _____    | _____    | - 1.192 V   |
| Ch4 100 mV Vert scale setting,<br>0 Div position setting, +4.5 V offset  | + 4.746 V   | _____    | _____    | + 4.854 V   |
| Ch4 100 mV Vert scale setting,<br>0 Div position setting, -4.5 V offset  | - 4.854 V   | _____    | _____    | - 4.746 V   |
| Ch4 200 mV Vert scale setting,<br>-2 Div position setting, +4.6 V offset | + 4.725 V   | _____    | _____    | + 4.875 V   |
| Ch4 200 mV Vert scale setting,<br>+2 Div position setting, -4.6 V offset | - 4.875 V   | _____    | _____    | - 4.725 V   |
| Ch4 500 mV Vert scale setting,<br>-2 Div position setting, +5.0 V offset | + 4.345 V   | _____    | _____    | + 4.655 V   |
| Ch4 500 mV Vert scale setting,<br>+2 Div position setting, -5.0 V offset | - 4.655 V   | _____    | _____    | - 4.345 V   |

| DC voltage measurement accuracy (averaged), <4 GHz models, 1 M $\Omega$ |            |          |          |            |
|-------------------------------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                                             | Minimum    | Incoming | Outgoing | Maximum    |
| Ch4 1.0 V Vert scale setting,<br>0 Div position setting, +96.0 V offset | + 98.390 V | _____    | _____    | + 99.610 V |
| Ch4 1.0 V Vert scale setting,<br>0 Div position setting, -96.0 V offset | - 99.610 V | _____    | _____    | - 98.390 V |

| DC gain accuracy (averaged), >20 GHz models       |           |          |          |           |
|---------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                       | Minimum   | Incoming | Outgoing | Maximum   |
| Ch1 6.25 mV Vert scale setting<br>0 V termination |           |          |          |           |
| 0 Div position setting, 0 V offset                | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| Ch1 10 mV Vert scale setting,<br>0 V termination  |           |          |          |           |
| 0 Div position setting, 0 V offset                | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |

| DC gain accuracy (averaged), >20 GHz models      |            |          |          |            |
|--------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                      | Minimum    | Incoming | Outgoing | Maximum    |
| Ch1 20 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| Ch1 50 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |

| DC gain accuracy (averaged), >20 GHz models       |          |          |          |          |
|---------------------------------------------------|----------|----------|----------|----------|
| Instrument performance test                       | Minimum  | Incoming | Outgoing | Maximum  |
| Ch1 100 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| +3.4 V termination                                |          |          |          |          |
| 0 Div position setting, +3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -3.4 V termination                                |          |          |          |          |
| 0 Div position setting, -3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -1.5 V termination                                |          |          |          |          |
| 0 Div position setting, -1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| Ch1 120 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| +3.4 V termination                                |          |          |          |          |
| -5 Div position setting, +3.4 V offset            | 705.6 mV | _____    | _____    | 734.4 mV |
| -5 Div position setting, +2.4 V offset            | 705.6 mV | _____    | _____    | 734.4 mV |
| -3.4 V termination                                |          |          |          |          |
| 5 Div position setting, -3.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 5 Div position setting, -2.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| -1.5 V termination                                |          |          |          |          |
| 5 Div position setting, -1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 5 Div position setting, -0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| Ch1 140 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, -1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, 0 V offset                | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, +1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |
| Ch1 200 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, -0.9 V offset             | 1176 mV  | _____    | _____    | 1224 mV  |
| 0 Div position setting, 0 V offset                | 1176 mV  | _____    | _____    | 1224 mV  |
| 0 Div position setting, +0.9 V offset             | 1176 mV  | _____    | _____    | 1224 mV  |

| DC gain accuracy (averaged), >20 GHz models       |           |          |          |           |
|---------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                       | Minimum   | Incoming | Outgoing | Maximum   |
| Ch1 400 mV Vert scale setting,<br>0 V termination |           |          |          |           |
| 0 Div position setting, -0.3 V offset             | 2352 mV   | _____    | _____    | 2448 mV   |
| 0 Div position setting, 0 V offset                | 2352 mV   | _____    | _____    | 2448 mV   |
| 0 Div position setting, +0.3 V offset             | 2352 mV   | _____    | _____    | 2448 mV   |
| Ch2 6.25 mV Vert scale setting<br>0 V termination |           |          |          |           |
| 0 Div position setting, 0 V offset                | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| Ch2 10 mV Vert scale setting,<br>0 V termination  |           |          |          |           |
| 0 Div position setting, 0 V offset                | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |

| DC gain accuracy (averaged), >20 GHz models      |            |          |          |            |
|--------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                      | Minimum    | Incoming | Outgoing | Maximum    |
| Ch2 20 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| Ch2 50 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |

| DC gain accuracy (averaged), >20 GHz models       |          |          |          |          |
|---------------------------------------------------|----------|----------|----------|----------|
| Instrument performance test                       | Minimum  | Incoming | Outgoing | Maximum  |
| Ch2 100 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| +3.4 V termination                                |          |          |          |          |
| 0 Div position setting, +3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -3.4 V termination                                |          |          |          |          |
| 0 Div position setting, -3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -1.5 V termination                                |          |          |          |          |
| 0 Div position setting, -1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| Ch2 120 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| +3.4 V termination                                |          |          |          |          |
| 0 Div position setting, +3.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +2.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| -3.4 V termination                                |          |          |          |          |
| 0 Div position setting, -3.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -2.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| -1.5 V termination                                |          |          |          |          |
| 0 Div position setting, -1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| Ch2 140 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, -1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, 0 V offset                | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, +1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |
| Ch2 200 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, -0.9 V offset             | 1176 mV  | _____    | _____    | 1224 mV  |
| 0 Div position setting, 0 V offset                | 1176 mV  | _____    | _____    | 1224 mV  |
| 0 Div position setting, +0.9 V offset             | 1176 mV  | _____    | _____    | 1224 mV  |

| DC gain accuracy (averaged), >20 GHz models       |           |          |          |           |
|---------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                       | Minimum   | Incoming | Outgoing | Maximum   |
| Ch2 400 mV Vert scale setting,<br>0 V termination |           |          |          |           |
| 0 Div position setting, -0.3 V offset             | 2352 mV   | _____    | _____    | 2448 mV   |
| 0 Div position setting, 0 V offset                | 2352 mV   | _____    | _____    | 2448 mV   |
| 0 Div position setting, +0.3 V offset             | 2352 mV   | _____    | _____    | 2448 mV   |
| Ch3 6.25 mV Vert scale setting<br>0 V termination |           |          |          |           |
| 0 Div position setting, 0 V offset                | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| Ch3 10 mV Vert scale setting,<br>0 V termination  |           |          |          |           |
| 0 Div position setting, 0 V offset                | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |

| DC gain accuracy (averaged), >20 GHz models      |            |          |          |            |
|--------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                      | Minimum    | Incoming | Outgoing | Maximum    |
| Ch3 20 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| Ch3 50 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |

| DC gain accuracy (averaged), >20 GHz models       |          |          |          |          |
|---------------------------------------------------|----------|----------|----------|----------|
| Instrument performance test                       | Minimum  | Incoming | Outgoing | Maximum  |
| Ch3 100 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| +3.4 V termination                                |          |          |          |          |
| 0 Div position setting, +3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -3.4 V termination                                |          |          |          |          |
| 0 Div position setting, -3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -1.5 V termination                                |          |          |          |          |
| 0 Div position setting, -1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| Ch3 120 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| +3.4 V termination                                |          |          |          |          |
| 0 Div position setting, +3.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +2.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| -3.4 V termination                                |          |          |          |          |
| 0 Div position setting, -3.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -2.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| -1.5 V termination                                |          |          |          |          |
| 0 Div position setting, -1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| Ch3 140 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, -1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, 0 V offset                | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, +1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |
| Ch3 200 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, -0.9 V offset             | 1176 mV  | _____    | _____    | 1224 mV  |
| 0 Div position setting, 0 V offset                | 1176 mV  | _____    | _____    | 1224 mV  |
| 0 Div position setting, +0.9 V offset             | 1176 mV  | _____    | _____    | 1224 mV  |

| DC gain accuracy (averaged), >20 GHz models       |           |          |          |           |
|---------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                       | Minimum   | Incoming | Outgoing | Maximum   |
| Ch3 400 mV Vert scale setting,<br>0 V termination |           |          |          |           |
| 0 Div position setting, -0.3 V offset             | 2352 mV   | _____    | _____    | 2448 mV   |
| 0 Div position setting, 0 V offset                | 2352 mV   | _____    | _____    | 2448 mV   |
| 0 Div position setting, +0.3 V offset             | 2352 mV   | _____    | _____    | 2448 mV   |
| Ch4 6.25 mV Vert scale setting<br>0 V termination |           |          |          |           |
| 0 Div position setting, 0 V offset                | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1 V offset               | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, +2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -2.4 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -1.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| 0 Div position setting, -0.5 V offset             | 37.24 mV  | _____    | _____    | 38.76 mV  |
| Ch4 10 mV Vert scale setting,<br>0 V termination  |           |          |          |           |
| 0 Div position setting, 0 V offset                | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1 V offset               | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +1.5 V termination                                |           |          |          |           |
| 0 Div position setting, +2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| +3.4 V termination                                |           |          |          |           |
| 0 Div position setting, +3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, +2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -3.4 V termination                                |           |          |          |           |
| 0 Div position setting, -3.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -2.4 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| -1.5 V termination                                |           |          |          |           |
| 0 Div position setting, -2.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -1.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |
| 0 Div position setting, -0.5 V offset             | + 58.8 mV | _____    | _____    | + 61.2 mV |

| DC gain accuracy (averaged), >20 GHz models      |            |          |          |            |
|--------------------------------------------------|------------|----------|----------|------------|
| Instrument performance test                      | Minimum    | Incoming | Outgoing | Maximum    |
| Ch4 20 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1 V offset              | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, +2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -2.4 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -1.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| 0 Div position setting, -0.5 V offset            | + 117.6 mV | _____    | _____    | + 122.4 mV |
| Ch4 50 mV Vert scale setting,<br>0 V termination |            |          |          |            |
| 0 Div position setting, 0 V offset               | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1 V offset              | + 294 mV   | _____    | _____    | + 306 mV   |
| +1.5 V termination                               |            |          |          |            |
| 0 Div position setting, +2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| +3.4 V termination                               |            |          |          |            |
| 0 Div position setting, +3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, +2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -3.4 V termination                               |            |          |          |            |
| 0 Div position setting, -3.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -2.4 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| -1.5 V termination                               |            |          |          |            |
| 0 Div position setting, -2.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -1.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |
| 0 Div position setting, -0.5 V offset            | + 294 mV   | _____    | _____    | + 306 mV   |

| DC gain accuracy (averaged), >20 GHz models       |          |          |          |          |
|---------------------------------------------------|----------|----------|----------|----------|
| Instrument performance test                       | Minimum  | Incoming | Outgoing | Maximum  |
| Ch4 100 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -1 V offset               | + 588 mV | _____    | _____    | + 612 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| +3.4 V termination                                |          |          |          |          |
| 0 Div position setting, +3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, +2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -3.4 V termination                                |          |          |          |          |
| 0 Div position setting, -3.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -2.4 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| -1.5 V termination                                |          |          |          |          |
| 0 Div position setting, -1.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| 0 Div position setting, -0.5 V offset             | + 588 mV | _____    | _____    | + 612 mV |
| Ch4 120 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, 0 V offset                | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -1 V offset               | 705.6 mV | _____    | _____    | 734.4 mV |
| +1.5 V termination                                |          |          |          |          |
| 0 Div position setting, +2.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| +3.4 V termination                                |          |          |          |          |
| 0 Div position setting, +3.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, +2.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| -3.4 V termination                                |          |          |          |          |
| 0 Div position setting, -3.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -2.4 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| -1.5 V termination                                |          |          |          |          |
| 0 Div position setting, -1.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| 0 Div position setting, -0.5 V offset             | 705.6 mV | _____    | _____    | 734.4 mV |
| Ch4 140 mV Vert scale setting,<br>0 V termination |          |          |          |          |
| 0 Div position setting, -1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, 0 V offset                | 823.2 mV | _____    | _____    | 856.8 mV |
| 0 Div position setting, +1 V offset               | 823.2 mV | _____    | _____    | 856.8 mV |

| DC gain accuracy (averaged), >20 GHz models       |         |          |          |         |
|---------------------------------------------------|---------|----------|----------|---------|
| Instrument performance test                       | Minimum | Incoming | Outgoing | Maximum |
| Ch4 200 mV Vert scale setting,<br>0 V termination |         |          |          |         |
| 0 Div position setting, -0.9 V offset             | 1176 mV | _____    | _____    | 1224 mV |
| 0 Div position setting, 0 V offset                | 1176 mV | _____    | _____    | 1224 mV |
| 0 Div position setting, +0.9 V offset             | 1176 mV | _____    | _____    | 1224 mV |
| Ch4 400 mV Vert scale setting,<br>0 V termination |         |          |          |         |
| 0 Div position setting, -0.3 V offset             | 2352 mV | _____    | _____    | 2448 mV |
| 0 Div position setting, 0 V offset                | 2352 mV | _____    | _____    | 2448 mV |
| 0 Div position setting, +0.3 V offset             | 2352 mV | _____    | _____    | 2448 mV |

| DC gain accuracy (averaged), ≥4 GHz, ≤20 GHz models                  |             |          |          |             |
|----------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                          | Minimum     | Incoming | Outgoing | Maximum     |
| Ch1 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset  | + 74.48 mV  | _____    | _____    | + 77.52 mV  |
| -5 Div position setting, +0.45 V offset                              | + 74.48 mV  | _____    | _____    | + 77.52 mV  |
| +5 Div position setting, -0.45 V offset                              | + 74.48 mV  | _____    | _____    | + 77.52 mV  |
| Ch1 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset  | + 148.96 mV | _____    | _____    | + 155.04 mV |
| -5 Div position setting, +0.4 V offset                               | + 148.96 mV | _____    | _____    | + 155.04 mV |
| +5 Div position setting, -0.4 V offset                               | + 148.96 mV | _____    | _____    | + 155.04 mV |
| Ch1 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset  | + 372.40 mV | _____    | _____    | + 387.60 mV |
| -5 Div position setting, +0.25 V offset                              | + 372.40 mV | _____    | _____    | + 387.60 mV |
| +5 Div position setting, -0.25 V offset                              | + 372.40 mV | _____    | _____    | + 387.60 mV |
| Ch1 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset | + 744.80 mV | _____    | _____    | + 775.20 mV |
| -5 Div position setting, +2.0 V offset                               | + 744.80 mV | _____    | _____    | + 775.20 mV |
| +5 Div position setting, -2.0 V offset                               | + 744.80 mV | _____    | _____    | + 775.20 mV |
| Ch1 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset | + 1.49 V    | _____    | _____    | + 1.55 V    |
| -5 Div position setting, +1.25 V offset                              | + 1.849 V   | _____    | _____    | + 1.55 V    |
| +5 Div position setting, -1.25 V offset                              | + 1.49 V    | _____    | _____    | + 1.55 V    |
| Ch1 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset | + 3.724 V   | _____    | _____    | + 3.876 V   |
| -5 Div position setting, 0 V offset                                  | + 3.724 V   | _____    | _____    | + 3.876 V   |
| +5 Div position setting, 0 V offset                                  | + 3.724 V   | _____    | _____    | + 3.876 V   |
| Ch2 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset  | + 74.48 mV  | _____    | _____    | + 77.52 mV  |
| -5 Div position setting, +0.45 V offset                              | + 74.48 mV  | _____    | _____    | + 77.52 mV  |
| +5 Div position setting, -0.45 V offset                              | + 74.48 mV  | _____    | _____    | + 77.52 mV  |
| Ch2 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset  | + 148.96 mV | _____    | _____    | + 155.04 mV |
| -5 Div position setting, +0.4 V offset                               | + 148.96 mV | _____    | _____    | + 155.04 mV |
| +5 Div position setting, -0.4 V offset                               | + 148.96 mV | _____    | _____    | + 155.04 mV |

| DC gain accuracy (averaged), $\geq 4$ GHz, $\leq 20$ GHz models                                                                                            |                                           |              |              |                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------|--------------|-------------------------------------------|
| Instrument performance test                                                                                                                                | Minimum                                   | Incoming     | Outgoing     | Maximum                                   |
| Ch2 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.25 V offset<br>+5 Div position setting, -0.25 V offset  | + 372.40 mV<br>+ 372.40 mV<br>+ 372.40 mV | <br><br><br> | <br><br><br> | + 387.60 mV<br>+ 387.60 mV<br>+ 387.60 mV |
| Ch2 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +2.0 V offset<br>+5 Div position setting, -2.0 V offset   | + 744.80 mV<br>+ 744.80 mV<br>+ 744.80 mV | <br><br><br> | <br><br><br> | + 775.20 mV<br>+ 775.20 mV<br>+ 775.20 mV |
| Ch2 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +1.25 V offset<br>+5 Div position setting, -1.25 V offset | + 1.49 V<br>+ 1.49 V<br>+ 1.49 V          | <br><br><br> | <br><br><br> | + 1.55 V<br>+ 1.55 V<br>+ 1.55 V          |
| Ch2 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, 0 V offset<br>+5 Div position setting, 0 V offset         | + 3.724 V<br>+ 3.724 V<br>+ 3.724 V       | <br><br><br> | <br><br><br> | + 3.876 V<br>+ 3.876 V<br>+ 3.876 V       |
| Ch3 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.45 V offset<br>+5 Div position setting, -0.45 V offset  | + 74.48 mV<br>+ 74.48 mV<br>+ 74.48 mV    | <br><br><br> | <br><br><br> | + 77.52 mV<br>+ 77.52 mV<br>+ 77.52 mV    |
| Ch3 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.4 V offset<br>+5 Div position setting, -0.4 V offset    | + 148.96 mV<br>+ 148.96 mV<br>+ 148.96 mV | <br><br><br> | <br><br><br> | + 155.04 mV<br>+ 155.04 mV<br>+ 155.04 mV |
| Ch3 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.25 V offset<br>+5 Div position setting, -0.25 V offset  | + 372.40 mV<br>+ 372.40 mV<br>+ 372.40 mV | <br><br><br> | <br><br><br> | + 387.60 mV<br>+ 387.60 mV<br>+ 387.60 mV |
| Ch3 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +2.0 V offset<br>+5 Div position setting, -2.0 V offset   | + 744.80 mV<br>+ 744.80 mV<br>+ 744.80 mV | <br><br><br> | <br><br><br> | + 775.20 mV<br>+ 775.20 mV<br>+ 775.20 mV |
| Ch3 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +1.25 V offset<br>+5 Div position setting, -1.25 V offset | + 1.49 V<br>+ 1.49 V<br>+ 1.49 V          | <br><br><br> | <br><br><br> | + 1.55 V<br>+ 1.55 V<br>+ 1.55 V          |
| Ch3 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, 0 V offset<br>+5 Div position setting, 0 V offset         | + 3.724 V<br>+ 3.724 V<br>+ 3.724 V       | <br><br><br> | <br><br><br> | + 3.876 V<br>+ 3.876 V<br>+ 3.876 V       |
| Ch4 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.45 V offset<br>+5 Div position setting, -0.45 V offset  | + 74.48 mV<br>+ 74.48 mV<br>+ 74.48 mV    | <br><br><br> | <br><br><br> | + 77.52 mV<br>+ 77.52 mV<br>+ 77.52 mV    |

| DC gain accuracy (averaged), $\geq 4$ GHz, $\leq 20$ GHz models                                                                                            |                                           |              |              |                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------|--------------|-------------------------------------------|
| Instrument performance test                                                                                                                                | Minimum                                   | Incoming     | Outgoing     | Maximum                                   |
| Ch4 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.4 V offset<br>+5 Div position setting, -0.4 V offset    | + 148.96 mV<br>+ 148.96 mV<br>+ 148.96 mV | <br><br><br> | <br><br><br> | + 155.04 mV<br>+ 155.04 mV<br>+ 155.04 mV |
| Ch4 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.25 V offset<br>+5 Div position setting, -0.25 V offset  | + 372.40 mV<br>+ 372.40 mV<br>+ 372.40 mV | <br><br><br> | <br><br><br> | + 387.60 mV<br>+ 387.60 mV<br>+ 387.60 mV |
| Ch4 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +2.0 V offset<br>+5 Div position setting, -2.0 V offset   | + 744.80 mV<br>+ 744.80 mV<br>+ 744.80 mV | <br><br><br> | <br><br><br> | + 775.20 mV<br>+ 775.20 mV<br>+ 775.20 mV |
| Ch4 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +1.25 V offset<br>+5 Div position setting, -1.25 V offset | + 1.49 V<br>+ 1.49 V<br>+ 1.49 V          | <br><br><br> | <br><br><br> | + 1.55 V<br>+ 1.55 V<br>+ 1.55 V          |
| Ch4 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, 0 V offset<br>+5 Div position setting, 0 V offset         | + 3.724 V<br>+ 3.724 V<br>+ 3.724 V       | <br><br><br> | <br><br><br> | + 3.876 V<br>+ 3.876 V<br>+ 3.876 V       |

| DC gain accuracy (averaged), $\geq 4$ GHz, $\leq 20$ GHz models                                                                                            |                                           |              |              |                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------|--------------|-------------------------------------------|
| Instrument performance test                                                                                                                                | Minimum                                   | Incoming     | Outgoing     | Maximum                                   |
| Ch1 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.45 V offset<br>+5 Div position setting, -0.45 V offset  | + 74.48 mV<br>+ 74.48 mV<br>+ 74.48 mV    | <br><br><br> | <br><br><br> | + 77.52 mV<br>+ 77.52 mV<br>+ 77.52 mV    |
| Ch1 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.4 V offset<br>+5 Div position setting, -0.4 V offset    | + 148.96 mV<br>+ 148.96 mV<br>+ 148.96 mV | <br><br><br> | <br><br><br> | + 155.04 mV<br>+ 155.04 mV<br>+ 155.04 mV |
| Ch1 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.25 V offset<br>+5 Div position setting, -0.25 V offset  | + 372.40 mV<br>+ 372.40 mV<br>+ 372.40 mV | <br><br><br> | <br><br><br> | + 387.60 mV<br>+ 387.60 mV<br>+ 387.60 mV |
| Ch1 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +2.0 V offset<br>+5 Div position setting, -2.0 V offset   | + 744.80 mV<br>+ 744.80 mV<br>+ 744.80 mV | <br><br><br> | <br><br><br> | + 775.20 mV<br>+ 775.20 mV<br>+ 775.20 mV |
| Ch1 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +1.25 V offset<br>+5 Div position setting, -1.25 V offset | + 1.49 V<br>+ 1.849 V<br>+ 1.49 V         | <br><br><br> | <br><br><br> | + 1.55 V<br>+ 1.55 V<br>+ 1.55 V          |

| DC gain accuracy (averaged), ≥4 GHz, ≤20 GHz models                                                                                                        |                                           |              |              |                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------|--------------|-------------------------------------------|
| Instrument performance test                                                                                                                                | Minimum                                   | Incoming     | Outgoing     | Maximum                                   |
| Ch1 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, 0 V offset<br>+5 Div position setting, 0 V offset         | + 3.724 V<br>+ 3.724 V<br>+ 3.724 V       | <br><br><br> | <br><br><br> | + 3.876 V<br>+ 3.876 V<br>+ 3.876 V       |
| Ch2 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.45 V offset<br>+5 Div position setting, -0.45 V offset  | + 74.48 mV<br>+ 74.48 mV<br>+ 74.48 mV    | <br><br><br> | <br><br><br> | + 77.52 mV<br>+ 77.52 mV<br>+ 77.52 mV    |
| Ch2 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.4 V offset<br>+5 Div position setting, -0.4 V offset    | + 148.96 mV<br>+ 148.96 mV<br>+ 148.96 mV | <br><br><br> | <br><br><br> | + 155.04 mV<br>+ 155.04 mV<br>+ 155.04 mV |
| Ch2 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.25 V offset<br>+5 Div position setting, -0.25 V offset  | + 372.40 mV<br>+ 372.40 mV<br>+ 372.40 mV | <br><br><br> | <br><br><br> | + 387.60 mV<br>+ 387.60 mV<br>+ 387.60 mV |
| Ch2 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +2.0 V offset<br>+5 Div position setting, -2.0 V offset   | + 744.80 mV<br>+ 744.80 mV<br>+ 744.80 mV | <br><br><br> | <br><br><br> | + 775.20 mV<br>+ 775.20 mV<br>+ 775.20 mV |
| Ch2 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +1.25 V offset<br>+5 Div position setting, -1.25 V offset | + 1.49 V<br>+ 1.49 V<br>+ 1.49 V          | <br><br><br> | <br><br><br> | + 1.55 V<br>+ 1.55 V<br>+ 1.55 V          |
| Ch2 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, 0 V offset<br>+5 Div position setting, 0 V offset         | + 3.724 V<br>+ 3.724 V<br>+ 3.724 V       | <br><br><br> | <br><br><br> | + 3.876 V<br>+ 3.876 V<br>+ 3.876 V       |
| Ch3 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.45 V offset<br>+5 Div position setting, -0.45 V offset  | + 74.48 mV<br>+ 74.48 mV<br>+ 74.48 mV    | <br><br><br> | <br><br><br> | + 77.52 mV<br>+ 77.52 mV<br>+ 77.52 mV    |
| Ch3 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.4 V offset<br>+5 Div position setting, -0.4 V offset    | + 148.96 mV<br>+ 148.96 mV<br>+ 148.96 mV | <br><br><br> | <br><br><br> | + 155.04 mV<br>+ 155.04 mV<br>+ 155.04 mV |
| Ch3 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.25 V offset<br>+5 Div position setting, -0.25 V offset  | + 372.40 mV<br>+ 372.40 mV<br>+ 372.40 mV | <br><br><br> | <br><br><br> | + 387.60 mV<br>+ 387.60 mV<br>+ 387.60 mV |
| Ch3 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +2.0 V offset<br>+5 Div position setting, -2.0 V offset   | + 744.80 mV<br>+ 744.80 mV<br>+ 744.80 mV | <br><br><br> | <br><br><br> | + 775.20 mV<br>+ 775.20 mV<br>+ 775.20 mV |

| DC gain accuracy (averaged), $\geq 4$ GHz, $\leq 20$ GHz models                                                                                            |                                           |              |              |                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------|--------------|-------------------------------------------|
| Instrument performance test                                                                                                                                | Minimum                                   | Incoming     | Outgoing     | Maximum                                   |
| Ch3 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +1.25 V offset<br>+5 Div position setting, -1.25 V offset | + 1.49 V<br>+ 1.49 V<br>+ 1.49 V          | <br><br><br> | <br><br><br> | + 1.55 V<br>+ 1.55 V<br>+ 1.55 V          |
| Ch3 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, 0 V offset<br>+5 Div position setting, 0 V offset         | + 3.724 V<br>+ 3.724 V<br>+ 3.724 V       | <br><br><br> | <br><br><br> | + 3.876 V<br>+ 3.876 V<br>+ 3.876 V       |
| Ch4 10 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.45 V offset<br>+5 Div position setting, -0.45 V offset  | + 74.48 mV<br>+ 74.48 mV<br>+ 74.48 mV    | <br><br><br> | <br><br><br> | + 77.52 mV<br>+ 77.52 mV<br>+ 77.52 mV    |
| Ch4 20 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.4 V offset<br>+5 Div position setting, -0.4 V offset    | + 148.96 mV<br>+ 148.96 mV<br>+ 148.96 mV | <br><br><br> | <br><br><br> | + 155.04 mV<br>+ 155.04 mV<br>+ 155.04 mV |
| Ch4 50 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +0.25 V offset<br>+5 Div position setting, -0.25 V offset  | + 372.40 mV<br>+ 372.40 mV<br>+ 372.40 mV | <br><br><br> | <br><br><br> | + 387.60 mV<br>+ 387.60 mV<br>+ 387.60 mV |
| Ch4 100 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +2.0 V offset<br>+5 Div position setting, -2.0 V offset   | + 744.80 mV<br>+ 744.80 mV<br>+ 744.80 mV | <br><br><br> | <br><br><br> | + 775.20 mV<br>+ 775.20 mV<br>+ 775.20 mV |
| Ch4 200 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, +1.25 V offset<br>+5 Div position setting, -1.25 V offset | + 1.49 V<br>+ 1.49 V<br>+ 1.49 V          | <br><br><br> | <br><br><br> | + 1.55 V<br>+ 1.55 V<br>+ 1.55 V          |
| Ch4 500 mV Vert scale setting,<br>0 Div position setting, 0 V offset<br>-5 Div position setting, 0 V offset<br>+5 Div position setting, 0 V offset         | + 3.724 V<br>+ 3.724 V<br>+ 3.724 V       | <br><br><br> | <br><br><br> | + 3.876 V<br>+ 3.876 V<br>+ 3.876 V       |

| Offset accuracy, $> 20$ GHz models                                                                                                                       |                                    |              |              |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------|--------------|-------------------------------------|
| Instrument performance test                                                                                                                              | Minimum                            | Incoming     | Outgoing     | Maximum                             |
| Ch1 6.25 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination | -3.13 mV<br>+3.3831 V<br>-3.4169 V | <br><br><br> | <br><br><br> | +3.125 mV<br>+3.4169 V<br>-3.3831 V |
| Ch1 10 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -3.5 mV<br>+3.3827 V<br>-3.4173 V  | <br><br><br> | <br><br><br> | +3.5 mV<br>+3.4173 V<br>-3.3827 V   |

| Offset accuracy, >20 GHz models                                                                                                                          |                                     |                         |                         |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------|-------------------------|-------------------------------------|
| Instrument performance test                                                                                                                              | Minimum                             | Incoming                | Outgoing                | Maximum                             |
| Ch1 20 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -4.5 mV<br>+3.3817 V<br>-3.4183 V   | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +4.5 mV<br>+3.4183 V<br>-3.3817 V   |
| Ch1 50 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -7.5 mV<br>+3.3787 V<br>-3.4213 V   | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +7.5 mV<br>+3.4213 V<br>-3.3787 V   |
| Ch1 100 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -12.5 mV<br>+3.3737 V<br>-3.4263 V  | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +12.5 mV<br>+3.4263 V<br>-3.3737 V  |
| Ch1 120 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -14.5 mV<br>+3.3717 V<br>-3.4283 V  | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +14.5 mV<br>+3.4283 V<br>-3.3717 V  |
| Ch1 140 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0525 V<br>-16.5 mV<br>+5.9475 V  | _____<br>_____<br>_____ | _____<br>_____<br>_____ | -5.9475 V<br>+16.5 mV<br>+6.0525 V  |
| Ch1 200 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0585 V<br>-22.5 mV<br>+5.9415 V  | _____<br>_____<br>_____ | _____<br>_____<br>_____ | -5.9415 V<br>+22.5 mV<br>+6.0585 V  |
| Ch1 400 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0785 mV<br>-42.5 mV<br>+5.9215 V | _____<br>_____<br>_____ | _____<br>_____<br>_____ | -5.9215 mV<br>+42.5 mV<br>+6.0785 V |
| Ch2 6.25 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination | -3.13 mV<br>+3.3831 V<br>-3.4169 V  | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +3.125 mV<br>+3.4169 V<br>-3.3831 V |
| Ch2 10 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -3.5 mV<br>+3.3827 V<br>-3.4173 V   | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +3.5 mV<br>+3.4173 V<br>-3.3827 V   |
| Ch2 20 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -4.5 mV<br>+3.3817 V<br>-3.4183 V   | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +4.5 mV<br>+3.4183 V<br>-3.3817 V   |
| Ch2 50 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -7.5 mV<br>+3.3787 V<br>-3.4213 V   | _____<br>_____<br>_____ | _____<br>_____<br>_____ | +7.5 mV<br>+3.4213 V<br>-3.3787 V   |

| Offset accuracy, >20 GHz models                                                                                                                          |                                     |              |              |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------|--------------|-------------------------------------|
| Instrument performance test                                                                                                                              | Minimum                             | Incoming     | Outgoing     | Maximum                             |
| Ch2 100 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -12.5 mV<br>+3.3737 V<br>-3.4263 V  | <br><br><br> | <br><br><br> | +12.5 mV<br>+3.4263 V<br>-3.3737 V  |
| Ch2 120 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -14.5 mV<br>+3.3717 V<br>-3.4283 V  | <br><br><br> | <br><br><br> | +14.5 mV<br>+3.4283 V<br>-3.3717 V  |
| Ch2 140 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0525 V<br>-16.5 mV<br>+5.9475 V  | <br><br><br> | <br><br><br> | +5.9475 V<br>+16.5 mV<br>+6.0525 V  |
| Ch2 200 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0585 V<br>-22.5 mV<br>+5.9414 V  | <br><br><br> | <br><br><br> | -5.9415 V<br>+22.5 mV<br>+6.0585 V  |
| Ch2 400 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0785 mV<br>-42.5 mV<br>+5.9215 V | <br><br><br> | <br><br><br> | -5.9215 V<br>+42.5 mV<br>+6.0785 mV |
| Ch3 6.25 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination | -3.13 mV<br>+3.3831 V<br>-3.4169 V  | <br><br><br> | <br><br><br> | +3.125 mV<br>+3.4169 V<br>-3.3831 V |
| Ch3 10 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -3.5 mV<br>+3.3827 V<br>-3.4173 V   | <br><br><br> | <br><br><br> | +3.5 mV<br>+3.4173 V<br>-3.3827 V   |
| Ch3 20 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -4.5 mV<br>+3.3817 V<br>-3.4183 V   | <br><br><br> | <br><br><br> | +4.5 mV<br>+3.4183 V<br>-3.3817 V   |
| Ch3 50 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -7.5 mV<br>+3.3787 V<br>-3.4213 V   | <br><br><br> | <br><br><br> | +7.5 mV<br>+3.4213 V<br>-3.3787 V   |
| Ch3 100 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -12.5 mV<br>+3.3737 V<br>-3.4263 V  | <br><br><br> | <br><br><br> | +12.5 mV<br>+3.4263 V<br>-3.3737 V  |
| Ch3 120 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -14.5 mV<br>+3.3717 V<br>-3.4283 V  | <br><br><br> | <br><br><br> | +14.5 mV<br>+3.4283 V<br>-3.3717 V  |

| Offset accuracy, >20 GHz models                                                                                                                          |                                    |          |          |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------|----------|-------------------------------------|
| Instrument performance test                                                                                                                              | Minimum                            | Incoming | Outgoing | Maximum                             |
| Ch3 140 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0525 V<br>-16.5 mV<br>+5.9475 V | <br><br> | <br><br> | -5.9475 V<br>+16.5 mV<br>+6.0525 V  |
| Ch3 200 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0585 V<br>-22.5 mV<br>+5.9415 V | <br><br> | <br><br> | -5.9415 V<br>+22.5 mV<br>+6.0585 V  |
| Ch3 400 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0785 V<br>-42.5 mV<br>+5.9215 V | <br><br> | <br><br> | -5.9215 V<br>+42.5 mV<br>+6.0785 V  |
| Ch4 6.25 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination | -3.13 mV<br>+3.3831 V<br>-3.4169 V | <br><br> | <br><br> | +3.125 mV<br>+3.4169 V<br>-3.3831 V |
| Ch4 10 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -3.5 mV<br>+3.3827 V<br>-3.4173 V  | <br><br> | <br><br> | +3.5 mV<br>+3.4173 V<br>-3.3827 V   |
| Ch4 20 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -4.5 mV<br>+3.3817 V<br>-3.4183 V  | <br><br> | <br><br> | +4.5 mV<br>+3.4183 V<br>-3.3817 V   |
| Ch4 50 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination   | -7.5 mV<br>+3.3787 V<br>-3.4213 V  | <br><br> | <br><br> | +7.5 mV<br>+3.4213 V<br>-3.3787 V   |
| Ch4 100 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -12.5 mV<br>+3.3737 V<br>-3.4263 V | <br><br> | <br><br> | +12.5 mV<br>+3.4263 V<br>-3.3737 V  |
| Ch4 120 mV Vert scale, 0 Div position setting,<br>0 V offset, 0 V termination<br>+3.4 V offset, +3.5 V termination<br>-3.4 V offset, -3.5 V termination  | -14.5 mV<br>+3.3717 V<br>-3.4283 V | <br><br> | <br><br> | +14.5 mV<br>+3.4283 V<br>-3.3717 V  |
| Ch4 140 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination<br>0 V offset, 0 V termination<br>+6 V offset, 0 V termination            | -6.0525 V<br>-16.5 mV<br>+5.9475 V | <br><br> | <br><br> | -5.9475 V<br>+16.5 mV<br>+6.0525 V  |

| Offset accuracy, >20 GHz models                                                |           |          |          |           |
|--------------------------------------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                                                    | Minimum   | Incoming | Outgoing | Maximum   |
| Ch4 200 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination | -6.0585 V | _____    | _____    | -5.9415 V |
| 0 V offset, 0 V termination                                                    | -22.5 mV  | _____    | _____    | +22.5 mV  |
| +6 V offset, 0 V termination                                                   | +5.9415 V | _____    | _____    | +6.0585 V |
| Ch4 400 mV Vert scale, 0 Div position setting,<br>-6 V offset, 0 V termination | -6.0785 V | _____    | _____    | -5.9215 V |
| 0 V offset, 0 V termination                                                    | -42.5 mV  | _____    | _____    | +42.5 mV  |
| +6 V offset, 0 V termination                                                   | +5.9215 V | _____    | _____    | +6.0785 V |

| Offset accuracy, ≥4 GHz, ≤20 GHz models                                  |             |          |          |             |
|--------------------------------------------------------------------------|-------------|----------|----------|-------------|
| Instrument performance test                                              | Minimum     | Incoming | Outgoing | Maximum     |
| Ch1 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset | + 495.75 mV | _____    | _____    | + 504.25 mV |
| 5 Div position setting, -0.45 V offset                                   | - 504.25 mV | _____    | _____    | - 495.75 mV |
| Ch1 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset  | + 494.75 mV | _____    | _____    | + 505.25 mV |
| 5 Div position setting, -0.4 V offset                                    | - 505.25 mV | _____    | _____    | - 494.75 mV |
| Ch1 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset | + 491.75 mV | _____    | _____    | + 508.25 mV |
| 5 Div position setting, -0.25 V offset                                   | - 508.25 mV | _____    | _____    | - 491.75 mV |
| Ch1 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset | + 2.474 V   | _____    | _____    | + 2.526 V   |
| 5 Div position setting, -2.0 V offset                                    | - 2.526 V   | _____    | _____    | - 2.474 V   |
| Ch1 200 mV Vert scale setting,<br>-5 Div position setting, +1.5 V offset | + 2.464 V   | _____    | _____    | + 2.536 V   |
| 5 Div position setting, -1.5 V offset                                    | - 2.536 V   | _____    | _____    | - 2.464 V   |
| Ch1 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset    | + 2.434 V   | _____    | _____    | + 2.566 V   |
| 5 Div position setting, 0 V offset                                       | - 2.566 V   | _____    | _____    | - 2.434 V   |
| Ch2 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset | + 495.75 mV | _____    | _____    | + 504.25 mV |
| 5 Div position setting, -0.45 V offset                                   | - 504.25 mV | _____    | _____    | - 495.75 mV |
| Ch2 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset  | + 494.75 mV | _____    | _____    | + 505.25 mV |
| 5 Div position setting, -0.4 V offset                                    | - 505.25 mV | _____    | _____    | - 494.75 mV |
| Ch2 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset | + 491.75 mV | _____    | _____    | + 508.25 mV |
| 5 Div position setting, -0.25 V offset                                   | - 508.25 mV | _____    | _____    | - 491.75 mV |
| Ch2 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset | + 2.474 V   | _____    | _____    | + 2.526 V   |
| 5 Div position setting, -2.0 V offset                                    | - 2.526 V   | _____    | _____    | - 2.474 V   |
| Ch2 200 mV Vert scale setting,<br>-5 Div position setting, +1.5 V offset | + 2.464 V   | _____    | _____    | + 2.536 V   |
| 5 Div position setting, -1.5 V offset                                    | - 2.536 V   | _____    | _____    | - 2.464 V   |

| Offset accuracy, $\geq 4$ GHz, $\leq 20$ GHz models                                                                |                            |          |          |                            |
|--------------------------------------------------------------------------------------------------------------------|----------------------------|----------|----------|----------------------------|
| Instrument performance test                                                                                        | Minimum                    | Incoming | Outgoing | Maximum                    |
| Ch2 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset<br>5 Div position setting, 0 V offset        | + 2.434 V<br>- 2.566 V     | _____    | _____    | + 2.566 V<br>- 2.434 V     |
| Ch3 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset<br>5 Div position setting, -0.45 V offset | + 495.75 mV<br>- 504.25 mV | _____    | _____    | + 504.25 mV<br>- 495.75 mV |
| Ch3 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset<br>5 Div position setting, -0.4 V offset   | + 494.75 mV<br>- 505.25 mV | _____    | _____    | + 505.25 mV<br>- 494.75 mV |
| Ch3 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset<br>5 Div position setting, -0.25 V offset | + 491.75 mV<br>- 508.25 mV | _____    | _____    | + 508.25 mV<br>- 491.75 mV |
| Ch3 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset<br>5 Div position setting, -2.0 V offset  | + 2.474 V<br>- 2.526 V     | _____    | _____    | + 2.526 V<br>- 2.474 V     |
| Ch3 200 mV Vert scale setting,<br>-5 Div position setting, +1.5 V offset<br>5 Div position setting, -1.5 V offset  | + 2.464 V<br>- 2.536 V     | _____    | _____    | + 2.536 V<br>- 2.464 V     |
| Ch3 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset<br>5 Div position setting, 0 V offset        | + 2.434 V<br>- 2.566 V     | _____    | _____    | + 2.566 V<br>- 2.434 V     |
| Ch4 10 mV Vert scale setting,<br>-5 Div position setting, +0.45 V offset<br>5 Div position setting, -0.45 V offset | + 495.75 mV<br>- 504.25 mV | _____    | _____    | + 504.25 mV<br>- 495.75 mV |
| Ch4 20 mV Vert scale setting,<br>-5 Div position setting, +0.4 V offset<br>5 Div position setting, -0.4 V offset   | + 494.75 mV<br>- 505.25 mV | _____    | _____    | + 505.25 mV<br>- 494.75 mV |
| Ch4 50 mV Vert scale setting,<br>-5 Div position setting, +0.25 V offset<br>5 Div position setting, -0.25 V offset | + 491.75 mV<br>- 508.25 mV | _____    | _____    | + 508.25 mV<br>- 491.75 mV |
| Ch4 100 mV Vert scale setting,<br>-5 Div position setting, +2.0 V offset<br>5 Div position setting, -2.0 V offset  | + 2.474 V<br>- 2.526 V     | _____    | _____    | + 2.526 V<br>- 2.474 V     |
| Ch4 200 mV Vert scale setting,<br>-5 Div position setting, +1.5 V offset<br>5 Div position setting, -1.5 V offset  | + 2.464 V<br>- 2.536 V     | _____    | _____    | + 2.536 V<br>- 2.464 V     |
| Ch4 500 mV Vert scale setting,<br>-5 Div position setting, 0 V offset<br>5 Div position setting, 0 V offset        | + 2.434 V<br>- 2.566 V     | _____    | _____    | + 2.566 V<br>- 2.434 V     |

| Channel bandwidth<3.5 GHz models |         |          |          |         |
|----------------------------------|---------|----------|----------|---------|
| Instrument performance test      | Minimum | Incoming | Outgoing | Maximum |
| Ch1                              |         |          |          |         |
| 1 V                              | 3.535 V | _____    | _____    | N/A     |
| 500 mV                           | 2.12 V  | _____    | _____    | N/A     |
| 200 mV                           | 848 mV  | _____    | _____    | N/A     |
| 100 mV                           | 424 mV  | _____    | _____    | N/A     |
| 50 mV                            | 212 mV  | _____    | _____    | N/A     |
| 20 mV                            | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                            | 42.4 mV | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV | _____    | _____    | N/A     |
| Ch2                              |         |          |          |         |
| 1 V                              | 3.535 V | _____    | _____    | N/A     |
| 500 mV                           | 2.12 V  | _____    | _____    | N/A     |
| 200 mV                           | 848 V   | _____    | _____    | N/A     |
| 100 mV                           | 424 mV  | _____    | _____    | N/A     |
| 50 mV                            | 212 mV  | _____    | _____    | N/A     |
| 20 mV                            | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                            | 42.4 mV | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV | _____    | _____    | N/A     |
| Ch3                              |         |          |          |         |
| 1 V                              | 3.535 V | _____    | _____    | N/A     |
| 500 mV                           | 2.12 V  | _____    | _____    | N/A     |
| 200 mV                           | 848 V   | _____    | _____    | N/A     |
| 100 mV                           | 424 mV  | _____    | _____    | N/A     |
| 50 mV                            | 212 mV  | _____    | _____    | N/A     |
| 20 mV                            | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                            | 42.4 mV | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV | _____    | _____    | N/A     |
| Ch4                              |         |          |          |         |
| 1 V                              | 3.535 V | _____    | _____    | N/A     |
| 500 mV                           | 2.12 V  | _____    | _____    | N/A     |
| 200 mV                           | 848 V   | _____    | _____    | N/A     |
| 100 mV                           | 424 mV  | _____    | _____    | N/A     |
| 50 mV                            | 212 mV  | _____    | _____    | N/A     |
| 20 mV                            | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                            | 42.4 mV | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV | _____    | _____    | N/A     |

| Channel bandwidth≥4 GHz, ≤20 GHz models |         |          |          |         |
|-----------------------------------------|---------|----------|----------|---------|
| Instrument performance test             | Minimum | Incoming | Outgoing | Maximum |
| Ch1                                     |         |          |          |         |
| 250 mV                                  | 1.061 V | _____    | _____    | N/A     |
| 100 mV                                  | 424 mV  | _____    | _____    | N/A     |
| 50 mV                                   | 212 mV  | _____    | _____    | N/A     |
| 20 mV                                   | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                                   | 42.4 mV | _____    | _____    | N/A     |
| Ch2                                     |         |          |          |         |
| 250 mV                                  | 1.061 V | _____    | _____    | N/A     |
| 100 mV                                  | 424 mV  | _____    | _____    | N/A     |
| 50 mV                                   | 212 mV  | _____    | _____    | N/A     |
| 20 mV                                   | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                                   | 42.4 mV | _____    | _____    | N/A     |
| Ch3                                     |         |          |          |         |
| 250 mV                                  | 1.061 V | _____    | _____    | N/A     |
| 100 mV                                  | 424 mV  | _____    | _____    | N/A     |
| 50 mV                                   | 212 mV  | _____    | _____    | N/A     |
| 20 mV                                   | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                                   | 42.4 mV | _____    | _____    | N/A     |
| Ch4                                     |         |          |          |         |
| 250 mV                                  | 1.061 V | _____    | _____    | N/A     |
| 100 mV                                  | 424 mV  | _____    | _____    | N/A     |
| 50 mV                                   | 212 mV  | _____    | _____    | N/A     |
| 20 mV                                   | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                                   | 42.4 mV | _____    | _____    | N/A     |

