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## Chapter 5 : Specifications

All specifications apply to the DS1000B Series Oscilloscopes and a probe with the Attenuation switch set to 10X unless noted otherwise. To meet these specifications, two conditions must first be met:

- The instrument must have been operating continuously for thirty minutes within the specified operating temperature.
- Must perform the Self Calibration operation, accessible through the Utility menu, if the operating temperature changes by more than 5°C.
- All specifications are guaranteed unless noted "typical".

## Specifications

| <b>Acquisition</b> |   |                         |
|--------------------|---|-------------------------|
| Sampling Modes     | Real-Time   | Equivalent-time         |
| Sampling Rate      | 2 GSa/s (half channel <sup>[1]</sup> )<br>1 GSa/s (each channel)  | 50 GSa/s <sup>[2]</sup> |
| Averages           | N time acquisitions, all channels simultaneously, N is selectable from 2, 4, 8, 16, 32, 64, 128 and 256 |                         |

| <b>Inputs</b>                        |   |
|--------------------------------------|---|
| Input Coupling                       | DC, AC, GND   |
| Input Impedance                      | 1MΩ±2%, in parallel with 18pF±3pF   |
| Probe Attenuation Factors            | 0.001X, 0.01X, 0.1X, 1X, 2X, 5X, 10X, 20X, 50X, 100X, 200X, 500X, 1000X   |
| Maximum Input Voltage                | Maximum Input Voltage of the analog channel:<br>CAT I 300Vrms, 1000Vpk; transient overvoltage 1000Vpk<br>CAT II 100Vrms, 1000Vpk<br>RP2200 10:1, CAT II 300Vrms<br>RP3200 10:1, CAT II 300Vrms<br>RP3300 10:1, CAT II 300Vrms |
| Time delay between channel (typical) | 500ps   |

| <b>Horizontal</b>                   |  |
|-------------------------------------|--|
| Sample Rate Range                   | 3.65Sa/s-2GSa/s (Real-Time),<br>3.65Sa/s-50GSa/s (Equivalent-time)                                       |
| Waveform interpolation              | Sin(x)/x   |
| Record Length                       | 16k samples for half channel <sup>[1]</sup><br>8k samples for each channel                               |
| Scan speed Range (Sec/div)          | 1ns/div~50s/div, DS1202/4B<br>2ns/div~50s/div, DS1102/4B<br>5ns/div~50s/div, DS1062/4B<br>1-2-5 Sequence |
| Sample Rate and Delay Time Accuracy | ±50ppm (over any≥1ms time interval)  |

|  |   |
|--|---|
| Delta Time Measurement Accuracy (Full Bandwidth) | Single-shot: $\pm(1 \text{ sample interval} + 50\text{ppm} \times \text{reading} + 0.6 \text{ ns})$<br>>16 averages: $\pm(1\text{sample interval} + 50\text{ppm} \times \text{reading} + 0.4 \text{ ns})$ |
|--|---|

| <b>Vertical</b>   |  |
|---|--|
| A/D converter   | 8-bit resolution, each channel samples simultaneously  |
| Volts/div Range   | 2mV/div-10V/div at input BNC   |
| Offset Range  | $\pm 40\text{V}(500\text{mV}\sim 10\text{V})$<br>$\pm 2\text{V}(2\text{mV}\sim 200\text{mV})$  |
| Analog Bandwidth  | 60MHz(DS1062/4B)<br>100MHz(DS1102/4B)<br>200MHz(DS1202/4B)   |
| Single-shot Bandwidth                                       | 60MHz(DS1062/4B)<br>100MHz(DS1102/4B)<br>200MHz(DS1202/4B)   |
| Selectable Analog Bandwidth Limit (typical)                 | 20MHz  |
| Lower Frequency Limit (AC -3dB)                             | $\leq 5\text{Hz}$ (at input BNC)   |
| Rise Time at BNC, typical                                   | <1.75ns, <3.5ns, <5.8ns,<br>On 200MHz, 100MHz, 60MHz respectively  |
| DC Gain Accuracy  | 2mV/div~5mV/div: $\pm 4\%$ (Sample or Average acquisition mode)<br>10mV/div~10V/div: $\pm 3\%$ (Sample or Average acquisition mode)  |
| DC Measurement Accuracy, Average Acquisition Mode           | Average of $\geq 16$ Waveforms with vertical position at zero:<br>$\pm(\text{DC Gain Accuracy} \times \text{reading} + 0.1\text{div} + 1\text{mV})$<br>Average of $\geq 16$ Waveforms with vertical position not at zero:<br>$\pm[\text{DC Gain Accuracy} \times (\text{reading} + \text{vertical position}) + (1\% \text{ of vertical position}) + 0.2\text{div}]$<br>Add 2mV for settings from 1mV/div to 200 mV/div<br>Add 50mV for settings from >200mV/div to 10V/div |
| Delta Volts Measurement Accuracy (Average Acquisition Mode) | Delta Volts between any two averages of 16 waveforms acquired under same setup and ambient conditions: $\pm(\text{DC Gain Accuracy} \times \text{reading} + 0.05 \text{ div})$   |