XX

| Channel bandwidth>20 GHz models |         |          |          |         |
|---------------------------------|---------|----------|----------|---------|
| Instrument performance test     | Minimum | Incoming | Outgoing | Maximum |
| Ch1                             |         |          |          |         |
| 400 mV                          | 1131 mV | _____    | _____    | N/A     |
| 200 mV                          | 848 mV  | _____    | _____    | N/A     |
| 140 mV                          | 594 mV  | _____    | _____    | N/A     |
| 120 mV                          | 509 mV  | _____    | _____    | N/A     |
| 100 mV                          | 424 mV  | _____    | _____    | N/A     |
| 50 mV                           | 212 mV  | _____    | _____    | N/A     |
| 20 mV                           | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                           | 42.4 mV | _____    | _____    | N/A     |
| 6.25 mV                         | 26.5 mV | _____    | _____    | N/A     |
| Ch2                             |         |          |          |         |
| 400 mV                          | 1131 mV | _____    | _____    | N/A     |
| 200 mV                          | 848 mV  | _____    | _____    | N/A     |
| 140 mV                          | 594 mV  | _____    | _____    | N/A     |
| 120 mV                          | 509 mV  | _____    | _____    | N/A     |
| 100 mV                          | 424 mV  | _____    | _____    | N/A     |
| 50 mV                           | 212 mV  | _____    | _____    | N/A     |
| 20 mV                           | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                           | 42.4 mV | _____    | _____    | N/A     |
| 6.25 mV                         | 26.5 mV | _____    | _____    | N/A     |
| Ch3                             |         |          |          |         |
| 400 mV                          | 1131 mV | _____    | _____    | N/A     |
| 200 mV                          | 848 mV  | _____    | _____    | N/A     |
| 140 mV                          | 594 mV  | _____    | _____    | N/A     |
| 120 mV                          | 509 mV  | _____    | _____    | N/A     |
| 100 mV                          | 424 mV  | _____    | _____    | N/A     |
| 50 mV                           | 212 mV  | _____    | _____    | N/A     |
| 20 mV                           | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                           | 42.4 mV | _____    | _____    | N/A     |
| 6.25 mV                         | 26.5 mV | _____    | _____    | N/A     |
| Ch4                             |         |          |          |         |
| 400 mV                          | 1131 mV | _____    | _____    | N/A     |
| 200 mV                          | 848 mV  | _____    | _____    | N/A     |
| 140 mV                          | 594 mV  | _____    | _____    | N/A     |
| 120 mV                          | 509 mV  | _____    | _____    | N/A     |
| 100 mV                          | 424 mV  | _____    | _____    | N/A     |
| 50 mV                           | 212 mV  | _____    | _____    | N/A     |
| 20 mV                           | 84.8 mV | _____    | _____    | N/A     |
| 10 mV                           | 42.4 mV | _____    | _____    | N/A     |
| 6.25 mV                         | 26.5 mV | _____    | _____    | N/A     |

| Channel bandwidth 3.5 GHz models |          |          |          |         |
|----------------------------------|----------|----------|----------|---------|
| Instrument performance test      | Minimum  | Incoming | Outgoing | Maximum |
| Ch1                              |          |          |          |         |
| 1 V                              | 2.83 V   | _____    | _____    | N/A     |
| 500 mV                           | 1.41 V   | _____    | _____    | N/A     |
| 200 mV                           | 566 mV   | _____    | _____    | N/A     |
| 100 mV                           | 283 mV   | _____    | _____    | N/A     |
| 50 mV                            | 141.4 mV | _____    | _____    | N/A     |
| 20 mV                            | 56.6 mV  | _____    | _____    | N/A     |
| 10 mV                            | 28.3 mV  | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV  | _____    | _____    | N/A     |
| Ch2                              |          |          |          |         |
| 1 V                              | 2.83 V   | _____    | _____    | N/A     |
| 500 mV                           | 1.41 V   | _____    | _____    | N/A     |
| 200 mV                           | 566 mV   | _____    | _____    | N/A     |
| 100 mV                           | 283 mV   | _____    | _____    | N/A     |
| 50 mV                            | 141.4 mV | _____    | _____    | N/A     |
| 20 mV                            | 56.6 mV  | _____    | _____    | N/A     |
| 10 mV                            | 28.3 mV  | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV  | _____    | _____    | N/A     |
| Ch3                              |          |          |          |         |
| 1 V                              | 2.83 V   | _____    | _____    | N/A     |
| 500 mV                           | 1.41 V   | _____    | _____    | N/A     |
| 200 mV                           | 566 mV   | _____    | _____    | N/A     |
| 100 mV                           | 283 mV   | _____    | _____    | N/A     |
| 50 mV                            | 141.4 mV | _____    | _____    | N/A     |
| 20 mV                            | 56.6 mV  | _____    | _____    | N/A     |
| 10 mV                            | 28.3 mV  | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV  | _____    | _____    | N/A     |
| Ch4                              |          |          |          |         |
| 1 V                              | 2.83 V   | _____    | _____    | N/A     |
| 500 mV                           | 1.41 V   | _____    | _____    | N/A     |
| 200 mV                           | 566 mV   | _____    | _____    | N/A     |
| 100 mV                           | 283 mV   | _____    | _____    | N/A     |
| 50 mV                            | 141.4 mV | _____    | _____    | N/A     |
| 20 mV                            | 56.6 mV  | _____    | _____    | N/A     |
| 10 mV                            | 28.3 mV  | _____    | _____    | N/A     |
| 5 mV                             | 21.2 mV  | _____    | _____    | N/A     |

| Input resistance                                                                  |               |          |          |               |
|-----------------------------------------------------------------------------------|---------------|----------|----------|---------------|
| Instrument performance test                                                       | Minimum       | Incoming | Outgoing | Maximum       |
| <b>Input resistance, &gt;20 GHz models</b>                                        |               |          |          |               |
| Ch1 6.25 mV/div                                                                   | 48.5 $\Omega$ | _____    | _____    | 51.5 $\Omega$ |
| Ch2 6.25 mV/div                                                                   | 48.5 $\Omega$ | _____    | _____    | 51.5 $\Omega$ |
| Ch3 6.25 mV/div                                                                   | 48.5 $\Omega$ | _____    | _____    | 51.5 $\Omega$ |
| Ch4 6.25 mV/div                                                                   | 48.5 $\Omega$ | _____    | _____    | 51.5 $\Omega$ |
| Ch1 140 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| Ch2 140 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| Ch3 140 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| Ch4 140 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| <b>Input resistance, <math>\geq 4</math> GHz, <math>\leq 20</math> GHz models</b> |               |          |          |               |
| Ch1 10 mV/div                                                                     | 49.0 $\Omega$ | _____    | _____    | 51.0 $\Omega$ |
| Ch1 100 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| Ch2 10 mV/div                                                                     | 49.0 $\Omega$ | _____    | _____    | 51.0 $\Omega$ |
| Ch2 100 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| Ch3 10 mV/div                                                                     | 49.0 $\Omega$ | _____    | _____    | 51.0 $\Omega$ |
| Ch3 100 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| Ch4 10 mV/div                                                                     | 49.0 $\Omega$ | _____    | _____    | 51.0 $\Omega$ |
| Ch4 100 mV/div                                                                    | 47.8 $\Omega$ | _____    | _____    | 52.2 $\Omega$ |
| <b>TekProtect</b>                                                                 |               |          |          |               |
| Ch1 +2.2 V                                                                        | NA            | _____    | _____    | +100 $\mu$ A  |
| Ch1 -2.2 V                                                                        | -100 $\mu$ A  | _____    | _____    | NA            |
| Ch1 -65 mA                                                                        | NA            | _____    | _____    | +3.42 V       |
| Ch1 -65 mA                                                                        | -3.42 V       | _____    | _____    | NA            |
| Ch2 +2.2 V                                                                        | NA            | _____    | _____    | +100 $\mu$ A  |
| Ch2 -2.2 V                                                                        | -100 $\mu$ A  | _____    | _____    | NA            |
| Ch2 -65 mA                                                                        | NA            | _____    | _____    | +3.42 V       |
| Ch2 -65 mA                                                                        | -3.42 V       | _____    | _____    | NA            |
| Ch3 +2.2 V                                                                        | NA            | _____    | _____    | +100 $\mu$ A  |
| Ch3 -2.2 V                                                                        | -100 $\mu$ A  | _____    | _____    | NA            |
| Ch3 -65 mA                                                                        | NA            | _____    | _____    | +3.42 V       |
| Ch3 -65 mA                                                                        | -3.42 V       | _____    | _____    | NA            |
| Ch4 +2.2 V                                                                        | NA            | _____    | _____    | +100 $\mu$ A  |
| Ch4 -2.2 V                                                                        | -100 $\mu$ A  | _____    | _____    | NA            |
| Ch4 -65 mA                                                                        | NA            | _____    | _____    | +3.42 V       |
| Ch4 -65 mA                                                                        | -3.42 V       | _____    | _____    | NA            |

| Time base system                                                          |              |          |          |               |
|---------------------------------------------------------------------------|--------------|----------|----------|---------------|
| Instrument performance test                                               | Minimum      | Incoming | Outgoing | Maximum       |
| <b>Long term sample rate, delay time, and internal reference accuracy</b> |              |          |          |               |
| 10 MHz, <4 GHz models                                                     | 9999.965 kHz | _____    | _____    | 10000.035 kHz |
| 10 MHz, $\geq 4$ GHz models                                               | 9999.975 kHz | _____    | _____    | 10000.025 kHz |
| <b>External reference</b>                                                 |              |          |          |               |
| 10 MHz                                                                    | Pass/Fail    | _____    | _____    | Pass/Fail     |
| <b>Delta time measurement, &lt;4 GHz models</b>                           |              |          |          |               |
| DPO7054C only:                                                            | N/A          | _____    | _____    | 6.0 ps        |
|                                                                           | N/A          | _____    | _____    | 12.0 ps       |

| Time base system                                |         |          |          |          |
|-------------------------------------------------|---------|----------|----------|----------|
| Instrument performance test                     | Minimum | Incoming | Outgoing | Maximum  |
| <b>Delta time measurement<br/>≥4 GHz models</b> |         |          |          |          |
| MSO/DPO72004C, BWE off                          |         |          |          |          |
| 50 mV, rms                                      | N/A     | _____    | _____    | 1.172 ps |
| 50 mV, pk-pk                                    | N/A     | _____    | _____    | 11.72 ps |
| 100 mV, rms                                     | N/A     | _____    | _____    | 1.186 ps |
| 100 mV, pk-pk                                   | N/A     | _____    | _____    | 11.86 ps |
| 10 mV, rms                                      | N/A     | _____    | _____    | 1.280 ps |
| 10 mV, pk-pk                                    | N/A     | _____    | _____    | 12.80 ps |
| MSO/DPO71604C, BWE off                          |         |          |          |          |
| 10 mV, rms                                      | N/A     | _____    | _____    | 1.280 ps |
| 10 mV, pk-pk                                    | N/A     | _____    | _____    | 12.80 ps |
| 50 mV, rms                                      | N/A     | _____    | _____    | 1.172 ps |
| 50 mV, pk-pk                                    | N/A     | _____    | _____    | 11.72 ps |
| 100 mV, rms                                     | N/A     | _____    | _____    | 1.186 ps |
| 100 mV, pk-pk                                   | N/A     | _____    | _____    | 11.86 ps |
| MSO/DPO71254C, BWE off                          |         |          |          |          |
| 10 mV, rms                                      | N/A     | _____    | _____    | 1.304 ps |
| 10 mV, pk-pk                                    | N/A     | _____    | _____    | 13.04 ps |
| 50 mV, rms                                      | N/A     | _____    | _____    | 1.201 ps |
| 50 mV, pk-pk                                    | N/A     | _____    | _____    | 12.01 ps |
| 100 mV, rms                                     | N/A     | _____    | _____    | 1.205 ps |
| 100 mV, pk-pk                                   | N/A     | _____    | _____    | 12.05 ps |
| MSO/DPO70804C, BWE off                          |         |          |          |          |
| 10 mV, rms                                      | N/A     | _____    | _____    | 1.462 ps |
| 10 mV, pk-pk                                    | N/A     | _____    | _____    | 14.62 ps |
| 50 mV, rms                                      | N/A     | _____    | _____    | 1.295 ps |
| 50 mV, pk-pk                                    | N/A     | _____    | _____    | 12.95 ps |
| 100 mV, rms                                     | N/A     | _____    | _____    | 1.336 ps |
| 100 mV, pk-pk                                   | N/A     | _____    | _____    | 13.36 ps |
| MSO/DPO70604C, BWE off                          |         |          |          |          |
| 10 mV, rms                                      | N/A     | _____    | _____    | 1.625 ps |
| 10 mV, pk-pk                                    | N/A     | _____    | _____    | 16.25 ps |
| 50 mV, rms                                      | N/A     | _____    | _____    | 1.427 ps |
| 50 mV, pk-pk                                    | N/A     | _____    | _____    | 14.27 ps |
| 100 mV, rms                                     | N/A     | _____    | _____    | 1.463 ps |
| 100 mV, pk-pk                                   | N/A     | _____    | _____    | 14.63 ps |
| MSO/DPO70404C, BWE off                          |         |          |          |          |
| 10 mV, rms                                      | N/A     | _____    | _____    | 2.022 ps |
| 10 mV, pk-pk                                    | N/A     | _____    | _____    | 20.22 ps |
| 50 mV, rms                                      | N/A     | _____    | _____    | 1.762 ps |
| 50 mV, pk-pk                                    | N/A     | _____    | _____    | 17.62 ps |
| 100 mV, rms                                     | N/A     | _____    | _____    | 1.821 ps |
| 100 mV, pk-pk                                   | N/A     | _____    | _____    | 18.21 ps |
| MSO/DPO73304DX, BWE on                          |         |          |          |          |

| Time base system            |         |          |          |          |
|-----------------------------|---------|----------|----------|----------|
| Instrument performance test | Minimum | Incoming | Outgoing | Maximum  |
| 6.25 mV, rms                | N/A     | _____    | _____    | 0.803 ps |
| 6.25 mV, pk-pk              | N/A     | _____    | _____    | 8.03 ps  |
| 50 mV, rms                  | N/A     | _____    | _____    | 0.564 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 5.64 ps  |
| 100 mV, rms                 | N/A     | _____    | _____    | 0.555 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 5.55 ps  |
| MSO/DPO72504DX BWE on       |         |          |          |          |
| 6.25 mV, rms                | N/A     | _____    | _____    | 0.881 ps |
| 6.25 mV, pk-pk              | N/A     | _____    | _____    | 8.81 ps  |
| 50 mV, rms                  | N/A     | _____    | _____    | 0.639 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 6.39 ps  |
| 100 mV, rms                 | N/A     | _____    | _____    | 0.639 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 6.39 ps  |
| MSO/DPO72304DX BWE on       |         |          |          |          |
| 6.25 mV, rms                | N/A     | _____    | _____    | 0.889 ps |
| 6.25 mV, pk-pk              | N/A     | _____    | _____    | 8.89 ps  |
| 50 mV, rms                  | N/A     | _____    | _____    | 0.666 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 6.66 ps  |
| 100 mV, rms                 | N/A     | _____    | _____    | 0.677 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 6.77 ps  |
| MSO/DPO72004C, BWE on       |         |          |          |          |
| 10 mV, rms                  | N/A     | _____    | _____    | 1.336 ps |
| 10 mV, pk-pk                | N/A     | _____    | _____    | 13.36 ps |
| 50 mV, rms                  | N/A     | _____    | _____    | 1.260 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 12.60 ps |
| 100 mV, rms                 | N/A     | _____    | _____    | 1.432 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 14.32 ps |
| MSO/DPO71604C, BWE on       |         |          |          |          |
| 10 mV, rms                  | N/A     | _____    | _____    | 1.219 ps |
| 10 mV, pk-pk                | N/A     | _____    | _____    | 12.19 ps |
| 50 mV, rms                  | N/A     | _____    | _____    | 1.154 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 11.54 ps |
| 100 mV, rms                 | N/A     | _____    | _____    | 1.159 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 11.59 ps |
| MSO/DPO71254C, BWE on       |         |          |          |          |
| 10 mV, rms                  | N/A     | _____    | _____    | 1.333 ps |
| 10 mV, pk-pk                | N/A     | _____    | _____    | 13.33 ps |
| 50 mV, rms                  | N/A     | _____    | _____    | 1.212 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 12.12 ps |
| 100 mV, rms                 | N/A     | _____    | _____    | 1.228 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 12.28 ps |
| MSO/DPO70804C, BWE on       |         |          |          |          |

| Time base system            |         |          |          |          |
|-----------------------------|---------|----------|----------|----------|
| Instrument performance test | Minimum | Incoming | Outgoing | Maximum  |
| 10 mV, rms                  | N/A     | _____    | _____    | 1.354 ps |
| 10 mV, pk-pk                | N/A     | _____    | _____    | 13.54 ps |
| 50 mV, rms                  | N/A     | _____    | _____    | 1.235 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 12.35 ps |
| 100 mV, rms                 | N/A     | _____    | _____    | 1.241 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 12.41 ps |
| MSO/DPO70604C, BWE on       |         |          |          |          |
| 10 mV, rms                  | N/A     | _____    | _____    | 1.445 ps |
| 10 mV, pk-pk                | N/A     | _____    | _____    | 14.45 ps |
| 50 mV, rms                  | N/A     | _____    | _____    | 1.295 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 12.95 ps |
| 100 mV, rms                 | N/A     | _____    | _____    | 1.329 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 13.29 ps |
| MSO/DPO70404C, BWE on       |         |          |          |          |
| 10 mV, rms                  | N/A     | _____    | _____    | 1.674 ps |
| 10 mV, pk-pk                | N/A     | _____    | _____    | 16.74 ps |
| 50 mV, rms                  | N/A     | _____    | _____    | 1.437 ps |
| 50 mV, pk-pk                | N/A     | _____    | _____    | 14.37 ps |
| 100 mV, rms                 | N/A     | _____    | _____    | 1.478 ps |
| 100 mV, pk-pk               | N/A     | _____    | _____    | 14.78 ps |

| Trigger system accuracy                                  |           |          |          |           |
|----------------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                              | Minimum   | Incoming | Outgoing | Maximum   |
| Time accuracy for time qualified triggers < 4 GHz models |           |          |          |           |
| time range < 1 ms                                        |           |          |          |           |
| Lower Limit                                              | 3.5 ns    | _____    | _____    | 6.5 ns    |
| Upper Limit                                              | 3.5 ns    | _____    | _____    | 6.5 ns    |
| time range ≥ 1 μs                                        |           |          |          |           |
| Lower Limit                                              | 1.9 μs    | _____    | _____    | 2.1 μs    |
| Upper Limit                                              | 1.9 μs    | _____    | _____    | 2.1 μs    |
| Time accuracy for time qualified triggers ≥ 4 GHz models |           |          |          |           |
| time range < 1 ms                                        |           |          |          |           |
| Lower Limit                                              | 4.77 ns   | _____    | _____    | 5.23 ns   |
| Upper Limit                                              | 4.77 ns   | _____    | _____    | 5.23 ns   |
| time range ≥ 1 μs                                        |           |          |          |           |
| Lower Limit                                              | 1.9 μs    | _____    | _____    | 2.1 μs    |
| Upper Limit                                              | 1.9 μs    | _____    | _____    | 2.1 μs    |
| Ch1 trigger sensitivity, 50 MHz                          | Pass/Fail | _____    | _____    | Pass/Fail |
| Ch1 delayed trigger sensitivity ≥ 4 GHz models: 50 MHz   | Pass/Fail | _____    | _____    | Pass/Fail |
| AUX trigger input sensitivity, 50 MHz                    | Pass/Fail | _____    | _____    | Pass/Fail |
| Ch1 trigger sensitivity                                  |           |          |          |           |

| Trigger system accuracy                                                              |           |          |          |           |
|--------------------------------------------------------------------------------------|-----------|----------|----------|-----------|
| Instrument performance test                                                          | Minimum   | Incoming | Outgoing | Maximum   |
| <4 GHz models:                                                                       | Pass/Fail | _____    | _____    | Pass/Fail |
| ≥4 GHz models: 4 GHz                                                                 | Pass/Fail | _____    | _____    | Pass/Fail |
| ≥4 GHz models: 6 GHz                                                                 | Pass/Fail | _____    | _____    | Pass/Fail |
| ≥4 GHz models: 8 GHz                                                                 | Pass/Fail | _____    | _____    | Pass/Fail |
| ≥4 GHz models: 11 GHz                                                                | Pass/Fail | _____    | _____    | Pass/Fail |
| Ch1 B trigger sensitivity                                                            |           |          |          |           |
| ≥4 GHz models: 4 GHz                                                                 | Pass/Fail | _____    | _____    | Pass/Fail |
| ≥4 GHz models: 6 GHz                                                                 | Pass/Fail | _____    | _____    | Pass/Fail |
| ≥4 GHz models: 9 GHz                                                                 | Pass/Fail | _____    | _____    | Pass/Fail |
| Ch1 AUX trigger input                                                                |           |          |          |           |
| <4 GHz models: 250 MHz                                                               | Pass/Fail | _____    | _____    | Pass/Fail |
| ≥4 GHz models: 1 GHz                                                                 | Pass/Fail | _____    | _____    | Pass/Fail |
| Aux trigger out                                                                      |           |          |          |           |
| Vout Hi ≤20 GHz                                                                      | 1.0 V     | _____    | _____    | 0.25 V    |
| Vout Lo ≤20 GHz                                                                      |           | _____    | _____    |           |
| Vout Hi ≥20 GHz                                                                      | 0.5 V     | _____    | _____    | 0.125 V   |
| Vout Lo ≥20 GHz                                                                      |           | _____    | _____    |           |
| Probe compensation output signal Voltage (difference)                                |           |          |          |           |
| <4 GHz models                                                                        | 985 mV    | _____    | _____    | 1015 mV   |
| ≥4 GHz models                                                                        | 343.2 mV  | _____    | _____    | 536.8 mV  |
| Serial trigger (≥4 GHz models with Option PTH or <4 GHz models with Option PTM only) |           |          |          |           |
| Baud rate limits                                                                     |           |          |          |           |
| Serial word recognizer                                                               |           |          |          |           |
| Signal path 0, Pattern matching 1                                                    |           |          |          |           |
| Trigger 1 UI before 0                                                                | Pass      | _____    | _____    | N/A       |
| Trigger on 0                                                                         | Pass      | _____    | _____    | N/A       |
| Trigger 1 UI after 0                                                                 | Pass      | _____    | _____    | N/A       |
| Signal path 1, Pattern matching 1                                                    |           |          |          |           |
| Trigger 1 UI before 1                                                                | Pass      | _____    | _____    | N/A       |
| Trigger on 1                                                                         | Pass      | _____    | _____    | N/A       |
| Trigger 1 UI after 1                                                                 | Pass      | _____    | _____    | N/A       |
| Clock recovery frequency range                                                       | Pass      | _____    | _____    | N/A       |
| <4 GHz models                                                                        |           |          |          |           |

|                                         |                                                                                                                                                                                                                                                                             |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Signal acquisition system checks</b> | These procedures check those characteristics that relate to the signal-acquisition system and are listed as checked under <i>Warranted Characteristics</i> in <i>Specifications</i> . See <a href="#">Equipment required</a> on page 116 for test equipment specifications. |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Check DC voltage measurement accuracy >20 GHz models.

| Equipment Required                                                                                                            | Prerequisites                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| One DC calibration generator (Item 6)<br>One SMA male-to-BNC female adapter (Item 19)<br>Two Dual-Banana Connectors, (Item 5) | The instrument must meet the prerequisites.<br>(See <a href="#">Prerequisites</a> on page 116.) |



**WARNING.** The generator is capable of outputting dangerous voltages. Be sure to set the DC calibration generator to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during the performance of this procedure.

1. Install the test hookup and preset the instrument controls:
  - a. Hook up the test-signal source:
    - Set the output of a DC calibration generator to off or 0 volts.
    - Connect the output of a DC calibration generator. (See [Figure 8: DC voltage accuracy test hookup, >20 GHz models](#) on page 177.)
  - b. Initialize the instrument: Press **DEFAULT SETUP**.
  - c. Modify the default settings:
    - From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab.
    - Set the Horizontal Scale to **1 ms/div**.
    - Set the Record Length to **5000**.
    - Set the Acquisition Mode to **Hi Res**.
    - Set the Trigger Source to **Line**.

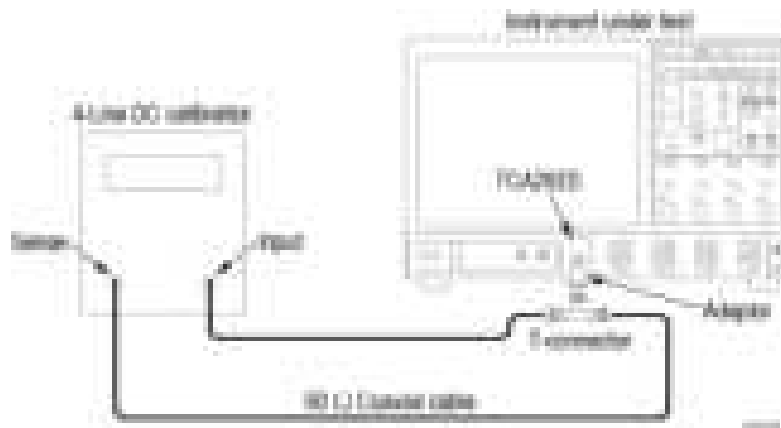


Figure 8: DC voltage accuracy test hookup, >20 GHz models

2. *Confirm input channels are within limits for DC accuracy at maximum offset, position, and termination voltage:* Do the following substeps - test Ch 1 first, skipping substep 2.a of this step since Ch 1 is already selected from step 1.

a. *Select an unchecked channel:*

- From the button bar, touch **Measure** and then **Clear All** to remove the previous measurement.
- Press the Vertical button of the channel just confirmed to remove the channel from the display.
- Press the front-panel Vertical button that corresponds to the channel you are to confirm.
- Set the generator output to 0 V.
- Move the test hookup to the channel you selected.

b. *Turn on the measurement Mean for the channel:*

- From the button bar, touch **Measure** and select the **Ampl** tab, **More**, and then touch **Mean** to measure the mean of the current channel.
- Press the **X** (Close) button.

---

**NOTE.** *If any of the voltages supplied by your generator are not calibrated, verify those generator voltages using a digital multimeter, item 27.*

---

c. *Set the vertical scale:* Set the vertical **Scale** to one of the settings listed in the following table that is not yet checked, starting with the first setting listed.

**Table 6: DC voltage measurement accuracy**

| Scale setting | Termination setting | Offset setting <sup>3</sup> | Generator setting | Accuracy limits          |
|---------------|---------------------|-----------------------------|-------------------|--------------------------|
| 6.25 mV       | +3.5 V              | +3.4 V                      | 3.419 V           | 3.4012 V to 3.4363 V     |
|               | +3.5 V              | +2.4 V                      | 2.419 V           | 2.4032 V to 2.4343 V     |
|               | +1.5 V              | +2.5 V                      | 2.509 V           | 2.49345 V to 2.52456 V   |
|               | +1.5 V              | +1.5 V                      | 1.509 V           | 1.49945 V to 1.51856     |
|               | +1.5 V              | +0.5 V                      | 509 mV            | 501.45 mV to 516.56 mV   |
|               | 0 V                 | 0 V                         | 18.5 mV           | 14.76 mV to 22.25 mV     |
|               | 0 V                 | -1.0 V                      | -991 mV           | -1.00056 V to -981.45 mV |
|               | 0 V                 | +1.0 V                      | 1.009 V           | 999.45 mV to 1.01856 V   |
|               | -3.5 V              | -3.4 V                      | -3.419 V          | -3.4363 V to -3.4012 V   |
|               | -3.5 V              | -2.4 V                      | -2.419 V          | -2.4343 V to -2.4032 V   |

<sup>3</sup> Set as precisely as the instrument's offset resolution permits.

| Scale setting | Termination setting | Offset setting <sup>3</sup> | Generator setting | Accuracy limits          |
|---------------|---------------------|-----------------------------|-------------------|--------------------------|
| 10 mV         | -1.5 V              | -2.5 V                      | -2.509 V          | -2.52456 V to -2.49345 V |
|               | -1.5 V              | -1.5 V                      | -1.509 V          | -1.51856 V to -1.49945 V |
|               | -1.5 V              | -0.5 V                      | -509 mV           | -516.56 mV to -501.45 mV |
|               | +3.5 V              | +3.4 V                      | 3.43 V            | 3.4117 V to 3.4483 V     |
|               | +3.5 V              | +2.4 V                      | 2.43 V            | 2.4137 V to 2.4463 V     |
|               | +1.5 V              | +2.5 V                      | 2.515 V           | 2.4988 V to 2.5312 V     |
|               | +1.5 V              | +1.5 V                      | 1.53 V            | 1.5195 V to 1.5405 V     |
|               | +1.5 V              | +0.5 V                      | 530 mV            | 521.5 mV to 538.5 mV     |
|               | 0 V                 | 0 V                         | 30 mV             | 25.5 mV to 34.5 mV       |
|               | 0 V                 | -1.0 V                      | -970 mV           | -980.5 mV to -959.5 mV   |
| 20 mV         | 0 V                 | +1.0 V                      | 1.03 V            | 1.0195 V to 1.0405 V     |
|               | -3.5 V              | -3.4 V                      | -3.43 V           | -3.4117 V to -3.4483 V   |
|               | -3.5 V              | -2.4 V                      | -2.43V            | -2.4137 V to -2.4463 V   |
|               | -1.5 V              | -2.5 V                      | -2.515 V          | -2.5312 V to -2.4988 V   |
|               | -1.5 V              | -1.5 V                      | -1.53 V           | -1.5405 V to -1.5195 V   |
|               | -1.5 V              | -0.5 V                      | -530 mV           | -538.5 mV to -521.5 mV   |
|               | +3.5 V              | +3.4 V                      | 3.46 V            | 3.4397 V to 3.4803 V     |
|               | +3.5 V              | +2.4 V                      | 2.46 V            | 2.4417 V to 2.4783 V     |
|               | +1.5 V              | +2.5 V                      | 2.56 V            | 2.5415 V to 2.5785 V     |
|               | +1.5 V              | +1.5 V                      | 1.56 V            | 1.5475 V to 1.5725 V     |
| 50 mV         | +1.5 V              | +0.5 V                      | 560 mV            | 549.5 mV to 570.5 mV     |
|               | 0 V                 | 0 V                         | 60 mV             | 53.5 mV to 66.5 mV       |
|               | 0 V                 | -1.0 V                      | -940 mV           | -952.5 mV to -927.5 mV   |
|               | 0 V                 | +1.0 V                      | 1.06 V            | 1.0475 V to 1.0725 V     |
|               | -3.5 V              | -3.4 V                      | -3.46 V           | -3.4803 V to -3.4397 V   |
|               | -3.5 V              | -2.4 V                      | -2.46 V           | -2.4783 V to -2.4417 V   |
|               | -1.5 V              | -2.5 V                      | -2.56 V           | -2.5785 V to -2.5415 V   |
|               | -1.5 V              | -1.5 V                      | -1.56 V           | -1.5725 V to -1.5475 V   |
|               | -1.5 V              | -0.5 V                      | -560 mV           | -570.5 mV to -549.5 mV   |
|               | +3.5 V              | +3.4 V                      | 3.55 V            | 3.5237 V to 3.5763 V     |
|               | +3.5 V              | +2.4 V                      | 2.55 V            | 2.5257 V to 2.5743 V     |
|               | +1.5 V              | +2.5 V                      | 2.65 V            | 2.6255 V to 2.6745 V     |
|               | +1.5 V              | +1.5 V                      | 1.65 V            | 1.6315 V to 1.6685 V     |
|               | +1.5 V              | +0.5 V                      | 650 mV            | 633.5 mV to 666.5 mV     |
|               | 0 V                 | 0 V                         | 150 mV            | 137.5 mV to 162.5 mV     |
|               | 0 V                 | -1.0 V                      | -850 mV           | -868.5 mV to -831.5 mV   |

<sup>3</sup> Set as precisely as the instrument's offset resolution permits.

| Scale setting | Termination setting | Offset setting <sup>3</sup> | Generator setting | Accuracy limits        |
|---------------|---------------------|-----------------------------|-------------------|------------------------|
| 100 mV        | 0 V                 | +1.0 V                      | 1.15 V            | 1.1315 V to 1.1685 V   |
|               | -3.5 V              | -3.4 V                      | -3.55 V           | -3.5763 V to -3.5237 V |
|               | -3.5 V              | -2.4 V                      | -2.55 V           | -2.5743 V to -2.5257 V |
|               | -1.5 V              | -2.5 V                      | -2.65 V           | -2.6745 V to -2.6255 V |
|               | -1.5 V              | -1.5 V                      | -1.65 V           | -1.6685 V to -1.6315 V |
|               | -1.5 V              | -0.5 V                      | -650 mV           | -666.5 mV to -633.5 mV |
|               | +3.5 V              | +3.4 V                      | 3.7 V             | 3.6637 V to 3.7363 V   |
|               | +3.5 V              | +2.4 V                      | 2.7 V             | 2.6657 V to 2.7343 V   |
|               | +1.5 V              | +2.5 V                      | 2.8 V             | 2.7655 V to 2.8345 V   |
|               | +1.5 V              | +1.5 V                      | 1.8 V             | 1.7715 V to 1.8285 V   |
|               | +1.5 V              | +0.5 V                      | 800 mV            | 773.5 mV to 826.5 mV   |
|               | 0 V                 | 0 V                         | 300 mV            | 277.5 mV to 322.5 mV   |
|               | 0 V                 | -1.0 V                      | -700 mV           | -728.5 mV to -671.5 mV |
|               | 0 V                 | +1.0 V                      | 1.3 V             | 1.2715 V to 1.3285 V   |
|               | -3.5 V              | -3.4 V                      | -3.7 V            | -3.7363 V to -3.6637 V |
| 120 mV        | -3.5 V              | -2.4 V                      | -2.7 V            | -2.7343 V to -2.6657 V |
|               | -1.5 V              | -2.5 V                      | -2.8 V            | -2.8345 V to -2.7655 V |
|               | -1.5 V              | -1.5 V                      | -1.8 V            | -1.8285 V to -1.7715 V |
|               | -1.5 V              | -0.5 V                      | -800 mV           | -826.5 mV to -773.5 mV |
|               | +3.5 V              | +3.4 V                      | 3.76 V            | 3.7197 V to 3.8003 V   |
|               | +3.5 V              | +2.4 V                      | 2.76 V            | 2.7217 V to 2.7983 V   |
|               | +1.5 V              | +2.5 V                      | 2.86 V            | 2.8215 V to 2.8985 V   |
|               | +1.5 V              | +1.5 V                      | 1.86 V            | 1.8275 V to 1.8925 V   |
|               | +1.5 V              | +0.5 V                      | 860 mV            | 829.5 mV to 890.5 mV   |
|               | 0 V                 | 0 V                         | 360 mV            | 333.5 mV to 386.5 mV   |
|               | 0 V                 | -1.0 V                      | -640 mV           | -672.5 mV to -607.5 mV |
|               | 0 V                 | +1.0 V                      | 1.36 V            | 1.3275 V to 1.3925 V   |
|               | -3.5 V              | -3.4 V                      | -3.76 V           | -3.8003 V to -3.7197 V |
|               | -3.5 V              | -2.4 V                      | -2.76 V           | -2.7983 V to -2.7217 V |
|               | -1.5 V              | -2.5 V                      | -2.86 V           | -2.8985 V to -2.8215 V |
| 140 mV        | -1.5 V              | -1.5 V                      | -1.86 V           | -1.8925 V to -1.8275 V |
|               | -1.5 V              | -0.5 V                      | -860 mV           | -890.5 mV to -829.5 mV |
|               | 0 V                 | -1.0 V                      | -580 mV           | -624.5 mV to -535.5 mV |
|               | 0 V                 | 0 V                         | 420 mV            | 379.5 mV to 460.5 mV   |
|               | 0 V                 | +1.0 V                      | 1.42 V            | 1.3755 V to 1.4645 V   |
| 200 mV        | 0 V                 | -1.0 V                      | -400 mV           | -456.5 mV to -343.5 mV |

<sup>3</sup> Set as precisely as the instrument's offset resolution permits.

| Scale setting | Termination setting | Offset setting <sup>3</sup> | Generator setting | Accuracy limits      |
|---------------|---------------------|-----------------------------|-------------------|----------------------|
|               | 0 V                 | 0 V                         | 600 mV            | 547.5 mV to 652.5 mV |
|               | 0 V                 | +1.0 V                      | 1.60 V            | 1.5435 V to 1.6565 V |
| 400 mV        | 0 V                 | -1.0 V                      | 200 mV            | 103.5 mV to 296.5 mV |
|               | 0 V                 | 0 V                         | 1.20 V            | 1.1075 V to 1.2925 V |
|               | 0 V                 | +1.0 V                      | 2.20 V            | 2.1035 V to 2.2965 V |

d. *Display the test signal:*

- Display the **Vertical Setup** menu.
- Use the keypad to set the Termination Voltage and Offset vertical settings as listed in the table for the current vertical scale setting. The baseline level may move off screen.
- Set the generator to the level and polarity indicated in the table for the vertical scale, termination voltage, and offset settings you have made.

e. *Measure the test signal:* Press the **X** (close) button. Read the measurement results at the measurement statistics **Mean** measurement readout. See the following figure.

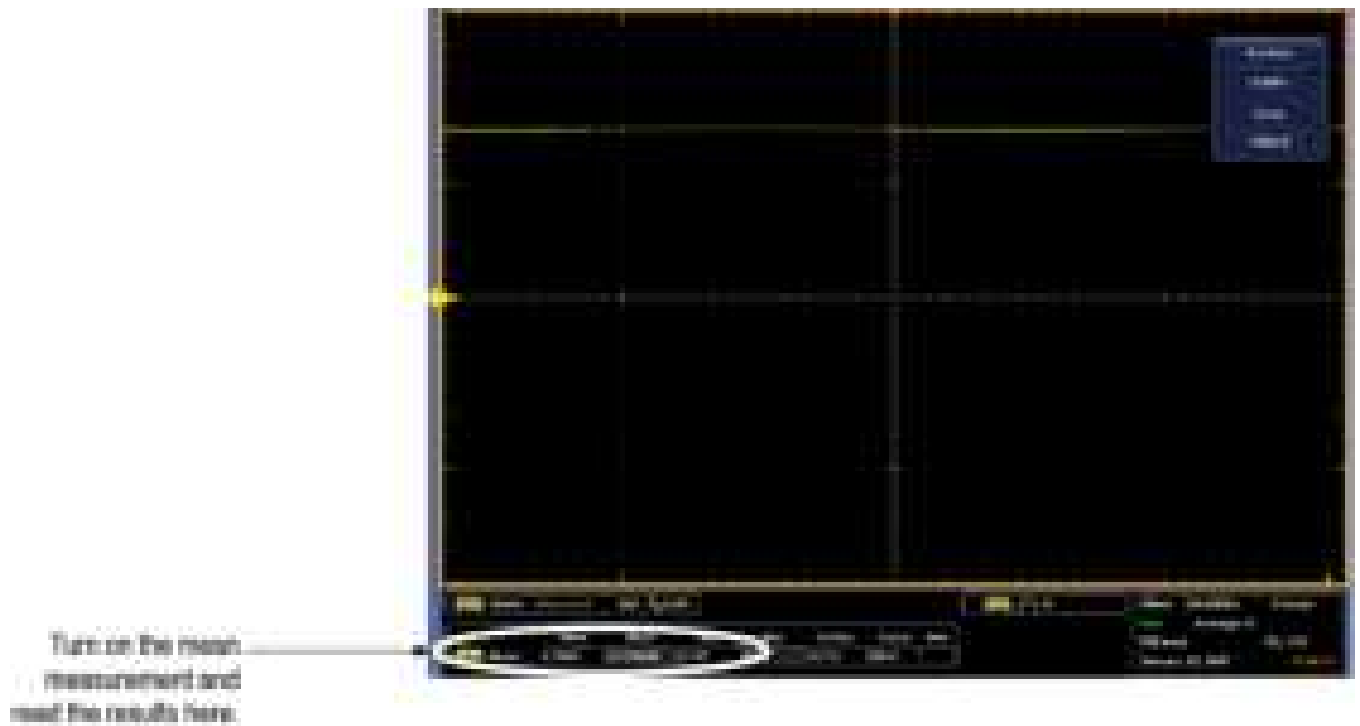


Figure 9: Measurement of DC accuracy

<sup>3</sup> Set as precisely as the instrument's offset resolution permits.

- f.** *Check against limits:*

  - CHECK that the readout for the measurement **Mean** readout on screen is within the limits listed for the current vertical scale and termination/offset/generator settings. Enter the value on test record.
  - Repeat substep 2.d, reversing the polarity of the termination voltage, offset, and generator settings as is listed in the table.
  - CHECK that the **Mean** measurement readout on screen is within the limits listed for the current vertical scale setting and termination/offset/generator settings. Enter the value on test record.
  - Repeat substeps 2.c through 2.f until all vertical scale settings are checked for the channel under test. (See [Table 6: DC voltage measurement accuracy](#) on page 178.)
- g.** *Test all channels:* Repeat substeps 2.a through 2.f for all four channels.
- 3.** *Disconnect the hookup:*

  - a.** *Set the generator output to 0 V.*
  - b.** Disconnect the equipment from the generator output and the input connector of the channel last tested.

**Check DC voltage measurement accuracy  $\leq 20$  GHz models.**

| Equipment Required                                                                    | Prerequisites                                                                                   |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| One DC calibration generator (Item 6)<br>One SMA male-to-BNC female adapter (Item 19) | The instrument must meet the prerequisites.<br>(See <a href="#">Prerequisites</a> on page 116.) |



**WARNING.** The generator is capable of outputting dangerous voltages. Be sure to set the DC calibration generator to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during the performance of this procedure.

1. Install the test hookup and preset the instrument controls:
  - a. Hook up the test-signal source:
    - Set the output of a DC calibration generator to off or 0 volts. Set the generator to drive a load impedance of 50  $\Omega$ .
    - Connect the output of a DC calibration generator. (See Figure 10: DC voltage accuracy test hookup,  $\leq 20$  GHz models.)
  - b. Initialize the instrument: Press **DEFAULT SETUP**.
  - c. Modify the default settings:
    - From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab.
    - Touch **Average** and set the number of averages to **16**.
    - < 4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .

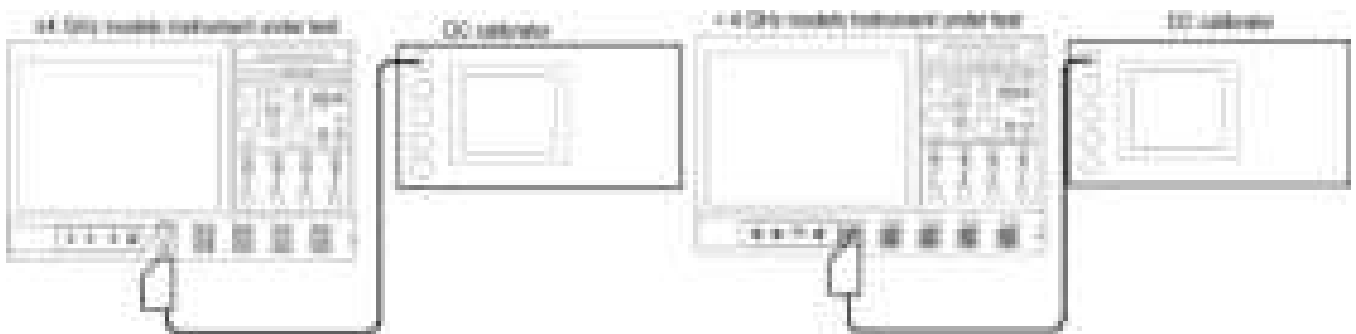


Figure 10: DC voltage accuracy test hookup,  $\leq 20$  GHz models

2. Confirm input channels are within limits for DC accuracy at maximum offset and position: Do the following substeps - test Ch 1 first, *skipping substep 2.a of this step since Ch 1 is already selected from step 1.*
  - a. Select an unchecked channel:
    - From the button bar, touch **Measure** and then **Clear All** to remove the previous measurement.

- Press the Vertical button of the channel just confirmed to remove the channel from the display.
  - Press the front-panel Vertical button that corresponds to the channel you are to confirm.
  - < 4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .
  - Set the generator output to 0 V.
  - Move the test hookup to the channel you selected.
- b. *Turn on the measurement Mean for the channel:*
- From the button bar, touch **Measure** and select the **Ampl** tab, **More**, and then touch **Mean** to measure the mean of the current channel.
  - Press the **X** (Close) button.

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**NOTE.** When setting the Fluke generator to output >5 V with the instrument termination set to 50  $\Omega$ , use the following procedure: Press the Aux button. Press the fourth soft key down (Selects the pulse with an exclamation point) Set the amplitude to 5.3 or 5.5 V Press the ->| key to select the pulse energy Set the energy to 50J, and press the Output On key Press the Trig Pulse soft key to trigger the pulse (this will generate a pulse with 25 seconds duration). Use the normal DC output for generator settings  $\leq 5$  V at termination setting 50  $\Omega$  and for any voltages at a termination setting of 1 M $\Omega$ .

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**NOTE.** If any of the voltages supplied by your generator are not calibrated, verify those generator voltages using a digital multimeter, item 27.

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- c. *Set the vertical scale:* Set the vertical **Scale** to one of the settings listed in the following table that is not yet checked, starting with the first setting listed.

**Table 7: DC voltage measurement accuracy**

| Scale setting                                                   | Position setting (Divs) | Offset setting <sup>4</sup> | Generator setting | Accuracy limits          |
|-----------------------------------------------------------------|-------------------------|-----------------------------|-------------------|--------------------------|
| <b><math>\geq 4</math> GHz, <math>\leq 20</math> GHz models</b> |                         |                             |                   |                          |
| 10 mV                                                           | -5                      | +0.45 V                     | +530 mV           | +524.75 mV to +535.25 mV |
|                                                                 | +5                      | -0.45 V                     | -530 mV           | -535.25 mV to -524.75 mV |
| 20 mV                                                           | -5                      | +0.4 V                      | +560 mV           | +552.75 mV to +567.25 mV |
|                                                                 | +5                      | -0.4 V                      | -560 mV           | -567.25 mV to -552.75 mV |

<sup>4</sup> Set as precisely as the instrument's offset resolution permits.

| Scale setting                                                               | Position setting (Divs) | Offset setting <sup>4</sup> | Generator setting | Accuracy limits          |
|-----------------------------------------------------------------------------|-------------------------|-----------------------------|-------------------|--------------------------|
| 50 mV                                                                       | -5                      | +0.25 V                     | +650 mV           | +636.75 mV to +663.25 mV |
|                                                                             | +5                      | -0.25 V                     | -650 mV           | -663.25 mV to -636.75 mV |
| 100 mV                                                                      | -5                      | +2.0 V                      | +2.8 V            | +2.764 V to 2.836 V      |
|                                                                             | +5                      | -2.0 V                      | -2.8 V            | -2.836 V to -2.764 V     |
| 200 mV                                                                      | -5                      | +1.25 V                     | +2.75 V           | +2.697 V to 2.803 V      |
|                                                                             | +5                      | -1.25 V                     | -2.75 V           | -2.803 V to -2.697 V     |
| 500 mV                                                                      | -5                      | 0 V                         | +3.5 V            | +3.394 V to 3.606 V      |
|                                                                             | +5                      | 0 V                         | -3.5 V            | -3.606 V to -3.394 V     |
| <b>&lt; 4 GHz models, 50 <math>\Omega</math> and 1 M<math>\Omega</math></b> |                         |                             |                   |                          |
| 1 mV                                                                        | -5                      | +0.5 V                      | +507 mV           | +504.24 mV to +509.76 mV |
|                                                                             | +5                      | -0.5 V                      | -507 mV           | -509.76 mV to -504.24 mV |
| 2 mV                                                                        | -5                      | +0.5 V                      | +516 mV           | +512.97 mV to +519.03 mV |
|                                                                             | +5                      | -0.5 V                      | -516 mV           | -519.03 mV to -512.97 mV |
| 5 mV                                                                        | -5                      | +0.5 V                      | +540 mV           | +536.26 mV to +543.74 mV |
|                                                                             | +5                      | -0.5 V                      | -540 mV           | -543.74 mV to -536.26 mV |
| 10 mV                                                                       | -5                      | +0.5 V                      | +580 mV           | +574.19 mV to +585.81 mV |
|                                                                             | +5                      | -0.5 V                      | -580 mV           | -585.81 mV to -574.19 mV |
| 20 mV                                                                       | -5                      | +0.5 V                      | +660 mV           | +651.62 mV to +668.38 mV |
|                                                                             | +5                      | -0.5 V                      | -660 mV           | -668.38 mV to -651.62 mV |
| 50 mV                                                                       | -5                      | +0.5 V                      | +900 mV           | +883.81 mV to +916.19 mV |
|                                                                             | +5                      | -0.5 V                      | -900 mV           | -916.19 mV to -883.81 mV |
| 90 mV                                                                       | -5                      | +0.5 V                      | +1.22 V           | +1.192 V to +1.248 V     |
|                                                                             | +5                      | -0.5 V                      | -1.22 V           | -1.248 V to -1.192 V     |
| 100 mV                                                                      | 0                       | +4.5 V                      | +4.8 V            | +4.746 V to +4.854 V     |
|                                                                             | 0                       | -4.5 V                      | -4.8 V            | -4.854 V to -4.746 V     |
| 200 mV                                                                      | -2                      | +4.6 V                      | +4.8 V            | +4.725 V to +4.875 V     |
|                                                                             | +2                      | -4.6 V                      | -4.8 V            | -4.875 V to -4.725 V     |
| 500 mV                                                                      | -2                      | +5.0 V                      | +4.5 V            | +4.345 V to +4.655 V     |
|                                                                             | +2                      | -5.0 V                      | -4.5 V            | -4.655 V to -4.345 V     |
| 1 V 50 $\Omega$                                                             | 0                       | +2.0 V                      | +5.0 V            | +4.742 V to +5.258 V     |
|                                                                             | 0                       | -2.0 V                      | -5.0 V            | -5.258 V to -4.742 V     |
| 1 V 1 M $\Omega$                                                            | 0                       | +96.0 V                     | +99.0 V           | +98.390 V to +99.610 V   |
|                                                                             | 0                       | -96.0 V                     | -99.0 V           | -99.610 V to -98.390 V   |

**d. Display the test signal:**

- From the button bar touch **Vertical** and touch **Position**.

<sup>4</sup> Set as precisely as the instrument's offset resolution permits.

- Use the keypad to set vertical position to a position setting listed in the table for the current vertical scale setting. The baseline level may move off screen.
  - Touch **Offset**.
  - Use the keypad to set vertical offset to the positive-polarity setting listed in the table for the current vertical scale setting. The baseline level will remain off screen.
  - Set the generator to the level and polarity indicated in the table for the vertical scale, position, and offset settings you have made.
- e. *Measure the test signal:* Press the **X** (close) button. Read the measurement results at the measurement statistics **Mean** measurement readout. See the following figure.

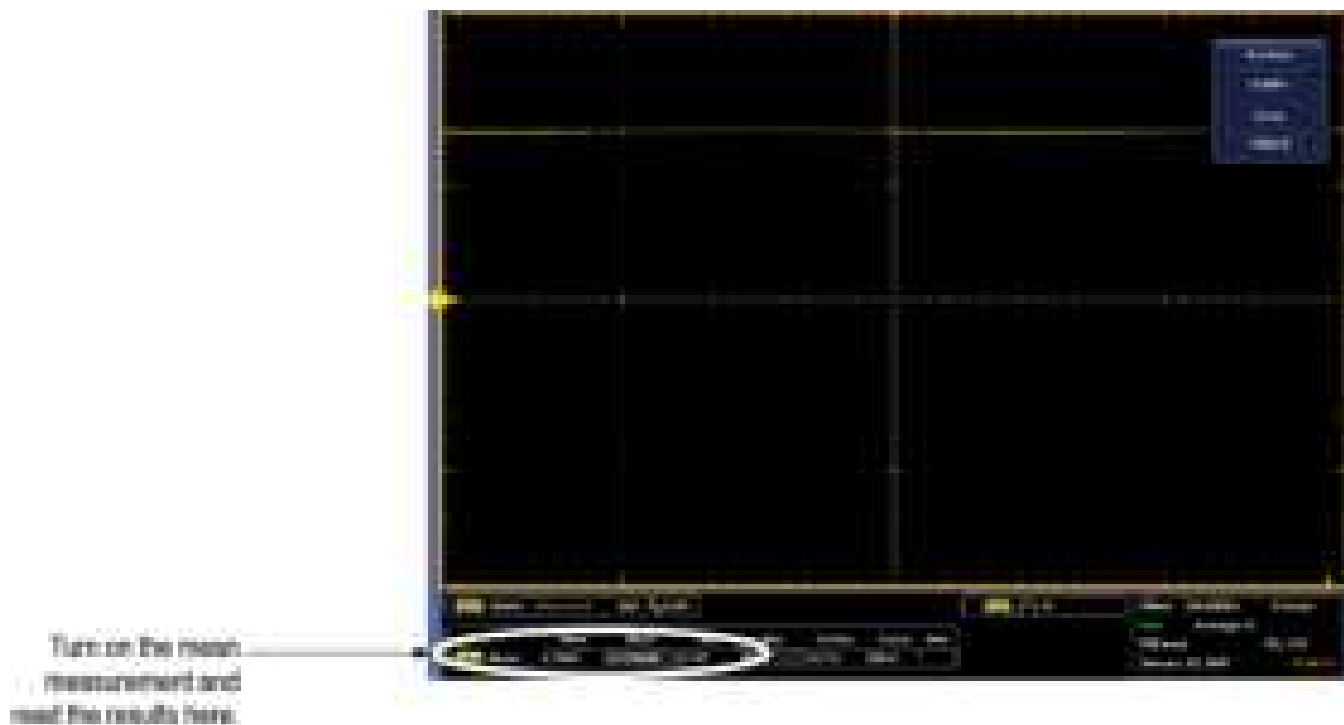


Figure 11: Measurement of DC accuracy at maximum offset and position

- f. *Check against limits:*
- CHECK that the readout for the measurement **Mean** readout on screen is within the limits listed for the current vertical scale and position/offset/generator settings. Enter the value on test record.
  - Repeat substep 2.d, reversing the polarity of the position, offset, and generator settings as is listed in the table.
  - CHECK that the **Mean** measurement readout on screen is within the limits listed for the current vertical scale setting and position/offset/generator settings. Enter the value on test record.

- Repeat substeps 2.c through 2.f until all vertical scale settings are checked for the channel under test. (See [Table 7: DC voltage measurement accuracy](#) on page 184.)
  - g. *Test all channels:* Repeat substeps 2.a through 2.f for all four channels.
  - h. If testing <4 GHz models, set the DC Calibration generator to drive a load impedance of 1 M $\Omega$ . Repeat substeps 2.a through 2.g with the instruments termination set to 1 M $\Omega$ .
3. *Disconnect the hookup:*
- a. *Set the generator output to 0 V.*
  - b. Disconnect the equipment from the generator output and the input connector of the channel last tested.

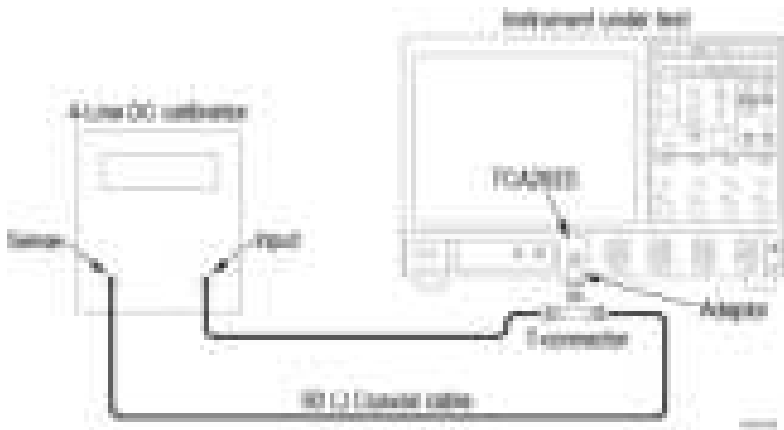
**Check DC gain accuracy >20 GHz models.**

| Equipment required                                                                                                                | Prerequisites                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| One DC calibration generator (Item 6)<br>One SMA male-to-female BNC adapter (Item 19)<br>One BNC “T”, male to 2 females (Item 32) | The instrument must meet the prerequisites.<br>(See <a href="#">Prerequisites</a> on page 116.) |



**WARNING.** The generator is capable of outputting dangerous voltages. To avoid injury, be sure to set the DC calibration generator to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during this procedure.

1. *Install the test hookup and preset the instrument controls:*
  - a. *Hook up the test-signal source:*
    - Set the output of a DC calibration generator to off or 0 volts. Set the DC impedance of the generator to 50  $\Omega$ .
    - Connect the generator to **Ch 1** through an adapter. Refer to the following figure.



**Figure 12: DC gain accuracy test hookup, >20 GHz models**

- b. *Initialize the instrument:* Press **Default Setup**
- c. *Modify the default settings:*
  - From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab.
  - Set the Horizontal Scale to **1 ms/div**.
  - Set the Record Length to **5000**.
  - Set the Acquisition Mode to **Hi Res**.
  - Set the Trigger Source to **Line**.

2. *Confirm input channels are within limits for DC gain accuracy. Do the following substeps - test Ch 1 first, skipping substep 2.a of this step since Ch 1 is already selected from step 1.*

a. *Select an unchecked channel:*

- From the tool bar, touch **Measure** and then **Clear All** to remove the previous measurement.
- Press the Vertical button of the channel just confirmed to remove the channel from the display.
- Press the front-panel Vertical button that corresponds to the channel you are to confirm.
- *Set the generator output to 0 V.*
- Move the test hookup to the channel you selected.

b. *Turn on the measurement Mean for the channel:*

- From the tool bar, touch **Measure** and select the **Ampl** tab, **More**, and then touch **Mean** to measure the mean of the current channel.
- Press the **X** (Close) button.

c. *Set the vertical scale:* Set the vertical **Scale** to one of the settings in the following table that is not yet checked, starting with the first setting.

**Table 8: Gain accuracy**

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch1 | 6.25 mV       | 0 V                 | 0                       | 0 V            | 19 mV              |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -19 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.019 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 981 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -981 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.019 V           |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 1.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 519 mV             |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 481 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 3.381 V            |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.381 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -3.419 V           |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.419 V           |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.519 V           |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.519 V           |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -481 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -519 mV            |                  |                                 |                        |
| Ch1 | 10 mV         | 0 V                 | 0                       | 0 V            | 30 mV              |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -30 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.03 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 970 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -970 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.03 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.47 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 1.47 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 530 mV             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 470 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 3.37 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.37 V             |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -3.43 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.43 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.53 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.53 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -470 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -530 mV            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch1 | 20 mV         | 0 V                 | 0                       | 0 V            | 60 mV              |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -60 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.06 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 940 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -940 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.06 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 1.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 560 mV             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 440 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 3.34 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.34 V             |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -3.46 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.46 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.56 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.56 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -440 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -560 mV            |                  |                                 |                        |
| Ch1 | 50 mV         | 0 V                 | 0                       | 0 V            | 150 mV             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -150 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.15 V             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | 850 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -850 mV            |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -1.15 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits    |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|--------------------|
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 1.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 650 mV             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 350 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 3.25 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.25 V             |                  |                                 |                    |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -3.55 V            |                  |                                 |                    |
|     |               |                     | 0                       | -2.4 V         | -2.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.55 V            |                  |                                 |                    |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -1.5 V         | -1.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -1.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -0.5 V         | -350 mV            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -650 mV            |                  |                                 |                    |
| Ch1 | 100 mV        | 0 V                 | 0                       | 0 V            | 300 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -300 mV            |                  |                                 |                    |
|     |               |                     | 0                       | +1 V           | 1.3 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 700 mV             |                  |                                 |                    |
|     |               |                     | 0                       | -1 V           | -700 mV            |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -1.3 V             |                  |                                 |                    |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 1.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 800 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 200 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 3.10 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.10 V             |                  |                                 |                    |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -3.70 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -2.70 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.20 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -1.80 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -0.5 V         | -200 mV            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -800 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.36 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 640 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -640 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.36 V            |                  |                                 |                        |
| Ch1 | 120 mV        | 0 V                 | 0                       | 0 V            | 360 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -360 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.36 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 640 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -640 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.36 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 1.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 860 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 140 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 3.04 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.04 V             |                  |                                 |                        |
|     |               |                     | 0                       | -3.4 V         | -3.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -3.76 V            |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -2.4 V         | -2.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -2.76 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.14 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.86 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -140 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -860 mV            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch1 | 140 mV        | 0 V                 | 0                       | -1 V           | -580 mV            |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | -1.42 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 420 mV             |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | -420 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.42 V             |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | 580 mV             |                  |                                 |                        |
| Ch1 | 200 mV        | 0 V                 | 0                       | -0.9 V         | -300 mV            |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 600 mV             |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | -600 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +0.9 V         | 1.50 V             |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | 300 mV             |                  |                                 |                        |
| Ch1 | 400 mV        | 0 V                 | 0                       | -0.3 V         | 900 mV             |                  |                                 | +2.352 V to +2.448 V   |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 1.20 V             |                  |                                 | +2.352 V to +2.448 V   |
|     |               |                     |                         |                | -1.20 V            |                  |                                 |                        |
|     |               |                     | 0                       | +0.3 V         | 1.50 V             |                  |                                 | +2.352 V to +2.448 V   |
|     |               |                     |                         |                | -900 mV            |                  |                                 |                        |
| Ch2 | 6.25 mV       | 0 V                 | 0                       | 0 V            | 19 mV              |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -19 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.019 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 981 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -981 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.019 V           |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 1.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 519 mV             |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 481 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 3.381 V            |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.381 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -3.419 V           |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.419 V           |                  |                                 |                        |
|     |               |                     | 0                       | -2.5 V         | -2.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.519 V           |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.519 V           |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -481 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -519 mV            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 30 mV              |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -30 mV             |                  |                                 |                        |
| Ch2 | 10 mV         | 0 V                 | 0                       | +1 V           | 1.03 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 970 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -970 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.03 V            |                  |                                 |                        |
|     |               |                     | 0                       | 2.5 V          | 2.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.47 V             |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 1.5 V          | 1.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 1.47 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 530 mV             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 470 mV             |                  |                                 |                        |
|     |               |                     | 0                       | 3.4 V          | 3.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 3.37 V             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 2.4 V          | 2.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.37 V             |                  |                                 |                        |
|     |               |                     | 0                       | -3.4 V         | -3.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -3.43 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.43 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.53 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.53 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -470 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -530 mV            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch2 | 20 mV         | 0 V                 | 0                       | 0 V            | 60 mV              |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -60 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.06 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 940 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -940 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.06 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 1.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 560 mV             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 440 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 3.34 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.34 V             |                  |                                 |                        |
|     |               |                     | 0                       | -3.4 V         | -3.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -3.46 V            |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -3.46 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.46 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.5 V         | -2.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.56 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.56 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -440 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -560 mV            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 150 mV             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -150 mV            |                  |                                 |                        |
| Ch2 | 50 mV         | 0 V                 | 0                       | +1 V           | 1.15 V             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | 850 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -850 mV            |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -1.15 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits    |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|--------------------|
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 1.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 650 mV             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 350 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 3.25 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.25 V             |                  |                                 |                    |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -3.55 V            |                  |                                 |                    |
|     |               |                     | 0                       | -2.4 V         | -2.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.55 V            |                  |                                 |                    |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -1.5 V         | -1.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -1.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -0.5 V         | -350 mV            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -650 mV            |                  |                                 |                    |
| Ch2 | 100 mV        | 0 V                 | 0                       | 0 V            | 300 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -300 mV            |                  |                                 |                    |
|     |               |                     | 0                       | +1 V           | 1.3 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 700 mV             |                  |                                 |                    |
|     |               |                     | 0                       | -1 V           | -700 mV            |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -1.3 V             |                  |                                 |                    |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 1.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 800 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 200 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 3.10 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.10 V             |                  |                                 |                    |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -3.70 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -2.70 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.20 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -1.80 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | - 200 mV           |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -800 mV            |                  |                                 |                        |
| Ch2 | 120 mV        | 0 V                 | 0                       | 0 V            | 360 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -360 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.36 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 640 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -640 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.36 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 1.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 860 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 140 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 3.04 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.04 V             |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -3.76 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -2.76 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.14 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.86 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -140 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -860 mV            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch2 | 140 mV        | 0 V                 | 0                       | -1 V           | -580 mV            |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | -1.42 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 420 mV             |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | -420 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.42 V             |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | 580 V              |                  |                                 |                        |
| Ch2 | 200 mV        | 0 V                 | 0                       | -0.9 V         | -300 mV            |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 600 mV             |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | -600 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +0.9 V         | 1.50 V             |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | 300 mV             |                  |                                 |                        |
| Ch2 | 400 mV        | 0 V                 | 0                       | -0.3 V         | 900 mV             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 1.20 V             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -1.20 V            |                  |                                 |                        |
|     |               |                     | 0                       | +0.3 V         | 1.50 V             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -900 mV            |                  |                                 |                        |
| Ch3 | 6.25 mV       | 0 V                 | 0                       | 0 V            | 19 mV              |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -19 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.019 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 981 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -981 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.019 V           |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 1.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 519 mV             |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 481 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 3.381 V            |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.381 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -3.419 V           |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.419 V           |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.519 V           |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.519 V           |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -481 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -519 mV            |                  |                                 |                        |
| Ch3 | 10 mV         | 0 V                 | 0                       | 0 V            | 30 mV              |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -30 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.03 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 970 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -970 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.03 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.47 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 1.47 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 530 mV             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 470 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 3.37 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.37 V             |                  |                                 |                        |
|     |               |                     | 0                       | -3.4 V         | -3.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -3.43 V            |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -3.43 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.43 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.5 V         | -2.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.53 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.53 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -470 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -530 mV            |                  |                                 |                        |
|     |               |                     |                         |                |                    |                  |                                 |                        |
|     |               |                     |                         |                |                    |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch3 | 20 mV         | 0 V                 | 0                       | 0 V            | 60 mV              |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -60 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.06 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 940 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -940 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.06 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 1.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 560 mV             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 440 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 3.34 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.34 V             |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -3.46 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.46 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.56 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.56 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -440 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -560 mV            |                  |                                 |                        |
| Ch3 | 50 mV         | 0 V                 | 0                       | 0 V            | 150 mV             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -150 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.15 V             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | 850 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -850 mV            |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -1.15 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits    |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|--------------------|
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 1.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 650 mV             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 350 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 3.25 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.25 V             |                  |                                 |                    |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -3.55 V            |                  |                                 |                    |
|     |               |                     | 0                       | -2.4 V         | -2.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.55 V            |                  |                                 |                    |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -1.5 V         | -1.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -1.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -0.5 V         | -350 mV            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -650 mV            |                  |                                 |                    |
| Ch3 | 100 mV        | 0 V                 | 0                       | 0 V            | 300 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -300 mV            |                  |                                 |                    |
|     |               |                     | 0                       | +1 V           | 1.3 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 700 mV             |                  |                                 |                    |
|     |               |                     | 0                       | -1 V           | -700 mV            |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -1.3 V             |                  |                                 |                    |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 1.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 800 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 200 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 3.10 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.10 V             |                  |                                 |                    |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -3.70 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -2.70 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.20 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -1.80 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -200 mV            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -800 mV            |                  |                                 |                        |
| Ch3 | 120 mV        | 0 V                 | 0                       | 0 V            | 360 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -360 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.36 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 640 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -640 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.36 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 1.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 860 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 140 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 3.04 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.04 V             |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -3.76 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -2.76 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.14 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.86 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -140 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -860 mV            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch3 | 140 mV        | 0 V                 | 0                       | -1 V           | -580 mV            |                  |                                 | +8.232 mV to +8.568 mV |
|     |               |                     |                         |                | -1.42 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 420 mV             |                  |                                 | +8.232 mV to +8.568 mV |
|     |               |                     |                         |                | -420 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.42 V             |                  |                                 | +8.232 mV to +8.568 mV |
|     |               |                     |                         |                | 580 mV             |                  |                                 |                        |
| Ch3 | 200 mV        | 0 V                 | 0                       | -0.9 V         | -300 mV            |                  |                                 | +1.176 mV to +1.224 mV |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 600 mV             |                  |                                 | +1.176 mV to +1.224 mV |
|     |               |                     |                         |                | -600 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +0.9 V         | 1.50 V             |                  |                                 | +1.176 mV to +1.224 mV |
|     |               |                     |                         |                | 300 mV             |                  |                                 |                        |
| Ch3 | 400 mV        | 0 V                 | 0                       | -0.3 V         | 900 mV             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 1.20 V             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -1.20 V            |                  |                                 |                        |
|     |               |                     | 0                       | +0.3 V         | 1.50 V             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -900 mV            |                  |                                 |                        |
| Ch4 | 6.25 mV       | 0 V                 | 0                       | 0 V            | 19 mV              |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -19 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.019 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 981 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -981 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.019 V           |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.519 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 1.481 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 519 mV             |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 481 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 3.381 V            |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.419 V            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | 2.381 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -3.419 V           |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.381 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.419 V           |                  |                                 |                        |
|     |               |                     | 0                       | -2.5 V         | -2.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -2.519 V           |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.481 V           |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -1.519 V           |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -481 mV            |                  |                                 | +37.24 mV to +38.76 mV |
|     |               |                     |                         |                | -519 mV            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 30 mV              |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -30 mV             |                  |                                 |                        |
| Ch4 | 10 mV         | 0 V                 | 0                       | +1 V           | 1.03 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 970 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -970 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.03 V            |                  |                                 |                        |
|     |               |                     | 0                       | 2.5 V          | 2.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.47 V             |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 1.5 V          | 1.53 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 1.47 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 530 mV             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 470 mV             |                  |                                 |                        |
|     |               |                     | 0                       | 3.4 V          | 3.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 3.37 V             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 2.4 V          | 2.43 V             |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | 2.37 V             |                  |                                 |                        |
|     |               |                     | 0                       | -3.4 V         | -3.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -3.43 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.37 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.43 V            |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -2.5 V         | -2.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -2.53 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.47 V            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -1.53 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -470 mV            |                  |                                 | +58.8 mV to +61.2 mV   |
|     |               |                     |                         |                | -530 mV            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch4 | 20 mV         | 0 V                 | 0                       | 0 V            | 60 mV              |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -60 mV             |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.06 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 940 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -940 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.06 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.56 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 1.44 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 560 mV             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 440 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 3.34 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.46 V             |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | 2.34 V             |                  |                                 |                        |
|     |               |                     | 0                       | -3.4 V         | -3.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -3.46 V            |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -2.4 V         | -2.34 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.46 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.5 V         | -2.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -2.56 V            |                  |                                 |                        |
|     |               |                     | 0                       | -1.5 V         | -1.44 V            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -1.56 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -0.5 V         | -440 mV            |                  |                                 | +117.6 mV to +122.4 mV |
|     |               |                     |                         |                | -560 mV            |                  |                                 |                        |
| Ch4 | 50 mV         | 0 V                 | 0                       | 0 V            | 150 mV             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -150 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.15 V             |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | 850 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -850 mV            |                  |                                 | +294 mV to +306 mV     |
|     |               |                     |                         |                | -1.15 V            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits    |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|--------------------|
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.65 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 1.35 V             |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 650 mV             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 350 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 3.25 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.55 V             |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | 2.25 V             |                  |                                 |                    |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -3.55 V            |                  |                                 |                    |
|     |               |                     | 0                       | -2.4 V         | -2.25 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.55 V            |                  |                                 |                    |
|     |               | -1.5 V              | 0                       | -2.5 V         | -2.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -2.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -1.5 V         | -1.35 V            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -1.65 V            |                  |                                 |                    |
|     |               |                     | 0                       | -0.5 V         | -350 mV            |                  |                                 | +294 mV to +306 mV |
|     |               |                     |                         |                | -650 mV            |                  |                                 |                    |
| Ch4 | 100 mV        | 0 V                 | 0                       | 0 V            | 300 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -300 mV            |                  |                                 |                    |
|     |               |                     | 0                       | +1 V           | 1.3 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 700 mV             |                  |                                 |                    |
|     |               |                     | 0                       | -1 V           | -700 mV            |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | -1.3 V             |                  |                                 |                    |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 1.5 V          | 1.8 V              |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 1.2 V              |                  |                                 |                    |
|     |               |                     | 0                       | 0.5 V          | 800 mV             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 200 mV             |                  |                                 |                    |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 3.10 V             |                  |                                 |                    |
|     |               |                     | 0                       | 2.4 V          | 2.70 V             |                  |                                 | +588 mV to +612 mV |
|     |               |                     |                         |                | 2.10 V             |                  |                                 |                    |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -3.70 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.10 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -2.70 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.20 V            |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -1.80 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | - 200 mV           |                  |                                 | +588 mV to +612 mV     |
|     |               |                     |                         |                | -800 mV            |                  |                                 |                        |
| Ch4 | 120 mV        | 0 V                 | 0                       | 0 V            | 360 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -360 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.36 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 640 mV             |                  |                                 |                        |
|     |               |                     | 0                       | -1 V           | -640 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.36 V            |                  |                                 |                        |
|     |               | 1.5 V               | 0                       | 2.5 V          | 2.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 1.5 V          | 1.86 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 1.14 V             |                  |                                 |                        |
|     |               |                     | 0                       | 0.5 V          | 860 mV             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 140 mV             |                  |                                 |                        |
|     |               | 3.4 V               | 0                       | 3.4 V          | 3.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 3.04 V             |                  |                                 |                        |
|     |               |                     | 0                       | 2.4 V          | 2.76 V             |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | 2.04 V             |                  |                                 |                        |
|     |               | -3.4 V              | 0                       | -3.4 V         | -3.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -3.76 V            |                  |                                 |                        |
|     |               |                     | 0                       | -2.4 V         | -2.04 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -2.76 V            |                  |                                 |                        |
|     |               | -1.5 V              | 0                       | -1.5 V         | -1.14 V            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -1.86 V            |                  |                                 |                        |
|     |               |                     | 0                       | -0.5 V         | -140 mV            |                  |                                 | +705.6 mV to +734.4 mV |
|     |               |                     |                         |                | -860 mV            |                  |                                 |                        |

| Ch  | Scale setting | Termination setting | Position setting (Divs) | Offset setting | Generat or setting | Measurement mean | Difference of measurement means | Accuracy limits        |
|-----|---------------|---------------------|-------------------------|----------------|--------------------|------------------|---------------------------------|------------------------|
| Ch4 | 140 mV        | 0 V                 | 0                       | -1 V           | -580 mV            |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | -1.42 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 420 V              |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | -420 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +1 V           | 1.42 V             |                  |                                 | +823.2 mV to +856.8 mV |
|     |               |                     |                         |                | 580 mV             |                  |                                 |                        |
| Ch4 | 200 mV        | 0 V                 | 0                       | -0.9 V         | -300 mV            |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 600 mV             |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | -600 mV            |                  |                                 |                        |
|     |               |                     | 0                       | +0.9 V         | 1.50 mV            |                  |                                 | +1.176 V to +1.224 V   |
|     |               |                     |                         |                | 300 V              |                  |                                 |                        |
| Ch4 | 400 mV        | 0 V                 | 0                       | -0.3 V         | 900 mV             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -1.50 V            |                  |                                 |                        |
|     |               |                     | 0                       | 0 V            | 1.20 V             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -1.20 V            |                  |                                 |                        |
|     |               |                     | 0                       | +0.3 V         | 1.50 V             |                  |                                 | +2.352 mV to +2.448 mV |
|     |               |                     |                         |                | -900 mV            |                  |                                 |                        |

d. *Display the test signal:*

- Display the **Vertical Setup** menu.
- Use the keypad to set the Termination Voltage, Position, and Offset vertical settings as listed in the table for the current vertical scale setting. The baseline level may move off screen.
- Set the generator so that its Sense value and polarity matches the generator setting in the table for the vertical scale, position, offset, and termination settings you have made. The DC test level should appear at about 3 division on screen. Using the Vertical Position knob, move the test level to 3 divisions above the center screen.

**NOTE.** *It's important to use the Sense reading of the generator instead of the Output level when adjusting the generator to the specified voltage setting.*

e. *Measure the test signal:* Press the **Close** button.

- Read the measurement results at the measurement statistics **Mean** measurement readout. Refer to the following figure.
- Record the Mean in the Measurement Mean column. (See [Table 8: Gain accuracy](#) on page 189.)

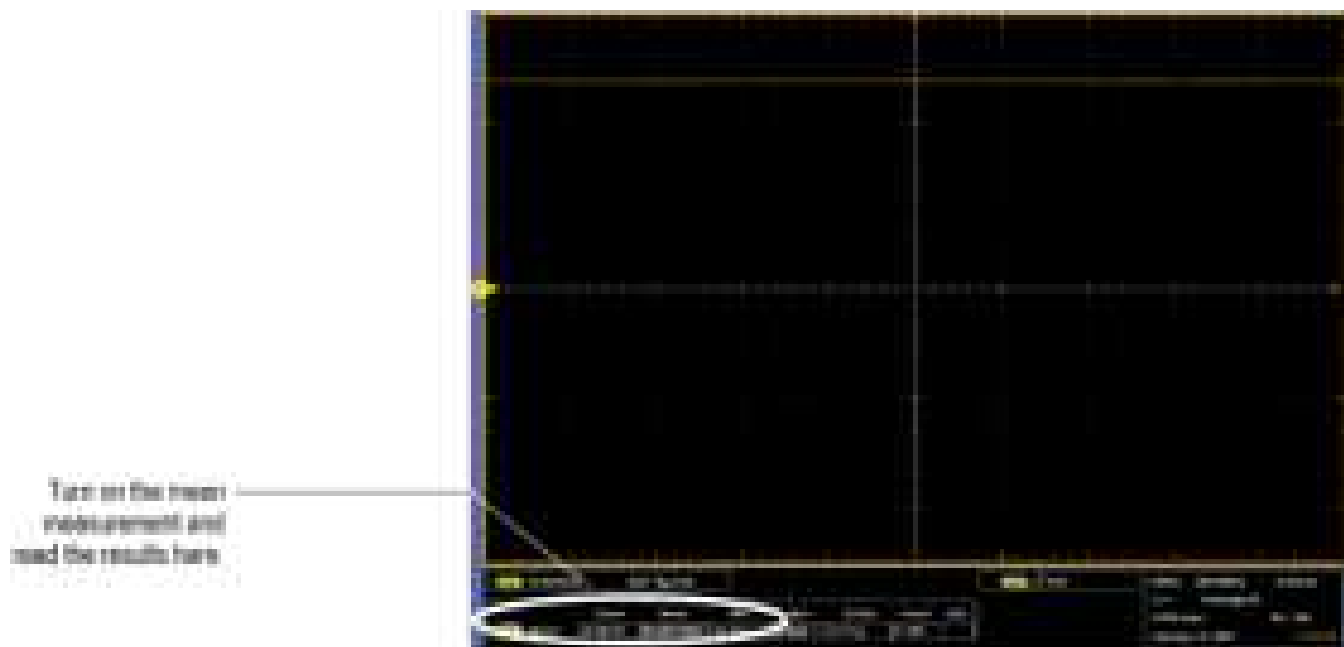


Figure 13: Measurement of DC gain accuracy

f. *Measure second mean:*

- Set the generator to the second level and polarity indicated in the table for the vertical scale, termination voltage, position, and offset settings you have made.
- Repeat substep 2.e using the current vertical scale, termination voltage, position, offset, and new generator setting for the second mean.

g. *Check against limits:*

- Subtract the second measurement mean from the first measurement mean for the current vertical scale, termination voltage, position, and offset.
- Record the difference of the two mean measurements in the Difference of Measurement Means column of the table. (See [Table 8: Gain accuracy](#) on page 189.)
- CHECK that the Difference of Measurement Mean is within the limits listed for the current vertical scale/termination/position/offset/generator settings. Enter measurement mean difference value on test record.



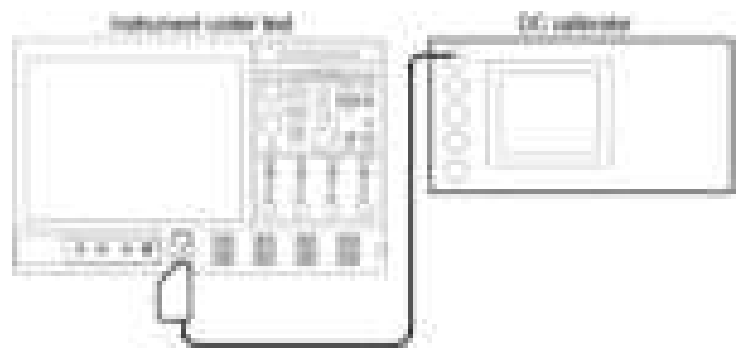
**Check DC gain accuracy  $\geq 4$  GHz  $\leq 20$  GHz models.**

| Equipment required                                                                    | Prerequisites                                                                                   |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| One DC calibration generator (Item 6)<br>One SMA male-to-female BNC adapter (Item 19) | The instrument must meet the prerequisites.<br>(See <a href="#">Prerequisites</a> on page 116.) |



**WARNING.** The generator is capable of outputting dangerous voltages. To avoid injury, be sure to set the DC calibration generator to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during this procedure.

1. *Install the test hookup and preset the instrument controls:*
  - a. *Hook up the test-signal source:*
    - Set the output of a DC calibration generator to off or 0 volts. Set the DC impedance of the generator to 50  $\Omega$ .
    - Connect the generator to **Ch 1** through an adapter. Refer to the following figure.



**Figure 14: DC gain accuracy test hookup,  $\geq 4$  GHz,  $\leq 20$  GHz models**

- b. *Initialize the instrument:* Press **Default Setup**
    - c. *Modify the default settings:*
      - From the tool bar, touch **Horiz/Acq** and select the **Acquisition** tab.
      - Touch **Average** and set the number of averages to **16**.
  2. *Confirm input channels are within limits for DC gain accuracy.* Do the following substeps - test Ch 1 first, *skipping substep 2.a of this step since Ch 1 is already selected from step 1.*
    - a. *Select an unchecked channel:*
      - From the tool bar, touch **Measure** and then **Clear All** to remove the previous measurement.
      - Press the Vertical button of the channel just confirmed to remove the channel from the display.

- Press the front-panel Vertical button that corresponds to the channel you are to confirm.
  - Set the generator output to 0 V.
  - Move the test hookup to the channel you selected.
- b. Turn on the measurement Mean for the channel:
- From the tool bar, touch **Measure** and select the **Ampl** tab, **More**, and then touch **Mean** to measure the mean of the current channel.
  - Press the **X** (Close) button.
- c. Set the vertical scale: Set the vertical **Scale** to one of the settings in the following table that is not yet checked, starting with the first setting.

Table 9: Gain accuracy

| Channel               | Scale setting | Position setting (Divs) | Offset setting | Generator setting | Measurement mean | Difference of measurement means | Accuracy limits            |
|-----------------------|---------------|-------------------------|----------------|-------------------|------------------|---------------------------------|----------------------------|
| <b>≥ 4 GHz models</b> |               |                         |                |                   |                  |                                 |                            |
| Ch1                   | 10 mV         | 0                       | 0 V            | +38.0 mV          |                  |                                 | +74.48 mV to +77.52 mV     |
|                       |               |                         |                | -38.0 mV          |                  |                                 |                            |
|                       |               | -5                      | +0.45 V        | +538 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|                       |               |                         |                | +462 mV           |                  |                                 |                            |
|                       |               | 5                       | -0.45 V        | -462 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|                       |               |                         |                | -538 mV           |                  |                                 |                            |
|                       | 20 mV         | 0                       | 0 V            | +76.0 mV          |                  |                                 | +148.960 mV to +155.040 mV |
|                       |               |                         |                | -76.0 mV          |                  |                                 |                            |
|                       |               | -5                      | +0.4 V         | +576.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|                       |               |                         |                | +424.0 mV         |                  |                                 |                            |
|                       |               | 5                       | -0.4 V         | -424.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|                       |               |                         |                | -576.0 mV         |                  |                                 |                            |
| Ch1                   | 50 mV         | 0                       | 0 V            | +190 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|                       |               |                         |                | -190 mV           |                  |                                 |                            |
|                       |               | -5                      | +0.25 V        | +690 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|                       |               |                         |                | +310 mV           |                  |                                 |                            |
|                       |               | 5                       | -0.25 V        | -310 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|                       |               |                         |                | -690 mV           |                  |                                 |                            |

| Channel | Scale setting | Position setting (Divs) | Offset setting | Generator setting | Measurement mean | Difference of measurement means | Accuracy limits            |
|---------|---------------|-------------------------|----------------|-------------------|------------------|---------------------------------|----------------------------|
|         | 100 mV        | 0                       | 0 V            | +380 mV           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | -380 mV           |                  |                                 |                            |
|         |               | -5                      | +2.0 V         | +2.88 V           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | +2.12 V           |                  |                                 |                            |
|         |               | 5                       | -2.0 V         | -2.12 V           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | -2.88 V           |                  |                                 |                            |
|         | 200 mV        | 0                       | 0 V            | +760 mV           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | -760 mV           |                  |                                 |                            |
|         |               | -5                      | +1.25 V        | +3.01 V           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | +1.49 V           |                  |                                 |                            |
|         |               | 5                       | -1.25 V        | -1.49 V           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | -3.01 V           |                  |                                 |                            |
|         | 500 mV        | 0                       | 0 V            | +1.90 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | -1.90 V           |                  |                                 |                            |
|         |               | -5                      | 0 V            | +4.40 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | +0.60 V           |                  |                                 |                            |
|         |               | 5                       | 0 V            | -0.60 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | -4.40 V           |                  |                                 |                            |
| Ch2     | 10 mV         | 0                       | 0 V            | +38.0 mV          |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | -38.0 mV          |                  |                                 |                            |
|         |               | -5                      | +0.45 V        | +538 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | +462 mV           |                  |                                 |                            |
|         |               | 5                       | -0.45 V        | -462 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | -538 mV           |                  |                                 |                            |
| Ch2     | 20 mV         | 0                       | 0 V            | +76.0 mV          |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | -76.0 mV          |                  |                                 |                            |
|         |               | -5                      | +0.4 V         | +576.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | +424.0 mV         |                  |                                 |                            |
|         |               | 5                       | -0.4 V         | -424.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | -576.0 mV         |                  |                                 |                            |
|         | 50 mV         | 0                       | 0 V            | +190 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | -190 mV           |                  |                                 |                            |
|         |               | -5                      | +0.25 V        | +690 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | +310 mV           |                  |                                 |                            |
|         |               | 5                       | -0.25 V        | -310 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | -690 mV           |                  |                                 |                            |

| Channel | Scale setting | Position setting (Divs) | Offset setting | Generator setting | Measurement mean | Difference of measurement means | Accuracy limits            |
|---------|---------------|-------------------------|----------------|-------------------|------------------|---------------------------------|----------------------------|
|         | 100 mV        | 0                       | 0 V            | +380 mV           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | -380 mV           |                  |                                 |                            |
|         |               | -5                      | +2.0 V         | +2.88 V           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | +2.12 V           |                  |                                 |                            |
|         |               | 5                       | -2.0 V         | -2.12 V           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | -2.88 V           |                  |                                 |                            |
|         | 200 mV        | 0                       | 0 V            | +760 mV           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | -760 mV           |                  |                                 |                            |
|         |               | -5                      | +1.25 V        | +3.01 V           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | +1.49 V           |                  |                                 |                            |
|         |               | 5                       | -1.25 V        | -1.49 V           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | -3.01 V           |                  |                                 |                            |
|         | 500 mV        | 0                       | 0 V            | +1.90 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | -1.90 V           |                  |                                 |                            |
|         |               | -5                      | 0 V            | +4.40 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | +0.60 V           |                  |                                 |                            |
|         |               | 5                       | 0 V            | -0.60 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | -4.40 V           |                  |                                 |                            |
| Ch3     | 10 mV         | 0                       | 0 V            | +38.0 mV          |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | -38.0 mV          |                  |                                 |                            |
|         |               | -5                      | +0.45 V        | +538 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | +462 mV           |                  |                                 |                            |
|         |               | 5                       | -0.45 V        | -462 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | -538 mV           |                  |                                 |                            |
|         | 20 mV         | 0                       | 0 V            | +76.0 mV          |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | -76.0 mV          |                  |                                 |                            |
|         |               | -5                      | +0.4 V         | +576.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | +424.0 mV         |                  |                                 |                            |
|         |               | 5                       | -0.4 V         | -424.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | -576.0 mV         |                  |                                 |                            |
|         | 50 mV         | 0                       | 0 V            | +190 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | -190 mV           |                  |                                 |                            |
|         |               | -5                      | +0.25 V        | +690 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | +310 mV           |                  |                                 |                            |
|         |               | 5                       | -0.25 V        | -310 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | -690 mV           |                  |                                 |                            |

| Channel | Scale setting | Position setting (Divs) | Offset setting | Generator setting | Measurement mean | Difference of measurement means | Accuracy limits            |
|---------|---------------|-------------------------|----------------|-------------------|------------------|---------------------------------|----------------------------|
|         | 100 mV        | 0                       | 0 V            | +380 mV           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | -380 mV           |                  |                                 |                            |
|         |               | -5                      | +2.0 V         | +2.88 V           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | +2.12 V           |                  |                                 |                            |
|         |               | 5                       | -2.0 V         | -2.12 V           |                  |                                 | +744.80 mV to +775.20 mV   |
|         |               |                         |                | -2.88 V           |                  |                                 |                            |
|         | 200 mV        | 0                       | 0 V            | +760 mV           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | -760 mV           |                  |                                 |                            |
|         |               | -5                      | +1.25 V        | +3.01 V           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | +1.49 V           |                  |                                 |                            |
|         |               | 5                       | -1.25 V        | -1.49 V           |                  |                                 | +1.49 V to +1.55 V         |
|         |               |                         |                | -3.01 V           |                  |                                 |                            |
| Ch3     | 500 mV        | 0                       | 0 V            | +1.90 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | -1.90 V           |                  |                                 |                            |
|         |               | -5                      | 0 V            | +4.40 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | +0.60 V           |                  |                                 |                            |
|         |               | 5                       | 0 V            | -0.60 V           |                  |                                 | +3.724 V to +3.876 V       |
|         |               |                         |                | -4.40 V           |                  |                                 |                            |
| Ch4     | 10 mV         | 0                       | 0 V            | +38.0 mV          |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | -38.0 mV          |                  |                                 |                            |
|         |               | -5                      | +0.45 V        | +538 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | +462 mV           |                  |                                 |                            |
|         |               | 5                       | -0.45 V        | -462 mV           |                  |                                 | +74.48 mV to +77.52 mV     |
|         |               |                         |                | -538 mV           |                  |                                 |                            |
|         | 20 mV         | 0                       | 0 V            | +76.0 mV          |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | -76.0 mV          |                  |                                 |                            |
|         |               | -5                      | +0.4 V         | +576.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | +424.0 mV         |                  |                                 |                            |
|         |               | 5                       | -0.4 V         | -424.0 mV         |                  |                                 | +148.960 mV to +155.040 mV |
|         |               |                         |                | -576.0 mV         |                  |                                 |                            |
|         | 50 mV         | 0                       | 0 V            | +190 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | -190 mV           |                  |                                 |                            |
|         |               | -5                      | +0.25 V        | +690 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | +310 mV           |                  |                                 |                            |
|         |               | 5                       | -0.25 V        | -310 mV           |                  |                                 | +372.40 mV to +387.60 mV   |
|         |               |                         |                | -690 mV           |                  |                                 |                            |

| Channel | Scale setting | Position setting (Divs) | Offset setting | Generator setting | Measurement mean | Difference of measurement means | Accuracy limits          |
|---------|---------------|-------------------------|----------------|-------------------|------------------|---------------------------------|--------------------------|
|         | 100 mV        | 0                       | 0 V            | +380 mV           |                  |                                 | +744.80 mV to +775.20 mV |
|         |               |                         |                | -380 mV           |                  |                                 |                          |
|         |               | -5                      | +2.0 V         | +2.88 V           |                  |                                 | +744.80 mV to +775.20 mV |
|         |               |                         |                | +2.12 V           |                  |                                 |                          |
|         |               | 5                       | -2.0 V         | -2.12 V           |                  |                                 | +744.80 mV to +775.20 mV |
|         |               |                         |                | -2.88 V           |                  |                                 |                          |
| Ch4     | 200 mV        | 0                       | 0 V            | +760 mV           |                  |                                 | +1.49 V to +1.55 V       |
|         |               |                         |                | -760 mV           |                  |                                 |                          |
|         |               | -5                      | +1.25 V        | +3.01 V           |                  |                                 | +1.49 V to +1.55 V       |
|         |               |                         |                | +1.49 V           |                  |                                 |                          |
|         |               | 5                       | -1.25 V        | -1.49 V           |                  |                                 | +1.49 V to +1.55 V       |
|         |               |                         |                | -3.01 V           |                  |                                 |                          |
|         | 500 mV        | 0                       | 0 V            | +1.90 V           |                  |                                 | +3.724 V to +3.876 V     |
|         |               |                         |                | -1.90 V           |                  |                                 |                          |
|         |               | -5                      | 0 V            | +4.40 V           |                  |                                 | +3.724 V to +3.876 V     |
|         |               |                         |                | +0.60 V           |                  |                                 |                          |
|         |               | 5                       | 0 V            | -0.60 V           |                  |                                 | +3.724 V to +3.876 V     |
|         |               |                         |                | -4.40 V           |                  |                                 |                          |

**d. Display the test signal:**

- From the tool bar touch **Vertical** and then touch **Position**.
- Use the keypad to set vertical position to the number of divisions listed in the table for the current vertical scale setting and offset.
- Touch **Offset**.
- Use the keypad to set vertical offset to the setting listed in the table for the current vertical scale and position settings. The baseline level may move off screen.
- Set the generator to the level and polarity indicated in the table for the vertical scale, position, and offset settings you have made. The DC test level should appear on screen. (If it does not return, the accuracy check has failed for the current vertical scale, position, and offset settings of the current channel.)

e. *Measure the test signal:* Press the **Close** button.

- Read the measurement results at the measurement statistics **Mean** measurement readout. Refer to the following figure.
- Record the Mean in the Measurement Mean column. (See [Table 9: Gain accuracy](#) on page 213.)

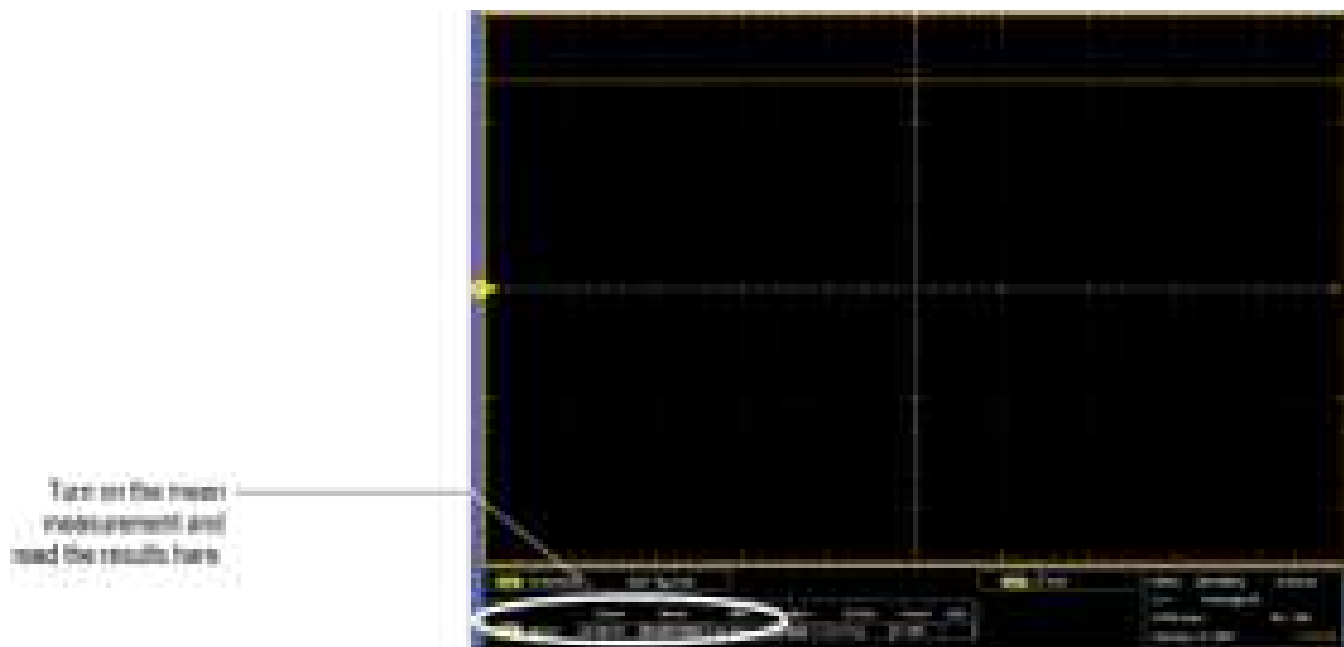


Figure 15: Measurement of DC gain accuracy

f. *Measure second mean:*

- Set the generator to the second level and polarity indicated in the table for the vertical scale, position, and offset settings you have made.
- Repeat substep 2.e using the current vertical scale, position, offset, and new generator setting for the second mean.

g. *Check against limits:*

- Subtract the second measurement mean from the first measurement mean for the current vertical scale, position, and offset.
- Record the difference of the two mean measurements in the Difference of Measurement Means column of the table. (See [Table 9: Gain accuracy](#) on page 213.)
- CHECK that the Difference of Measurement Mean is within the limits listed for the current vertical scale/position/offset/generator settings. Enter measurement mean difference value on test record.

h. Repeat substeps 2.d through 2.g, using the next position, offset and generator settings listed in the table for the current vertical scale.

- i. Repeat substeps 2.c through 2.h until all vertical scale settings, listed in the table, are checked for the channel under test. (See [Table 9: Gain accuracy](#) on page 213.)
  - j. *Test all channels:* Repeat substeps 2.a through 2.i for all four channels.
- 3. *Disconnect the hookup:*
  - a. *Set the generator output to 0 V.*
  - b. Disconnect the generator output from the channel last tested.

Check offset accuracy >20 GHz models.

| Equipment Required                                                                                                     | Prerequisites                                                                                |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| One DC calibration generator (Item 6)<br>One SMA male-to-female BNC adapter (Item 19)<br>One BNC “T” adapter (Item 32) | The instrument must meet the prerequisites. (See <a href="#">Prerequisites</a> on page 116.) |



**WARNING.** The generator is capable of outputting dangerous voltages. To avoid injury, be sure to set the DC calibration generator to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during this procedure.

1. Install the test hookup and preset the instrument controls:
  - a. Hook up the test-signal source:
    - Set the output of a DC calibration generator to off or 0 volts. Set the DC impedance of the generator to 50  $\Omega$ .
    - Connect the output of a DC calibration generator to **Ch 1** through an adapter. Refer to the following figure.

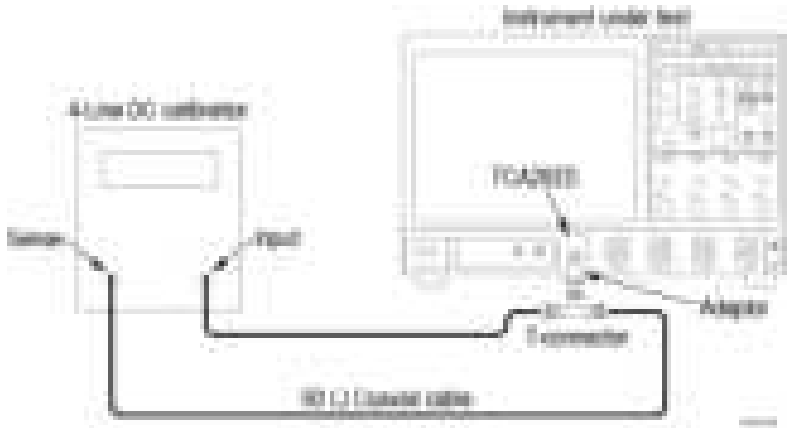


Figure 16: Offset accuracy test hookup, >20 GHz models

- b. Initialize the instrument: Press **Default Setup**.
    - c. Modify the default settings:
      - Set the Horizontal Scale to **1 ms/div**.
      - Set the Record Length to **5000**.
      - Set the Acquisition Mode to **Hi Res**.
      - Set the Trigger Source to **Line**.