| <b>Trigger</b>  |  |   |
|---|--|---|
| Trigger Sensitivity   | 0.1div-1.0div (adjustable)   |   |
| Trigger Level Range   | Internal   | ±6 divisions from center of screen                    |
|   | EXT  | ±0.6V   |
|   | EXT/5  | ±3V   |
| Trigger Level Accuracy (typical) applicable for the signal of rising and falling time ≥20ns | Internal   | ±(0.3div × V/div)(±4 divisions from center of screen) |
|   | EXT  | ±(6% of setting + 40 mV)                              |
|   | EXT/5  | ±(6% of setting + 200 mV)                             |
| Trigger Offset  | Normal mode: pre-trigger(storage depth/(2×sampling) rate), delayed trigger 1s  |   |
|   | Slow Scan mode: pre-trigger 6div, delayed trigger 6div   |   |
| Trigger Holdoff range   | 100ns~1.5s   |   |
| HF Rejection  | 100kHz ±20%  |   |
| LF Rejection  | 10kHz ±20%   |   |
| Set Level to 50% (typical)  | Input signal frequency ≥50Hz   |   |
| <b>Edge Trigger</b>   |  |   |
| Edge trigger slope  | Rising, Falling, Rising + Falling  |   |
| <b>Pulse Trigger</b>  |  |   |
| Trigger condition   | (>, <, =) Positive pulse, (>, <, =) negative pulse   |   |
| Pulse Width range   | 20ns ~10s  |   |
| <b>Video Trigger</b>  |  |   |
| Video standard & line frequency   | Support standard NTSC, PAL and SECAM broadcast systems. Line number range: 1~525 (NTSC) and 1~625 (PAL/SECAM)  |   |
| <b>Pattern Trigger</b>  |  |   |
| Pattern setup   | H, L, X,  ,  |   |
| <b>Alternate Trigger</b>  |  |   |
| Trigger on CH1, CH2, CH3, CH4   | Edge, Pulse, Video   |   |

| <b>Measurements</b> |        |   |
|---------------------|--------|---|
| Cursor              | Manual | Voltage difference between cursors (ΔV)<br>Time difference between cursors (ΔT) |

|              |       |   |
|--------------|-------|---|
|              |       | Reciprocal of $\Delta T$ in Hertz ( $1/\Delta T$ )  |
|              | Track | Voltage value for Y-axis waveform<br>Time value for X-axis waveform   |
|              | Auto  | Cursors are visible for Automatic Measurement   |
| Auto Measure |       | Vpp, Vamp, Vmax, Vmin, Vtop, Vbase, Vavg, Vrms, Overshoot, Preshoot, Freq, Period, Rise Time, Fall Time, +Width, -Width, +Duty, -Duty, Delay A→Bf, Delay A→Bt, Phase A→Bf, Phase A→Bt |

- [1] Half channel indicates selecting one of the channels in CH1 and CH2, or in CH3 and CH4.
- [2] This is the highest specification, the specific specifications are as follows:  
 DS1202/4B: 50GSa/s  
 DS1102/4B: 25GSa/s  
 DS1062/4B: 10GSa/s

## General Specifications

| <b>Display</b>                 |  |
|--------------------------------|--|
| Display Type                   | 5.7 inch. (145 mm) diagonal TFT Liquid Crystal Display |
| Display Resolution             | 320 horizontal ×RGB×240 vertical pixels                |
| Display Color                  | 64k color  |
| Display Contrast (typical)     | 150:1  |
| Backlight Brightness (typical) | 300 nit  |

| <b>Probe Compensator Output</b> |                  |
|---------------------------------|------------------|
| Output Voltage (typical)        | Amplitude, ~3Vpp |
| Frequency (typical)             | 1kHz             |

| <b>Power</b>      |                                 |
|-------------------|---------------------------------|
| Supply Voltage    | AC, 100~240 V, 45~440Hz, CAT II |
| Power Consumption | Less than 50VA                  |
| Fuse              | 2A, T rating, 250 V             |

| <b>Environmental</b> |  |
|----------------------|--|
| Ambient Temperature  | Operating 10°C ~ 40°C                  |
|                      | Non-operating -20°C ~ +60°C            |
| Cooling Method       | Fan force air flow                     |
| Humidity             | +35°C or below: ≤90% relative humidity |
|                      | +35°C ~ +40°C: ≤60% relative humidity  |
| Altitude             | Operating 3,000 m or below             |
|                      | Non-operating 15,000 m or below        |

| <b>Mechanical</b> |                 |        |
|-------------------|-----------------|--------|
| Size              | Width           | 325mm  |
|                   | Height          | 159mm  |
|                   | Depth           | 133 mm |
| Heavy             | Without package | 3kg    |
|                   | Packaged        | 4.3 kg |

|                  |
|------------------|
| <b>IP Degree</b> |
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| IP2X |
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|                             |
|-----------------------------|
| <b>Calibration Interval</b> |
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| The recommended calibration interval is one year |
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