2. *Confirm input channels are within limits for offset accuracy. Do the following substeps - test Ch 1 first, skipping substep 2.a since Ch 1 is already selected from step 1.*
  - a. *Select an unchecked channel:*
    - From the tool bar, touch **Measure** and then **Clear All** to remove the previous measurement.
    - Press the Vertical button of the channel just confirmed to remove the channel from the display.
    - Press the front-panel Vertical button that corresponds to the channel you are to confirm.
    - *Set the generator output to 0 V.*
    - Move the test hookup to the channel you selected.
  - b. *Turn on the measurement Mean for the channel:*
    - From the tool bar, touch **Measure** and select the **Ampl** tab, **More**, and then touch **Mean** to measure the mean of the current channel.
    - Press the **X** (Close) button.
  - c. *Set the vertical scale:* Set the vertical **Scale** to one of the settings in the following table that is not yet checked.

Table 10: Offset accuracy

| Scale setting | Position setting (Divs) | Offset setting <sup>5</sup> | Termination setting | Generator setting | Accuracy limits        |
|---------------|-------------------------|-----------------------------|---------------------|-------------------|------------------------|
| 6.25 mV       | 0                       | 0 V                         | 0 V                 | 0 V               | -3.13 mV to +3.25 mV   |
|               |                         | +3.4 V                      | +3.5 V              | +3.4 V            | +3.3831 V to +3.4169 V |
|               |                         | -3.4 V                      | -3.5 V              | -3.4 V            | -3.4169 V to -3.3831 V |
| 10 mV         | 0                       | 0 V                         | 0 V                 | 0 V               | -3.5 mV to +3.5 mV     |
|               |                         | +3.4 V                      | +3.5 V              | +3.4 V            | +3.3827 V to +3.4173 V |
|               |                         | -3.4 V                      | -3.5 V              | -3.4 V            | -3.4173 V to -3.3827 V |
| 20 mV         | 0                       | 0 V                         | 0 V                 | 0 V               | -4.5 mV to +4.5 mV     |
|               |                         | +3.4 V                      | +3.5 V              | +3.4 V            | +3.3817 V to +3.4183 V |
|               |                         | -3.4 V                      | -3.5 V              | -3.4 V            | -3.4183 V to -3.3817 V |
| 50 mV         | 0                       | 0 V                         | 0 V                 | 0 V               | -7.5 mV to +7.5 mV     |
|               |                         | +3.4 V                      | +3.5 V              | +3.4 V            | +3.3787 V to +3.4213 V |
|               |                         | -3.4 V                      | -3.5 V              | -3.4 V            | -3.4213 V to -3.3787 V |
| 100 mV        | 0                       | 0 V                         | 0 V                 | 0 V               | -12.5 mV to +12.5 mV   |
|               |                         | +3.4 V                      | +3.5 V              | +3.4 V            | +3.3737 V to +3.4263 V |
|               |                         | -3.4 V                      | -3.5 V              | -3.4 V            | -3.4263 V to -3.3737 V |

<sup>5</sup> Set as precisely as the instrument's offset resolution permits.

| Scale setting | Position setting (Divs) | Offset setting <sup>5</sup> | Termination setting | Generator setting | Accuracy limits          |
|---------------|-------------------------|-----------------------------|---------------------|-------------------|--------------------------|
| 120 mV        | 0                       | 0 V                         | 0 V                 | 0 V               | –14.5 mV to +14.5 mV     |
|               |                         | +3.4 V                      | +3.5 V              | +3.4 V            | +3.3717 V to +3.4283 V   |
|               |                         | –3.4 V                      | –3.5 V              | –3.4 V            | –3.4283 V to –3.3717 V   |
| 140 mV        | 0                       | –6 V                        | 0 V                 | –6 V              | –6.0525 V to –5.9475 V   |
|               |                         | 0 V                         | 0 V                 | 0 V               | –16.5 mV to +16.5 mV     |
|               |                         | +6 V                        | 0 V                 | +6 V              | +5.9475 V to +6.0525 V   |
| 200 mV        | 0                       | –6 V                        | 0 V                 | –6 V              | –6.0585 V to –5.9415 V   |
|               |                         | 0 V                         | 0 V                 | 0 V               | –22.5 V to +22.5 V       |
|               |                         | +6 V                        | 0 V                 | +6 V              | +5.9415 V to +6.0585 V   |
| 400 mV        | 0                       | –6 V                        | 0 V                 | –6 V              | –6.0785 V to –5.9215 V   |
|               |                         | 0 V                         | 0 V                 | 0 V               | –42.5 mV to +42.5 mV     |
|               |                         | +6 V                        | 0 V                 | +6 V              | +5.9215 mV to +6.0785 mV |

d. *Display the test signal:*

- Display the **Vertical Setup** menu.
- Use the keypad to set the Termination Voltage, Position, and Offset vertical settings as listed in the table for the current vertical scale setting. The baseline level may move off screen.
- Set the generator so that its Sense value and polarity matches the generator setting in the table for the vertical scale, termination voltage, position, and offset settings you have made.

---

**NOTE.** *It's important to use the Sense reading of the generator instead of the Output level when adjusting the generator to the specified voltage setting.*

---

<sup>5</sup> Set as precisely as the instrument's offset resolution permits.

- e. *Measure the test signal:* Press **Close**. Read the measurement results at the **Mean** measurement readout. Refer to the following figure.



Figure 17: Measurement of offset accuracy

- f. *Check against limits:*
- CHECK that the readout for the measurement **Mean** readout on screen is within the limits listed for the current vertical scale and position/offset/generator settings. Enter the value on the test record.
  - Repeat substep 2.d, using the offset and generator settings as is listed in the table.
  - CHECK that the **Mean** measurement readout on screen is within the limits listed for the current vertical scale setting and position/offset/termination/generator settings. Enter the value on the test record.
  - Repeat substep 2.d, using the negative-polarity offset and generator settings as is listed in the table.
  - CHECK that the **Mean** measurement readout on screen is within the limits listed for the current vertical scale setting and position/offset/termination/generator settings. Enter the value on the test record.
  - Repeat substeps 2.c through 2.f until all vertical scale settings, are checked for the channel under test. (See [Table 10: Offset accuracy](#) on page 221.)
- g. *Test all channels:* Repeat substeps 2.a through 2.f for all four channels.
3. *Disconnect the hookup:*
- a. Set the generator output to 0 V.
  - b. Disconnect the generator from the channel last tested.

**Check offset accuracy  $\geq 4$  GHz  $\leq 20$  GHz models.**

| Equipment Required                                                                    | Prerequisites                                                                                   |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| One DC calibration generator (Item 6)<br>One SMA male-to-female BNC adapter (Item 19) | The instrument must meet the prerequisites.<br>(See <a href="#">Prerequisites</a> on page 116.) |

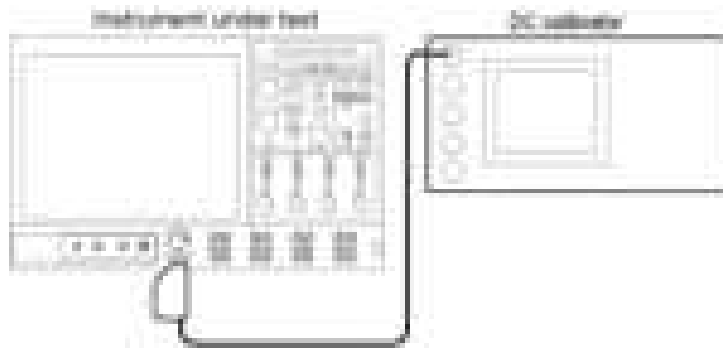


**WARNING.** The generator is capable of outputting dangerous voltages. To avoid injury, be sure to set the DC calibration generator to off or 0 volts before connecting, disconnecting, and/or moving the test hookup during this procedure.

**1. Install the test hookup and preset the instrument controls:**

**a. Hook up the test-signal source:**

- Set the output of a DC calibration generator to off or 0 volts. Set the DC impedance of the generator to 50  $\Omega$ .
- Connect the output of a DC calibration generator to **Ch 1** through an adapter. Refer to the following figure.



**Figure 18: Offset accuracy test hookup,  $\geq 4$  GHz,  $\leq 20$  GHz models**

**b. Initialize the instrument: Press **Default Setup**.**

**c. Modify the default settings:**

- From the tool bar, touch **Horiz/Acq** and select the **Acquisition** tab.
- Touch **Average** and set the number of averages to **16**.

**2. Confirm input channels are within limits for offset accuracy.** Do the following substeps - test Ch 1 first, *skipping substep 2.a since Ch 1 is already selected from step 1.*

**a. Select an unchecked channel:**

- From the tool bar, touch **Measure** and then **Clear All** to remove the previous measurement.
- Press the Vertical button of the channel just confirmed to remove the channel from the display.

- Press the front-panel Vertical button that corresponds to the channel you are to confirm.
  - Set the generator output to 0 V.
  - Move the test hookup to the channel you selected.
- b. *Turn on the measurement Mean for the channel:*
- From the tool bar, touch **Measure** and select the **Ampl** tab, **More**, and then touch **Mean** to measure the mean of the current channel.
  - Press the **X** (Close) button.
- c. *Set the vertical scale:* Set the vertical **Scale** to one of the settings in the following table that is not yet checked.

Table 11: Offset accuracy

| Scale setting | Position setting (Divs) | Offset setting <sup>6</sup> | Generator setting | Accuracy limits          |
|---------------|-------------------------|-----------------------------|-------------------|--------------------------|
| 10 mV         | -5                      | +0.45 V                     | +500 mV           | +495.75 mV to +504.25 mV |
|               | 5                       | -0.45 V                     | -500 mV           | -504.25 mV to -495.75 mV |
| 20 mV         | -5                      | +0.4 V                      | +500 mV           | +494.75 mV to +505.25 mV |
|               | 5                       | -0.4 V                      | -500 mV           | -505.25 mV to -494.75 mV |
| 50 mV         | -5                      | +0.25 V                     | +500 mV           | +491.75 mV to +508.25 mV |
|               | 5                       | -0.25 V                     | -500 mV           | -508.25 mV to -491.75 mV |
| 100 mV        | -5                      | +2.0 V                      | +2.5 V            | +2.474 V to +2.526 V     |
|               | 5                       | -2.0 V                      | -2.5 V            | -2.526 V to -2.474 V     |
| 200 mV        | -5                      | +1.5 V                      | +2.5 V            | +2.464 V to +2.536 V     |
|               | 5                       | -1.5 V                      | -2.5 V            | -2.536 V to -2.464 V     |
| 500 mV        | -5                      | 0 V                         | +2.5 V            | +2.434 V to +2.566 V     |
|               | 5                       | 0 V                         | -2.5 V            | -2.566 V to -2.434 V     |

- d. *Display the test signal:*
- From the tool bar touch **Vertical** and then touch **Position**.
  - Use the keypad to set vertical position to the setting listed in the table.
  - Touch **Offset**.
  - Use the keypad to set vertical offset to the positive-polarity setting listed in the table for the current vertical scale setting. The baseline level may move off screen.
  - Set the generator to the level and polarity indicated in the table for the vertical scale, position, and offset settings you have made.

<sup>6</sup> Set as precisely as the instrument's offset resolution permits.

- e. *Measure the test signal:* Press **Close**. Read the measurement results at the **Mean** measurement readout. Refer to the following figure.



Figure 19: Measurement of offset accuracy

- f. *Check against limits:*
  - CHECK that the readout for the measurement **Mean** readout on screen is within the limits listed for the current vertical scale and position/offset/generator settings. Enter the value on the test record.
  - Repeat substep 2.d, using the offset and generator settings as is listed in the table.
  - CHECK that the **Mean** measurement readout on screen is within the limits listed for the current vertical scale setting and position/offset/generator settings. Enter the value on the test record.
  - Repeat substep 2.d, using the negative-polarity offset and generator settings as is listed in the table.
  - CHECK that the **Mean** measurement readout on screen is within the limits listed for the current vertical scale setting and position/offset/generator settings. Enter the value on the test record.
  - Repeat substeps 2.c through 2.f until all vertical scale settings, are checked for the channel under test. (See Table 11: Offset accuracy.)
- g. *Test all channels:* Repeat substeps 2.a through 2.f for all four channels.
3. *Disconnect the hookup:*
  - a. *Set the generator output to 0 V.*
  - b. Disconnect the generator from the channel last tested.

**Check analog bandwidth < 3.5 GHz models.**

| Equipment required                                                                                                                                                                                                                                                 | Prerequisites                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One sine wave generator (Item 9)<br>One level meter and power sensor (Item 10)<br>One power splitter (Item 11)<br>50 $\Omega$ precision cable 2.92 mm male-to-female (Item 12)<br>One K male-to-male adapter (Item 13)<br>SMA male-to-BNC female adapter (Item 19) | (See <a href="#">Prerequisites</a> on page 116.) |

**1. Install the test hookup and preset the instrument controls:****a. Initialize the instrument:**

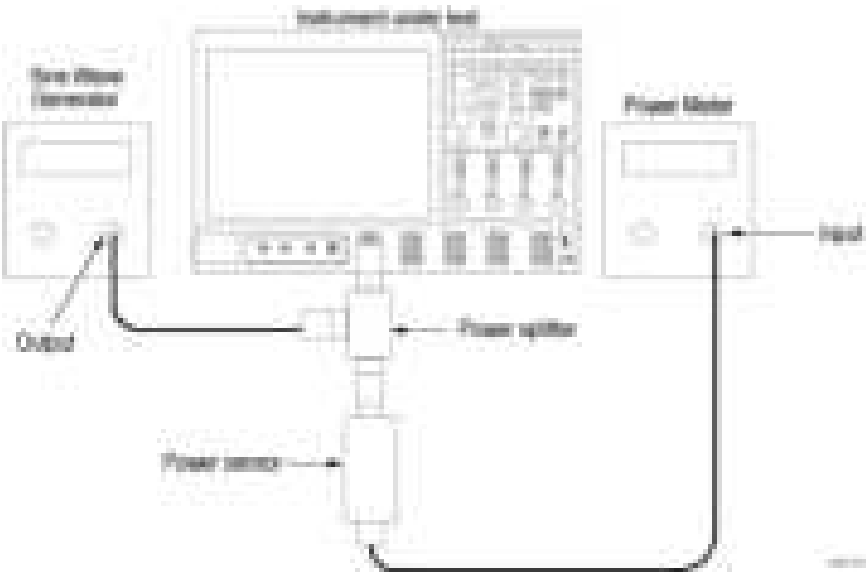
- Press **Default Setup**.

**b. Modify the default settings:**

- Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .
- From the Bandwidth drop-down list, select the maximum bandwidth for your instrument.
- Turn the horizontal **Scale** knob to **50 ns**.
- From the button bar, touch **Horiz/Acq** and select the **Horizontal** tab. Select Constant Sample Rate mode. Set the Sample Rate to **200 GS/s**.
- From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab. Set the acquisition mode as follows: Touch **Average** and set the number of averages to **16**.
- Set the sampling mode as follows: Touch the **Equivalent ET** button.
- From the button bar, touch **Measure**. Touch Setups **Ref Levs**; then touch the **Histogram** button.

**c. Hook up the test-signal source:** Connect the sine wave output of a sine wave generator to **Ch 1** through a power splitter. Connect the power sensor of the power meter to the power splitter. (See [Figure 20: Analog](#)

*bandwidth test hookup, < 3.5 GHz models* on page 228.) Set the output of the generator to a reference frequency of 50 MHz or less.



**Figure 20: Analog bandwidth test hookup, < 3.5 GHz models**

2. *Confirm the input channels are within limits for analog bandwidth:* Do the following substeps - test Ch 1 first, *skipping substeps 2.a and 2.b since Ch 1 is already set up for testing from step 1.*
- a. *Select an unchecked channel:*
- From the button bar, touch **Measure** and then **Clear All** to remove the previous measurement.
  - Press the Vertical button of the channel just confirmed to remove the channel from the display.
  - Press the front-panel Vertical button that corresponds to the channel you are to confirm.
  - Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50 Ω**.
  - Move the leveled output of the sine wave generator to the channel you selected.
- b. *Match the trigger source to the channel selected:* Press the **Trigger Source** button until the source that corresponds to the channel you are to confirm is on.

**Table 12: Analog bandwidth, < 3.5 GHz models**

| Vertical scale | Reference amplitude | Horizontal scale | Test frequency |          |          | -3 dB    |
|----------------|---------------------|------------------|----------------|----------|----------|----------|
|                |                     |                  | DPO7254C       | DPO7104C | DPO7054C |          |
| 5 mV           | 30 mV               | 1 ns             | 2.0 GHz        | 1 GHz    | 500 MHz  | ≥21.2 mV |

| Vertical scale | Reference amplitude | Horizontal scale | Test frequency |          |          | -3 dB                 |
|----------------|---------------------|------------------|----------------|----------|----------|-----------------------|
|                |                     |                  | DPO7254C       | DPO7104C | DPO7054C |                       |
| 10 mV          | 60 mV               | 1 ns             | 2.501 GHz      | 1 GHz    | 500 MHz  | ≥42.4 mV              |
| 20 mV          | 120 mV              | 1 ns             | 2.501 GHz      | 1 GHz    | 500 MHz  | ≥84.8 mV              |
| 50 mV          | 300 mV              | 1 ns             | 2.501 GHz      | 1 GHz    | 500 MHz  | ≥212 mV               |
| 100 mV         | 600 mV              | 1 ns             | 2.501 GHz      | 1 GHz    | 500 MHz  | ≥424 mV               |
| 200 mV         | 1.2 V               | 1 ns             | 2.501 GHz      | 1 GHz    | 500 MHz  | ≥848 mV               |
| 500 mV         | 3 V <sup>7</sup>    | 1 ns             | 2.501 GHz      | 1 GHz    | 500 MHz  | ≥2.12 V <sup>7</sup>  |
| 1 V            | 5 V <sup>7</sup>    | 1 ns             | 2.501 GHz      | 1 GHz    | 500 MHz  | ≥3.535 V <sup>7</sup> |

c. *Set the vertical scale:*

For the channel you are testing, set the vertical **Scale** to the next setting in the table, starting with the 100 mV setting. (See [Table 12: Analog bandwidth, < 3.5 GHz models](#) on page 228.)

d. *Set the triggering coupling:* From the button bar, touch Trigger, then select Coupling **DC**.

e. *Display the test signal:* Do the following subparts to first display the reference signal and then the test signal.

- From the button bar touch **Measure**; then select the **Time** tab.
- Touch the **Freq** button to measure the frequency of the current channel.
- Select the **Ampl** tab. Touch the **Amplitude** button.
- Touch the **Statistics** button, then touch the **Mean** button.
- Touch the **X** (Close) button.
- Set the generator output so the Chx Amplitude mean readout equals the reference amplitude in the table. This corresponds to the vertical scale set in substep 2.c. (See [Table 12: Analog bandwidth, < 3.5 GHz models](#) on page 228.)
- Record the reading on the power meter.
- Set the trigger as follows:

Press the front-panel **Push-Set 50%** as necessary to trigger a stable display. At full bandwidth, you may also want to make small, manual adjustments to the trigger level. You can use the **Trigger Level** knob to do this.

f. *Measure the test signal:*

Set the frequency of the generator, as shown on screen to the test frequency in the table that corresponds to the vertical scale set in substep

<sup>7</sup> If your generator cannot output the required amplitude, determine its maximum output at the Test frequency, and use this for the reference amplitude. The -3 dB limit can be calculated as:  $0.707 \times \text{reference amplitude}$ .

2.c. (See [Table 12: Analog bandwidth, < 3.5 GHz models](#) on page 228.)  
(See [Figure 21: Measurement of analog bandwidth](#) on page 230.)

Set the horizontal **Scale** to the horizontal scale setting that corresponds to the vertical scale set in substep 2.c. (See [Table 12: Analog bandwidth, < 3.5 GHz models](#) on page 228.) Press **PUSH-SET 50%** as necessary to trigger the signal.

Adjust the output of the generator until the reading on the power meter is equal to the reading recorded on the power meter in substep 2.e.

Read the results at the Chx Amplitude mean readout, which will automatically measure the amplitude of the test signal. Refer to the following figure.

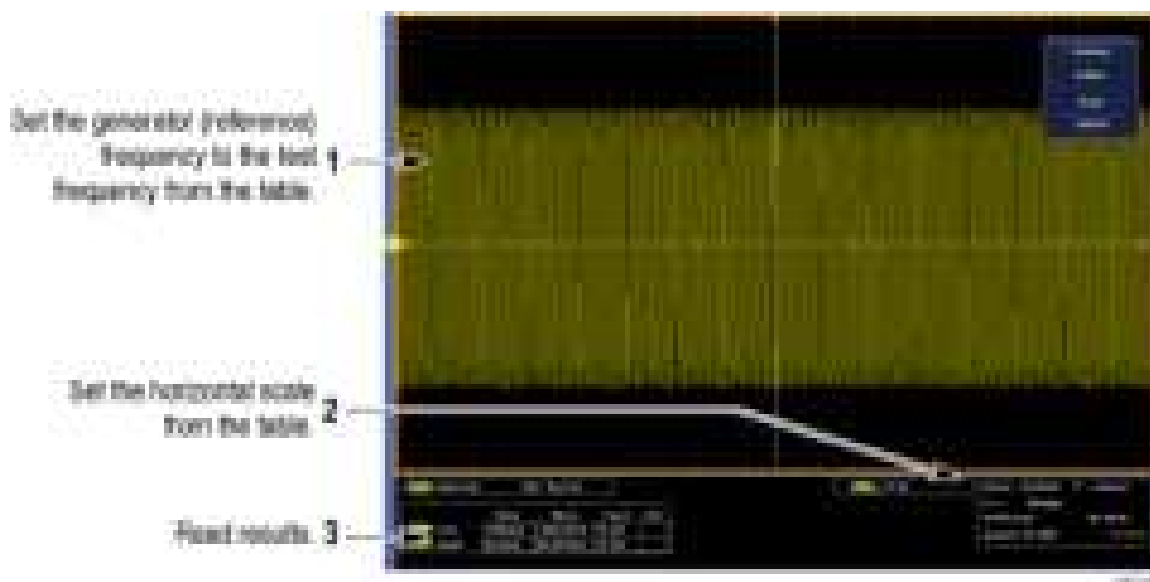


Figure 21: Measurement of analog bandwidth

g. *Check against limits:*

- CHECK that the **Amplitude** mean readout on screen is within the limits listed in the table for the current vertical scale setting. (See [Table 12: Analog bandwidth, < 3.5 GHz models](#) on page 228.)
- Enter the voltage on the test record.
- When finished checking, set the horizontal **Scale** back to the 20 ns.

h. *Check remaining vertical scale settings against limits:*

- Check the remaining vertical scale settings for the channel under test by repeating substeps 2.c through 2.g for each of the remaining scale settings for the channel under test.
- When doing substep 2.f, skip the subparts that turn on the Chx Amplitude mean measurement until you check a new channel.
- When selecting a new channel and before doing substep 2.f, touch the **Clear All** button to remove the previous channel measurements.

- i. *Test all channels:* Repeat substeps 2.a through 2.g for all four channels.
3. *Disconnect the hookup:* Disconnect the test hook up from the input connector of the channel last tested.

**Check channel bandwidth  $\geq$  3.5 GHz models.**

| Equipment Required                                                                                                                                                                                                                                                 | Prerequisites                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One sine wave generator (Item 9)<br>One level meter and power sensor (Item 10)<br>One power splitter (Item 11)<br>50 $\Omega$ precision cable 2.92 mm male-to-female (Item 12)<br>One K male-to-male adapter (Item 13)<br>SMA male-to-BNC female adapter (Item 19) | (See <a href="#">Prerequisites</a> on page 116.) |

**1. Install the test hookup and preset the instrument controls:****a. Initialize the instrument:**

- Press **Default Setup**.

**b. Modify the default settings:**

- Touch **Vertical**, select **Vertical Setup**.
- DPO7354C: Touch Termination **50  $\Omega$** .
- From the Bandwidth drop-down list, select the maximum bandwidth for your instrument.
- Turn the horizontal **Scale** knob to **40 ns**. (DPO7354C: set to **50 ns**.)
- From the button bar, touch **Horiz/Acq** and select the **Horizontal** tab. Select Constant Sample Rate mode. Set the Sample Rate to **250 GS/s** or **200 GS/s**, depending on instrument setup. (DPO7354C: set to **200 GS/s**.)
- From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab. Set the acquisition mode as follows: Touch **Sample**.
- Set the sampling mode as follows: Touch the **Interpolate IT** button.
- From the button bar, touch **Measure**. Touch Setups **Ref Levs**; then touch the **Histogram Mode** button.
- If your instrument has enhanced bandwidth, from the toolbar, touch **Vertical** and check **Force Constant Sample Rate** (Digital filters ensured). Select **Apply to All Channels**.

**c. Hook up the test-signal source:** Connect the sine wave output of the sine wave generator to **Ch 1** through a power splitter. Connect the power sensor of the power meter to the power splitter. Set the output of the

2. *Confirm the input channels are within limits for bandwidth:* Do the following substeps - test Ch 1 first, *skipping substeps 2.a and 2.b since Ch 1 is already set up for testing from step 1.*
  - a. *Select an unchecked channel:*
    - MSO/DPO71254C and MSO/DPO72504DX: Press **Cursors** to remove cursors from the display.
    - From the button bar, touch **Measure** and then **Clear All** to remove the previous measurement.
    - Press the Vertical button of the channel just confirmed to remove the channel from the display.
    - Press the front-panel Vertical button that corresponds to the channel you are to confirm.
    - DPO7354C: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50 Ω**.
    - Move the test setup to the channel you selected.

| Vertical scale | Reference amplitude<br>(6 div) | Horizontal scale | Test frequency      |                     |                     | -3 dB limits |
|----------------|--------------------------------|------------------|---------------------|---------------------|---------------------|--------------|
|                |                                |                  | MSO/DPO/<br>73304DX | MSO/DPO/<br>72504DX | MSO/DPO/<br>72304DX |              |
| 6.25 mV        | 37.5 mV                        | 1 ns             | 33 GHz              | 24.9 GHz            | 23 GHz              | ≥26.5 mV     |
| 10 mV          | 60 mV                          | 1 ns             | 33 GHz              | 24.9 GHz            | 23 GHz              | ≥42.4 mV     |

| Vertical scale | Reference amplitude (6 div) | Horizontal scale | Test frequency  |                 |                 | -3 dB limits |
|----------------|-----------------------------|------------------|-----------------|-----------------|-----------------|--------------|
|                |                             |                  | MSO/DPO/73304DX | MSO/DPO/72504DX | MSO/DPO/72304DX |              |
| 20 mV          | 120 mV                      | 1 ns             | 33 GHz          | 24.9 GHz        | 23 GHz          | ≥84.8 mV     |
| 50 mV          | 300 mV                      | 1 ns             | 33 GHz          | 24.9 GHz        | 23 GHz          | ≥212 mV      |
| 100 mV         | 600 mV                      | 1 ns             | 33 GHz          | 24.9 GHz        | 23 GHz          | ≥424 mV      |
| 120 mV         | 720 mV                      | 1 ns             | 33 GHz          | 24.9 GHz        | 23 GHz          | ≥509 mV      |
| 140 mV         | 840 mV                      | 1 ns             | 33 GHz          | 24.9 GHz        | 23 GHz          | ≥594 mV      |
| 200 mV         | 1200 mV <sup>8</sup>        | 1 ns             | 33 GHz          | 24.9 GHz        | 23 GHz          | ≥848 mV      |
| 400 mV         | 1600 mV <sup>8</sup>        | 1 ns             | 33 GHz          | 24.9 GHz        | 23 GHz          | ≥1131 mV     |

Table 14: Channel bandwidth ≥4 GHz, ≤20 GHz models

| Vertical scale | Reference amplitude (6 div) | Horizontal scale | Test frequency |                |                |                |                |                | -3 dB limits |
|----------------|-----------------------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|
|                |                             |                  | MSO/DPO/72004C | MSO/DPO/71604C | MSO/DPO/71254C | MSO/DPO/70804C | MSO/DPO/70604C | MSO/DPO/70404C |              |
| 10 mV          | 60 mV                       | 1 ns             | 18 GHz         | 16 GHz         | 12.5 GHz       | 8 GHz          | 6 GHz          | 4 GHz          | ≥42.4 mV     |
| 20 mV          | 120 mV                      | 1 ns             | 20 GHz         | 16 GHz         | 12.5 GHz       | 8 GHz          | 6 GHz          | 4 GHz          | ≥84.8 mV     |
| 50 mV          | 300 mV                      | 1 ns             | 20 GHz         | 16 GHz         | 12.5 GHz       | 8 GHz          | 6 GHz          | 4 GHz          | ≥212 mV      |
| 100 mV         | 600 mV                      | 1 ns             | 20 GHz         | 16 GHz         | 12.5 GHz       | 8 GHz          | 6 GHz          | 4 GHz          | ≥424 mV      |
| 250 mV         | 1.5 V                       | 1 ns             | 20 GHz         | 16 GHz         | 12.5 GHz       | 8 GHz          | 6 GHz          | 4 GHz          | ≥1.061 V     |

Table 15: Channel bandwidth 3.5 GHz model

| Vertical scale | Reference amplitude | Horizontal scale | Test frequency | -3 dB limits         |
|----------------|---------------------|------------------|----------------|----------------------|
|                |                     |                  | DPO7354C       |                      |
| 5 mV           | 30 mV               | 1 ns             | 2.0 GHz        | ≥21.2 mV             |
| 10 mV          | 40 mV               | 1 ns             | 3.5 GHz        | ≥28.3 mV             |
| 20 mV          | 80 mV               | 1 ns             | 3.5 GHz        | ≥56.6 mV             |
| 50 mV          | 200 mV              | 1 ns             | 3.5 GHz        | ≥141.4 mV            |
| 100 mV         | 400 mV              | 1 ns             | 3.5 GHz        | ≥283 mV              |
| 200 mV         | 800 mV              | 1 ns             | 3.5 GHz        | ≥566 mV              |
| 500 mV         | 2 V <sup>8</sup>    | 1 ns             | 3.5 GHz        | ≥1.41 V <sup>8</sup> |
| 1 V            | 4 V <sup>8</sup>    | 1 ns             | 3.5 GHz        | ≥2.83 V <sup>8</sup> |

- b. *Match the trigger source to the channel selected:* Press the Trigger **Source** button until the source that corresponds to the channel you are to confirm is on.

For models with bandwidth >9 GHz: Set the trigger Source to **Line**.

- c. DPO7354C: Set the input impedance to **50 Ω**.

<sup>8</sup> If your generator cannot output the required amplitude, determine its maximum output at the Test frequency, and use this for the reference amplitude. The -3 dB limit can be calculated as:  $0.707 \times \text{reference amplitude}$ .

d. *Set the vertical scale:*

For the channel you are testing, set the vertical **Scale** to the setting listed in the tables (starting with the lowest setting). See the preceding Channel bandwidth table that applies to your instrument.

e. *Set the trigger coupling:* From the button bar, touch **Trigger** and select Coupling **DC**.

f. *Display the test signal:* Do the following subparts to first display the reference signal and then the test signal.

- MSO/DPO71254C and MSO/DPO72504DX: From the button bar, touch **Cursors**. Touch Cursor Type **H Bars**.
- From the button bar touch **Measure**; then select the **Time** tab.
- Touch the **Freq** button to measure the frequency of the current channel.
- Select the **Ampl** tab. Touch the **Amplitude** button.
- From the Annotation drop-down list, select **None**.
- Touch the **Statistics** button, then touch the **Mean** button.
- Touch the **X (Close)** button.
- Set the generator output so the Chx Amplitude mean readout equals the reference amplitude. See the preceding Channel Bandwidth table that applies to your oscilloscope model. This corresponds to the vertical scale set in substep 2.d.
- Record the reading on the power meter.
- Set the trigger as follows: Press the front-panel **Push-Set 50%** button as necessary to trigger a stable display. At full bandwidth, you may also want to make small, manual adjustments to the trigger level. You can use the **Trigger Level** knob to do this.

---

**NOTE.** *If you are using Line trigger, the test signal is not shown as a stable display.*

---

g. *Measure the test signal:*

- MSO/DPO71254C and MSO/DPO72504DX: Set the frequency of the generator to the test frequency in the tables that corresponds to the vertical scale set in substep 2.d.
- All instruments except the MSO/DPO71254C and MSO/DPO72504DX: Set the frequency of the generator, as shown on

screen, to the test frequency in the tables that corresponds to the vertical scale set in substep 2.d.

- Set the horizontal **Scale** to the horizontal scale setting in the tables that corresponds to the vertical scale set in substep 2.d. Press **PUSH-SET 50%** as necessary to trigger the signal.
- Adjust the output of the generator until the reading on the power meter is equal to the reading recorded on the power meter in step 2.f.
- MSO/DPO71254C and MSO/DPO72504DX: Using the Multipurpose knobs, adjust Cursor 1 to the top of the waveform and Cursor 2 to the bottom of the waveform. Read the absolute value of the result at the  $\Delta V$  readout.
- All instruments except the MSO/DPO71254C and MSO/DPO72504DX: Read the results at the Chx Amplitude mean readout, which will automatically measure the amplitude of the test signal. (See [Figure 23: Measurement of analog bandwidth](#) on page 236.)

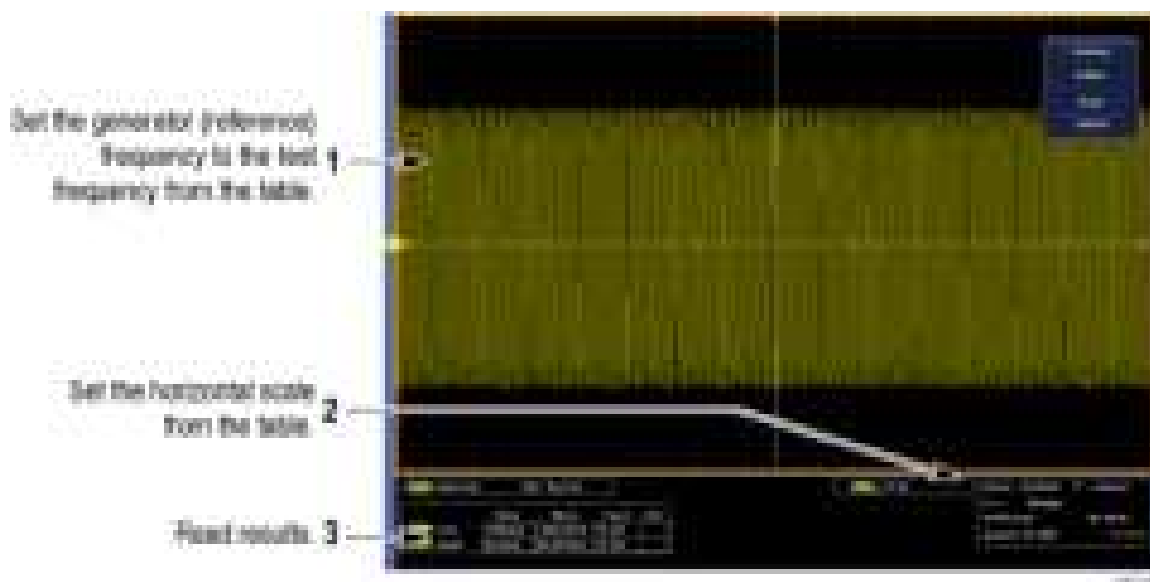


Figure 23: Measurement of analog bandwidth

**h. Check against limits:**

- CHECK that the measured amplitude is within the limits for the current vertical scale setting in the table.
- Enter the voltage on the test record.
- When finished checking, set the horizontal **Scale** back to the 20 ns.

**i. Check remaining vertical scale settings against limits:**

- Check the remaining vertical scale settings for the channel under test by repeating substeps 2.a through 2.h for each of the remaining scale settings for the channel under test.

- When doing substep 2.f, skip the subparts that turn on the Chx Amplitude mean measurement until you check a new channel.
- When selecting a new channel and before doing substep 2.e, touch the **Clear All** button to remove the previous channel measurements.
- j. *Test all channels:* Repeat substeps 2.a through 2.i for all four channels.
- 3. *Disconnect the hookup:* Disconnect the test hook up from the input connector of the channel last tested.

**Check input resistance  $\geq 4$  GHz models.**

| Equipment Required                                                                                                                                                                                                                                                        | Prerequisites                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One Digital Multimeter (Item 27)<br>One Dual-Banana Connector, (Item 5)<br>One precision 50 $\Omega$ coaxial cable (Item 4)<br>One SMA male-to-female BNC adapter (Item 19)<br>One SMA female-to-female adapter (Item 16)<br>One SMA male short circuit adapter (Item 25) | (See <a href="#">Prerequisites</a> on page 116.) |

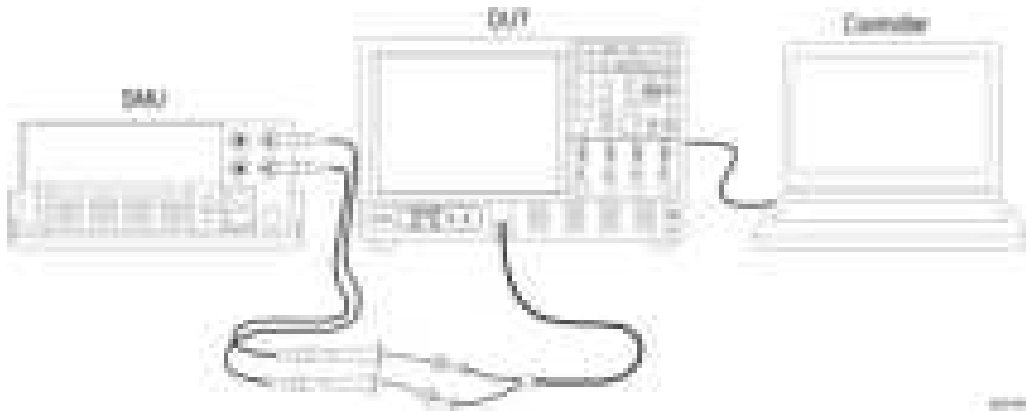
**Figure 24: Input resistance test hookup,  $\geq 4$  GHz models**

1. *Install the test hookup and preset the instrument controls:*
  - a. *Initialize the instrument:* Press the **Default Setup** button.
  - b. Short the cable from the multimeter by connecting a shorting adapter and SMA-to-SMA adapter to the BNC-to-SMA adapter.
  - c. Read and record the resistance of the multimeter leads.
  - d. *Hook up the test-signal source:* Connect, through a 50  $\Omega$  precision coaxial cable, the input of the multimeter to **Ch 1** through adapters. (See [Figure 24: Input resistance test hookup,  \$\geq 4\$  GHz models](#) on page 238.)
  - e. Set the Vertical **Scale** to **10 mV** (6.25 mv for  $>20$  GHz models) per division
2. *Check input impedance against limits:*
  - a. *Measure the impedance:* Read and record the measured impedance.
  - b. Remove the dual banana connector from the digital multimeter (DMM), turn it 180 degrees and reinsert it in the DMM input.
  - c. *Measure the impedance:* Read and record the measured impedance.
  - d. Add the two measurements and divide the result by 2.
  - e. Subtract the resistance of the multimeter leads from the average that you calculated.
  - f. Enter the result on the test record.



**Check TekProtect.** This procedure is only for MSO/DPO70000C instruments that have TekProtect installed. TekProtect provides protection from electrical overstress (EOS) and electrostatic discharge (ESD) on the four analog input channels.

| Equipment required                                                                                                                      | Prerequisites                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Source Measure Unit (Item 34)<br>Adapter, TCA-BNC (Item 19)<br>Adapter, BNC to minigrabber (Item 18)<br>Instrument controller (Item 35) | (See <a href="#">Prerequisites</a> on page 116.) |



**Figure 25: TekProtect initial test hookup**

1. *Install the test hookup and preset the instrument controls:*
  - a. *Initialize the instrument:* Press the Default Setup button.
  - b. Using the instrument controller, send the INSPECT command to the oscilloscope. Do not make additional settings changes to the instrument until asked to in Step 9.
  - c. Hook up the test-signal source: Connect the Source Measure Unit to the CH 1 input of the oscilloscope using the SMU test leads and the two adapters. Connect the SMU High Sense to the center conductor. Connect the SMU Low Sense to the ground (outer) conductor.
2. Set the Source Measure Unit to output +2.0 V. Verify that the measured current is less than +100  $\mu$ A. Enter the value in the test record.
3. Set the Source Measure Unit to output -2.0 V. Verify that the measured current is less than -100  $\mu$ A. Enter the value in the test record.
4. Set the Source Measure Unit to output +65 mA, with the overvoltage limit set to +3.5 V. Verify that the measured voltage is  $\leq 3.42$  V. Enter the value in the test record.
5. Set the Source Measure Unit to output -65 mA, with the overvoltage limit set to -3.5 V. Verify that the measured voltage is  $\geq -3.42$  V. Enter the value in the test record.
6. Move the test setup to an unchecked input channel.

7. Repeat steps 2 through 6 until all 4 input channels have been checked.
8. *Disconnect the hookup*: Disconnect the equipment from the instrument.
9. Return the instrument to normal operation by pressing the Default Setup button.
10. Check the completion status: If any of the 4 checks on any of the 4 channels is outside the limits, return the instrument to Tektronix Service for repair.

#### **Time base system checks**

These procedures check those characteristics that relate to the time base system and are listed as checked under *Warranted Characteristics* in *Specifications*.

Check timebase and delay time accuracy and reference.

| Equipment Required                                                                                                                                                   | Prerequisites                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One timer-counter (Item 8)<br>One 50 $\Omega$ , precision coaxial cable (Item 4)<br>One SMA male-to-female BNC adapter (Item 19)<br>One sine wave generator (Item 9) | (See <a href="#">Prerequisites</a> on page 116.) |

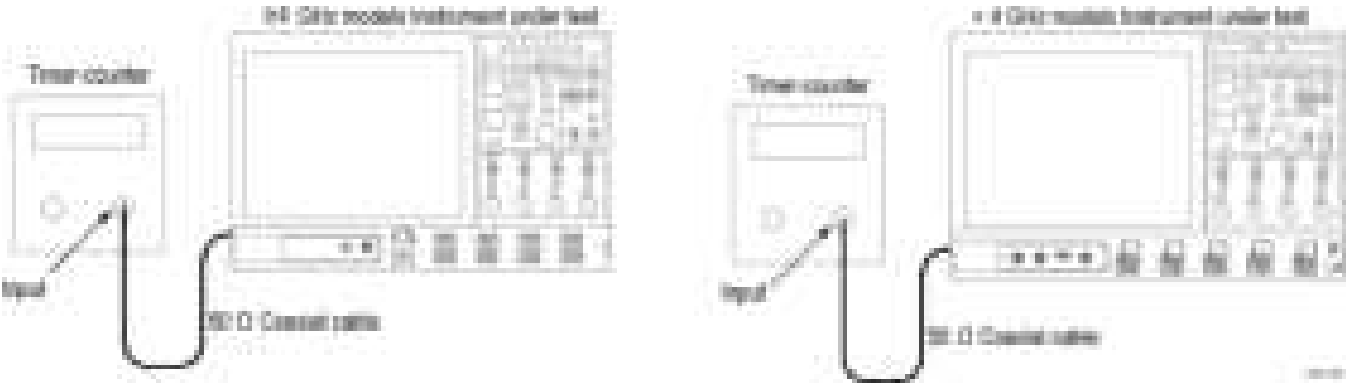


Figure 26: Timebase and delay time initial test hookup

1. *Install the test hookup and preset the instrument controls:*
  - a. *Hook up the test-signal source:* Connect the input of the timer-counter to **AUX Out** (<4 GHz models) or reference output ( $\geq$ 4 GHz models). (See [Figure 26: Timebase and delay time initial test hookup](#) on page 242.)
    - Set the timer-counter gate to 1 s.
    - Set the timer-counter to count the 10 MHz reference output.
  - b. *Initialize the instrument:* Press the **Default Setup** button.
  - c. <4 GHz models: Display menu mode. Select Utilities > External Signals and press **Ref Out**.
2. *Confirm the time base is within limits for accuracies:*
  - a. *Check long-term sample rate, delay time accuracies, and reference output frequency:*
    - CHECK that the count on the timer-counter is within limits. (See [Long term sample rate, delay time, and internal reference accuracy](#) in the test record.)
    - Enter the count on the test record.

3. *Disconnect the hookup:* Disconnect the equipment from the instrument.

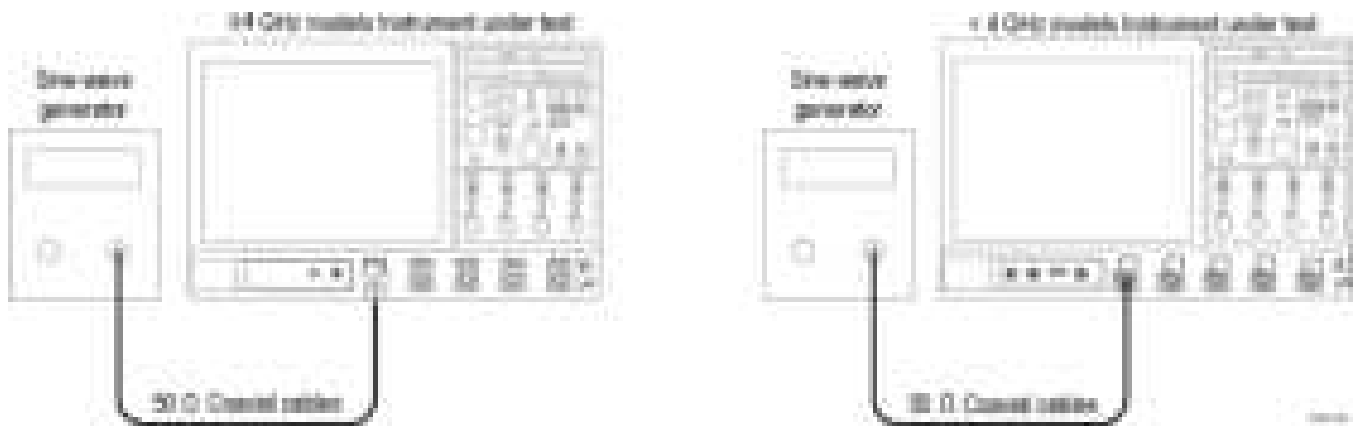


Figure 27: Timebase and delay time second test hookup

4. *Install the test hookup and preset the instrument controls:*

- a. *Initialize the instrument:* Press the **Default Setup** button.
- b. *Hook up the test-signal source:* Connect the output of the sine wave generator to **Ch 1** input. (See [Figure 27: Timebase and delay time second test hookup](#) on page 243.)
  - From the button bar, touch **Measure** and select the **Ampl** tab.
  - Touch the **Pk-Pk** button.
  - Touch the **X** (Close) button.
  - Set the Vertical **Scale** to 50 mV.
  - <4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .
  - Set the generator for a 10.0 MHz sine wave.
  - Set the generator to output a 4 division signal. Adjust the output until the Pk-Pk readout displays 200 mV.
- c. *Set the instrument controls:*
  - Move the cable from the **Ch 1** input to the rear-panel **Ext Ref** input (See [Figure 28: Timebase and delay time final test hookup](#) on page 244.)
  - From menu mode, touch **Utilities** and select **External Signals**.
  - Touch the **External** button to select the external reference.

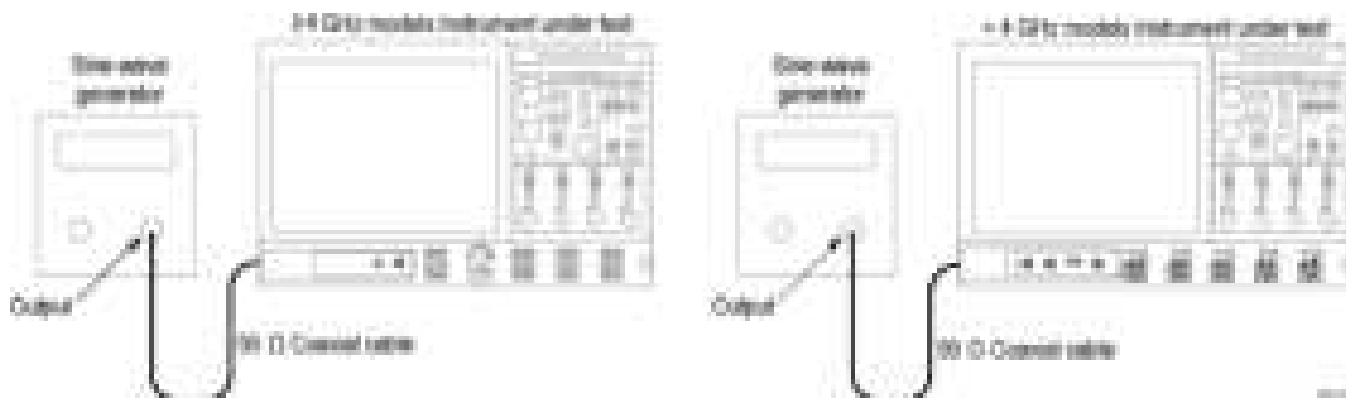


Figure 28: Timebase and delay time final test hookup

5. *Confirm external reference:*

- a. *Perform a signal path compensation:*
  - Touch **Utilities** and select **Instrument Calibration**.
  - Touch **Run SPC** (**Calibrate** on some instruments) and wait for the signal path compensation to finish.
- b. *Check the completion status:* Enter the pass/fail status in the test record. If the Status is Fail, refer the instrument to qualified service personnel.

**6.** *Disconnect the hookup:*

- a.** Disconnect all test equipment from the instrument.
- b.** *Set the instrument controls:*
  - From menu mode, touch **Utilities** and select **External Signals**.
  - Touch the **Internal** button to select the internal reference.
- c.** *Perform a signal path compensation:*
  - Touch **Utilities** and select **Instrument Calibration**.
  - Touch **Run SPC (Calibrate** on some instruments) and wait for the signal path compensation to finish.

Check delta time measurement accuracy <4 GHz models.

| Equipment Required                                                                                                                                                                                                                                                                                                                                                                                                                            | Prerequisites                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One 50 $\Omega$ , precision coaxial cable (Item 4)<br>One 50 $\Omega$ , 60 inch precision coaxial cable, male-to-male SMA connectors (Item 28)<br>One Pulse Generator (Item 20)<br>One BNC elbow connector (Item 24)<br>One SMA "T", male to two SMA female connectors (Item 22)<br>One SMA female to BNC male connector (Item 23)<br>One SMA termination connector, short circuit, (Item 25)<br>One SMA male-to-female BNC adapter (Item 17) | (See <a href="#">Prerequisites</a> on page 116.) |

This procedure checks the "sample rate" portion of the Delta Time Measurement Accuracy as listed in *Specifications*. The previous procedure, that checks the reference, (See [Check timebase and delay time accuracy and reference](#) on page 242) verified the "PPM" portion of the delta time specification.

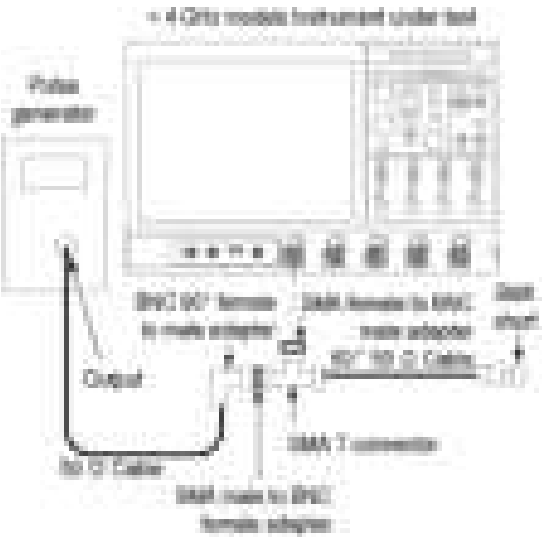


Figure 29: Delta time accuracy test hookup, <4 GHz models

1. Install the test hookup and preset the instrument controls:
  - a. Initialize the instrument: Press the **Default Setup** button.
  - b. Hook up the pulse generator:
    - <4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .
    - Connect the pulse generator output to a **50 $\Omega$**  precision coaxial cable followed by a 90° right-angle female to male SMA adapter. The adapter is connected to one side of the female SMA T connector. The other side of the SMA T is connected to a 60 inch **50  $\Omega$**  coaxial

cable. Connect the SMA short, to the remaining end of the cable. Now connect the male SMA T connector to **Ch 1** through an SMA female to BNC male adapter.

- Set the pulse generator output for a positive-going pulse with a rise-time as shown in the table for your instrument, and for the fastest possible repetition rate (at least 1 kHz). (See [Table 16: Delta time measurement settings](#) on page 247.)
  - Set the pulse generator output for about 500 mV. (This amplitude can be adjusted later to get a 5-division pulse on screen.)
- c. *Modify the initialized front-panel control settings:*
- Power on the pulse generator.
  - Touch **Utilities**, select **User Preferences**, select the **Units** tab, and then select the **1-2-5** button.
  - Readjust the Trigger **Level** knob so the trigger level is about 50% of the rising edge of the positive pulse.
  - Press **Autoset**. You may see both positive and negative pulses. Adjust the Trigger **Level** knob so the trigger level is about 50% of the rising edge of the positive pulse.
  - From the button bar, touch the **Horiz/Acq** button and select the **Acquisition** tab. Press the **RT** button to turn on Real Time Only.
  - <4 GHz models: Set the horizontal **SCALE** as indicated in the following table.

**Table 16: Delta time measurement settings**

| Instrument | Pulse generator rise and fall time range | Horizontal scale setting | Sample rate | Delta time accuracy limit |
|------------|------------------------------------------|--------------------------|-------------|---------------------------|
| DPO7354C   | ≤ 150 ps                                 | 10 ns/div                | 10 GS/s     | ≤ 6.0 ps                  |
| DPO7254C   | ≤ 150 ps                                 | 10 ns/div                | 10 GS/s     | ≤ 6.0 ps                  |
| DPO7104C   | ≤ 150 ps                                 | 10 ns/div                | 10 GS/s     | ≤ 6.0 ps                  |
| DPO7054C   | ≤ 150 ps                                 | 20 ns/div                | 5 GS/s      | ≤ 12.0 ps                 |

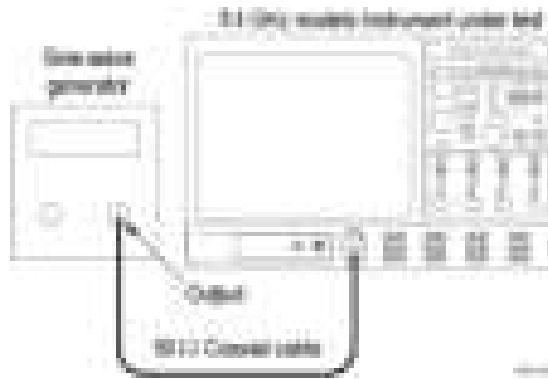
- Adjust the generator output or instrument vertical scale and position as necessary to obtain at least **5 divisions** of the **positive** pulse.
- d. *Set up for statistics measurements:*
- Press **Run/Stop** button to freeze the display.
  - From the button bar, touch **Measure** and select the **Time** tab to show the Time Measurements menu.
  - Touch the **Pos Width** button.
  - Touch Setups **Statistics** and then touch **All**. Touch **Reset** to reset the statistics.

- Touch **Weight n=**. On the keypad press **1000**, then **Enter**. Touch **Setup**.
  - Touch Setups **Ref Levs** and then touch **Absolute**.
  - Touch **MidRef**. Using the keypad or multipurpose knobs, set the mid reference level. Set the reference level near the center of the upper portion of the pulse, above any noise, and below any overshoot or ringing on the pulse. Touch the **X** (Close) button.
  - Press the **Run/Stop** button to start the acquisitions.
  - Wait about 30 seconds.
  - Press **Run/Stop** button to freeze the display.
  - Read the Std Dev statistic measurement.
  - The standard deviation (St Dev) measurement must be less than or equal to the Delta-time accuracy limit for your instrument. (See [Table 16: Delta time measurement settings](#) on page 247.)
  - Enter the result for delta time on the test record.
- e. *Repeat for all other channels:*
- Note the vertical scale setting of the channel just confirmed.
  - Press the Vertical channel button for the channel just confirmed to remove the channel from display.
  - Touch **Measure** and then **Clear All** to remove the measurement.
  - Press the front-panel button that corresponds to the channel you are to confirm.
  - Set vertical scale to the setting noted in step STEP-22, first bullet.
  - Press the Trigger **Source** button to toggle the source to the channel selected.
  - <4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50 Ω**.
  - Move the test hookup to the channel you selected.
  - Press **Run/Stop** button to start the display.
  - Repeat step 1.d.
  - Touch **Utilities**, select **User Preferences**, select the **Units** tab, and then select the **1-2-3** button.
2. *Disconnect all test equipment from the instrument.*

**Check delta time measurement accuracy  $\geq 4$  GHz models.**

| Equipment Required                                                                                              | Prerequisites                                    |
|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One 50 $\Omega$ , precision coaxial cable (Item 4)<br>One sine-wave generator (Item 9)<br>One adapter (Item 19) | (See <a href="#">Prerequisites</a> on page 116.) |

This procedure checks the Delta Time Measurement Accuracy as listed in *Specifications*.



**Figure 30: Delta time accuracy test hookup,  $\geq 4$  GHz models**

1. *Install the test hookup and preset the instrument controls:*
  - a. *Initialize the instrument:* Press the **Default Setup** button.
  - b. *Hook up the sine-wave generator:*
    - Connect the sine-wave output of the sine-wave generator through a **50  $\Omega$**  precision coaxial cable to **Ch 1** through an adapter.
    - Power on the generator.
    - Set the sine-wave generator to output a sine wave of the frequency shown in the table. (See [Table 17: Delta time measurement settings,  \$\geq 4\$  GHz models](#) on page 250.)
    - Set the generator output for 80 mV. (This amplitude will be adjusted later to get an 8-division pulse on screen.)
    - Set the Vertical Scale to 10 mV per division.
  - c. *Modify the initialized front-panel control settings:*
    - Readjust the Trigger **Level** knob so the trigger level is at 50% of the rising edge of the sine wave.
    - From the button bar, touch the **Horiz/Acq** button. Select the **Manual** button to turn on Manual Mode.
    - Select the **Acquisition** tab. Press the **IT** button to turn on Interpolate Time Only.
    - From the button bar, touch the **Vertical** button.

- Select **Analog Only** (for tests with BWE on, select **Digital Filters (DSP) Enabled**).
- Set the vertical scale, generator frequency, record length, and sample rate as indicated in the following table for the instrument under test.

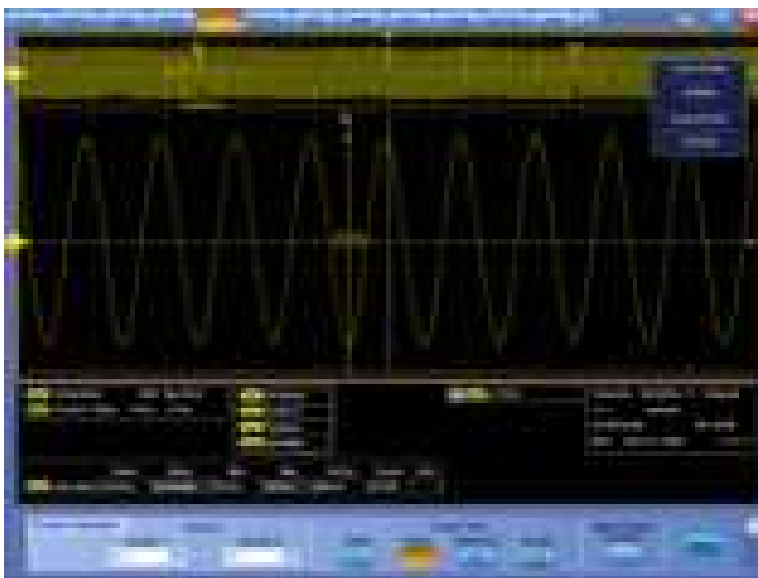
**Table 17: Delta time measurement settings, ≥4 GHz models**

| Instrument                    | Volts/div | Sine wave generator frequency | Record length | Sample rate (IT mode) | Burst width | Delta time rms accuracy limit | Delta time pk-pk accuracy limit |
|-------------------------------|-----------|-------------------------------|---------------|-----------------------|-------------|-------------------------------|---------------------------------|
| <b>BWE off</b>                |           |                               |               |                       |             |                               |                                 |
| MSO/DPO72004C                 | 10 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.280 ps                      | 12.80 ps                        |
|                               | 50 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.172 ps                      | 11.72 ps                        |
|                               | 100 mV    | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.186 ps                      | 11.86 ps                        |
| MSO/DPO71604C                 | 10 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.280 ps                      | 12.80 ps                        |
|                               | 50 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.172 ps                      | 11.72 ps                        |
|                               | 100 mV    | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.186 ps                      | 11.86 ps                        |
| MSO/DPO71254C                 | 10 mV     | 7.76 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.304 ps                      | 13.04 ps                        |
|                               | 50 mV     | 7.76 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.201 ps                      | 12.01 ps                        |
|                               | 100 mV    | 7.76 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.205 ps                      | 12.05 ps                        |
| MSO/DPO70804C                 | 10 mV     | 4.97 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.462 ps                      | 14.62 ps                        |
|                               | 50 mV     | 4.97 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.295 ps                      | 12.95 ps                        |
|                               | 100 mV    | 4.97 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.336 ps                      | 13.36 ps                        |
| MSO/DPO70604C                 | 10 mV     | 3.73 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.625 ps                      | 16.25 ps                        |
|                               | 50 mV     | 3.73 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.427 ps                      | 14.27 ps                        |
|                               | 100 mV    | 3.73 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.463 ps                      | 14.63 ps                        |
| MSO/DPO70404C                 | 10 mV     | 2.48 GHz                      | 10000         | 500 GS/s              | 10 ns       | 2.022 ps                      | 20.22 ps                        |
|                               | 50 mV     | 2.48 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.762 ps                      | 17.62 ps                        |
|                               | 100 mV    | 2.48 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.821 ps                      | 18.21 ps                        |
| <b>BWE on</b>                 |           |                               |               |                       |             |                               |                                 |
| MSO/<br>DPO73304DX,<br>33 GHz | 6.25 mV   | 19.49 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.803 ps                      | 8.03 ps                         |
|                               | 50 mV     | 19.49 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.564 ps                      | 5.64 ps                         |
|                               | 100 mV    | 19.49 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.555 ps                      | 5.55 ps                         |
| MSO/<br>DPO72504DX,<br>25 GHz | 6.25 mV   | 15.53 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.881 ps                      | 8.81 ps                         |
|                               | 50 mV     | 15.53 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.639 ps                      | 6.39 ps                         |
|                               | 100 mV    | 15.53 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.639 ps                      | 6.39 ps                         |
| MSO/<br>DPO72304DX,<br>23 GHz | 6.25 mV   | 14.28 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.889 ps                      | 8.89 ps                         |
|                               | 50 mV     | 14.28 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.666 ps                      | 6.66 ps                         |
|                               | 100 mV    | 14.28 GHz                     | 10000         | 500 GS/s              | 10 ns       | 0.677 ps                      | 6.77 ps                         |

| Instrument                                       | Volts/div | Sine wave generator frequency | Record length | Sample rate (IT mode) | Burst width | Delta time rms accuracy limit | Delta time pk-pk accuracy limit |
|--------------------------------------------------|-----------|-------------------------------|---------------|-----------------------|-------------|-------------------------------|---------------------------------|
| MSO/<br>DPO72004C,<br>20 GHz<br>20 GHz<br>18 GHz | 50 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.260 ps                      | 12.60 ps                        |
|                                                  | 100 mV    | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.432 ps                      | 14.32 ps                        |
|                                                  | 10 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.336 ps                      | 13.36 ps                        |
| MSO/<br>DPO71604C,<br>16 GHz                     | 10 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.219 ps                      | 12.19 ps                        |
|                                                  | 50 mV     | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.154 ps                      | 11.54 ps                        |
|                                                  | 100 mV    | 9.94 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.159 ps                      | 11.59 ps                        |
| MSO/<br>DPO71254C,<br>12.5 GHz                   | 10 mV     | 7.45 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.333 ps                      | 13.33 ps                        |
|                                                  | 50 mV     | 7.45 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.212 ps                      | 12.12 ps                        |
|                                                  | 100 mV    | 7.45 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.228 ps                      | 12.28 ps                        |
| MSO/<br>DPO70804C,<br>8 GHz                      | 10 mV     | 4.97 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.354 ps                      | 13.54 ps                        |
|                                                  | 50 mV     | 4.97 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.235 ps                      | 12.35 ps                        |
|                                                  | 100 mV    | 4.97 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.241 ps                      | 12.41 ps                        |
| MSO/<br>DPO70604C,<br>6 GHz                      | 10 mV     | 3.73 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.445 ps                      | 14.45 ps                        |
|                                                  | 50 mV     | 3.73 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.295 ps                      | 12.95 ps                        |
|                                                  | 100 mV    | 3.73 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.329 ps                      | 13.29 ps                        |
| MSO/<br>DPO70404C,<br>4 GHz                      | 10 mV     | 2.48 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.674 ps                      | 16.74 ps                        |
|                                                  | 50 mV     | 2.48 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.437 ps                      | 14.37 ps                        |
|                                                  | 100 mV    | 2.48 GHz                      | 10000         | 500 GS/s              | 10 ns       | 1.478 ps                      | 14.78 ps                        |

- d. Adjust the generator output as necessary to obtain **8 divisions** of displayed waveform.
- e. *Set up for statistics measurements:*
  - From the button bar, touch **Measure** and select the **More** tab to show the More Measurements menu.
  - Touch the **Burst Width** button.
  - Touch Setups **Gating** and then touch **Cursor**.
  - Touch **Setup**.
  - Touch Setups **Statistics** and then touch **All**. Set the Weight n= to **1000**. Touch **Reset** to reset the statistics.
  - Touch **Setup**.
  - Touch Setups **Ref Levs** and then touch **Absolute**.
  - Touch **MidRef**. Using the keypad or multipurpose knobs, set the mid reference level to **0 V**. Touch the **X** (Close) button.
  - Click one of the cursors to assign the multipurpose knobs to the cursors.
  - Using the multipurpose knobs, set the Cursor 1 x position to **-5.0 ns**, and set the Cursor 2 x position to **+5 ns**.

- Press the **Multiview Zoom** front panel button.
- Using the multipurpose knobs, set the Zoom position to 25%, and set the Zoom factor to 20.
- Press the **Cursors** front-panel button once to assign the multipurpose knobs to the Cursors.
- Set the Cursor 1 x position to align the cursor with the nearest trough of the waveform.



- Press the **Zoom** button. Set the Zoom position to 75%.
  - Press the **Cursors** button once. Set the Cursor 2 x position to align the cursor with the nearest trough of the waveform.
- f. *Read the measurement:*
- Press the **Clear** button. Allow approximately 1000 acquisitions to accumulate, then press **Run/Stop**.
  - Read the Std Dev statistic measurement.
  - Enter the time on the test record.
  - The standard deviation (St Dev) measurement must be less than or equal to the rms Delta-time accuracy limit for your instrument. (See [Table 17: Delta time measurement settings, ≥4 GHz models](#) on page 250.)
  - Read the Max and Min statistic measurements.
  - Subtract the Max and Min statistic measurements.
  - Enter the time on the test record.
  - The absolute value of the difference of the Max and Min measurements must be less than or equal to the pk-pk Delta-time

accuracy limit for your instrument and bandwidth setting. (See [Table 17: Delta time measurement settings,  \$\geq 4\$  GHz models](#) on page 250.)

- Press the **Run/Stop** button.
- g. *Repeat for all other Volts/div settings in the table:*
  - Set the vertical scale, generator frequency, record length, and sample rate as indicated in the table.
  - Repeat step 1.f.
- 2. *Disconnect all test equipment from the instrument.*

## Trigger system checks

These procedures check those characteristics that relate to the trigger system and are listed as checked in *Specifications*.

## Check time qualified trigger accuracy

| Equipment Required                                                                                                                                                    | Prerequisites                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One sine wave generator (Item 9)<br>One 2X attenuator (Item 26)<br>One 50 $\Omega$ , precision coaxial cable (Item 4)<br>One SMA male-to-female BNC adapter (Item 19) | (See <a href="#">Prerequisites</a> on page 116.) |

1. *Install the test hookup and preset the instrument controls:*
  - a. *Initialize the instrument:* Press the **Default Setup** button.
  - b. *Modify the default setup:*
    - < 4 GHz models: Set the horizontal **Scale** to 2.5 ns.
    - $\geq 4$  GHz models: Set the horizontal **Scale** to 2 ns.
    - < 4 GHz models: From the button bar, click the **Vertical** button; then click the Termination **50  $\Omega$**  button.

- c. *Hook up the test-signal source:* Connect the output of the sine wave generator to Ch 1 as shown in the following figure.

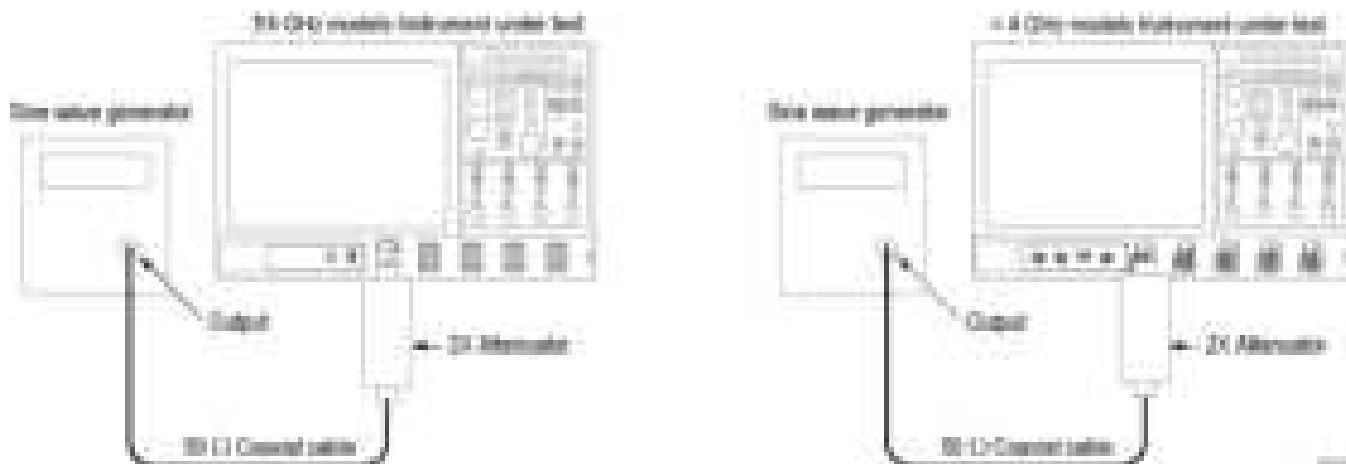


Figure 31: Time qualified trigger test hookup

- d. *Set the trigger mode:* Press the Trigger **Mode** button to toggle it to **Normal**.

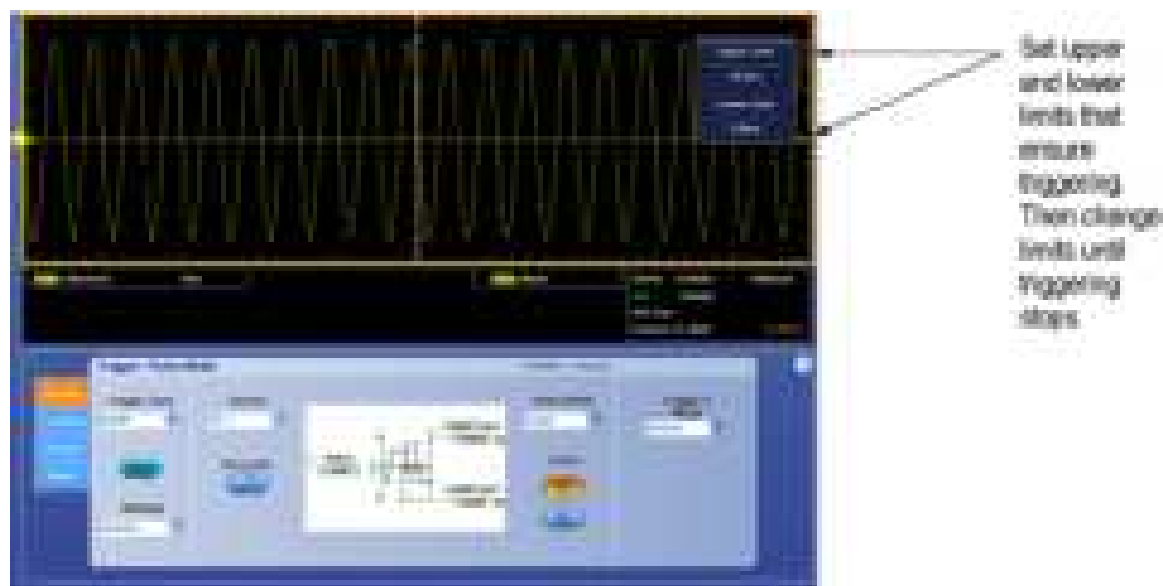


Figure 32: Measurement of time accuracy for pulse and glitch triggering

2. *Confirm the trigger system is within time-accuracy limits for time qualified trigger accuracy (time range < 1  $\mu$ s):*
  - a. *Set upper and lower limits that ensure triggering at 100 MHz:* (See [Figure 32: Measurement of time accuracy for pulse and glitch triggering](#) on page 254.)
    - Press the front-panel **Advanced** button and select the **A Event** tab; then pull down on Trigger Type and select **Width** triggering.
    - Pull down Pulse Width and select **Inside** limits.

- Touch **Upper Limit**. Use the keypad to set the upper limit to 10 ns.
  - Touch **Lower Limit**. Use the keypad to set the lower limit to 2 ns.
- b. *Display the test signal:*
- Set the Horizontal **Scale** to 20 ns.
  - Set the output of the sine wave generator for a 100 MHz, five-division sine wave on screen. Set the Vertical **Scale** to 20 mV (the waveform will overdrive the display).
  - Press **PUSH-SET 50%**.
- c. *Check against limits:* Do the following subparts in the order listed.
- While doing the following subparts, monitor the display (it will stop acquiring) and the front-panel light **Trig'd** (it will extinguish) to determine when triggering is lost.
  - $\geq 4$  GHz models: Press the multipurpose knobs until Fine is on.
  - Use the multipurpose knob to *increase* the **Lower Limit** readout until triggering is lost.
  - CHECK that the **Lower Limit** readout, after the instrument stops triggering, is within the following limits:

| Model               | Limit              |
|---------------------|--------------------|
| < 4 GHz models      | 3.5 ns to 6.5 ns   |
| $\geq 4$ GHz models | 4.77 ns to 5.23 ns |

- Enter the time on the test record.
- Use the keypad to return the **Lower Limit** to 2 ns and reestablish triggering.
- Touch **Upper Limit**; then use the multipurpose knob to slowly *decrease* the **Upper Limit** readout until triggering stops.
- CHECK that the **Upper Limit** readout, after the instrument loses triggering, is within the following limits:

| Model               | Limit                         |
|---------------------|-------------------------------|
| < 4 GHz models      | 3.5 ns to 6.5 ns, inclusive   |
| $\geq 4$ GHz models | 4.77 ns to 5.23 ns, inclusive |

- Enter the time on the test record.

3. *Confirm the trigger system is within time-accuracy limits for pulse-glitch or pulse-width triggering (time range  $\geq 1 \mu\text{s}$ ):*

a. *Set upper and lower limits that ensure triggering at 250 kHz:*

- Touch **Upper Limit**. Use the keypad to set the upper limit to 4  $\mu\text{s}$ .
- Touch **Lower Limit**. Use the keypad to set the lower limit to 500 ns.

b. *Display the test signal:*

- < 4 GHz models: Set the Horizontal **Scale** to 5  $\mu\text{s}$ .
- $\geq 4$  GHz models: Set the Horizontal **Scale** to 4  $\mu\text{s}$ .
- Set the Vertical **Scale** to 100 mV.
- Set the output of the sine wave generator for a 250 kHz, five-division sine wave on screen. Set the Vertical **Scale** to 20 mV (the waveform will overdrive the display).
- Press **PUSH-SET 50%**.

c. *Check against limits:* Do the following subparts in the order listed.

- $\geq 4$  GHz models: Press the multipurpose knobs until Fine is on.
- Use the multipurpose knob to *increase* the **Lower Limit** readout until triggering is lost.
- CHECK that the **Lower Limit** readout, after the instrument stops triggering, is within the following limits:

| Model               | Limit                                              |
|---------------------|----------------------------------------------------|
| < 4 GHz models      | 1.9 $\mu\text{s}$ to 2.1 $\mu\text{s}$ , inclusive |
| $\geq 4$ GHz models | 1.9 $\mu\text{s}$ to 2.1 $\mu\text{s}$ , inclusive |

- Enter the time on the test record.
- Use the keypad to return the **Lower Limit** to 500 ns and reestablish triggering.
- Touch **Upper Limit**; then use the multipurpose knob to slowly *decrease* the **Upper Limit** readout until triggering stops.
- CHECK that the **Upper Limit** readout, after the instrument loses triggering, is within the following limits:

| Model               | Limit                                              |
|---------------------|----------------------------------------------------|
| < 4 GHz models      | 1.9 $\mu\text{s}$ to 2.1 $\mu\text{s}$ , inclusive |
| $\geq 4$ GHz models | 1.9 $\mu\text{s}$ to 2.1 $\mu\text{s}$ , inclusive |

- Enter the time on the test record.

4. *Disconnect the hookup:* Disconnect the equipment from the instrument.

## Check sensitivity edge trigger DC coupled

| Equipment required                                                                                                                                                                                                                                                                                                                                                                                                                                     | Prerequisites                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| One leveled sine wave generator (Item 9)<br>Three precision 50 $\Omega$ coaxial cables (Item 21)<br>Two SMA female to BNC male adapters (Item 23)<br>Three SMA female-to-female adapters (Item 16)<br>One 10X attenuator (Item 1)<br>One power splitter (Item 11)<br>Male N-to-BNC adapter (Item 14)<br>One SMA adapter (Item 19)<br>One 5X attenuator (Item 2)<br>One 2X attenuator (Item 26)<br>< 4 GHz models, one 50 $\Omega$ termination (Item 3) | (See <a href="#">Prerequisites</a> on page 116.) |

**NOTE.** The sine wave generator output amplitude must be leveled to within 0.35 dB of the reference frequency (10 MHz) through the trigger frequency being tested. Refer to the Sine Wave Generator Leveling Procedure if your sine wave generator does not have automatic output amplitude leveling. (See [Sine wave generator leveling procedure](#) on page 281.)

1. *Install the test hookup and preset the instrument controls:*

- a. *Initialize the instrument:* Press the **Default Setup** button.
- b. *Modify the initialized front-panel control settings:*
  - Set the Horizontal **Scale** to 20 ns.
  - < 4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .
  - Press the Trigger **Mode** button to toggle it to **Normal**.
  - From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab.
  - Touch **Average** and set the number of averages to **16**.
  - Touch the **Equivalent ET** button.
- c. *Hook up the test-signal source:*
  - Connect the signal output of the generator to a power splitter. Connect one output of the power splitter to **Ch 1** as shown in the following figure. Connect the other output of the power splitter to the **Aux Input** as in the following figure.

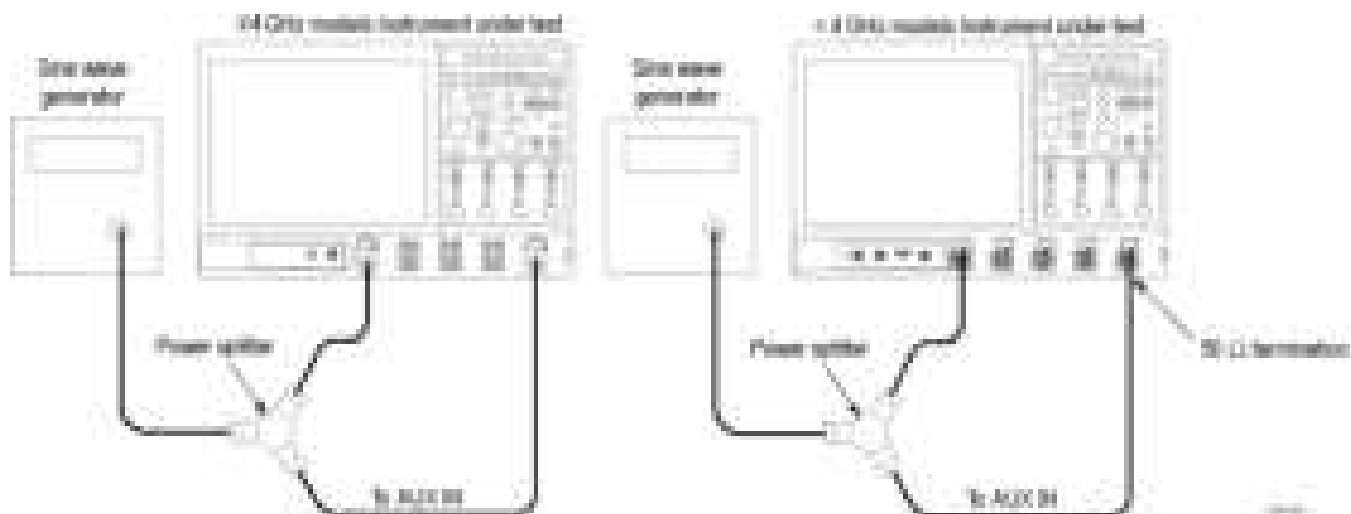


Figure 33: Sensitivity, edge trigger, DC coupled test hookup

2. *Confirm the trigger system is within sensitivity limits (50 MHz):*

- a. *Display the test signal:*
  - Set the generator frequency to 50 MHz.
  - From the button bar, touch **Measure**.
  - Touch Setup **Ref Levs**; then touch the **Min-Max** button.
  - Touch the **Setup** button and select the **Ampl** tab; then touch the **Amplitude** button.
  - Touch the X (close) button.

- Press **Push-Set 50%**.
- Set the generator amplitude on screen as follows:

| Model          | Divisions   |
|----------------|-------------|
| ≥ 4 GHz models | 4 divisions |
| < 4 GHz models | 7 divisions |

- Now fine adjust the generator output until the **Ch 1 Amplitude** readout indicates the amplitude is as follows (Readout may fluctuate):

| Model          | Amplitude |
|----------------|-----------|
| ≥ 4 GHz models | 400 mV    |
| < 4 GHz models | 700 mV    |

- Disconnect the 50  $\Omega$  precision coaxial cable at **Ch 1** and reconnect it to **Ch 1** through a 10X attenuator.
- b. Check the A trigger system for stable triggering at limits:**
- Read the following definition: A stable trigger is one that is consistent; that is, one that results in a uniform, regular display triggered on the selected slope (positive or negative). This display should *not* have its trigger point switching between opposite slopes, nor should it roll across the screen. At horizontal scale settings of 2 ms/division and faster, **Trig'd** will remain constantly lighted. It will flash for slower settings.
  - Press the Trigger **Slope** button to select the positive slope.
  - Adjust the Trigger **Level** knob so that there is a stable trigger. CHECK that the trigger is stable for the test waveform on the positive slope.
  - Press the Trigger **Slope** button to select the negative slope. Adjust the Trigger **Level** knob so that there is a stable trigger.
  - CHECK that the trigger is stable for the test waveform on the negative slope.
  - Enter pass or fail in the test record.
  - Leave the trigger system triggered on the positive slope of the waveform before continuing to the next step.

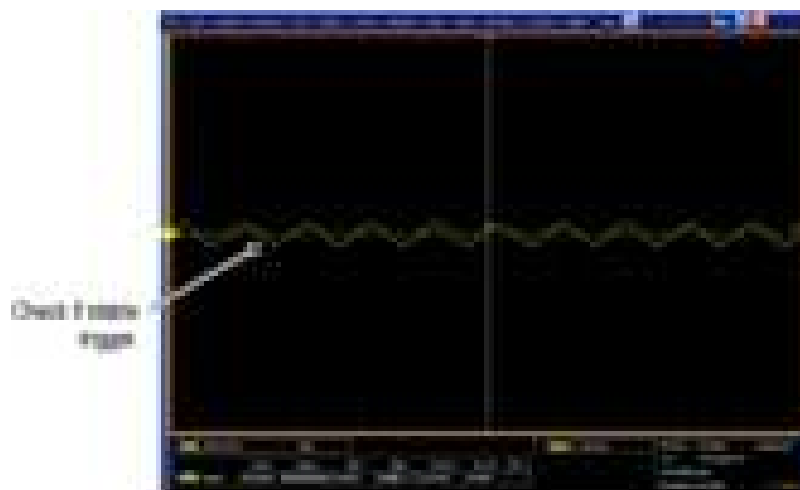


Figure 34: Measurement of trigger sensitivity - 50 MHz results shown

- c.  $\geq 4$  GHz models: *Check B trigger system for stable triggering at limits:* Do the following subparts in the order listed.
  - From the button bar touch **Trig**, select the **A Event** tab, and set the **Source** to Line.
  - Select the **A->B Seq** tab, and touch the A then B **Trig After Time** button.
  - Select the **B Event** tab, and touch the **Set To 50%** button.
  - CHECK that a stable trigger is obtained for the test waveform for both the positive and negative slopes of the waveform. Use the **Trigger Level** knob to stabilize the A trigger. Touch **Level** and use the keypad or the multipurpose knob/Fine button to stabilize the B trigger. Touch one of the Slope buttons to switch between trigger slopes. (See [Figure 34: Measurement of trigger sensitivity - 50 MHz results shown](#) on page 260.)
  - Enter pass or fail in the test record.
  - Leave the Delayed trigger system triggered on the positive slope of the waveform before continuing to the next step. Also, return to the A trigger: select the **A->B Seq** tab and touch the A->B Sequence **A Only** button. Then select the **A Event** tab.
  - Select the **A Event** tab, and set the **Source** to CH1.
  - Press the X (Close button).
3. *Confirm the AUX Trigger input (at 50 MHz):*
  - a. *Display the test signal:*
    - Remove the 10X attenuator and reconnect the cable to **Ch 1**.
    - Set the signal amplitude as follows: **2.5 divisions**
    - Now fine adjust the generator output until the **Ch 1 Amplitude** readout indicates the amplitude is as follows (readout may fluctuate): **250 mV**
  - b. *Check the AUX trigger source for stable triggering at limits:* Do the following in the order listed.
    - Use the definition for stable trigger from step 2.b.
    - Press the Trigger **Source** button to toggle it to **Aux** (Ext).
    - Press **Push-Set 50%**.
    - CHECK that a stable trigger is obtained for the test waveform on both the positive and negative slopes. Press the Trigger **Slope** button to switch between trigger slopes. Use the Trigger **Level** knob to stabilize the trigger if required.
    - Enter pass or fail in the test record.

- Leave the trigger system triggered on the positive slope of the waveform before proceeding to the next check.
  - Press the Trigger **Source** button to toggle it to **Ch 1**.
4. *Confirm that the A trigger system is within sensitivity limits (full bandwidth):*
- a. *Set the Horizontal Scale:* Set the Horizontal **Scale** to 200 ps.
  - b. *Display the test signal:*
    - Set the generator frequency to full bandwidth as follows:

| Model          | Generator frequency |
|----------------|---------------------|
| ≥ 4 GHz models | 4 GHz               |
| DPO7354C       | 3.5 GHz             |
| DPO7254C       | 2.5 GHz             |
| DPO7104C       | 1 GHz               |
| DPO7054C       | 500 MHz             |

- Set the generator amplitude on screen as follows:

| Model          | Amplitude     |
|----------------|---------------|
| ≥ 4 GHz models | 2 divisions   |
| DPO7354C       | 2.5 divisions |
| DPO7254C       | 6 divisions   |
| DPO7104C       | 6 divisions   |
| DPO7054C       | 6 divisions   |

- Now fine adjust the generator output until the **Ch 1 Amplitude** readout indicates the amplitude is as follows (readout may fluctuate):

| Model          | Amplitude |
|----------------|-----------|
| ≥ 4 GHz models | 200 mV    |
| DPO7354C       | 250 mV    |
| DPO7254C       | 600 mV    |
| DPO7104C       | 600 mV    |
| DPO7054C       | 600 mV    |

- Disconnect the cable at **Ch 1** and reconnect it to **Ch 1** through an attenuator:

| Model          | Attenuator |
|----------------|------------|
| ≥ 4 GHz models | 2X         |
| DPO7354C       | None       |
| DPO7254C       | 5X         |
| DPO7104C       | 5X         |
| DPO7054C       | 5X         |

- Check that a stable trigger is obtained.
- c. Repeat step 2, substeps 2.b and 2.c for the full bandwidth selected.

**Table 18: Trigger settings for ≥ 4 GHz models**

| Generator amplitude | Generator frequency |           | Horizontal scale |
|---------------------|---------------------|-----------|------------------|
|                     | A trigger           | B trigger |                  |
|                     | 10 MHz              | 10 MHz    | 200 ns           |
| 150 mV              | 6 GHz               | 6 GHz     | 200 ps           |
| 200 mV              | 8 GHz               | NA        | 200 ps           |
| 500 mV              | 11 GHz              | 9 GHz     | 200 ps           |

- d. ≥ 4 GHz models: *Display the test signal:*
- Remove the attenuator.
  - Set the generator frequency to 10 MHz. Set the Horizontal SCALE as indicated in the table. (See [Table 18: Trigger settings for ≥ 4 GHz models](#) on page 263.)
  - Fine adjust the generator output until the **Ch 1 Amplitude** readout indicates the amplitude listed in the table for a frequency not yet checked. (See [Table 18: Trigger settings for ≥ 4 GHz models](#) on page 263.)
  - Set the generator frequency to the frequency in the table that corresponds to the amplitude just set. Set the Horizontal SCALE as indicated in the table. (See [Table 18: Trigger settings for ≥ 4 GHz models](#) on page 263.)
  - CHECK that a stable trigger is obtained.
  - Read the following definition: A stable trigger is one where the **Trig'd** LED will remain constantly lighted.
  - Press the Trigger **Slope** button to select the positive slope.
  - Adjust the Trigger **Level** knob so that there is a stable trigger. CHECK that the trigger is stable.
  - Press the Trigger **Slope** button to select the negative slope. Adjust the Trigger **Level** knob so that there is a stable trigger.
  - CHECK that the trigger is stable.
  - Enter pass or fail in the test record.

- Leave the trigger system triggered on the positive slope of the waveform before continuing to the next step.
  - From the button bar touch **Trig**, select the **A Event** tab, and set the **Source** to Line.
  - If you are using a generator amplitude of 200 mV, skip to step 4.e.
  - If the generator frequency is different for the B trigger, set the generator frequency to the frequency in the table that corresponds to the amplitude in the table. (See [Table 18: Trigger settings for  \$\geq 4\$  GHz models](#) on page 263.)
  - From the button bar touch **Trig**, select the **A->B Seq** tab, and touch the A then B **Trig After Time** button.
  - Select the **B Event** tab, and touch the **Set To 50%** button.
  - CHECK that a stable trigger is obtained for the test waveform for both the positive and negative slopes of the waveform. Use the **Trigger Level** knob to stabilize the A trigger. Touch **Level** and use the keypad or the multipurpose knob/Fine button to stabilize the B trigger. Touch one of the Slope buttons to switch between trigger slopes. (See [Figure 34: Measurement of trigger sensitivity - 50 MHz results shown](#) on page 260.)
  - Enter pass or fail in the test record.
  - Leave the B trigger system triggered on the positive slope of the waveform before continuing to the next step. Also, return to the A trigger: select the **A->B Seq** tab and touch the A->B Sequence **A Only** button. Then select the **A Event** tab.
  - From the button bar touch **Trig**, select the **A Event** tab, and set the **Source** to CH1.
  - Press the X (Close button).
- e.  $\geq 4$  GHz models: Repeat step 4.d until each frequency in the table is checked. (See [Table 18: Trigger settings for  \$\geq 4\$  GHz models](#) on page 263.)
- f. *Display the test signal (Aux trigger at bandwidth):*
- Set the Horizontal Scale to 1 ns.
  - $< 4$  GHz models: Remove the attenuator and reconnect the cable to **Ch 1**.
  - $\geq 4$  GHz models: Reconnect the cable to **Ch 1**.
  - Set the generator frequency to full bandwidth as follows:

| Model               | Generator frequency |
|---------------------|---------------------|
| $\geq 4$ GHz models | 1 GHz               |
| $< 4$ GHz models    | 250 MHz             |

- Set the generator amplitude on screen as follows:

| Model          | Amplitude   |
|----------------|-------------|
| ≥ 4 GHz models | 7 divisions |
| < 4 GHz models | 7 divisions |

- Now fine adjust the generator output until the **Ch 1 Amplitude** readout indicates the amplitude is as follows (readout may fluctuate):

| Model          | Amplitude |
|----------------|-----------|
| ≥ 4 GHz models | 700 mV    |
| < 4 GHz models | 700 mV    |

- Disconnect the cable at **Aux In** and reconnect it to **Aux In** through an attenuator:

| Model          | Attenuator |
|----------------|------------|
| ≥ 4 GHz models | 2X         |
| < 4 GHz models | 2X         |

- g. Repeat step 4.f only, for the full bandwidth selected.

---

**NOTE.** You just checked the trigger sensitivity. If desired, you may repeat steps 1 through step 4.c for the other channels (Ch 2, Ch 3, and Ch 4).

---

5. *Disconnect the hookup:* Disconnect the equipment from Aux In and the channel last tested.

## Output signal checks

The procedure that follows checks those characteristics of the output signals that are listed as checked under *Warranted Characteristics* in *Specifications*.

# Check aux trigger out

| Equipment required                                                              | Prerequisites                                                                                                                                                                                           |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| One precision 50 $\Omega$ coaxial cable (Item 4)<br>One 2X attenuator (Item 33) | (See <a href="#">Prerequisites</a> on page 116.) Also, the instrument must have passed the <i>DC Voltage Measurement Accuracy</i> . (See <a href="#">Signal acquisition system checks</a> on page 176.) |

1. *Install the test hookup and preset the instrument controls:*

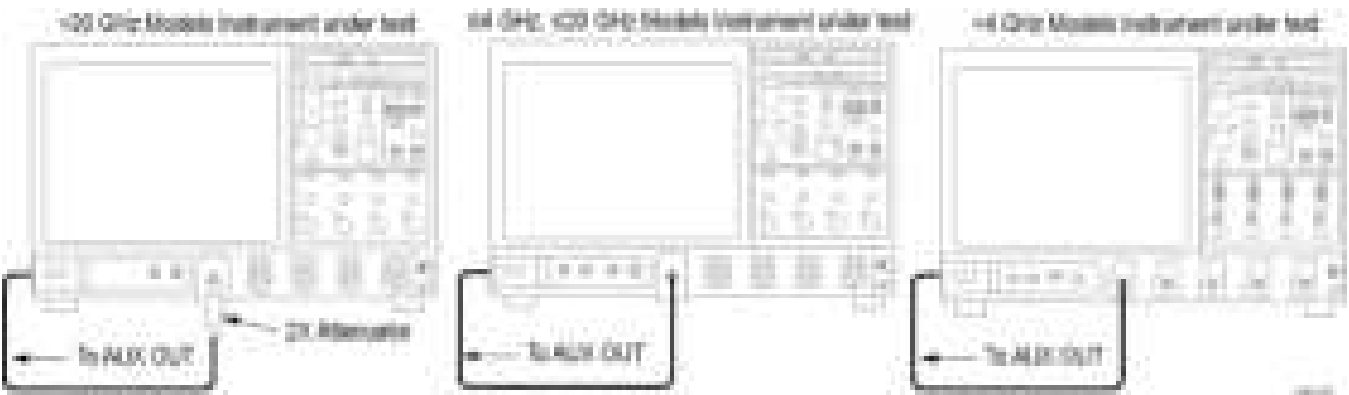


Figure 35: Aux Trigger Out test hookup

- a. *Hook up test-signal source:* Connect **Aux Out** to **Ch 1** through a 50  $\Omega$  precision cable and an adapter. (See Figure 35: Aux Trigger Out test hookup.)
  - b. *Initialize the instrument:* Press the **Default Setup** button.
  - c. *Modify the initialized front-panel control settings:*
    - Press the Vertical **Ch 1** button to toggle it off.
    - Set the Horizontal **Scale** to 200  $\mu$ s.
    - From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab.
    - Touch **Average** and set the number of averages to **64**.
    - Touch the **X** (close) button.
2. *Confirm Aux Out is within limits for logic levels:*
- a. *Display the test signal:*
    - Press the Vertical **Ch 1** button to display that channel.
    - < 4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .

- Set the **Vertical Scale** to **500 mV /div** ( $\leq 20$  GHz models) or **120 mV/div** ( $> 20$  GHz models).
  - Use the Vertical **Position** knob to center the display on screen.
- b. Measure logic levels:**
- From the button bar, touch **Measure** and select the **Ampl** tab.
  - Touch the **High** and **Low** buttons.
  - Touch the **X** (close) button.
- c. Check Aux Out output against limits:** (See [Figure 36: Measurement of trigger out limits](#) on page 267.)
- $\leq 20$  GHz models: CHECK that the **Ch 1 High** readout is  $\geq 1.0$  volt and that the **Ch 1 Low** readout  $\leq 0.25$  volts.
  - $> 20$  GHz models: CHECK that the **Ch 1 High** readout is  $\geq 0.5$  volt and that the **Ch 1 Low** readout  $\leq 0.125$  volts.
- 3. Disconnect the hookup:** Disconnect the test setup from the inputs and outputs.



Figure 36: Measurement of trigger out limits

# Check probe compensation or fast edge output

| Equipment required                                                                                                                                              | Prerequisites                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| One BNC to Minigrabber adapter (item 18)<br>One precision 50 $\Omega$ coaxial cable (Item 21)<br>One DC calibration generator (Item 6)<br>One adapter (Item 19) | (See <a href="#">Prerequisites</a> on page 116.) Also, the instrument must have passed <i>Check Timebase and Delay Time Accuracy and Reference</i> . (See <a href="#">Check timebase and delay time accuracy and reference</a> on page 242.) |

1. *Install the test hookup and preset the instrument controls:*
  - a. *Hook up test-signal:* Refer to the following figure.

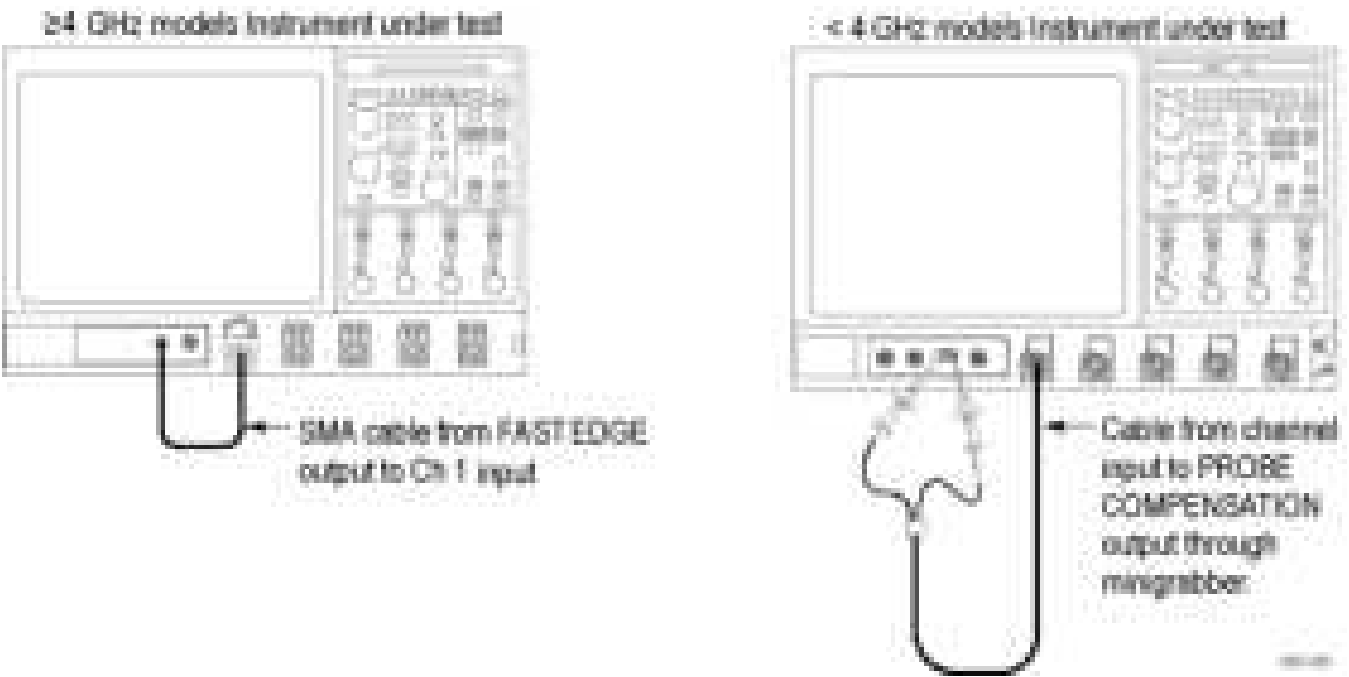


Figure 37: Probe compensation or fast edge output initial test hookup

- b. *Initialize the instrument:* Press the **Default Setup** button.
- c. *Modify the initialized front-panel control settings:*
  - Set the **Vertical Scale** to **200 mV /div** ( $\leq 20$  GHz models) or **120 mV/div** ( $> 20$  GHz models).
  - Set the **Horizontal Scale** to **200  $\mu$ s**.
  - Press **Push-Set 50%**.
  - Use the Vertical **Position** knob to center the display on screen.
  - From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab.
  - Touch **Average** and set the number of averages to **128**.

2. *Confirm the Probe Compensator signal:*



Figure 38: Measurement of probe compensator frequency

a. *Save the probe compensation signal in reference memory:*

- From the menu bar, touch **File**; **Save As . . .**, **Waveform**, and then **Ref 1**.
- Touch the **Save** button to save the probe compensation signal in reference 1.
- < 4 GHz models: Disconnect the signal from **Ch 1** and the probe compensation connector.
- $\geq$  4 GHz models: Disconnect the signal from **Ch 1** and the Fast Edge connector.
- Touch **File**; **Recall . . .**, **Waveform**, and then select the file name.
- Touch the **Recall** button to recall the probe compensation signal to the display.

b. *Hook up the DC standard source:*

- Set the output of a DC calibration generator to off or 0 volts.
- Connect the output of a DC calibration generator to **Ch 1**. Refer to the following figure.

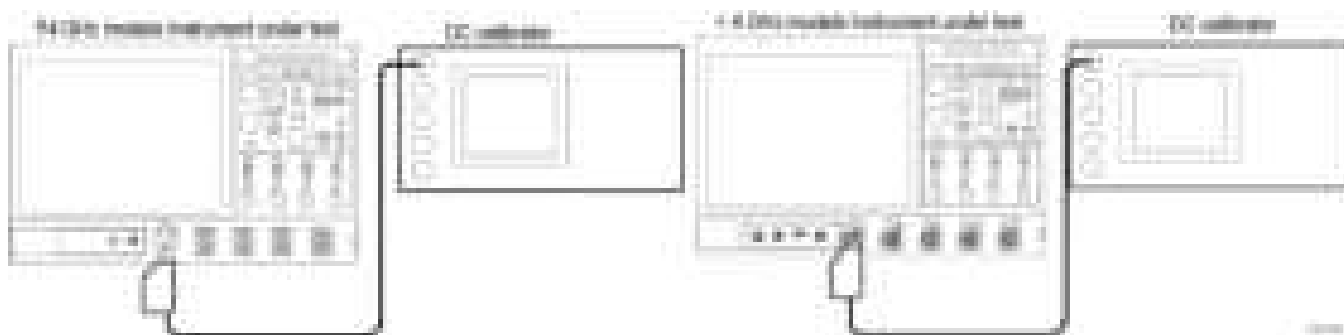


Figure 39: Probe compensation or fast edge output second test hookup

- c. *Measure amplitude of the probe compensation signal:*
  - From the button bar, touch **Horiz/Acq** and select the **Acquisition** tab.
  - Touch **Average** and set the number of averages to **16** using the keypad or the multipurpose knob.
  - Adjust the output of the DC calibration generator until it precisely overlaps the top (upper) level of the stored probe compensation signal.
  - Record the setting of the DC generator.
  - Adjust the output of the DC calibration generator until it precisely overlaps the base (lower) level of the stored probe compensation signal.
  - Record the setting of the DC generator.
- d. Press the **X** (close) button to remove the menus from the display. (See Figure 40: Measurement of probe compensator amplitude.)



Figure 40: Measurement of probe compensator amplitude

- e. *Check against limits:*
  - Subtract the value just obtained (base level) from that obtained previously (top level).

- CHECK that the difference obtained is within limits as follows:

| Model          | Limits               |
|----------------|----------------------|
| ≥ 4 GHz models | 343.2 mV to 536.8 mV |
| < 4 GHz models | 985 mV to 1015 mV    |

- Enter voltage difference on test record.

3. *Disconnect the hookup:* Disconnect the equipment from **Ch 1**.

## Serial trigger checks (Optional on some models)

These procedures check those characteristics that relate to the serial trigger system and are listed as checked in *Specifications*.

### Check serial trigger baud rate limits

| Equipment required                                                                                            | Prerequisites                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| One precision 50 $\Omega$ coaxial cable (Item 4)<br>One sine-wave generator (Item 9)<br>One adapter (Item 19) | (See <a href="#">Prerequisites</a> on page 116.) Also, the instrument must have passed <i>Check DC Voltage Measurement Accuracy</i> . (See <a href="#">Signal acquisition system checks</a> on page 176.) |

1. *Install the test hookup and preset the instrument controls:*

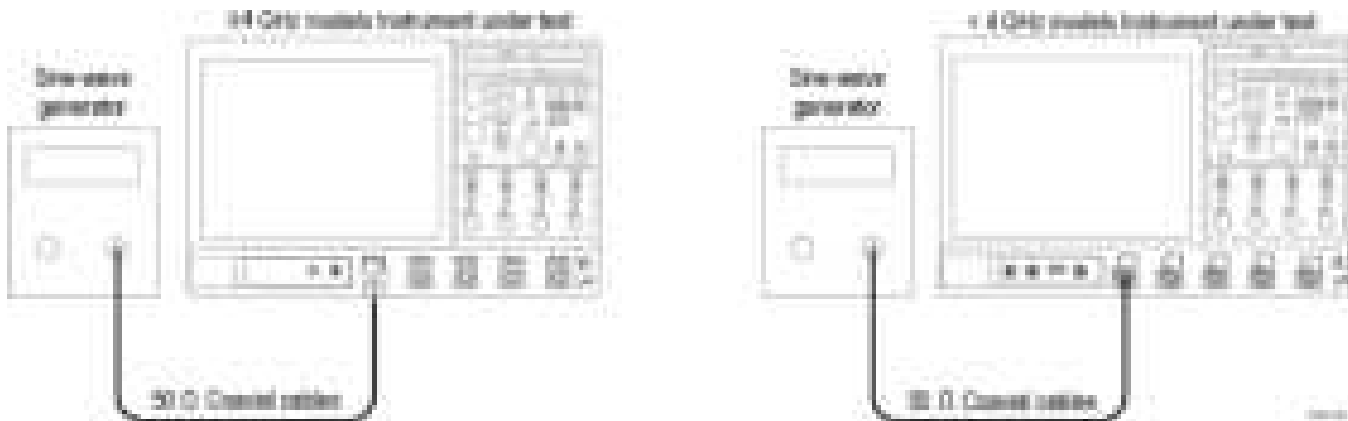


Figure 41: Serial trigger baud rate test hookup

- a. *Hook Up the test-signal source:* (See Figure 41: Serial trigger baud rate test hookup.)
  - Connect the sine wave output of the sine-wave generator through a 50 Ω precision coaxial cable to Ch 1 through an adapter.
  - Set the sine-wave generator to output a 416 MHz sine wave.
- b. *Initialize the instrument:* Press the **Default Setup** button.
- c. *Modify the initialized front-panel control settings:*
  - Set the vertical **Scale** to 50 mV per division.
  - < 4 GHz models: Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50Ω**.
  - Set the horizontal **Scale** to 1 ns per division.
  - Adjust the sine-wave generator output for 4 divisions of amplitude centered on the display.
  - Adjust the trigger **Level** to trigger at 25% (-1 division) on the sine wave.

Table 19: Serial pattern data

| Serial pattern data               | Trigger location    |
|-----------------------------------|---------------------|
| B6DB 6DB6 DB6D B6DB <sub>16</sub> | One UI before the 0 |
| 6DB6 DB6D B6DB 6DB6 <sub>16</sub> | At the 0            |
| DB6D B6DB 6DB6 DB6D <sub>16</sub> | One UI after the 0  |

2. *Verify that the signal path can do isolated 0 and pattern matching circuits can do isolated 1:*
  - a. From the button bar, touch **Cursors** and then the **Setup** button. If using the menu bar, touch **Cursors** and then select **Cursor Setup**. Touch the **Cursor** button to toggle it on and display the cursors.
  - b. Set the Tracking Mode to **Tracking**.

- c. Touch the **X** (close) button.
- d. From the button bar, touch **Trig**, select the **A Event** tab, and touch the **Select** button.
- e. Touch the **Serial** button, set Coding to NRZ, and then set the Standard to **GB Ethernet**.
- f. Touch the **Edit** button.
- g. Set the Format to **Hex** and then touch the **Clear** button.
- h. Enter data into the Serial Pattern Data field for one of the settings in the table that is not yet checked, starting with the first setting. (See [Table 19: Serial pattern data](#) on page 272.)
- i. Touch **Enter**.
- j. Right click on the graticule, select Cursors > **Move Cursors to Center**.
- k. Adjust the cursors until the  $\Delta t$  readout equals 800 ps (one unit interval).
- l. Center Cursor 2 in the low of the waveform just to the right of the center graticule line (See [Figure 42: Isolated 0 triggering](#) on page 274.)
- m. Verify that the instrument triggers one Unit Interval (UI, one baud divided by the bit period) before the 0 in the input signal. The absolute value of the T1 cursor readout must be  $\leq 325$  ps. Enter pass or fail in the test record.
- n. Touch the **Edit** and then the **Clear** button.
- o. Enter data into Serial Pattern Data field for the next setting in the table that is not yet checked. (See [Table 19: Serial pattern data](#) on page 272.)
- p. Touch **Enter**.

- q. Center the Cursor 1 in the low of the waveform nearest the center graticule line. (See [Figure 42: Isolated 0 triggering](#) on page 274.)

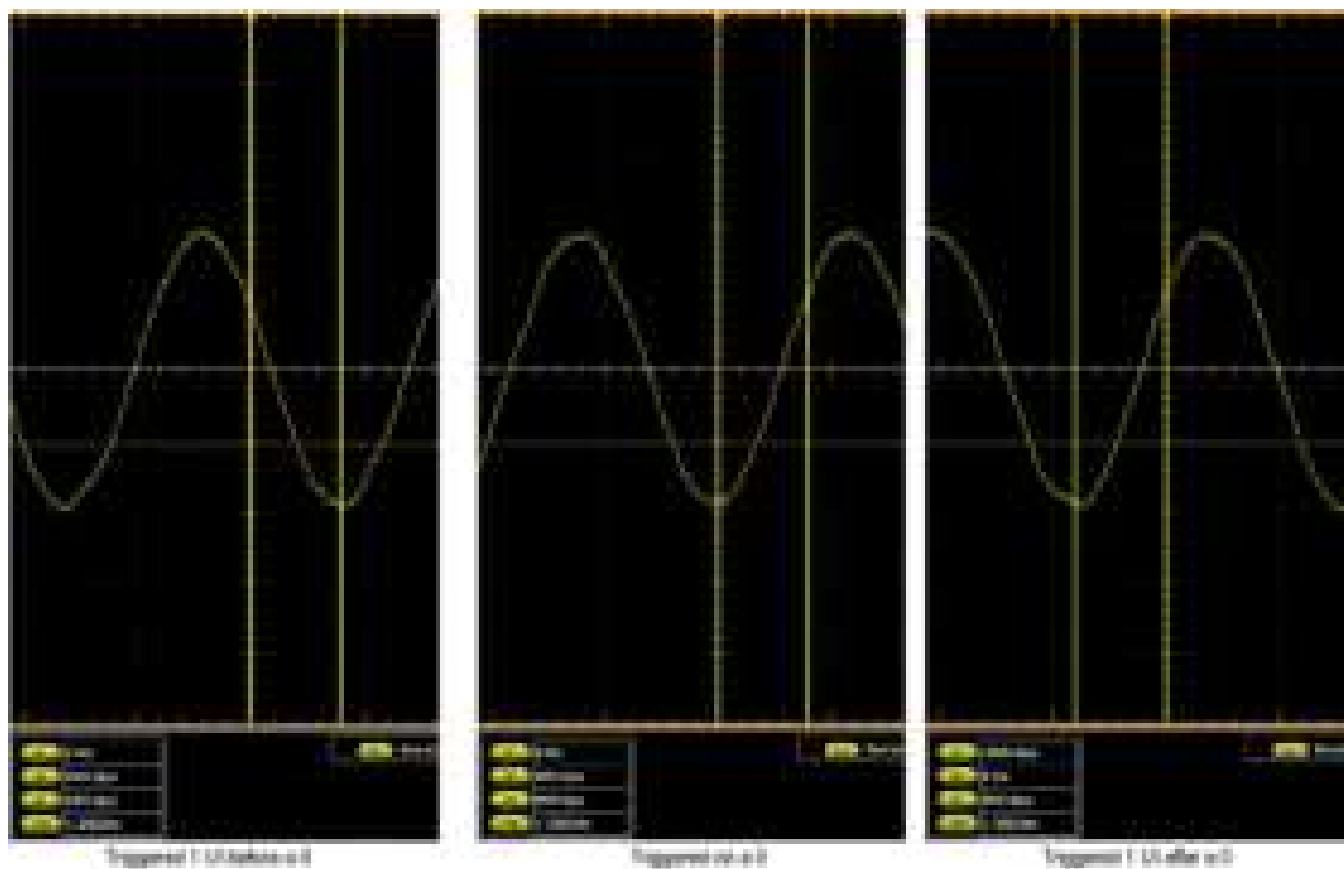


Figure 42: Isolated 0 triggering

- r. Verify that the instrument triggers at the 0 in the input signal. The absolute value of the T1 cursor readout must be  $\leq 325$  ps. Enter pass or fail in the test record.
- s. Touch the **Edit** and then the **Clear** button.
- t. Enter data into Serial Pattern Data field for the next setting in the table that is not yet checked. (See [Table 19: Serial pattern data](#) on page 272.)
- u. Touch **Enter**.
- v. Center Cursor 1 in the low of the waveform just to the left of the center graticule line. (See [Figure 42: Isolated 0 triggering](#) on page 274.)
- w. Verify that the instrument triggers one Unit Interval (UI) after the 0 in the input signal. The absolute value of the T2 cursor readout must be  $\leq 325$  ps. Enter pass or fail in the test record.

3. Verify that the serial path and pattern matching circuits can do isolated 1s:
  - a. Adjust the trigger **Level** to trigger at 75% (+1 division) on the sine wave.
  - b. Touch the **Edit** and then the **Clear** button.
  - c. Enter data into the Serial Pattern Data field for one of the settings in the table that is not yet checked, starting with the first setting. (See [Table 20: Word recognizer data](#) on page 275.)

**Table 20: Word recognizer data**

| Serial pattern data               | Trigger location    |
|-----------------------------------|---------------------|
| 4924 9249 2492 4924 <sub>16</sub> | One UI before the 1 |
| 9249 2492 4924 9249 <sub>16</sub> | At the 1            |
| 2492 4924 9249 2492 <sub>16</sub> | One UI after the 1  |

- d. Touch **Enter**.
- e. Center Cursor 2 in the high of the waveform just to the right of the center graticule line. (See [Figure 43: Isolated 1 triggering](#) on page 276.)
- f. Verify that the instrument triggers one Unit Interval (UI) before the 1 in the input signal. The absolute value of the T1 cursor readout must be  $\leq 325$  ps. Enter pass or fail in the test record.
- g. Touch the **Edit** and then the **Clear** button.
- h. Enter data into the Serial Pattern Data field for the next setting that is not yet checked.
- i. Touch **Enter**.
- j. Center the Cursor 1 in the waveform high nearest the center graticule line. (See [Figure 43: Isolated 1 triggering](#) on page 276.)
- k. Verify that the instrument triggers at the 1 in the input signal. The absolute value of the T1 cursor readout must be  $\leq 325$  ps. Enter pass or fail in the test record.
- l. Touch the **Edit** and then the **Clear** button.
- m. Enter data into the Serial Pattern Data field for the next setting in the table that is not yet checked. (See [Table 20: Word recognizer data](#) on page 275.)
- n. Touch **Enter**.
- o. Center Cursor 1 in the high of the waveform just to the left of the center graticule line. (See [Figure 43: Isolated 1 triggering](#) on page 276.)
- p. Verify that the instrument triggers one Unit Interval (UI) after the 1 in the input signal. The absolute value of the T2 cursor readout must be  $\leq 325$  ps. Enter pass or fail in the test record.

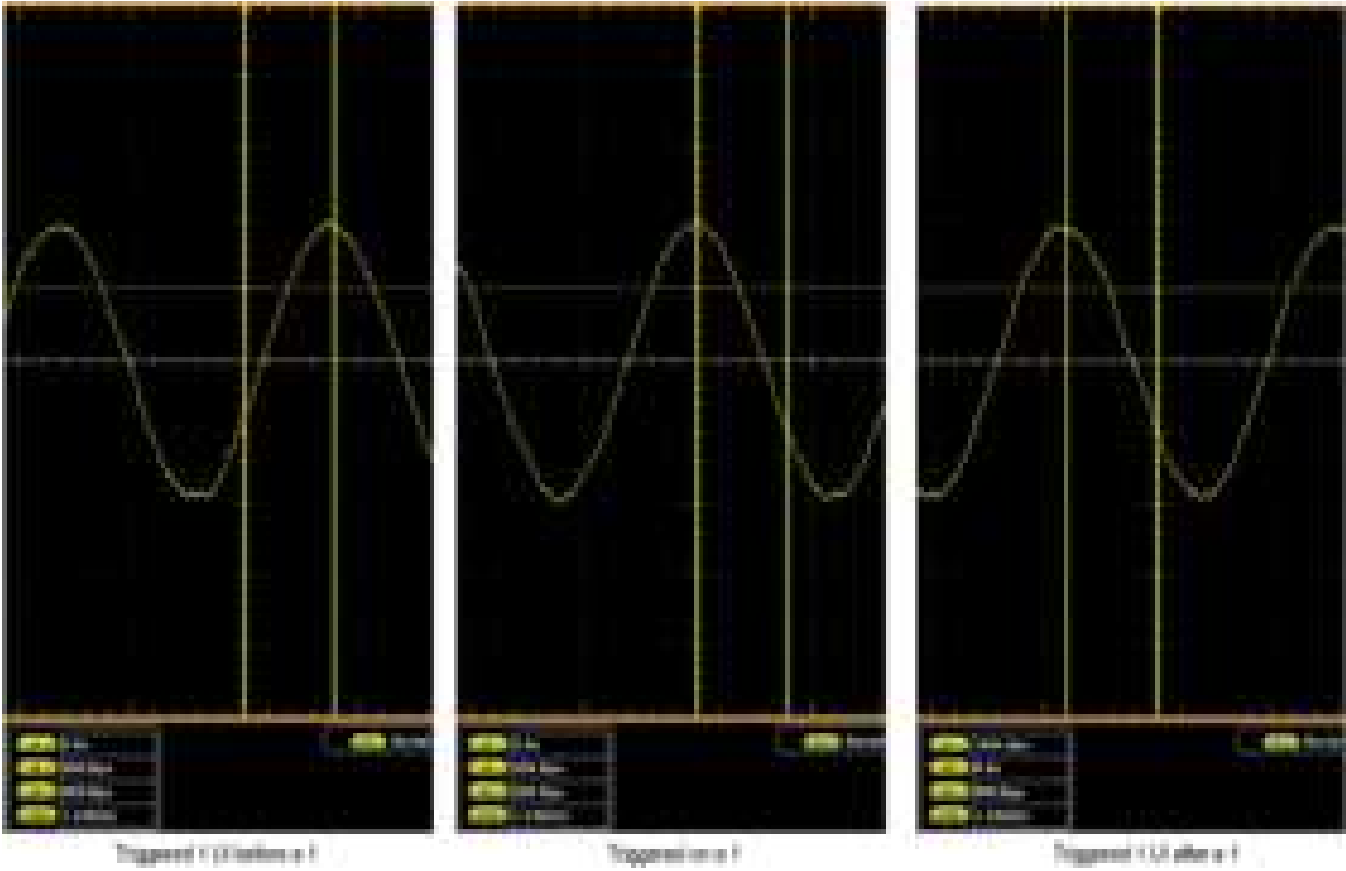
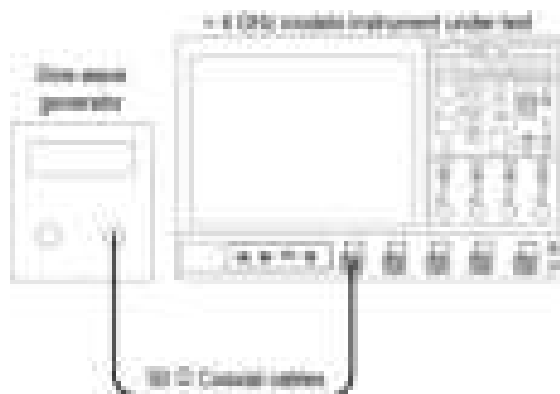


Figure 43: Isolated 1 triggering

## Check serial trigger clock recovery range <4 GHz models

| Equipment required                                                                                            | Equipment required                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| One precision 50 $\Omega$ coaxial cable (Item 4)<br>One sine-wave generator (Item 9)<br>One adapter (Item 19) | The oscilloscope must meet the prerequisites.<br>Also, the instrument must have passed <i>Check DC Voltage Measurement Accuracy</i> . (See <a href="#">Signal acquisition system checks</a> on page 176.) |

1. *Install the test hookup and preset the instrument controls:*



**Figure 44: Serial trigger clock recovery range test hookup, <4 GHz Models**

- a. *Hook up test-signal source 1:* (See [Figure 44: Serial trigger clock recovery range test hookup, <4 GHz Models](#) on page 278.)
    - Connect the sine wave output of the sine-wave generator through a 50  $\Omega$  precision coaxial cable to Ch 1 through an adapter.
    - Set the sine-wave generator to output a 1.5625 GHz sine wave.
  - b. *Initialize the instrument:* Press the **Default Setup** button.
  - c. *Modify the initialized front-panel control settings:*
    - Set the Vertical **Scale** to 50 mV per division.
    - Touch **Vertical**, select **Vertical Setup**, and then touch Termination **50  $\Omega$** .
    - Set the horizontal **Scale** to 200 ps per division.
    - From the button bar, touch the **Display** button.
    - Set the Display Style to **Dots**.
    - Set the Display Persistence to **Variable**, and set the persist Time to **3.0 s**.
    - Touch the **X** (close) button.
    - Adjust the sine-wave generator output for 8 divisions of amplitude.
    - From the button bar, touch **Trig** and select the **A Event** tab.
    - Touch the **Select** button.
    - Touch the **Comm** button. Set **Source** to Ch1, **Type** to R Clk, and **Coding** to NRZ.
2. *Verify the clock recovery at frequency:*
- a. From the button bar, touch **Trig** and select the **A Event** tab.
  - b. Set the sine-wave generator to output one of the input frequencies in the table that is not yet checked, starting with the first setting. (See [Table 21: Clock recovery input frequencies and baud rates](#) on page 279.)

- c. Set the instrument Bit Rate to the Recovered clock Baud rate listed in the table for the current input frequency.

---

**NOTE.** *The instrument will attempt to acquire lock once. If the input data is disrupted, removed, or heavily distorted, the instrument may not acquire lock or may lose lock. If the recovered clock is not locked to the incoming data, the waveform display will not be stable. Once the input data is available, press the PUSH SET TO 50% knob to force the instrument to acquire lock again.*

---

- d. Press **PUSH-SET 50%**.

---

**NOTE.** *As the input frequency is lowered, adjust the Horizontal SCALE to maintain about 3 to 5 eyes across the display.*

---

- e. Verify that lock is acquired. (See [Figure 45: Clock recovery](#) on page 280.)
  - f. Repeat substeps 2.b through 2.d for each input frequency and Baud rate listed in the table. (See [Table 21: Clock recovery input frequencies and baud rates](#) on page 279.)
  - g. If all tests pass, enter passed in the test record.
3. *Disconnect the hookup:* Disconnect the equipment from the instrument.

**Table 21: Clock recovery input frequencies and baud rates**

| Input frequency | Recovered clock baud rate |
|-----------------|---------------------------|
| 625 MHz         | 1.25 Gbaud                |
| 312.5 MHz       | 1.25 Gbaud                |
| 312.5 MHz       | 1.1875 Gbaud              |
| 296.87 MHz      | 1.25 Gbaud                |
| 168.75 MHz      | 675 Mbaud                 |
| 300 MHz         | 1200 Mbaud                |
| 156.25 MHz      | 625 Mbaud                 |
| 78.12 MHz       | 312.5 Mbaud               |
| 78.12 MHz       | 296.87 Mbaud              |
| 74.21 MHz       | 312.5 Mbaud               |
| 31.25 MHz       | 125 Mbaud                 |
| 15.62 MHz       | 62.5 Mbaud                |
| 7.81 MHz        | 31.25 Mbaud               |
| 3.9 MHz         | 15.62 Mbaud               |
| 1.95 MHz        | 7.81 Mbaud                |
| 976.56 kHz      | 3.9 Mbaud                 |

| Input frequency | Recovered clock baud rate |
|-----------------|---------------------------|
| 488.28 kHz      | 1.95 Mbaud                |
| 381 kHz         | 1.52 Mbaud                |

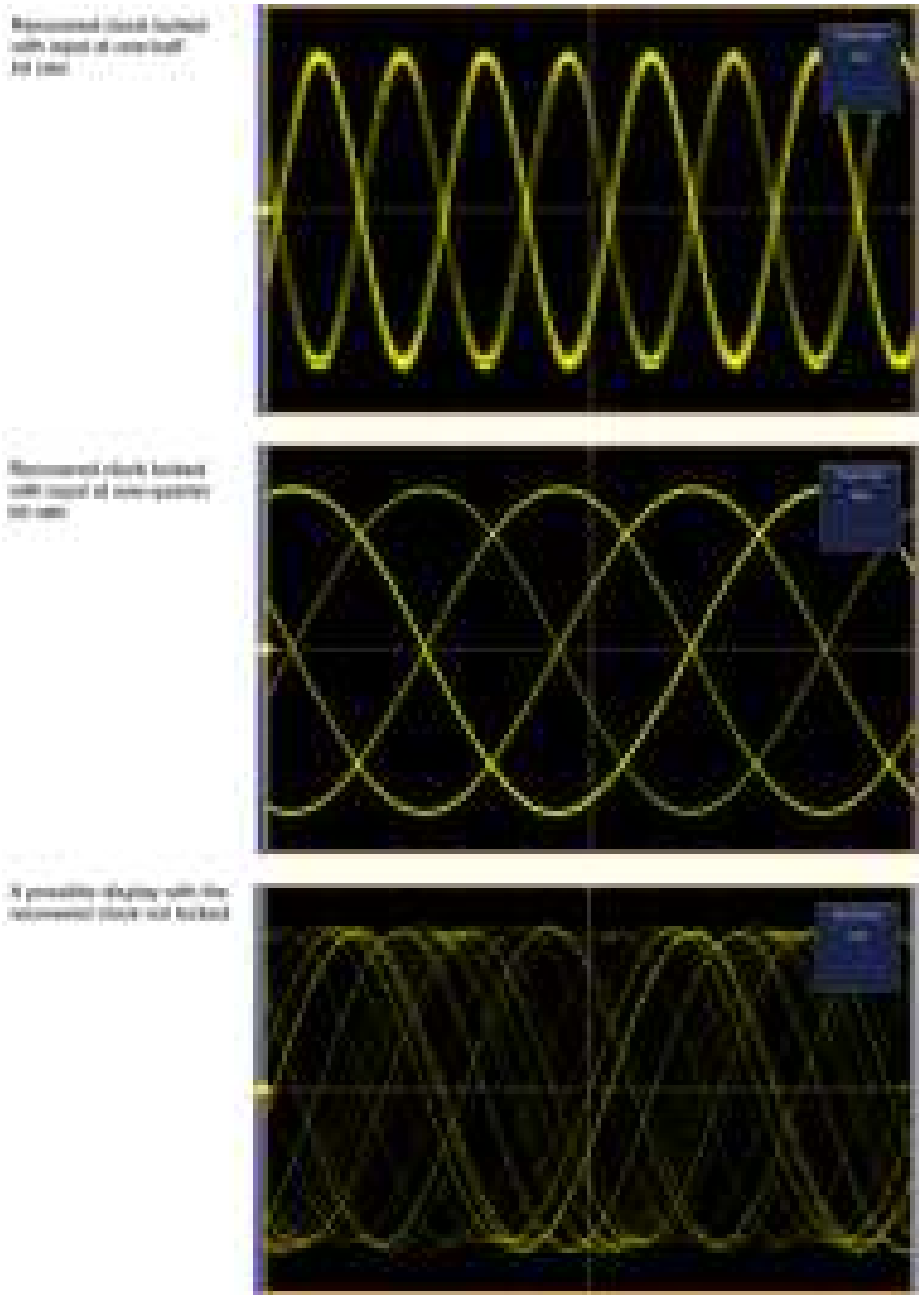


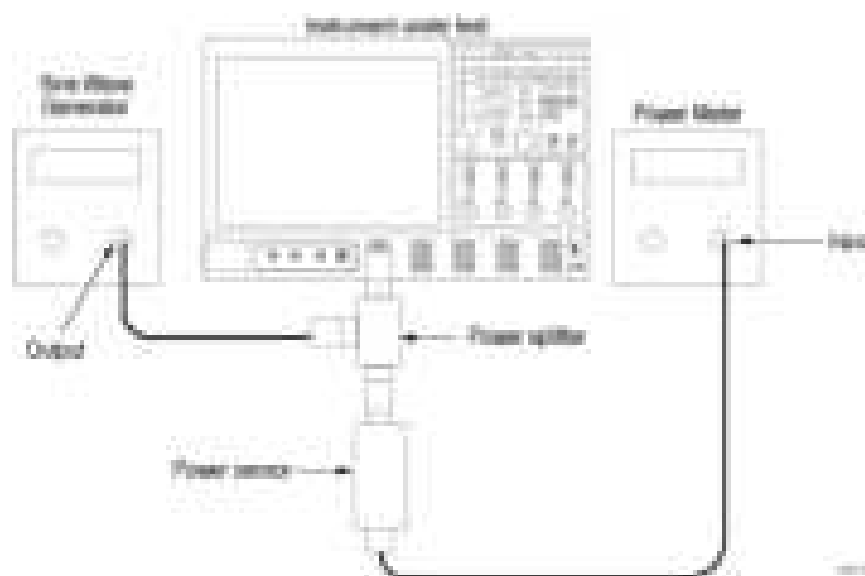
Figure 45: Clock recovery

## Sine wave generator leveling procedure

Some procedures in this manual require a sine wave generator to produce the necessary test signals. If you do not have a leveled sine wave generator, use one of the following methods to level the output amplitude of your sine wave generator.

### Method 1

| Equipment required                                                                                                                                                                                    | Prerequisites                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Sine wave generator (Item 9)<br>Meter, power and sensor (Item 10)<br>Power splitter (Item 11)<br>50 $\Omega$ precision cable 2.92 mm male-to-female (Item 12)<br>One K male-to-male adapter (Item 13) | (See <a href="#">Prerequisites</a> on page 116.) |



**Figure 46: Sine wave generator leveling equipment setup**

1. *Install the test hookup:* Connect the equipment as shown in the above figure.
2. *Set the Generator:*
  - Set the sine wave generator to a reference frequency of 10 MHz.
  - Adjust the sine wave generator amplitude to the required number of divisions as measured by the instrument.

3. *Record the reference level:* Note the reading on the level meter.
4. *Set the generator to the new frequency and reference level:*
  - Change the sine wave generator to the desired new frequency.
  - Input the correction factor and/or the new frequency into the level meter.
  - Adjust the sine wave generator amplitude until the level meter again reads the value noted in step 3. The signal amplitude is now correctly set for the new frequency.

## Method 2

| Equipment required                                                                                                                                                                                                     | Prerequisites                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Sine wave generator (Item 9)<br>Level meter and power sensor (Item 10)<br>Two male N to female BNC adapters (Item 14)<br>Two precision coaxial cables (Item 4)<br>One or two SMA male-to-female BNC adapters (Item 19) | (See <a href="#">Prerequisites</a> on page 116.) |

1. *Install the test hookup:* Connect the equipment as shown in the figure below (start with the sine wave generator connected to the instrument). (See [Figure 47: Equipment setup for maximum amplitude](#) on page 283.)
2. *Set the Generator:*
  - Set the sine wave generator to a reference frequency of 10 MHz.
  - Adjust the sine wave generator amplitude to the required number of divisions as measured by the instrument.

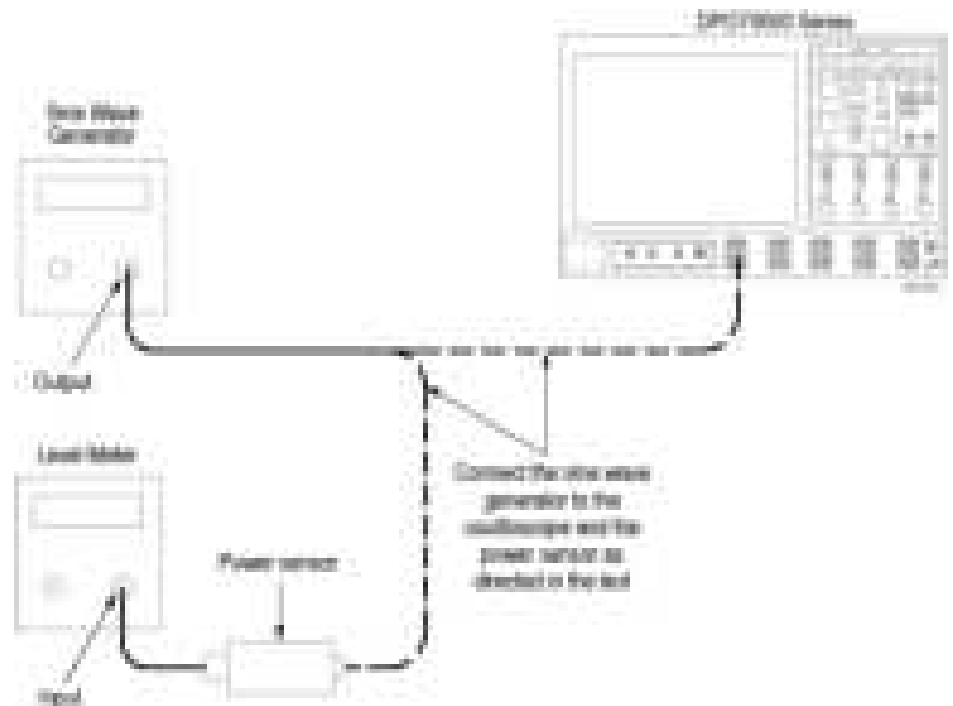


Figure 47: Equipment setup for maximum amplitude

**3. *Record the reference level:***

- Disconnect the sine wave generator from the instrument.
- Connect the sine wave generator to the power sensor.
- Note the level meter reading.

**4. *Set the generator to the new frequency and reference level:***

- Change the sine wave generator to the desired new frequency.
- Input the correction factor and/or the new frequency into the level meter.
- Adjust the sine wave generator amplitude until the level meter again reads the value noted in step 3. The signal amplitude is now correctly set for the new frequency.
- Disconnect the sine wave generator from the power sensor.
- Connect the sine wave generator to the instrument.

# Performance verification (MSO/DPO5000/B series)

## Performance verification (MSO/DPO5000/B series)

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.

Required equipment

### 1. DC voltage source

| Minimum requirements              | Examples                                                      |
|-----------------------------------|---------------------------------------------------------------|
| 3 mV to 4 V, $\pm 0.1\%$ accuracy | Fluke 9500B Oscilloscope Calibrator with a 9530 Output Module |

### 2. Leveled sine wave generator

|                                               |  |
|-----------------------------------------------|--|
| 50 kHz to 2 GHz, $\pm 4\%$ amplitude accuracy |  |
|-----------------------------------------------|--|

### 3. Time mark generator

|                                                         |  |
|---------------------------------------------------------|--|
| 80 ms period, $\pm 1$ ppm accuracy, rise time $< 50$ ns |  |
|---------------------------------------------------------|--|

### 4. Logic Probe (MSO5000/B Series only)

|                                             |                                                                     |
|---------------------------------------------|---------------------------------------------------------------------|
| Low capacitance digital probe, 16 channels. | P6616 probe; standard accessory for MSO5000/B Series oscilloscopes. |
|---------------------------------------------|---------------------------------------------------------------------|

### 5. BNC-to-0.1 inch pin adapter to connect the logic probe to the signal source. (MSO5000/B Series only)

|                                                                       |                                                                                          |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| BNC-to-0.1 inch pin adapter; female BNC to 2x16 .01 inch pin headers. | Tektronix adapter part number 679-6240-00; to connect the Fluke 9500 to the P6616 probe. |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------|

### 6. Digital Multimeter (DMM)

|                         |  |
|-------------------------|--|
| 0.1% accuracy or better |  |
|-------------------------|--|

### 7. One 50 $\Omega$ terminator

|                                                                       |                                   |
|-----------------------------------------------------------------------|-----------------------------------|
| Impedance 50 $\Omega$ ; connectors: female BNC input, male BNC output | Tektronix part number 011-0049-02 |
|-----------------------------------------------------------------------|-----------------------------------|

### 8. One 50 $\Omega$ BNC cable

|                         |                                   |
|-------------------------|-----------------------------------|
| Male-to-male connectors | Tektronix part number 012-0057-01 |
|-------------------------|-----------------------------------|

## 9. Optical Mouse

|          |                                                                                                                |
|----------|----------------------------------------------------------------------------------------------------------------|
| USB, PS2 | Tektronix part number 119-7054-00; standard accessory for MSO5000/B Series and DPO5000/B Series oscilloscopes. |
|----------|----------------------------------------------------------------------------------------------------------------|

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

These procedures cover all MSO5000/B series and DPO5000/B series models. Disregard checks that do not apply to the specific model you are testing.

Print the test record on the following pages and use it to record the performance test results for your oscilloscope.

**NOTE.** Completion of the performance verification procedure does not update the stored time and date of the latest successful adjustment. The date and time are updated only when the adjustment procedures in the service manual are successfully completed.

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, you should return the instrument to Tektronix for adjustment or repair.

## Test record

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

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

| Input Impedance                           |                |                |             |                 |
|-------------------------------------------|----------------|----------------|-------------|-----------------|
| Performance checks                        | Vertical scale | Low limit      | Test result | High limit      |
| Channel 1 Input Impedance, 1 M $\Omega$   | 10 mV/div      | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 100 mV/div     | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 1 V/div        | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
| Channel 1 Input Impedance, 250 k $\Omega$ | 100 mV/div     | 246 k $\Omega$ |             | 254 k $\Omega$  |
| Channel 1 Input Impedance, 50 $\Omega$    | 10 mV/div      | 49.5 $\Omega$  |             | 50.5 $\Omega$   |
|                                           | 100 mV/div     | 49.5 $\Omega$  |             | 50.5 $\Omega$   |

| Input Impedance                           |                |                |             |                 |
|-------------------------------------------|----------------|----------------|-------------|-----------------|
| Performance checks                        | Vertical scale | Low limit      | Test result | High limit      |
| Channel 2 Input Impedance, 1 M $\Omega$   | 10 mV/div      | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 100 mV/div     | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 1 V/div        | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
| Channel 2 Input Impedance, 250 k $\Omega$ | 100 mV/div     | 246 k $\Omega$ |             | 254 k $\Omega$  |
| Channel 2 Input Impedance, 50 $\Omega$    | 10 mV/div      | 49.5 $\Omega$  |             | 50.5 $\Omega$   |
|                                           | 100 mV/div     | 49.5 $\Omega$  |             | 50.5 $\Omega$   |
| Channel 3 Input Impedance, 1 M $\Omega$   | 10 mV/div      | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 100 mV/div     | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 1 V/div        | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
| Channel 3 Input Impedance, 250 k $\Omega$ | 100 mV/div     | 246 k $\Omega$ |             | 254 k $\Omega$  |
| Channel 3 Input Impedance, 50 $\Omega$    | 10 mV/div      | 49.5 $\Omega$  |             | 50.5 $\Omega$   |
|                                           | 100 mV/div     | 49.5 $\Omega$  |             | 50.5 $\Omega$   |
| Channel 4 Input Impedance, 1 M $\Omega$   | 10 mV/div      | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 100 mV/div     | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
|                                           | 1 V/div        | 990 k $\Omega$ |             | 1.01 M $\Omega$ |
| Channel 4 Input Impedance, 250 k $\Omega$ | 100 mV/div     | 246 k $\Omega$ |             | 254 k $\Omega$  |
| Channel 4, Input Impedance, 50 $\Omega$   | 10 mV/div      | 49.5 $\Omega$  |             | 50.5 $\Omega$   |
|                                           | 100 mV/div     | 49.5 $\Omega$  |             | 50.5 $\Omega$   |

| DC Balance                                    |                |            |             |            |
|-----------------------------------------------|----------------|------------|-------------|------------|
| Performance checks                            | Vertical scale | Low limit  | Test result | High limit |
| Channel 1 DC Balance, 50 $\Omega$ , 20 MHz BW | 1 mV/div       | -0.2 mV    |             | 0.2 mV     |
|                                               | 2 mV/div       | -0.2 mV    |             | 0.2 mV     |
|                                               | 5 mV/div       | -0.5 mV    |             | 0.5 mV     |
|                                               | 10 mV/div      | -1 mV      |             | 1 mV       |
|                                               | 20 mV/div      | -2 mV      |             | 2 mV       |
|                                               | 50 mV/div      | -5 mV/div  |             | 5 mV/div   |
|                                               | 100 mV/div     | -10 mV     |             | 10 mV      |
|                                               | 200 mV/div     | -20 mV/div |             | 20 mV/div  |
|                                               | 500 mV/div     | -50 mV/div |             | 50 mV/div  |
|                                               | 1 V/div        | -100 mV    |             | 100 mV     |

| DC Balance                                         |                |             |             |            |
|----------------------------------------------------|----------------|-------------|-------------|------------|
| Performance checks                                 | Vertical scale | Low limit   | Test result | High limit |
| Channel 1 DC Balance,<br>1 M $\Omega$ , 20 MHz BW  | 1 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                    | 2 mV/div       | -0.4 mV     |             | 0.4 mV     |
|                                                    | 5 mV/div       | -1 mV/div   |             | 1 mV/div   |
|                                                    | 10 mV/div      | -2 mV       |             | 2 mV       |
|                                                    | 20 mV/div      | -4 mV/div   |             | 4 mV/div   |
|                                                    | 100 mV/div     | -20 mV      |             | 20 mV      |
|                                                    | 500 mV/div     | -100 mV/div |             | 100 mV/div |
|                                                    | 1 V/div        | -200 mV     |             | 200 mV     |
|                                                    | 10 V/div       | -2 V        |             | 2 V        |
| Channel 1 DC Balance,<br>50 $\Omega$ , 250 MHz BW  | 20 mV/div      | -2 mV       |             | 2 mV       |
| Channel 1 DC Balance,<br>1 M $\Omega$ , 250 MHz BW | 20 mV/div      | -4 mV       |             | 4 mV       |
| Channel 1 DC Balance,<br>50 $\Omega$ , Full BW     | 20 mV/div      | -2 mV       |             | 2 mV       |
| Channel 1 DC Balance,<br>1 M $\Omega$ , Full BW    | 20 mV/div      | -4 mV       |             | 4 mV       |
| Channel 2 DC Balance,<br>50 $\Omega$ , 20 MHz BW   | 1 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                    | 2 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                    | 5 mV/div       | -0.5 mV     |             | 0.5 mV     |
|                                                    | 10 mV/div      | -1 mV       |             | 1 mV       |
|                                                    | 20 mV/div      | -2 mV       |             | 2 mV       |
|                                                    | 50 mV/div      | -5 mV/div   |             | 5 mV/div   |
|                                                    | 100 mV/div     | -10 mV      |             | 10 mV      |
|                                                    | 200 mV/div     | -20 mV/div  |             | 20 mV/div  |
|                                                    | 500 mV/div     | -50 mV/div  |             | 50 mV/div  |
|                                                    | 1 V/div        | -100 mV     |             | 100 mV     |
| Channel 2 DC Balance,<br>1 M $\Omega$ , 20 MHz BW  | 1 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                    | 2 mV/div       | -0.4 mV     |             | 0.4 mV     |
|                                                    | 5 mV/div       | -1 mV/div   |             | 1 mV/div   |
|                                                    | 10 mV/div      | -2 mV       |             | 2 mV       |
|                                                    | 20 mV/div      | -4 mV/div   |             | 4 mV/div   |
|                                                    | 100 mV/div     | -20 mV      |             | 20 mV      |
|                                                    | 500 mV/div     | -100 mV/div |             | 100 mV/div |
|                                                    | 1 V/div        | -200 mV     |             | 200 mV     |
|                                                    | 10 V/div       | -2 V        |             | 2 V        |
| Channel 2 DC Balance,<br>50 $\Omega$ , 250 MHz BW  | 20 mV/div      | -2 mV       |             | 2 mV       |

| DC Balance                                      |                |             |             |            |
|-------------------------------------------------|----------------|-------------|-------------|------------|
| Performance checks                              | Vertical scale | Low limit   | Test result | High limit |
| Channel 2 DC Balance, 1 M $\Omega$ , 250 MHz BW | 20 mV/div      | -4 mV       |             | 4 mV       |
| Channel 2 DC Balance, 50 $\Omega$ , Full BW     | 20 mV/div      | -2 mV       |             | 2 mV       |
| Channel 2 DC Balance, 1 M $\Omega$ , Full BW    | 20 mV/div      | -4 mV       |             | 4 mV       |
| Channel 3 DC Balance, 50 $\Omega$ , 20 MHz BW   | 1 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                 | 2 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                 | 5 mV/div       | -0.5 mV     |             | 0.5 mV     |
|                                                 | 10 mV/div      | -1 mV       |             | 1 mV       |
|                                                 | 20 mV/div      | -2 mV       |             | 2 mV       |
|                                                 | 50 mV/div      | -5 mV/div   |             | 5 mV/div   |
|                                                 | 100 mV/div     | -10 mV      |             | 10 mV      |
|                                                 | 200 mV/div     | -20 mV/div  |             | 20 mV/div  |
|                                                 | 500 mV/div     | -50 mV/div  |             | 50 mV/div  |
|                                                 | 1 V/div        | -100 mV     |             | 100 mV     |
| Channel 3 DC Balance, 1 M $\Omega$ , 20 MHz BW  | 1 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                 | 2 mV/div       | -0.4 mV     |             | 0.4 mV     |
|                                                 | 5 mV/div       | -1 mV/div   |             | 1 mV/div   |
|                                                 | 10 mV/div      | -2 mV       |             | 2 mV       |
|                                                 | 20 mV/div      | -4 mV/div   |             | 4 mV/div   |
|                                                 | 100 mV/div     | -20 mV      |             | 20 mV      |
|                                                 | 500 mV/div     | -100 mV/div |             | 100 mV/div |
|                                                 | 1 V/div        | -200 mV     |             | 200 mV     |
| Channel 3 DC Balance, 50 $\Omega$ , 250 MHz BW  | 20 mV/div      | -2 mV       |             | 2 mV       |
|                                                 | 20 mV/div      | -4 mV       |             | 4 mV       |
| Channel 3 DC Balance, 50 $\Omega$ , Full BW     | 20 mV/div      | -2 mV       |             | 2 mV       |
| Channel 3 DC Balance, 1 M $\Omega$ , Full BW    | 20 mV/div      | -4 mV       |             | 4 mV       |

| DC Balance                                         |                |             |             |            |
|----------------------------------------------------|----------------|-------------|-------------|------------|
| Performance checks                                 | Vertical scale | Low limit   | Test result | High limit |
| Channel 4 DC Balance,<br>50 $\Omega$ , 20 MHz BW   | 1 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                    | 2 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                    | 5 mV/div       | -0.5 mV     |             | 0.5 mV     |
|                                                    | 10 mV/div      | -1 mV       |             | 1 mV       |
|                                                    | 20 mV/div      | -2 mV       |             | 2 mV       |
|                                                    | 50 mV/div      | -5 mV/div   |             | 5 mV/div   |
|                                                    | 100 mV/div     | -10 mV      |             | 10 mV      |
|                                                    | 200 mV/div     | -20 mV/div  |             | 20 mV/div  |
|                                                    | 500 mV/div     | -50 mV/div  |             | 50 mV/div  |
|                                                    | 1 V/div        | -100 mV     |             | 100 mV     |
| Channel 4 DC Balance,<br>1 M $\Omega$ , 20 MHz BW  | 1 mV/div       | -0.2 mV     |             | 0.2 mV     |
|                                                    | 2 mV/div       | -0.4 mV     |             | 0.4 mV     |
|                                                    | 5 mV/div       | -1 mV/div   |             | 1 mV/div   |
|                                                    | 10 mV/div      | -2 mV       |             | 2 mV       |
|                                                    | 20 mV/div      | -4 mV/div   |             | 4 mV/div   |
|                                                    | 100 mV/div     | -20 mV      |             | 20 mV      |
|                                                    | 500 mV/div     | -100 mV/div |             | 100 mV/div |
|                                                    | 1 V/div        | -200 mV     |             | 200 mV     |
|                                                    | 10 V/div       | -2 V        |             | 2 V        |
| Channel 4 DC Balance,<br>50 $\Omega$ , 250 MHz BW  | 20 mV/div      | -2 mV       |             | 2 mV       |
| Channel 4 DC Balance,<br>1 M $\Omega$ , 250 MHz BW | 20 mV/div      | -4 mV       |             | 4 mV       |
| Channel 4 DC Balance,<br>50 $\Omega$ , Full BW     | 20 mV/div      | -2 mV       |             | 2 mV       |
| Channel 4 DC Balance,<br>1 M $\Omega$ , Full BW    | 20 mV/div      | -4 mV       |             | 4 mV       |

| DC Gain Accuracy                                                            |           |                |           |             |            |
|-----------------------------------------------------------------------------|-----------|----------------|-----------|-------------|------------|
| Performance checks                                                          | Bandwidth | Vertical scale | Low limit | Test result | High limit |
| Channel 1 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 $\Omega$  | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |
| Channel 1 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M $\Omega$ | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |
| Channel 2 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 $\Omega$  | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |

| DC Gain Accuracy                                                            |           |                |           |             |            |
|-----------------------------------------------------------------------------|-----------|----------------|-----------|-------------|------------|
| Performance checks                                                          | Bandwidth | Vertical scale | Low limit | Test result | High limit |
| Channel 2 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M $\Omega$ | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |
| Channel 3 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 $\Omega$  | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |
| Channel 3 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M $\Omega$ | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |

| DC Gain Accuracy                                                            |           |                |           |             |            |
|-----------------------------------------------------------------------------|-----------|----------------|-----------|-------------|------------|
| Performance checks                                                          | Bandwidth | Vertical scale | Low limit | Test result | High limit |
| Channel 4 DC Gain Accuracy, 0 V offset, 0 V vertical position, 50 $\Omega$  | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |
| Channel 4 DC Gain Accuracy, 0 V offset, 0 V vertical position, 1 M $\Omega$ | 20 MHz    | 2 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 5 mV/div       | -1.5%     |             | 1.5%       |
|                                                                             |           | 10 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 50 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             |           | 100 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 200 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 500 mV/div     | -1.5%     |             | 1.5%       |
|                                                                             |           | 1 V/div        | -1.5%     |             | 1.5%       |
|                                                                             | 250 MHz   | 20 mV/div      | -1.5%     |             | 1.5%       |
|                                                                             | FULL      | 20 mV/div      | -1.5%     |             | 1.5%       |

| DC Offset Accuracy                                   |                |                              |           |             |            |
|------------------------------------------------------|----------------|------------------------------|-----------|-------------|------------|
| Performance checks                                   | Vertical scale | Vertical offset <sup>1</sup> | Low limit | Test result | High limit |
| All models:                                          |                |                              |           |             |            |
| Channel 1 DC Offset Accuracy, 20 MHz BW, 50 $\Omega$ | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                      | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                      | 100 mV/div     | 5.0 V                        | 4.965 V   |             | 5.035 V    |
|                                                      | 100 mV/div     | -5.0 V                       | -5.035 V  |             | -4.965 V   |

<sup>1</sup> Use this value for both the calibrator output and the oscilloscope offset setting.

| DC Offset Accuracy                                    |                |                              |           |             |            |
|-------------------------------------------------------|----------------|------------------------------|-----------|-------------|------------|
| Performance checks                                    | Vertical scale | Vertical offset <sup>1</sup> | Low limit | Test result | High limit |
| Channel 1 DC Offset Accuracy, 20 MHz BW, 1 M $\Omega$ | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                       | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                       | 100 mV/div     | 9.0 V                        | 8.935 V   |             | 9.065 V    |
|                                                       | 100 mV/div     | - 9.0 V                      | -9.065 V  |             | -8.935 V   |
|                                                       | 500 mV/div     | 9.0 V                        | 8.855 V   |             | 9.145 V    |
|                                                       | 500 mV/div     | - 9.0 V                      | -9.145 V  |             | -8.855 V   |
|                                                       | 1.01 V/div     | 99.5 V                       | 98.80 V   |             | 100.2 V    |
|                                                       | 1.01 V/div     | -99.5 V                      | -100.2 V  |             | -98.80 V   |
|                                                       | 3 V/div        | 99.5 V                       | 98.4 V    |             | 100.6 V    |
|                                                       | 3 V/div        | -99.5 V                      | -100.6 V  |             | -98.4 V    |
| Channel 2 DC Offset Accuracy, 20 MHz BW, 50 $\Omega$  | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                       | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                       | 100 mV/div     | 5.0 V                        | 4.965 V   |             | 5.035 V    |
|                                                       | 100 mV/div     | -5.0 V                       | -5.035 V  |             | -4.965 V   |
| Channel 2 DC Offset Accuracy, 20 MHz BW, 1 M $\Omega$ | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                       | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                       | 100 mV/div     | 9.0 V                        | 8.935 V   |             | 9.065 V    |
|                                                       | 100 mV/div     | -9.0 V                       | -9.065 V  |             | -8.935 V   |
|                                                       | 500 mV/div     | 9.0 V                        | 8.855 V   |             | 9.145 V    |
|                                                       | 500 mV/div     | - 9.0 V                      | -9.145 V  |             | -8.855 V   |
|                                                       | 1.01 V/div     | 99.5 V                       | 98.80 V   |             | 100.2 V    |
|                                                       | 1.01 V/div     | -99.5 V                      | -100.2 V  |             | -98.80 V   |
|                                                       | 3 V/div        | 99.5 V                       | 98.40 V   |             | 100.6 V    |
|                                                       | 3 V/div        | -99.5 V                      | -100.6 V  |             | -98.4 V    |
| Channel 3 DC Offset Accuracy, 20 MHz BW, 50 $\Omega$  | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                       | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                       | 100 mV/div     | 5.0 V                        | 4.965 V   |             | 5.035 V    |
|                                                       | 100 mV/div     | -5.0 V                       | -5.035 V  |             | -4.965 V   |

<sup>1</sup> Use this value for both the calibrator output and the oscilloscope offset setting.

| DC Offset Accuracy                                    |                |                              |           |             |            |
|-------------------------------------------------------|----------------|------------------------------|-----------|-------------|------------|
| Performance checks                                    | Vertical scale | Vertical offset <sup>1</sup> | Low limit | Test result | High limit |
| Channel 3 DC Offset Accuracy, 20 MHz BW, 1 M $\Omega$ | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                       | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                       | 100 mV/div     | 9.0 V                        | 8.935 V   |             | 9.065 V    |
|                                                       | 100 mV/div     | -9.0 V                       | -9.065 V  |             | -8.935 V   |
|                                                       | 500 mV/div     | 9.0 V                        | 8.855 V   |             | 9.145 V    |
|                                                       | 500 mV/div     | - 9.0 V                      | -9.145 V  |             | -8.855 V   |
|                                                       | 1.01 V/div     | 99.5 V                       | 98.80 V   |             | 100.2 V    |
|                                                       | 1.01 V/div     | -99.5 V                      | -100.2 V  |             | -98.80 V   |
|                                                       | 3 V/div        | 99.5 V                       | 98.4 V    |             | 100.6 V    |
|                                                       | 3 V/div        | -99.5 V                      | -100.6 V  |             | -98.4 V    |
| Channel 4 DC Offset Accuracy, 20 MHz BW, 50 $\Omega$  | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                       | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                       | 100 mV/div     | 5.0 V                        | 4.965 V   |             | 5.035 V    |
|                                                       | 100 mV/div     | -5.0 V                       | -5.035 V  |             | -4.965 V   |
| Channel 4 DC Offset Accuracy, 20 MHz BW, 1 M $\Omega$ | 1 mV/div       | 900 mV                       | 895.3 mV  |             | 904.7 mV   |
|                                                       | 1 mV/div       | -900 mV                      | -904.7 mV |             | -895.3 mV  |
|                                                       | 100 mV/div     | 9.0 V                        | 8.935 V   |             | 9.065 V    |
|                                                       | 100 mV/div     | -9.0 V                       | -9.065 V  |             | -8.935 V   |
|                                                       | 500 mV/div     | 9.0 V                        | 8.855 V   |             | 9.145 V    |
|                                                       | 500 mV/div     | - 9.0 V                      | -9.145 V  |             | -8.855 V   |
|                                                       | 1.01 V/div     | 99.5 V                       | 98.80 V   |             | 100.2 V    |
|                                                       | 1.01 V/div     | -99.5 V                      | -100.2 V  |             | -98.80 V   |
|                                                       | 3 V/div        | 99.5 V                       | 98.4 V    |             | 100.6 V    |
|                                                       | 3 V/div        | -99.5 V                      | -100.6 V  |             | -98.4 V    |

<sup>1</sup> Use this value for both the calibrator output and the oscilloscope offset setting.

| Analog Bandwidth                                |           |                                                                                          |                                    |                    |                    |         |                                                              |
|-------------------------------------------------|-----------|------------------------------------------------------------------------------------------|------------------------------------|--------------------|--------------------|---------|--------------------------------------------------------------|
| Performance checks                              |           |                                                                                          |                                    |                    |                    |         |                                                              |
| Bandwidth at Channel                            | Impedance | Vertical scale                                                                           | Horizontal scale                   | V <sub>in-pp</sub> | V <sub>bw-pp</sub> | Limit   | Test result<br>Gain = V <sub>bw-pp</sub> /V <sub>in-pp</sub> |
| All Models                                      |           |                                                                                          |                                    |                    |                    |         |                                                              |
| Channel 1                                       | 50 Ω      | 1 mV/div                                                                                 | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                                 | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div<br>MSO/DPO5204/<br>B<br>MSO/DPO5104/<br>BMSO/<br>DPO5054/<br>BMSO/<br>DPO5034/B | 1 ns/div<br>(1.5 GHz)<br>(Full BW) |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                               | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                                  | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
| MSO5204/B, DPO5204/B, MSO5104/B, DPO5104/B Only |           |                                                                                          |                                    |                    |                    |         |                                                              |
| Channel 1                                       | 1 MΩ      | 1 mV/div                                                                                 | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                                 | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div                                                                                 | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                               | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                                  | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
| All Models                                      |           |                                                                                          |                                    |                    |                    |         |                                                              |

| Analog Bandwidth                                |           |                                                                              |                                    |                    |                    |         |                                                              |
|-------------------------------------------------|-----------|------------------------------------------------------------------------------|------------------------------------|--------------------|--------------------|---------|--------------------------------------------------------------|
| Performance checks                              |           |                                                                              |                                    |                    |                    |         |                                                              |
| Bandwidth at Channel                            | Impedance | Vertical scale                                                               | Horizontal scale                   | V <sub>in-pp</sub> | V <sub>bw-pp</sub> | Limit   | Test result<br>Gain = V <sub>bw-pp</sub> /V <sub>in-pp</sub> |
| Channel 2                                       | 50 Ω      | 1 mV/div                                                                     | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                     | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div<br>MSO/DPO5204/B<br>MSO/DPO5104/BMSO/<br>DPO5054/BMSO/<br>DPO5034/B | 1 ns/div<br>(1.5 GHz)<br>(Full BW) |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                    | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                    | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                   | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                      | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
| MSO5204/B, DPO5204/B, MSO5104/B, DPO5104/B Only |           |                                                                              |                                    |                    |                    |         |                                                              |
| Channel 2                                       | 1 MΩ      | 1 mV/div                                                                     | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                     | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div                                                                     | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                    | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                    | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                   | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                      | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
| All Models                                      |           |                                                                              |                                    |                    |                    |         |                                                              |

| Analog Bandwidth                                |           |                                                                                          |                                    |                    |                    |         |                                                              |
|-------------------------------------------------|-----------|------------------------------------------------------------------------------------------|------------------------------------|--------------------|--------------------|---------|--------------------------------------------------------------|
| Performance checks                              |           |                                                                                          |                                    |                    |                    |         |                                                              |
| Bandwidth at Channel                            | Impedance | Vertical scale                                                                           | Horizontal scale                   | V <sub>in-pp</sub> | V <sub>bw-pp</sub> | Limit   | Test result<br>Gain = V <sub>bw-pp</sub> /V <sub>in-pp</sub> |
| Channel 3                                       | 50 Ω      | 1 mV/div                                                                                 | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                                 | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div<br>MSO/DPO5204/<br>B<br>MSO/DPO5104/<br>BMSO/<br>DPO5054/<br>BMSO/<br>DPO5034/B | 1 ns/div<br>(1.5 GHz)<br>(Full BW) |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                               | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                                  | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
| MSO5204/B, DPO5204/B, MSO5104/B, DPO5104/B Only |           |                                                                                          |                                    |                    |                    |         |                                                              |
| Channel 3                                       | 1 MΩ      | 1 mV/div                                                                                 | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                                 | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div                                                                                 | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                               | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                                  | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
| All Models                                      |           |                                                                                          |                                    |                    |                    |         |                                                              |

| Analog Bandwidth                                |           |                                                                                          |                                    |                    |                    |         |                                                              |
|-------------------------------------------------|-----------|------------------------------------------------------------------------------------------|------------------------------------|--------------------|--------------------|---------|--------------------------------------------------------------|
| Performance checks                              |           |                                                                                          |                                    |                    |                    |         |                                                              |
| Bandwidth at Channel                            | Impedance | Vertical scale                                                                           | Horizontal scale                   | V <sub>in-pp</sub> | V <sub>bw-pp</sub> | Limit   | Test result<br>Gain = V <sub>bw-pp</sub> /V <sub>in-pp</sub> |
| Channel 4                                       | 50 Ω      | 1 mV/div                                                                                 | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                                 | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div<br>MSO/DPO5204/<br>B<br>MSO/DPO5104/<br>BMSO/<br>DPO5054/<br>BMSO/<br>DPO5034/B | 1 ns/div<br>(1.5 GHz)<br>(Full BW) |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                               | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                                  | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
| MSO5204/B, DPO5204/B, MSO5104/B, DPO5104/B Only |           |                                                                                          |                                    |                    |                    |         |                                                              |
| Channel 4                                       | 1 MΩ      | 1 mV/div                                                                                 | 5 ns/div<br>(175 MHz)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 2 mV/div                                                                                 | 2.5 ns/div<br>(350 MHz)            |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 5 mV/div                                                                                 | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 10 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 50 mV/div                                                                                | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 100 mV/div                                                                               | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |
|                                                 |           | 1 V/div                                                                                  | 1 ns/div<br>(Full BW)              |                    |                    | ≥ 0.707 |                                                              |

| Random Noise, Sample Acquisition Mode     |               |                                   |                 |                  |                 |
|-------------------------------------------|---------------|-----------------------------------|-----------------|------------------|-----------------|
| Performance checks                        |               | Vertical sensitivity = 100 mV/div |                 |                  |                 |
|                                           |               | 1 M $\Omega$                      |                 | 50 $\Omega$      |                 |
|                                           | Bandwidth     | Test result (mV)                  | High limit (mV) | Test result (mV) | High limit (mV) |
| <b>MSO5204, DPO5204</b>                   |               |                                   |                 |                  |                 |
| Channel 1                                 | Full          |                                   | 8.18            |                  | 6.15            |
|                                           | 250 MHz limit |                                   | 5.12            |                  | 4.08            |
|                                           | 20 MHz limit  |                                   | 5.12            |                  | 4.08            |
| Channel 2                                 | Full          |                                   | 8.18            |                  | 6.15            |
|                                           | 250 MHz limit |                                   | 5.12            |                  | 4.08            |
|                                           | 20 MHz limit  |                                   | 5.12            |                  | 4.08            |
| Channel 3                                 | Full          |                                   | 8.18            |                  | 6.15            |
|                                           | 250 MHz limit |                                   | 5.12            |                  | 4.08            |
|                                           | 20 MHz limit  |                                   | 5.12            |                  | 4.08            |
| Channel 4                                 | Full          |                                   | 8.18            |                  | 6.15            |
|                                           | 250 MHz limit |                                   | 5.12            |                  | 4.08            |
|                                           | 20 MHz limit  |                                   | 5.12            |                  | 4.08            |
| <b>MSO5104, DPO5104</b>                   |               |                                   |                 |                  |                 |
| Channel 1                                 | Full          |                                   | 8.15            |                  | 6.08            |
|                                           | 250 MHz limit |                                   | 5.10            |                  | 4.05            |
|                                           | 20 MHz limit  |                                   | 5.10            |                  | 4.05            |
| Channel 2                                 | Full          |                                   | 8.15            |                  | 6.08            |
|                                           | 250 MHz limit |                                   | 5.10            |                  | 4.05            |
|                                           | 20 MHz limit  |                                   | 5.10            |                  | 4.05            |
| Channel 3                                 | Full          |                                   | 8.15            |                  | 6.08            |
|                                           | 250 MHz limit |                                   | 5.10            |                  | 4.05            |
|                                           | 20 MHz limit  |                                   | 5.10            |                  | 4.05            |
| Channel 4                                 | Full          |                                   | 8.15            |                  | 6.08            |
|                                           | 250 MHz limit |                                   | 5.10            |                  | 4.05            |
|                                           | 20 MHz limit  |                                   | 5.10            |                  | 4.05            |
| <b>MSO5034, DPO5034, MSO5054, DPO5054</b> |               |                                   |                 |                  |                 |
| Channel 1                                 | Full          |                                   | 8.13            |                  | 8.13            |
|                                           | 250 MHz limit |                                   | 6.10            |                  | 6.10            |
|                                           | 20 MHz limit  |                                   | 4.10            |                  | 4.10            |
| Channel 2                                 | Full          |                                   | 8.13            |                  | 8.13            |
|                                           | 250 MHz limit |                                   | 6.10            |                  | 6.10            |
|                                           | 20 MHz limit  |                                   | 4.10            |                  | 4.10            |

| Random Noise, Sample Acquisition Mode |               |                                   |                 |                  |                 |
|---------------------------------------|---------------|-----------------------------------|-----------------|------------------|-----------------|
| Performance checks                    |               | Vertical sensitivity = 100 mV/div |                 |                  |                 |
|                                       |               | 1 M $\Omega$                      |                 | 50 $\Omega$      |                 |
|                                       | Bandwidth     | Test result (mV)                  | High limit (mV) | Test result (mV) | High limit (mV) |
| Channel 3                             | Full          |                                   | 8.13            |                  | 8.13            |
|                                       | 250 MHz limit |                                   | 6.10            |                  | 6.10            |
|                                       | 20 MHz limit  |                                   | 4.10            |                  | 4.10            |
| Channel 4                             | Full          |                                   | 8.13            |                  | 8.13            |
|                                       | 250 MHz limit |                                   | 6.10            |                  | 6.10            |
|                                       | 20 MHz limit  |                                   | 4.10            |                  | 4.10            |

| Random Noise, Sample Acquisition Mode |               |                                   |                 |                  |                 |
|---------------------------------------|---------------|-----------------------------------|-----------------|------------------|-----------------|
| Performance checks                    |               | Vertical sensitivity = 100 mV/div |                 |                  |                 |
|                                       |               | 1 M $\Omega$                      |                 | 50 $\Omega$      |                 |
|                                       | Bandwidth     | Test result (mV)                  | High limit (mV) | Test result (mV) | High limit (mV) |
| <b>MSO5204B, DPO5204B</b>             |               |                                   |                 |                  |                 |
| Channel 1                             | Full          |                                   | 5.0             |                  | 4.5             |
|                                       | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                       | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |
| Channel 2                             | Full          |                                   | 5.0             |                  | 4.5             |
|                                       | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                       | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |
| Channel 3                             | Full          |                                   | 5.0             |                  | 4.5             |
|                                       | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                       | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |
| Channel 4                             | Full          |                                   | 5.0             |                  | 4.5             |
|                                       | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                       | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |
| <b>MSO5104B, DPO5104B</b>             |               |                                   |                 |                  |                 |
| Channel 1                             | Full          |                                   | 4.5             |                  | 4.5             |
|                                       | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                       | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |
| Channel 2                             | Full          |                                   | 4.5             |                  | 4.5             |
|                                       | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                       | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |
| Channel 3                             | Full          |                                   | 4.5             |                  | 4.5             |
|                                       | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                       | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |

| Random Noise, Sample Acquisition Mode  |               |                                   |                 |                  |                 |
|----------------------------------------|---------------|-----------------------------------|-----------------|------------------|-----------------|
| Performance checks                     |               | Vertical sensitivity = 100 mV/div |                 |                  |                 |
|                                        |               | 1 M $\Omega$                      |                 | 50 $\Omega$      |                 |
|                                        | Bandwidth     | Test result (mV)                  | High limit (mV) | Test result (mV) | High limit (mV) |
| Channel 4                              | Full          |                                   | 4.5             |                  | 4.5             |
|                                        | 250 MHz limit |                                   | 3.8             |                  | 3.7             |
|                                        | 20 MHz limit  |                                   | 4.0             |                  | 3.0             |
| MSO5034B, DPO5034B, MSO5054B, DPO5054B |               |                                   |                 |                  |                 |
| Channel 1                              | Full          |                                   |                 |                  | 5.0             |
|                                        | 250 MHz limit |                                   |                 |                  | 4.75            |
|                                        | 20 MHz limit  |                                   |                 |                  | 4.00            |
| Channel 2                              | Full          |                                   |                 |                  | 5.00            |
|                                        | 250 MHz limit |                                   |                 |                  | 4.75            |
|                                        | 20 MHz limit  |                                   |                 |                  | 4.00            |
| Channel 3                              | Full          |                                   |                 |                  | 5.00            |
|                                        | 250 MHz limit |                                   |                 |                  | 4.75            |
|                                        | 20 MHz limit  |                                   |                 |                  | 4.00            |
| Channel 4                              | Full          |                                   |                 |                  | 5.00            |
|                                        | 250 MHz limit |                                   |                 |                  | 4.75            |
|                                        | 20 MHz limit  |                                   |                 |                  | 4.00            |

| Sample Rate and Delay Time Accuracy |                |             |                |
|-------------------------------------|----------------|-------------|----------------|
| Performance checks                  | Low limit      | Test result | High limit     |
|                                     | -0.8 divisions |             | +0.8 divisions |

| Delta Time Measurement Accuracy                        |               |                        |             |            |
|--------------------------------------------------------|---------------|------------------------|-------------|------------|
| Performance checks                                     |               |                        |             |            |
| MSO/DPO5204/B Channel 1                                |               |                        |             |            |
| Sample rate = 10 GS/s, 4 ns/Div, Source freq = 240 MHz |               |                        |             |            |
|                                                        | MSO/DPO V/Div | Source V <sub>pp</sub> | Test result | High limit |
|                                                        | 1 mV          | 8 mV                   |             | NA         |
|                                                        | 5 mV          | 40 mV                  |             | 65 ps      |
|                                                        | 100 mV        | 800 mV                 |             | 61 ps      |
|                                                        | 500 mV        | 4 V                    |             | 61 ps      |
|                                                        | 1 V           | 4 V                    |             | 70 ps      |
| Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz  |               |                        |             |            |

| Delta Time Measurement Accuracy                          |        |        |  |         |
|----------------------------------------------------------|--------|--------|--|---------|
|                                                          | 1 mV   | 8 mV   |  | 708 ps  |
|                                                          | 5 mV   | 40 mV  |  | 322 ps  |
|                                                          | 100 mV | 800 mV |  | 236 ps  |
|                                                          | 500 mV | 4 V    |  | 233 ps  |
|                                                          | 1 V    | 4 V    |  | 417 ps  |
| Sample rate = 5 GS/s, 400 ns/Div, Source freq = 2.4 MHz  |        |        |  |         |
|                                                          | 1 mV   | 8 mV   |  | 6.68 ns |
|                                                          | 5 mV   | 40 mV  |  | 3.01 ns |
|                                                          | 100 mV | 800 mV |  | 2.06 ns |
|                                                          | 500 mV | 4 V    |  | 2.02 ns |
|                                                          | 1 V    | 4 V    |  | 4.01 ns |
| Sample rate = 2.5 GS/s, 4 µs/Div, Source freq = 240 kHz  |        |        |  |         |
|                                                          | 1 mV   | 8 mV   |  | 69.8 ns |
|                                                          | 5 mV   | 40 mV  |  | 30.0 ns |
|                                                          | 100 mV | 800 mV |  | 20.6 ns |
|                                                          | 500 mV | 4 V    |  | 20.2 ns |
|                                                          | 1 V    | 4 V    |  | 40.1 ns |
| Sample rate = 200 MS/s, 40 µs/Div, Source freq = 24 kHz  |        |        |  |         |
|                                                          | 1 mV   | 8 mV   |  | 698 ns  |
|                                                          | 5 mV   | 40 mV  |  | 300 ns  |
|                                                          | 100 mV | 800 mV |  | 206 ns  |
|                                                          | 500 mV | 4 V    |  | 202 ns  |
|                                                          | 1 V    | 4 V    |  | 401 ns  |
| Sample rate = 20 MS/s, 400 µs/Div, Source freq = 2.4 kHz |        |        |  |         |
|                                                          | 1 mV   | 8 mV   |  | 6.98 µs |
|                                                          | 5 mV   | 40 mV  |  | 3.00 µs |
|                                                          | 100 mV | 800 mV |  | 2.06 µs |
|                                                          | 500 mV | 4 V    |  | 2.02 µs |
|                                                          | 1 V    | 4 V    |  | 4.01 µs |
| MSO/DPO5204/B Channel 2                                  |        |        |  |         |

| Delta Time Measurement Accuracy                                 |                        |             |            |
|-----------------------------------------------------------------|------------------------|-------------|------------|
| <b>Sample rate = 10 GS/s, 4 ns/Div, Source freq = 240 MHz</b>   |                        |             |            |
| MSO/DPO V/Div                                                   | Source V <sub>pp</sub> | Test result | High limit |
| 1 mV                                                            | 8 mV                   |             | NA         |
| 5 mV                                                            | 40 mV                  |             | 65 ps      |
| 100 mV                                                          | 800 mV                 |             | 61 ps      |
| 500 mV                                                          | 4 V                    |             | 61 ps      |
| 1 V                                                             | 4 V                    |             | 70 ps      |
| <b>Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>    |                        |             |            |
| 1 mV                                                            | 8 mV                   |             | 708 ps     |
| 5 mV                                                            | 40 mV                  |             | 322 ps     |
| 100 mV                                                          | 800 mV                 |             | 236 ps     |
| 500 mV                                                          | 4 V                    |             | 233 ps     |
| 1 V                                                             | 4 V                    |             | 417 ps     |
| <b>Sample rate = 5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b>  |                        |             |            |
| 1 mV                                                            | 8 mV                   |             | 6.68 ns    |
| 5 mV                                                            | 40 mV                  |             | 3.01 ns    |
| 100 mV                                                          | 800 mV                 |             | 2.06 ns    |
| 500 mV                                                          | 4 V                    |             | 2.02 ns    |
| 1 V                                                             | 4 V                    |             | 4.01 ns    |
| <b>Sample rate = 2.5 GS/s, 4 µs/Div, Source freq = 240 kHz</b>  |                        |             |            |
| 1 mV                                                            | 8 mV                   |             | 69.8 ns    |
| 5 mV                                                            | 40 mV                  |             | 30.0 ns    |
| 100 mV                                                          | 800 mV                 |             | 20.6 ns    |
| 500 mV                                                          | 4 V                    |             | 20.2 ns    |
| 1 V                                                             | 4 V                    |             | 40.1 ns    |
| <b>Sample rate = 200 MS/s, 40 µs/Div, Source freq = 24 kHz</b>  |                        |             |            |
| 1 mV                                                            | 8 mV                   |             | 698 ns     |
| 5 mV                                                            | 40 mV                  |             | 300 ns     |
| 100 mV                                                          | 800 mV                 |             | 206 ns     |
| 500 mV                                                          | 4 V                    |             | 202 ns     |
| 1 V                                                             | 4 V                    |             | 401 ns     |
| <b>Sample rate = 20 MS/s, 400 µs/Div, Source freq = 2.4 kHz</b> |                        |             |            |
| 1 mV                                                            | 8 mV                   |             | 6.98 µs    |
| 5 mV                                                            | 40 mV                  |             | 3.00 µs    |
| 100 mV                                                          | 800 mV                 |             | 2.06 µs    |
| 500 mV                                                          | 4 V                    |             | 2.02 µs    |
| 1 V                                                             | 4 V                    |             | 4.01 µs    |
| <b>MSO/DPO5204/B Channel 3</b>                                  |                        |             |            |

| Delta Time Measurement Accuracy                                                |                 |             |              |
|--------------------------------------------------------------------------------|-----------------|-------------|--------------|
| <b>Sample rate = 10 GS/s, 4 ns/Div, Source freq = 240 MHz</b>                  |                 |             |              |
| MSO/DPO V/Div                                                                  | Source $V_{pp}$ | Test result | High limit   |
| 1 mV                                                                           | 8 mV            |             | NA           |
| 5 mV                                                                           | 40 mV           |             | 65 ps        |
| 100 mV                                                                         | 800 mV          |             | 61 ps        |
| 500 mV                                                                         | 4 V             |             | 61 ps        |
| 1 V                                                                            | 4 V             |             | 70 ps        |
| <b>Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>                   |                 |             |              |
| 1 mV                                                                           | 8 mV            |             | 708 ps       |
| 5 mV                                                                           | 40 mV           |             | 322 ps       |
| 100 mV                                                                         | 800 mV          |             | 236 ps       |
| 500 mV                                                                         | 4 V             |             | 233 ps       |
| 1 V                                                                            | 4 V             |             | 417 ps       |
| <b>Sample rate = 5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b>                 |                 |             |              |
| 1 mV                                                                           | 8 mV            |             | 6.68 ns      |
| 5 mV                                                                           | 40 mV           |             | 3.00 ns      |
| 100 mV                                                                         | 800 mV          |             | 2.06 ns      |
| 500 mV                                                                         | 4 V             |             | 2.02 ns      |
| 1 V                                                                            | 4 V             |             | 4.01 ns      |
| <b>Sample rate = 2.5 GS/s, 4 <math>\mu</math>s/Div, Source freq = 240 kHz</b>  |                 |             |              |
| 1 mV                                                                           | 8 mV            |             | 69.8 ns      |
| 5 mV                                                                           | 40 mV           |             | 30.0 ns      |
| 100 mV                                                                         | 800 mV          |             | 20.6 ns      |
| 500 mV                                                                         | 4 V             |             | 20.2 ns      |
| 1 V                                                                            | 4 V             |             | 40.1 ns      |
| <b>Sample rate = 200 MS/s, 40 <math>\mu</math>s/Div, Source freq = 24 kHz</b>  |                 |             |              |
| 1 mV                                                                           | 8 mV            |             | 698 ns       |
| 5 mV                                                                           | 40 mV           |             | 300 ns       |
| 100 mV                                                                         | 800 mV          |             | 206 ns       |
| 500 mV                                                                         | 4 V             |             | 202 ns       |
| 1 V                                                                            | 4 V             |             | 401 ns       |
| <b>Sample rate = 20 MS/s, 400 <math>\mu</math>s/Div, Source freq = 2.4 kHz</b> |                 |             |              |
| 1 mV                                                                           | 8 mV            |             | 6.98 $\mu$ s |
| 5 mV                                                                           | 40 mV           |             | 3.00 $\mu$ s |
| 100 mV                                                                         | 800 mV          |             | 2.06 $\mu$ s |
| 500 mV                                                                         | 4 V             |             | 2.02 $\mu$ s |
| 1 V                                                                            | 4 V             |             | 4.01 $\mu$ s |
| <b>MSO/DPO5204/B Channel 4</b>                                                 |                 |             |              |

| Delta Time Measurement Accuracy                                 |                              |                    |                   |
|-----------------------------------------------------------------|------------------------------|--------------------|-------------------|
| <b>Sample rate = 10 GS/s, 4 ns/Div, Source freq = 240 MHz</b>   |                              |                    |                   |
| <b>MSO/DPO V/Div</b>                                            | <b>Source V<sub>pp</sub></b> | <b>Test result</b> | <b>High limit</b> |
| 1 mV                                                            | 8 mV                         |                    | NA                |
| 5 mV                                                            | 40 mV                        |                    | 65 ps             |
| 100 mV                                                          | 800 mV                       |                    | 61 ps             |
| 500 mV                                                          | 4 V                          |                    | 61 ps             |
| 1 V                                                             | 4 V                          |                    | 70 ps             |
| <b>Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>    |                              |                    |                   |
| 1 mV                                                            | 8 mV                         |                    | 708 ps            |
| 5 mV                                                            | 40 mV                        |                    | 322 ps            |
| 100 mV                                                          | 800 mV                       |                    | 236 ps            |
| 500 mV                                                          | 4 V                          |                    | 233 ps            |
| 1 V                                                             | 4 V                          |                    | 417 ps            |
| <b>Sample rate = 5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b>  |                              |                    |                   |
| 1 mV                                                            | 8 mV                         |                    | 6.68 ns           |
| 5 mV                                                            | 40 mV                        |                    | 3.01 ns           |
| 100 mV                                                          | 800 mV                       |                    | 2.06 ns           |
| 500 mV                                                          | 4 V                          |                    | 2.02 ns           |
| 1 V                                                             | 4 V                          |                    | 4.01 ns           |
| <b>Sample rate = 2.5 GS/s, 4 µs/Div, Source freq = 240 kHz</b>  |                              |                    |                   |
| 1 mV                                                            | 8 mV                         |                    | 69.8 ns           |
| 5 mV                                                            | 40 mV                        |                    | 30.0 ns           |
| 100 mV                                                          | 800 mV                       |                    | 20.6 ns           |
| 500 mV                                                          | 4 V                          |                    | 20.2 ns           |
| 1 V                                                             | 4 V                          |                    | 40.1 ns           |
| <b>Sample rate = 200 MS/s, 40 µs/Div, Source freq = 24 kHz</b>  |                              |                    |                   |
| 1 mV                                                            | 8 mV                         |                    | 698 ns            |
| 5 mV                                                            | 40 mV                        |                    | 300 ns            |
| 100 mV                                                          | 800 mV                       |                    | 206 ns            |
| 500 mV                                                          | 4 V                          |                    | 202 ns            |
| 1 V                                                             | 4 V                          |                    | 401 ns            |
| <b>Sample rate = 20 MS/s, 400 µs/Div, Source freq = 2.4 kHz</b> |                              |                    |                   |
| 1 mV                                                            | 8 mV                         |                    | 6.98 µs           |
| 5 mV                                                            | 40 mV                        |                    | 3.00 µs           |
| 100 mV                                                          | 800 mV                       |                    | 2.06 µs           |
| 500 mV                                                          | 4 V                          |                    | 2.02 µs           |
| 1 V                                                             | 4 V                          |                    | 4.01 µs           |
| <b>MSO/DPO5104/B Channel 1</b>                                  |                              |                    |                   |

| Delta Time Measurement Accuracy                                                 |                 |             |              |
|---------------------------------------------------------------------------------|-----------------|-------------|--------------|
| <b>Sample rate = 5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>                    |                 |             |              |
| MSO/DPO V/Div                                                                   | Source $V_{pp}$ | Test result | High limit   |
| 1 mV                                                                            | 8 mV            |             | NA           |
| 5 mV                                                                            | 40 mV           |             | 118 ps       |
| 100 mV                                                                          | 800 mV          |             | 117 ps       |
| 500 mV                                                                          | 4 V             |             | 117 ps       |
| 1 V                                                                             | 4 V             |             | 122 ps       |
| <b>Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>                    |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 464 ps       |
| 5 mV                                                                            | 40 mV           |             | 276 ps       |
| 100 mV                                                                          | 800 mV          |             | 234 ps       |
| 500 mV                                                                          | 4 V             |             | 232 ps       |
| 1 V                                                                             | 4 V             |             | 417 ps       |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b>                |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 4.50 ns      |
| 5 mV                                                                            | 40 mV           |             | 2.52 ns      |
| 100 mV                                                                          | 800 mV          |             | 2.06 ns      |
| 500 mV                                                                          | 4 V             |             | 2.03 ns      |
| 1 V                                                                             | 4 V             |             | 4.01 ns      |
| <b>Sample rate = 250 MS/s, 4 <math>\mu</math>s/Div, Source freq = 240 kHz</b>   |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 45.0 ns      |
| 5 mV                                                                            | 40 mV           |             | 25.2 ns      |
| 100 mV                                                                          | 800 mV          |             | 20.5 ns      |
| 500 mV                                                                          | 4 V             |             | 20.3 ns      |
| 1 V                                                                             | 4 V             |             | 40.1 ns      |
| <b>Sample rate = 25 MS/s, 40 <math>\mu</math>s/Div, Source freq = 24 kHz</b>    |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 450 ns       |
| 5 mV                                                                            | 40 mV           |             | 252 ns       |
| 100 mV                                                                          | 800 mV          |             | 205 ns       |
| 500 mV                                                                          | 4 V             |             | 203 ns       |
| 1 V                                                                             | 4 V             |             | 401 ns       |
| <b>Sample rate = 2.5 MS/s, 400 <math>\mu</math>s/Div, Source freq = 2.4 kHz</b> |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 4.50 $\mu$ s |
| 5 mV                                                                            | 40 mV           |             | 2.52 $\mu$ s |
| 100 mV                                                                          | 800 mV          |             | 2.05 $\mu$ s |
| 500 mV                                                                          | 4 V             |             | 2.03 $\mu$ s |
| 1 V                                                                             | 4 V             |             | 4.01 $\mu$ s |
| <b>MSO/DPO5104/B Channel 2</b>                                                  |                 |             |              |

| Delta Time Measurement Accuracy                                  |                        |             |            |
|------------------------------------------------------------------|------------------------|-------------|------------|
| <b>Sample rate = 5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>     |                        |             |            |
| MSO/DPO V/Div                                                    | Source V <sub>pp</sub> | Test result | High limit |
| 1 mV                                                             | 8 mV                   |             | NA         |
| 5 mV                                                             | 40 mV                  |             | 118 ps     |
| 100 mV                                                           | 800 mV                 |             | 117 ps     |
| 500 mV                                                           | 4 V                    |             | 117 ps     |
| 1 V                                                              | 4 V                    |             | 122 ps     |
| <b>Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>     |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 464 ps     |
| 5 mV                                                             | 40 mV                  |             | 276 ps     |
| 100 mV                                                           | 800 mV                 |             | 234 ps     |
| 500 mV                                                           | 4 V                    |             | 232 ps     |
| 1 V                                                              | 4 V                    |             | 417 ps     |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b> |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 4.50 ns    |
| 5 mV                                                             | 40 mV                  |             | 2.52 ns    |
| 100 mV                                                           | 800 mV                 |             | 2.05 ns    |
| 500 mV                                                           | 4 V                    |             | 2.03 ns    |
| 1 V                                                              | 4 V                    |             | 4.01 ns    |
| <b>Sample rate = 250 MS/s, 4 μs/Div, Source freq = 240 kHz</b>   |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 45.0 ns    |
| 5 mV                                                             | 40 mV                  |             | 25.2 ns    |
| 100 mV                                                           | 800 mV                 |             | 20.5 ns    |
| 500 mV                                                           | 4 V                    |             | 20.3 ns    |
| 1 V                                                              | 4 V                    |             | 40.1 ns    |
| <b>Sample rate = 25 MS/s, 40 μs/Div, Source freq = 24 kHz</b>    |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 450 ns     |
| 5 mV                                                             | 40 mV                  |             | 252 ns     |
| 100 mV                                                           | 800 mV                 |             | 205 ns     |
| 500 mV                                                           | 4 V                    |             | 203 ns     |
| 1 V                                                              | 4 V                    |             | 401 ns     |
| <b>Sample rate = 2.5 MS/s, 400 μs/Div, Source freq = 2.4 kHz</b> |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 4.50 μs    |
| 5 mV                                                             | 40 mV                  |             | 2.52 μs    |
| 100 mV                                                           | 800 mV                 |             | 2.05 μs    |
| 500 mV                                                           | 4 V                    |             | 2.03 μs    |
| 1 V                                                              | 4 V                    |             | 4.01 μs    |
| <b>MSO/DPO5104/B Channel 3</b>                                   |                        |             |            |

| Delta Time Measurement Accuracy                                                 |                 |             |              |
|---------------------------------------------------------------------------------|-----------------|-------------|--------------|
| <b>Sample rate = 5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>                    |                 |             |              |
| MSO/DPO V/Div                                                                   | Source $V_{pp}$ | Test result | High limit   |
| 1 mV                                                                            | 8 mV            |             | NA           |
| 5 mV                                                                            | 40 mV           |             | 118 ps       |
| 100 mV                                                                          | 800 mV          |             | 117 ps       |
| 500 mV                                                                          | 4 V             |             | 117 ps       |
| 1 V                                                                             | 4 V             |             | 122 ps       |
| <b>Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>                    |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 464 ps       |
| 5 mV                                                                            | 40 mV           |             | 276 ps       |
| 100 mV                                                                          | 800 mV          |             | 234 ps       |
| 500 mV                                                                          | 4 V             |             | 232 ps       |
| 1 V                                                                             | 4 V             |             | 417 ps       |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b>                |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 4.50 ns      |
| 5 mV                                                                            | 40 mV           |             | 2.52 ns      |
| 100 mV                                                                          | 800 mV          |             | 2.05 ns      |
| 500 mV                                                                          | 4 V             |             | 2.03 ns      |
| 1 V                                                                             | 4 V             |             | 4.01 ns      |
| <b>Sample rate = 250 MS/s, 4 <math>\mu</math>s/Div, Source freq = 240 kHz</b>   |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 45.0 ns      |
| 5 mV                                                                            | 40 mV           |             | 25.2 ns      |
| 100 mV                                                                          | 800 mV          |             | 20.5 ns      |
| 500 mV                                                                          | 4 V             |             | 20.3 ns      |
| 1 V                                                                             | 4 V             |             | 40.1 ns      |
| <b>Sample rate = 25 MS/s, 40 <math>\mu</math>s/Div, Source freq = 24 kHz</b>    |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 450 ns       |
| 5 mV                                                                            | 40 mV           |             | 252 ns       |
| 100 mV                                                                          | 800 mV          |             | 205 ns       |
| 500 mV                                                                          | 4 V             |             | 203 ns       |
| 1 V                                                                             | 4 V             |             | 401 ns       |
| <b>Sample rate = 2.5 MS/s, 400 <math>\mu</math>s/Div, Source freq = 2.4 kHz</b> |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 4.50 $\mu$ s |
| 5 mV                                                                            | 40 mV           |             | 2.52 $\mu$ s |
| 100 mV                                                                          | 800 mV          |             | 2.05 $\mu$ s |
| 500 mV                                                                          | 4 V             |             | 2.03 $\mu$ s |
| 1 V                                                                             | 4 V             |             | 4.01 $\mu$ s |
| <b>MSO/DPO5104/B Channel 4</b>                                                  |                 |             |              |

| Delta Time Measurement Accuracy                                  |                        |             |            |
|------------------------------------------------------------------|------------------------|-------------|------------|
| <b>Sample rate = 5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>     |                        |             |            |
| MSO/DPO V/Div                                                    | Source V <sub>pp</sub> | Test result | High limit |
| 1 mV                                                             | 8 mV                   |             | NA         |
| 5 mV                                                             | 40 mV                  |             | 118 ps     |
| 100 mV                                                           | 800 mV                 |             | 117 ps     |
| 500 mV                                                           | 4 V                    |             | 117 ps     |
| 1 V                                                              | 4 V                    |             | 122 ps     |
| <b>Sample rate = 5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>     |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 464 ps     |
| 5 mV                                                             | 40 mV                  |             | 276 ps     |
| 100 mV                                                           | 800 mV                 |             | 234 ps     |
| 500 mV                                                           | 4 V                    |             | 232 ps     |
| 1 V                                                              | 4 V                    |             | 417 ps     |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b> |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 4.50 ns    |
| 5 mV                                                             | 40 mV                  |             | 2.52 ns    |
| 100 mV                                                           | 800 mV                 |             | 2.05 ns    |
| 500 mV                                                           | 4 V                    |             | 2.03 ns    |
| 1 V                                                              | 4 V                    |             | 4.01 ns    |
| <b>Sample rate = 250 MS/s, 4 μs/Div, Source freq = 240 kHz</b>   |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 45.0 ns    |
| 5 mV                                                             | 40 mV                  |             | 25.2 ns    |
| 100 mV                                                           | 800 mV                 |             | 20.5 ns    |
| 500 mV                                                           | 4 V                    |             | 20.3 ns    |
| 1 V                                                              | 4 V                    |             | 40.1 ns    |
| <b>Sample rate = 25 MS/s, 40 μs/Div, Source freq = 24 kHz</b>    |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 450 ns     |
| 5 mV                                                             | 40 mV                  |             | 252 ns     |
| 100 mV                                                           | 800 mV                 |             | 205 ns     |
| 500 mV                                                           | 4 V                    |             | 203 ns     |
| 1 V                                                              | 4 V                    |             | 401 ns     |
| <b>Sample rate = 2.5 MS/s, 400 μs/Div, Source freq = 2.4 kHz</b> |                        |             |            |
| 1 mV                                                             | 8 mV                   |             | 4.50 μs    |
| 5 mV                                                             | 40 mV                  |             | 2.52 μs    |
| 100 mV                                                           | 800 mV                 |             | 2.05 μs    |
| 500 mV                                                           | 4 V                    |             | 2.03 μs    |
| 1 V                                                              | 4 V                    |             | 4.01 μs    |
| <b>MSO/DPO5054/B and MSO/DPO5034/B Channel 1</b>                 |                        |             |            |

| Delta Time Measurement Accuracy                                                 |                 |             |              |
|---------------------------------------------------------------------------------|-----------------|-------------|--------------|
| <b>Sample rate = 2.5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>                  |                 |             |              |
| MSO/DPO V/Div                                                                   | Source $V_{pp}$ | Test result | High limit   |
| 1 mV                                                                            | 8 mV            |             | NA           |
| 5 mV                                                                            | 40 mV           |             | 234 ps       |
| 100 mV                                                                          | 800 mV          |             | 233 ps       |
| 500 mV                                                                          | 4 V             |             | 233 ps       |
| 1 V                                                                             | 4 V             |             | 237 ps       |
| <b>Sample rate = 2.5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>                  |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 735 ps       |
| 5 mV                                                                            | 40 mV           |             | 422 ps       |
| 100 mV                                                                          | 800 mV          |             | 357 ps       |
| 500 mV                                                                          | 4 V             |             | 354 ps       |
| 1 V                                                                             | 4 V             |             | 581 ps       |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b>                |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 6.99 ns      |
| 5 mV                                                                            | 40 mV           |             | 3.54 ns      |
| 100 mV                                                                          | 800 mV          |             | 2.72 ns      |
| 500 mV                                                                          | 4 V             |             | 2.69 ns      |
| 1 V                                                                             | 4 V             |             | 5.34 ns      |
| <b>Sample rate = 250 MS/s, 4 <math>\mu</math>s/Div, Source freq = 240 kHz</b>   |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 69.9 ns      |
| 5 mV                                                                            | 40 mV           |             | 35.4 ns      |
| 100 mV                                                                          | 800 mV          |             | 27.2 ns      |
| 500 mV                                                                          | 4 V             |             | 26.9 ns      |
| 1 V                                                                             | 4 V             |             | 53.4 ns      |
| <b>Sample rate = 25 MS/s, 40 <math>\mu</math>s/Div, Source freq = 24 kHz</b>    |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 699 ns       |
| 5 mV                                                                            | 40 mV           |             | 354 ns       |
| 100 mV                                                                          | 800 mV          |             | 272 ns       |
| 500 mV                                                                          | 4 V             |             | 269 ns       |
| 1 V                                                                             | 4 V             |             | 534 ns       |
| <b>Sample rate = 2.5 MS/s, 400 <math>\mu</math>s/Div, Source freq = 2.4 kHz</b> |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 6.99 $\mu$ s |
| 5 mV                                                                            | 40 mV           |             | 3.54 $\mu$ s |
| 100 mV                                                                          | 800 mV          |             | 2.72 $\mu$ s |
| 500 mV                                                                          | 4 V             |             | 2.69 $\mu$ s |
| 1 V                                                                             | 4 V             |             | 5.34 $\mu$ s |
| <b>MSO/DPO5054/B and MSO/DPO5034/B Channel 2</b>                                |                 |             |              |

| Delta Time Measurement Accuracy                                  |                              |                    |                   |
|------------------------------------------------------------------|------------------------------|--------------------|-------------------|
| <b>Sample rate = 2.5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>   |                              |                    |                   |
| <b>MSO/DPO V/Div</b>                                             | <b>Source V<sub>pp</sub></b> | <b>Test result</b> | <b>High limit</b> |
| 1 mV                                                             | 8 mV                         |                    | NA                |
| 5 mV                                                             | 40 mV                        |                    | 234 ps            |
| 100 mV                                                           | 800 mV                       |                    | 233 ps            |
| 500 mV                                                           | 4 V                          |                    | 233 ps            |
| 1 V                                                              | 4 V                          |                    | 237 ps            |
| <b>Sample rate = 2.5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>   |                              |                    |                   |
| 1 mV                                                             | 8 mV                         |                    | 735 ps            |
| 5 mV                                                             | 40 mV                        |                    | 422 ps            |
| 100 mV                                                           | 800 mV                       |                    | 357 ps            |
| 500 mV                                                           | 4 V                          |                    | 254 ps            |
| 1 V                                                              | 4 V                          |                    | 581 ps            |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b> |                              |                    |                   |
| 1 mV                                                             | 8 mV                         |                    | 6.99 ns           |
| 5 mV                                                             | 40 mV                        |                    | 3.54 ns           |
| 100 mV                                                           | 800 mV                       |                    | 2.72 ns           |
| 500 mV                                                           | 4 V                          |                    | 2.69 ns           |
| 1 V                                                              | 4 V                          |                    | 5.34 ns           |
| <b>Sample rate = 250 MS/s, 4 μs/Div, Source freq = 240 kHz</b>   |                              |                    |                   |
| 1 mV                                                             | 8 mV                         |                    | 69.9 ns           |
| 5 mV                                                             | 40 mV                        |                    | 35.4 ns           |
| 100 mV                                                           | 800 mV                       |                    | 27.2 ns           |
| 500 mV                                                           | 4 V                          |                    | 26.9 ns           |
| 1 V                                                              | 4 V                          |                    | 53.4 ns           |
| <b>Sample rate = 25 MS/s, 40 μs/Div, Source freq = 24 kHz</b>    |                              |                    |                   |
| 1 mV                                                             | 8 mV                         |                    | 699 ns            |
| 5 mV                                                             | 40 mV                        |                    | 354 ns            |
| 100 mV                                                           | 800 mV                       |                    | 272 ns            |
| 500 mV                                                           | 4 V                          |                    | 269 ns            |
| 1 V                                                              | 4 V                          |                    | 534 ns            |
| <b>Sample rate = 2.5 MS/s, 400 μs/Div, Source freq = 2.4 kHz</b> |                              |                    |                   |
| 1 mV                                                             | 8 mV                         |                    | 6.99 μs           |
| 5 mV                                                             | 40 mV                        |                    | 3.54 μs           |
| 100 mV                                                           | 800 mV                       |                    | 2.72 μs           |
| 500 mV                                                           | 4 V                          |                    | 2.69 μs           |
| 1 V                                                              | 4 V                          |                    | 5.34 μs           |
| <b>MSO/DPO5054/B and MSO/DPO5034/B Channel 3</b>                 |                              |                    |                   |

| Delta Time Measurement Accuracy                                                 |                 |             |              |
|---------------------------------------------------------------------------------|-----------------|-------------|--------------|
| <b>Sample rate = 2.5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>                  |                 |             |              |
| MSO/DPO V/Div                                                                   | Source $V_{pp}$ | Test result | High limit   |
| 1 mV                                                                            | 8 mV            |             | NA           |
| 5 mV                                                                            | 40 mV           |             | 234 ps       |
| 100 mV                                                                          | 800 mV          |             | 233 ps       |
| 500 mV                                                                          | 4 V             |             | 233 ps       |
| 1 V                                                                             | 4 V             |             | 237 ps       |
| <b>Sample rate = 2.5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>                  |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 735 ps       |
| 5 mV                                                                            | 40 mV           |             | 422 ps       |
| 100 mV                                                                          | 800 mV          |             | 257 ps       |
| 500 mV                                                                          | 4 V             |             | 254 ps       |
| 1 V                                                                             | 4 V             |             | 581 ps       |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b>                |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 6.99 ns      |
| 5 mV                                                                            | 40 mV           |             | 3.54 ns      |
| 100 mV                                                                          | 800 mV          |             | 2.72 ns      |
| 500 mV                                                                          | 4 V             |             | 2.69 ns      |
| 1 V                                                                             | 4 V             |             | 5.34 ns      |
| <b>Sample rate = 250 MS/s, 4 <math>\mu</math>s/Div, Source freq = 240 kHz</b>   |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 69.9 ns      |
| 5 mV                                                                            | 40 mV           |             | 35.4 ns      |
| 100 mV                                                                          | 800 mV          |             | 27.2 ns      |
| 500 mV                                                                          | 4 V             |             | 26.9 ns      |
| 1 V                                                                             | 4 V             |             | 53.4 ns      |
| <b>Sample rate = 25 MS/s, 40 <math>\mu</math>s/Div, Source freq = 24 kHz</b>    |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 699 ns       |
| 5 mV                                                                            | 40 mV           |             | 354 ns       |
| 100 mV                                                                          | 800 mV          |             | 272 ns       |
| 500 mV                                                                          | 4 V             |             | 269 ns       |
| 1 V                                                                             | 4 V             |             | 534 ns       |
| <b>Sample rate = 2.5 MS/s, 400 <math>\mu</math>s/Div, Source freq = 2.4 kHz</b> |                 |             |              |
| 1 mV                                                                            | 8 mV            |             | 6.99 $\mu$ s |
| 5 mV                                                                            | 40 mV           |             | 3.54 $\mu$ s |
| 100 mV                                                                          | 800 mV          |             | 2.72 $\mu$ s |
| 500 mV                                                                          | 4 V             |             | 2.69 $\mu$ s |
| 1 V                                                                             | 4 V             |             | 5.34 $\mu$ s |
| <b>MSO/DPO5054/B and MSO/DPO5034/B Channel 4</b>                                |                 |             |              |

| Delta Time Measurement Accuracy                                  |                      |                              |                    |                   |
|------------------------------------------------------------------|----------------------|------------------------------|--------------------|-------------------|
| <b>Sample rate = 2.5 GS/s, 4 ns/Div, Source freq = 240 MHz</b>   |                      |                              |                    |                   |
|                                                                  | <b>MSO/DPO V/Div</b> | <b>Source V<sub>pp</sub></b> | <b>Test result</b> | <b>High limit</b> |
|                                                                  | 1 mV                 | 8 mV                         |                    | NA                |
|                                                                  | 5 mV                 | 40 mV                        |                    | 234 ps            |
|                                                                  | 100 mV               | 800 mV                       |                    | 233 ps            |
|                                                                  | 500 mV               | 4 V                          |                    | 233 ps            |
|                                                                  | 1 V                  | 4 V                          |                    | 237 ps            |
| <b>Sample rate = 2.5 GS/s, 40 ns/Div, Source freq = 24 MHz</b>   |                      |                              |                    |                   |
|                                                                  | 1 mV                 | 8 mV                         |                    | 735 ps            |
|                                                                  | 5 mV                 | 40 mV                        |                    | 422 ps            |
|                                                                  | 100 mV               | 800 mV                       |                    | 257 ps            |
|                                                                  | 500 mV               | 4 V                          |                    | 354 ps            |
|                                                                  | 1 V                  | 4 V                          |                    | 581 ps            |
| <b>Sample rate = 2.5 GS/s, 400 ns/Div, Source freq = 2.4 MHz</b> |                      |                              |                    |                   |
|                                                                  | 1 mV                 | 8 mV                         |                    | 6.99 ns           |
|                                                                  | 5 mV                 | 40 mV                        |                    | 3.54 ns           |
|                                                                  | 100 mV               | 800 mV                       |                    | 2.72 ns           |
|                                                                  | 500 mV               | 4 V                          |                    | 2.69 ns           |
|                                                                  | 1 V                  | 4 V                          |                    | 5.34 ns           |
| <b>Sample rate = 250 MS/s, 4 µs/Div, Source freq = 240 kHz</b>   |                      |                              |                    |                   |
|                                                                  | 1 mV                 | 8 mV                         |                    | 69.9 ns           |
|                                                                  | 5 mV                 | 40 mV                        |                    | 35.4 ns           |
|                                                                  | 100 mV               | 800 mV                       |                    | 27.2 ns           |
|                                                                  | 500 mV               | 4 V                          |                    | 26.9 ns           |
|                                                                  | 1 V                  | 4 V                          |                    | 53.4 ns           |
| <b>Sample rate = 25 MS/s, 40 µs/Div, Source freq = 24 kHz</b>    |                      |                              |                    |                   |
|                                                                  | 1 mV                 | 8 mV                         |                    | 699 ns            |
|                                                                  | 5 mV                 | 40 mV                        |                    | 354 ns            |
|                                                                  | 100 mV               | 800 mV                       |                    | 272 ns            |
|                                                                  | 500 mV               | 4 V                          |                    | 269 ns            |
|                                                                  | 1 V                  | 4 V                          |                    | 534 ns            |
| <b>Sample rate = 2.5 MS/s, 400 µs/Div, Source freq = 2.4 kHz</b> |                      |                              |                    |                   |
|                                                                  | 1 mV                 | 8 mV                         |                    | 6.99 µs           |
|                                                                  | 5 mV                 | 40 mV                        |                    | 3.54 µs           |
|                                                                  | 100 mV               | 800 mV                       |                    | 2.72 µs           |
|                                                                  | 500 mV               | 4 V                          |                    | 2.69 µs           |
|                                                                  | 1 V                  | 4 V                          |                    | 5.34 µs           |

| Digital Threshold Accuracy, MSO5000/B series only |           |                 |                 |           |             |            |
|---------------------------------------------------|-----------|-----------------|-----------------|-----------|-------------|------------|
| Performance checks:                               |           |                 |                 |           |             |            |
| Digital channel                                   | Threshold | V <sub>S-</sub> | V <sub>S+</sub> | Low limit | Test result | High limit |
| D0                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D1                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D2                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D3                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D4                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D5                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D6                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D7                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D8                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D9                                                | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D10                                               | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D11                                               | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D12                                               | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D13                                               | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D14                                               | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |
| D15                                               | 0 V       |                 |                 | -0.1 V    |             | 0.1 V      |
|                                                   | 4 V       |                 |                 | 3.78 V    |             | 4.22 V     |

| Auxiliary (Trigger) Output |                   |              |             |               |
|----------------------------|-------------------|--------------|-------------|---------------|
| Performance checks         |                   | Low limit    | Test result | High limit    |
| Trigger Output             | High 1 M $\Omega$ | $\geq 2.5$ V |             | –             |
|                            | Low 1 M $\Omega$  | –            |             | $\leq 0.7$ V  |
| Trigger Output             | High 50 $\Omega$  | $\geq 1.0$ V |             | –             |
|                            | Low 50 $\Omega$   | –            |             | $\leq 0.25$ V |

## Performance tests (MSO/DPO5000-B series)

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 cabinet must be installed on the instrument.
- You must have performed and passed the procedures under *Self Test*. (See [Self test](#) on page 317.)
- A signal-path compensation must have been done within the recommended calibration interval and at a temperature within  $\pm 5$  °C ( $\pm 9$  °F) of the present operating temperature. (If at the time you did the prerequisite *Self Test*, the temperature was within the limits just stated, 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 (+64 °F) and +28 °C (+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. (See [Environmental specifications](#) on page 97.) (The warm-up requirement is usually met in the course of meeting the Self Test prerequisites listed above).
- Support sensor, probe, and adapter setups to avoid stress or torque when connected to the device under test (DUT).

## Self test

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

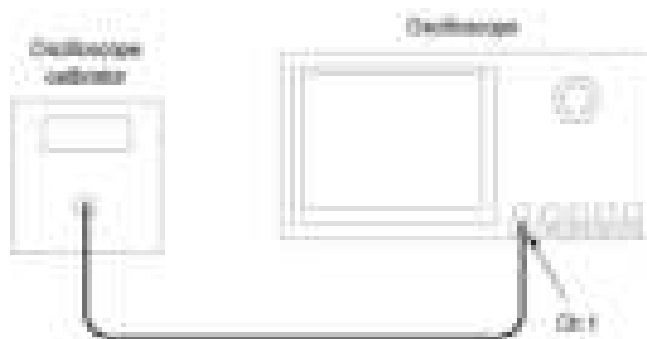
| Equipment required | Prerequisites                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------|
| None               | Power on the instrument and allow a 20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

1. *Run the System Diagnostics (may take several minutes):*
  - a. Ensure that an optical mouse is installed on one of the USB connectors.
  - b. Disconnect everything from the oscilloscope inputs.
  - c. If the instrument is in toolbar mode, put the instrument into menu bar mode by clicking on the down arrow at the top of the display.
  - d. Pull down the **Utilities** menu and select **Instrument Diagnostics**. This displays the diagnostics control window.
  - e. Click the **Run** button in the diagnostics control window.
  - f. Wait. The internal diagnostics perform an exhaustive verification of proper instrument function. This verification may take several minutes. When the verification is finished, the resulting status will appear in the diagnostics control window
  - g. Verify that the status of all tests on the readout is **Pass**.
2. *Run the signal-path compensation routine (may take 5 to 15 minutes):*
  - a. Pull down the **Utilities** menu and select **Instrument Calibration**. This displays the instrument calibration control window. If required because the instrument is in service mode, select the **Signal Path** button under Calibration Area.
  - b. Click the **Run SPC** button to start the routine.
  - c. Wait. Signal-path compensation may take 5 to 15 minutes to run.
  - d. Verify that the **SPC Status** is **Pass** and that the **Temperature Status** is Ready.
3. *Return to regular service:* Click the **X** (close) button to exit the instrument calibration control window.

## Check input impedance (Resistance)

This test checks the Input Impedance.

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.** The generator is capable of providing dangerous voltages. 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.

---

2. Push the front-panel **Default Setup** button.
3. Set the impedance to 1 M $\Omega$  as follows:
  - a. Set the calibrator impedance to 1 M $\Omega$ .
  - b. Push the front-panel Vertical **V** menu button.
  - c. Set the **Termination** to 1 M $\Omega$ .
4. Set the Vertical **Scale** to 10 mV/div.

**NOTE.** Impedance measuring equipment that produce 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 because of the measurement voltage amplitude.

---

5. Use the calibrator to measure the input impedance of the oscilloscope and enter the value in the test record.
6. Repeat steps 4 and 5 for all vertical scale settings in the test record.
7. Repeat the tests at 250 k $\Omega$  as follows:
  - a. Set the calibrator impedance to 1 M $\Omega$ .
  - b. In the toolbar, click the **Utilities** menu and select **Instrument Diagnostics**.
  - c. Click the on-screen **Manual Product Verification** button.

- d. Click the on-screen box to Verify the probe host terminations.
- e. Set the Vertical **Scale** to **100 mV/division**.
- f. Use the calibrator to measure the input impedance of the oscilloscope and enter the value in the test record.
8. *Repeat the tests at 50  $\Omega$  as follows:*
  - a. Set the calibrator impedance to 50  $\Omega$ .
  - b. Push the front-panel oscilloscope Vertical **V** menu button.
  - c. Set the **Termination** to **50  $\Omega$** .
  - d. Repeat steps 4 through 6.
9. *Repeat the procedure for all remaining channels as follows:*
  - a. Push the front-panel button to deselect the channel that you have already tested.
  - b. Push the front-panel button to select the next channel to be tested.
  - c. Move the calibrator connection to the next channel to be tested.
  - d. Starting from step 3, repeat the procedure until all channels have been tested.
10. Press the **Menu Off** button.

## Check DC balance

This test checks the DC balance. You do not need to connect any test equipment (other than the 50  $\Omega$  terminator) to the oscilloscope to perform this check.



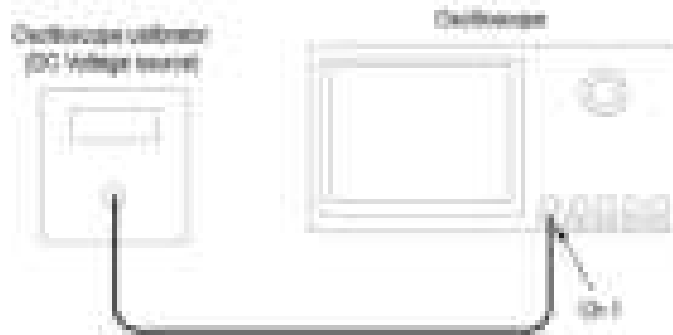
1. Attach a 50  $\Omega$  terminator to the oscilloscope channel 1 input.
2. Push the front-panel **Default Setup** button.
3. *Set the oscilloscope impedance to 50  $\Omega$  as follows:*
  - a. Push the front-panel oscilloscope Vertical **V** menu button.
  - b. Set the **Termination** to **50  $\Omega$** .

4. Set the **Bandwidth** to **20 MHz**.
5. Set the Horizontal **Scale** to **1 ms/division**.
6. *Set the Acquisition mode to Average as follows:*
  - a. Push the front-panel **Acquire** button.
  - b. In the Acquisition window, select the **Acquisition** tab at the left.
  - c. Select **Average** Acquisition mode.
  - d. Ensure that the **number of averages** is set to **16**.
7. *Set the trigger source to AC line as follows:*
  - a. Push the front-panel Trigger **Menu** button.
  - b. In the Trigger menu, under **Source**, click **Select**.
  - c. Click **Line** to set the trigger source to AC line, and then click **OK**.
8. Set the Vertical **Scale** to **1 mV**.
9. *Select the mean measurement (if not already selected) as follows:*
  - a. Push the front-panel Wave Inspector **Measure** button.
  - b. In the Measurements Setup window, go to the **Measurements** box. Click the **More** button and then select **Mean**.
  - c. View the **Mean** measurement value in the display.
10. Enter the mean value as the test result in the test record.
11. Repeat steps 8 through 10 for each vertical scale setting in the test record.
12. Repeat steps 5 through 11 for each bandwidth setting in the test record table.
13. *Repeat the tests at 1 M $\Omega$  impedance as follows:*
  - a. Push the front-panel Vertical **V** menu button.
  - b. Set the **Termination** to **1M  $\Omega$** .
  - c. Repeat steps 4 through 12.
14. *Repeat the procedure for all remaining channels as follows:*
  - a. Push the front-panel button to deselect the channel that you have already tested.
  - b. Push the front-panel button to select the next channel to be tested.
  - c. Move the 50  $\Omega$  terminator to the channel input to be tested.
  - d. Starting from step 3, repeat the procedure until all channels have been tested.
15. Press the **Menu Off** button.

## Check DC gain accuracy

This test checks the DC gain accuracy.

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



**WARNING.** The generator is capable of providing dangerous voltages. 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.

2. Push the front-panel **Default Setup** button.
3. Set the input impedance to 50  $\Omega$  as follows:
  - a. Set the calibrator to 50  $\Omega$  output impedance.
  - b. Push the front-panel oscilloscope Vertical **V** menu button.
  - c. Set the **Termination** to **50  $\Omega$** .
4. Set the **Bandwidth** to **20 MHz**.
5. Set the Acquisition mode to Average as follows:
  - a. Push the front-panel **Acquire** button.
  - b. In the Acquisition window, select the **Acquisition** tab at the left.
  - c. Select **Average** Acquisition mode.
  - d. Ensure that the **number of averages** is set to **16**.
6. Set the trigger source to AC line as follows:
  - a. Push the Trigger **Menu** front-panel button.
  - b. In the Trigger menu, under **Source**, click **Select**.
  - c. Click **Line** to set the trigger source to AC line, and then click **OK**.
7. Set the Vertical **Scale** to **2 mV/division**.

8. Record the negative-measured and positive-measured mean readings in the worksheet as follows:
  - a. Set the DC Voltage Source to  $V_{\text{negative}}$ .
  - b. Push the front-panel Wave Inspector **Measure** button.
  - c. In the Measurements Setup window, go to the **Measurements** box. Click the **More** button and then select **Mean**.
  - d. View the **Mean** measurement value in the display.
  - e. In the Measurement Setup window, select **Statistics**.
  - f. Click **Reset**.
  - g. Enter the mean reading in the worksheet as  $V_{\text{negative-measured}}$ . (See [Table 22: Gain expected worksheet](#) on page 322.)
  - h. Set the DC Voltage Source to  $V_{\text{positive}}$ .
  - i. Click **Reset** again.
  - j. Enter the mean reading in the worksheet as  $V_{\text{positive-measured}}$ .

Table 22: Gain expected worksheet

| Oscilloscope Vertical Scale Setting | $V_{\text{diffExpected}}$ | $V_{\text{negative}}$ | $V_{\text{positive}}$ | $V_{\text{negative-measured}}$ | $V_{\text{positive-measured}}$ | $V_{\text{diff}}$ | Test Result (Gain Accuracy) |
|-------------------------------------|---------------------------|-----------------------|-----------------------|--------------------------------|--------------------------------|-------------------|-----------------------------|
| 2 mV/div                            | 18 mV                     | -9 mV                 | +9 mV                 |                                |                                |                   |                             |
| 5 mV                                | 45 mV                     | -22.5 mV              | +22.5 mV              |                                |                                |                   |                             |
| 10 mV                               | 90 mV                     | -45 mV                | +45 mV                |                                |                                |                   |                             |
| 20 mV                               | 180 mV                    | -90 mV                | +90 mV                |                                |                                |                   |                             |
| 50 mV                               | 450 mV                    | -225 mV               | +225 mV               |                                |                                |                   |                             |
| 100 mV                              | 900 mV                    | -450 mV               | +450 mV               |                                |                                |                   |                             |
| 200 mV                              | 1800 mV                   | -900 mV               | +900 mV               |                                |                                |                   |                             |
| 500 mV                              | 4900 mV                   | -2450 mV              | +2450 mV              |                                |                                |                   |                             |
| 1.0 V                               | 9000 mV                   | -4500 mV              | +4500 mV              |                                |                                |                   |                             |
| 20 mV at 250 MHz                    | 180 mV                    | -90 mV                | +90 mV                |                                |                                |                   |                             |
| 20 mV at Full bandwidth             | 180 mV                    | -90 mV                | +90 mV                |                                |                                |                   |                             |

9. Record Gain Accuracy as follows:
  - a. Calculate  $V_{\text{diff}}$  as follows:
 
$$V_{\text{diff}} = |V_{\text{negative-measured}} - V_{\text{positive-measured}}|$$
  - b. Enter  $V_{\text{diff}}$  in the worksheet. (See [Table 22: Gain expected worksheet](#) on page 322.)
  - c. Calculate *Gain Accuracy* as follows:

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

- d. Enter *Gain Accuracy* in the worksheet and in the test record.

**10. Repeat tests at 1 MΩ impedance as follows:**

- a. Set the calibrator to 1 MΩ output.
- b. Push the front-panel Vertical **V** menu button.
- c. Set the **Termination** to **1 MΩ**
- d. Repeat steps 8 through 9.

**11. Repeat steps 7 through 10 for all vertical scale settings in the test record.**

**12. Repeat the procedure for all remaining channels:**

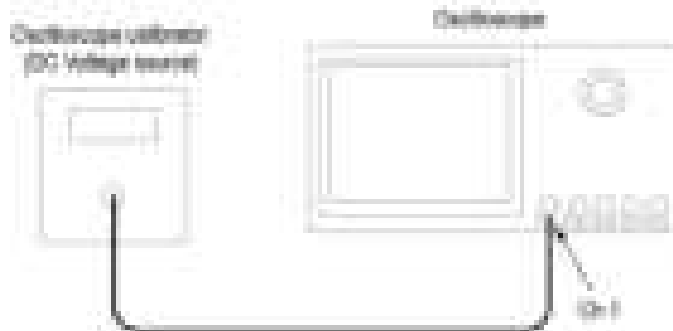
- a. Push the front-panel button to deselect the channel that you have already tested.
- b. Push the front-panel button to select the next channel to be tested.
- c. Move the DC voltage source connection to the channel input to be tested.
- d. Starting from step 3, repeat the procedure until all channels have been tested.

**13. Press the **Menu Off** button.**

## Check offset accuracy

This test checks the offset accuracy.

1. Connect the oscilloscope to a 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.** The generator is capable of providing dangerous voltages. 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.

2. Push the front-panel **Default Setup** button.
3. Set the impedance to 50  $\Omega$  as follows:
  - a. Set the calibrator to 50  $\Omega$  output impedance.
  - b. Push the front-panel oscilloscope Vertical **V** menu button.
  - c. Set the **Termination** to **50  $\Omega$** .
4. Set the calibrator to 900 mV, as shown in the test record.
5. Set the **Bandwidth** to **20 MHz**.
6. Set the Horizontal **Scale** to 1 ms/div.
7. Set the Vertical **Scale** to 1 mV/div.
8. In the Vertical menu, set the oscilloscope **Vertical Offset** to 900 mV.
9. Check that the vertical position is set to 0 divisions. If it is not, turn the Vertical **Position** knob to set the position to 0.
10. Set the Acquisition mode to Average as follows:
  - a. Push the front-panel **Acquire** button.
  - b. In the Acquisition window, select the **Acquisition** tab at the left.
  - c. Click **Average** Acquisition mode.
  - d. Ensure that the **number of averages** is set to **16**.

11. *Set the trigger source to AC line as follows:*
  - a. Push the Trigger **Menu** front-panel button.
  - b. In the Trigger menu, under **Source**, click **Select**.
  - c. Click **Line** to set the trigger source to AC line, and then click **OK**.
12. *Select the mean measurement as follows:*
  - a. Push the front-panel Wave Inspector **Measure** button.
  - b. In the Measurements Setup window, go to the **Measurements** box. Click the **More** button and then select **Mean**.
  - c. View the **Mean** measurement value in the display.
13. Enter the mean value as the test result in the test record.
14. Repeat step 13 for each vertical scale and vertical offset setting shown in the test record.
15. *Repeat the tests at 1 M $\Omega$  impedance as follows:*
  - a. Change the calibrator impedance to 1 M $\Omega$ .
  - b. Push the front-panel Vertical **V** menu button.
  - c. Set the **Termination** to 1 M $\Omega$ .
  - d. Repeat steps 4 through 14.
16. *Repeat the procedure for all remaining channels as follows:*
  - a. Push the front-panel button to deselect the channel that you have already tested.
  - b. Push the front-panel button to select the next channel to be tested.
  - c. Move the DC voltage source connection to the channel input to be tested.
  - d. Starting from step 3, repeat the procedure until all channels have been tested.
17. Press the **Menu Off** button.

## Check analog bandwidth

This test checks the bandwidth at 50  $\Omega$  termination for each channel. The typical bandwidth at 1 M  $\Omega$  termination is checked on the MSO/DPO5200/B and MSO/DPO5100/B series products as a functional check.

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



**WARNING.** The generator is capable of providing dangerous voltages. 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.

2. Push the front-panel **Default Setup** button.
3. Set the impedance to 50  $\Omega$  as follows:
  - a. Set the calibrator to 50  $\Omega$  output impedance, and to generate a sine wave.
  - b. Push the front-panel oscilloscope Vertical **V** menu button.
  - c. Under **Termination**, click **50  $\Omega$** .
4. Set the Vertical **Scale** to **1 mV**.
5. Set the Acquisition mode to Sample as follows:
  - a. Push the front-panel **Acquire** button.
  - b. In the Acquisition window, select the **Acquisition** tab at the left.
  - c. Click **Sample** Acquisition mode.
6. Adjust the signal source to 8 vertical divisions at the selected vertical scale with a set frequency of 50 kHz. For example, at 5 mV/div, use a  $\geq 40$  mV<sub>p-p</sub> signal, and at 2 mV/div, use a  $\geq 16$  mV<sub>p-p</sub> signal.

**NOTE.** At some V/div settings, the generator may not provide 8 vertical divisions of signal. Use the maximum output setting of the generator to obtain as many vertical divisions of signal as possible.

7. Set the Horizontal **Scale** to **1 ms/division**.

8. *Record the peak-to-peak measurement as follows:*
  - a. Push the front-panel Wave Inspector **Measure** button.
  - b. In the **Measurements** box, click **Pk-Pk**.
  - c. This will provide a mean  $V_{p-p}$  of the signal. Call this value  $V_{in-pp}$ .
  - d. Enter this value in the test record.
9. Set the Horizontal **Scale** to **5 ns/division**.
10. Adjust the signal source to the maximum bandwidth frequency for the bandwidth and model desired, as shown in the following worksheet.
11. *Record the peak-to-peak measurement as follows:*
  - a. With the **Pk-Pk** measurement still displayed from step 8, view the measurement at the new frequency.
  - b. This will provide a mean  $V_{p-p}$  of the signal. Call this value  $V_{bw-pp}$ .

- c. Enter this value in the test record.

**NOTE.** For more information on the contents of this worksheet, refer to the bandwidth specifications. (See [Analog bandwidth 50  \$\Omega\$  DC coupled](#) on page 0 .)

**Table 23: Maximum bandwidth frequency worksheet**

| Model: MSO5204/B, DPO5204/B |                        |                   |
|-----------------------------|------------------------|-------------------|
| Impedance                   | Vertical Scale         | Maximum bandwidth |
| 50 $\Omega$                 | 10 mV/div — 1 V/div    | 2 GHz             |
|                             | 5 mV/div — 9.95 mV/div | 1.5 GHz           |
|                             | 2 mV/div — 4.98 mV/div | 350 MHz           |
|                             | 1 mV/div — 1.99 mV/div | 175 MHz           |
| 1 M $\Omega$                | 5 mV/div — 1 V/div     | 500 MHz, typical  |
|                             | 2 mV/div — 4.98 mV/div | 350 MHz, typical  |
|                             | 1 mV/div — 1.99 mV/div | 175 MHz, typical  |
| 50 $\Omega$                 | 5 mV/div — 1 V/div     | 1 GHz             |
|                             | 2 mV/div — 4.98 mV/div | 350 MHz           |
|                             | 1 mV/div — 1.99 mV/div | 175 MHz           |
| 1 M $\Omega$                | 5 mV/div — 1 V/div     | 500 MHz, typical  |
|                             | 2 mV/div — 4.98 mV/div | 350 MHz, typical  |
|                             | 1 mV/div — 1.99 mV/div | 175 MHz, typical  |
| 50 $\Omega$                 | 5 mV/div — 1 V/div     | 500 MHz           |
|                             | 2 mV/div — 4.98 mV/div | 350 MHz           |
|                             | 1 mV/div — 1.99 mV/div | 175 MHz           |
| 50 $\Omega$                 | 2 mV/div — 1 V/div     | 350 MHz           |
|                             | 1 mV/div — 1.99 mV/div | 175 MHz           |

12. Use the values of  $V_{bw-pp}$  and  $V_{in-pp}$  stored in the test record to calculate the *Gain* at bandwidth with the following equation:

$$Gain = V_{bw-pp} / V_{in-pp}$$

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

13. Repeat steps 4 through 12 for all combinations of Vertical Scale and Horizontal Scale settings listed in the test record.
14. For MSO/DPO5204/B and MSO/DPO5104/B models only, repeat the tests at 1 M $\Omega$  impedance as follows:
- Change the calibrator impedance to 1 M $\Omega$ .
  - Push the front-panel Vertical **V** menu button.
  - Set the **Termination** to 1 M $\Omega$ .
  - Repeat steps 4 through 13.

15. *Repeat the procedure for all remaining channels as follows:*
  - a. Push the front-panel button to deselect the channel that you have already tested.
  - b. Push the front-panel button to select the next channel to be tested.
  - c. Move the calibrator connection to the channel input to be tested.
  - d. Starting from step 3, repeat the procedure until all channels have been tested.
16. Press the **Menu Off** button.

## Check random noise sample acquisition mode

This test checks random noise at 50  $\Omega$  and 1 M  $\Omega$  for each channel. You do not need to connect any test equipment to the oscilloscope for this test.

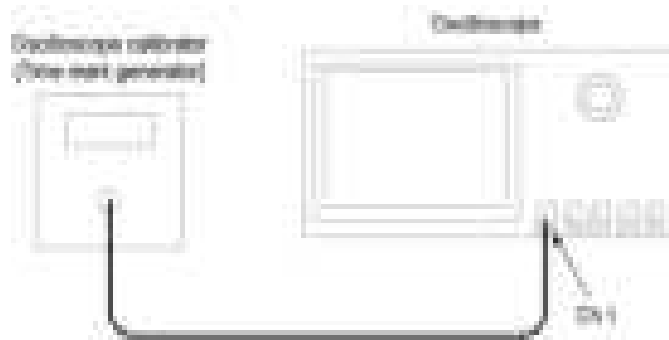
1. Disconnect everything from the oscilloscope inputs.
2. Push the front-panel **Default Setup** button.
3. *Select the RMS measurement as follows:*
  - a. Push the front-panel Wave Inspector **Measure** button.
  - b. In the Measurement Setup window, select the **RMS** measurement.
  - c. Ensure that the channel being tested is selected in the **Channels** box.
4. *Reset the Statistics as follows:*
  - a. Select **Statistics**.
  - b. Click **Reset**.
  - c. Click **OK**.
5. Read and make a note of the RMS Mean value. This is the Sampled Mean Value (SMV).
6. *Set the Acquisition mode to Average as follows:*
  - a. Push the front-panel **Acquire** button.
  - b. In the Acquisition window, select the **Acquisition** tab at the left.
  - c. Click to select **Average** Acquisition mode.
  - d. Ensure that the **number of averages** is set to **16**.
7. *Reset statistics as follows:*
  - a. Push the front-panel Wave Inspector **Measure** button.
  - b. In the Measurement Setup window, select **Statistics**.
  - c. Click **Reset**.
8. Read and make a note of the RMS Mean value. This is the Averaged Mean Value (AMV).

9. Calculate the RMS noise ( $\text{RMS noise} = \text{SMV} - \text{AMV}$ ), and enter the calculated RMS noise in the test record.
10. *Set the Acquisition mode to Sample as follows:*
  - a. Push the front-panel **Acquire** button.
  - b. In the Acquisition window, select the **Acquisition** tab at the left.
  - c. Select the **Sample** Acquisition mode.
11. *Repeat the tests at 50  $\Omega$  as follows:*
  - a. Push the front-panel oscilloscope Vertical **V** menu button.
  - b. Set the **Termination** to **50  $\Omega$** .
  - c. Repeat steps 4 through 10.
12. *Repeat the tests at all bandwidth settings as follows:*
  - a. Push the front-panel oscilloscope Vertical **V** menu button.
  - b. Set the **Termination** to **1 M $\Omega$** .
  - c. Select the next **Bandwidth** at which to test.
  - d. Starting at step 4, repeat the procedure for each bandwidth setting in the test record.
13. Press the **Menu Off** button.

## Check sample rate and delay time accuracy

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  $\Omega$  cable, as shown in the following illustration.



**WARNING.** The generator is capable of providing dangerous voltages. 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.

2. Set the time mark generator period to **80 ms**. Use a time mark waveform with a fast rising edge.
3. Push the front-panel **Default Setup** button.
4. Set the impedance to 50  $\Omega$  as follows:
  - a. Push the front-panel oscilloscope Vertical **V** menu button.
  - b. Set the **Termination** to **50  $\Omega$** .
5. If it is adjustable, set the time mark amplitude to approximately **1 Vp-p**.
6. Set the Vertical **Scale** to **500 mV**.
7. Set the Horizontal **Scale** to **20 ms/div**.
8. Set the Vertical **Position** to center the time mark signal on the screen.
9. Set the **Trigger Level** as necessary for a triggered display.
10. Adjust the Horizontal **Position** to move the trigger location to the center of the screen (50%).
11. Set the delay to 80 ms as follows:
  - a. Push the front-panel **Acquire** button. Ensure that the **Horizontal** tab on the left side of the screen is selected.
  - b. Turn **Delay** on.
  - c. Turn the Horizontal **Position** knob clockwise (or click the Delay box and use the keypad) to set the delay to exactly **80 ms**.
12. Set the horizontal scale to **500 ns/div** using the Horizontal **Scale** knob or by clicking in the Scale box and using the up/down arrows.

13. Compare the rising edge of the marker with the center horizontal graticule line. The rising edge should be within  $\pm 0.8$  divisions of center graticule. Enter the deviation in the test record.

---

**NOTE.** A 5 ppm time base error is 400 ns or 0.8 divisions of displacement.

---

14. Press the **Menu Off** button.

## Check delta time measurement accuracy

This test checks the Delta-time measurement accuracy for a given instrument setting and input signal.

1. Connect a 50  $\Omega$  coaxial cable from the signal source to the oscilloscope channel 1, as shown in the following illustration.




---

**WARNING.** The generator is capable of providing dangerous voltages. 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.

---

2. Push the oscilloscope front-panel **Default Setup** button.
3. Set the Horizontal **Scale** to one of the unchecked values listed in the test record. For example, set the scale to 4 ns/div as follows:
  - a. Turn the Horizontal **Scale** knob to set the time per division as close as you can to the desired setting. In this case, set the scale to 5 ns/div.
  - b. Push the front-panel **Acquire** button.
  - c. Select **Manual Mode**.
  - d. Click the **Sample Rate** field and set the sample rate to one of the unchecked values listed in the test record.
  - e. Click the **Record Length** field to bring up the on screen keypad.
  - f. Reduce the record length until the correct Horizontal **Scale** is set.

4. Set the Vertical **Scale** to **5 mV/div**.
5. *Set the impedance to 50  $\Omega$  as follows:*
  - a. Set the sine wave generator output impedance to 50  $\Omega$ .
  - b. Push the front-panel oscilloscope Vertical **V** menu button.
  - c. Set the **Termination** to **50  $\Omega$** .
6. *Set the Mean & St Dev Samples to 1000 as follows:*
  - a. Push the Wave Inspector **Measure** button.
  - b. In the Measurements Setup window, select the **More** tab on the left.
  - c. Select the **Burst Width** measurement.
  - d. Select **Statistics**.
  - e. Click in the **Weight n=** box and set the value to 1000.
7. Set the signal source to 240 MHz and 40 mV as shown in the test record.

---

**NOTE.** *To provide consistent results, set the signal source frequency such that the zero crossing does not occur at the beginning or end of the record.*

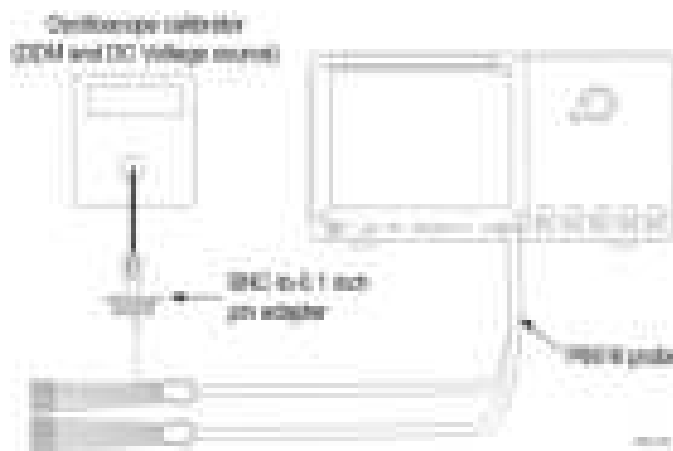
---

8. *Reset statistics as follows:*
  - a. Push the front-panel Wave Inspector **Measure** button.
  - b. In the Measurement Setup window, select **Statistics**.
  - c. Click **Reset**.
  - d. Wait 5 or 10 seconds for the oscilloscope to acquire all of the samples before taking the reading.
9. *Check the oscilloscope performance as follows:*
  - a. Verify that the **St Dev** is less than the upper limit shown in the test record.
  - b. Enter the reading in the test record.
  - c. Repeat the check for each combination of oscilloscope and source signal settings in the test record, using the method in step 3 to change the Horizontal Scale settings.
10. *Repeat the procedure for all remaining channels as follows:*
  - a. Push the front-panel button to deselect the channel that you have already tested.
  - b. Push the front-panel channel button for the next channel to be tested.
  - c. Connect the signal source to the input for that channel.
  - d. Repeat the procedure from step 5 until all channels have been tested.
11. Press the **Menu Off** button.

## Check digital threshold accuracy (MSO5000/B only)

For the MSO5000/B series only, this test checks the threshold accuracy of the digital channels. This procedure applies to digital channels D0 through D15, and to channel threshold values of 0 V and +4 V.

1. Connect the P6616 digital probe to the MSO5000/B series instrument.



**WARNING.** The generator is capable of providing dangerous voltages. 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.

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

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 [Required equipment](#) table. Be sure to connect channel D0 from the probe connector to both the corresponding signal pin and to a ground pin on the adapter.

3. Push the front-panel **Default Setup** button.
4. Turn on the digital channels and set the thresholds as follows:
  - a. Push the front-panel **D15-D0** button.
  - b. Select the **D7-D0** tab on the left and turn channels D7-D0 **On**.
  - c. Select the **D15-D8** tab and turn channels D15-D8 **On**.
  - d. The instrument will display the 16 digital channels.
  - e. Click in the **Global Threshold** box and set the value to **0.00 V**.
  - f. Click **Apply**.
  - g. All thresholds are now set for the 0 V threshold check.
5. Set the Horizontal Scale to 5  $\mu\text{s}/\text{div}$ .

6. *Set the source as follows:*
  - a. Push the front-panel **Trigger Menu** button.
  - b. Under **Source**, click **Select**.
  - c. In the Source Selection box, select **Ch D0**. Click OK.
7. Set the DC voltage source (Vs) to -400 mV. Wait 3 seconds. Check the logic level of the channel D0 signal display. If it is at a static logic high, change the DC voltage source Vs to -500 mV.
8. Increment Vs by +10 mV. Wait 3 seconds and check the logic level of the channel D0 signal display. If it is a static logic high, record the Vs value as in the 0 V row of the test record.  
  
If the signal level is a logic low or is alternating between high and low, repeat this step (increment Vs by 10 mV, wait 3 seconds, and check for a static logic high) until a value for **Vs** is found.
9. Click the lower **Slope** button to change the slope to **Falling**.
10. Set the DC voltage source (Vs) to +400 mV. Wait 3 seconds. Check the logic level of the channel D0 signal display.  
  
If it is at a static logic low, change the DC voltage source Vs to +500 mV.
11. Reduce Vs by -10 mV. Wait 3 seconds and check the logic level of the channel D0 signal display. If it is a static logic low, record the Vs value as **Vs+** in the 0 V row of the test record.  
  
If the signal level is a logic high or is alternating between high and low, repeat this step (decrement Vs by 10 mV, wait 3 seconds, and check for a static logic low) until a value for **Vs+** is found.
12. Find the average using this formula:  $V_{sAvg} = (V_{s-} + V_{s+})/2$ . Record the average as the test result in the test record.  
  
Compare the test result to the limits. If the result is between the limits, continue with the procedure to test the channel at the +4 V threshold value.
13. *Begin the +4 V threshold test as follows:*
  - a. Push the front-panel **D15-D0** button.
  - b. Set the **D0 Threshold** value to **4.00 V** (+4.0 V/div).
14. Set the DC voltage source (Vs) to +4.4 V. Wait 3 seconds. Check the logic level of the channel D0 signal display.  
  
If it is a static logic low, change the DC voltage source Vs to +4.5 V.
15. Decrement Vs by -10 mV. Wait 3 seconds and check the logic level of the channel D0 signal display. If it is a static logic low, record the Vs value as **Vs+** in the 4 V row of the test record.  
  
If the signal level is a logic high or is alternating between high and low, repeat this step (decrement Vs by 10 mV, wait 3 seconds, and check for a static logic low) until a value for **Vs+** is found.
16. Push the front-panel **Trigger Menu** button.

17. Click the lower **Slope** button to change the slope to **Rising**.
18. Set the DC voltage source (Vs) to +3.6 V. Wait 3 seconds. Check the logic level of the channel D0 signal display.  
  
If the signal level is a static logic high, change the DC voltage source Vs to +3.5 V.
19. Increment Vs by +10 mV. Wait 3 seconds and check the logic level of the channel D0 signal display. If it is a static logic high, record the Vs value in the 4 V row of the test record.  
  
If the signal level is a logic low or is alternating between high and low, repeat this step (increment Vs by 10 mV, wait 3 seconds, and check for a static logic high) until a value for **Vs-** is found.
20. Find the average using this formula:  $V_{sAvg} = (V_{s-} + V_{s+})/2$ . Record the average as the test result in the test record.  
  
Compare the test result to the limits. If the result is between the limits, the channel passes the test.
21. *Repeat the procedure for all remaining digital channels as follows:*
  - a. Push the front-panel **Trigger Menu** button.
  - b. Under **Source**, click **Select**.
  - c. In the Source Selection box, select the next digital channel (such as D1) to be tested.
  - d. Connect the DC voltage source to the digital channel to be tested.
  - e. Starting from step 7, repeat the procedure until all 16 digital channels have been tested.
22. Press the **Menu Off** button.

## Check trigger out

This test checks the trigger output.

1. Connect the Trigger Out (AUX OUT) signal from the rear of the instrument to the channel 1 input using a 50  $\Omega$  cable, as shown in the following illustration.



2. Push the front-panel **Default Setup** button.
3. Set the acquisition mode to Average as follows:
  - a. Push the front-panel **Acquire** button.
  - b. In the Acquisition window, select the **Acquisition** tab at the left.
  - c. Select **Average** Acquisition mode.
  - d. Ensure that the **number of averages** is set to **16**.
4. Set the Vertical **Scale** to **1 V/div**.
5. Set the Horizontal **Scale** to **200 ns**.
6. *Record the Low and High measurements at 1 M $\Omega$  as follows:*
  - a. Push the front-panel Wave Inspector **Measure** button.
  - b. Ensure that the **Amplitude** tab is selected.
  - c. Select the **Low** measurement.
  - d. Enter the Low measurement reading in the test record.
  - e. Select the **High** measurement.
  - f. Enter the High measurement reading in the test record.
7. *Record the Low and High measurements at 50  $\Omega$  as follows:*
  - a. Push the front-panel oscilloscope Vertical **V** menu button.
  - b. Set the **Termination** to **50  $\Omega$** .
  - c. Push the front-panel Wave Inspector **Measure** button.
  - d. Ensure that the **Amplitude** tab is selected.
  - e. Select the **Low** measurement.

- f.** Enter the Low measurement reading in the test record.
- g.** Select the **High** measurement.
- h.** Enter the High measurement reading in the test record.

This completes the performance verification procedure.

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