

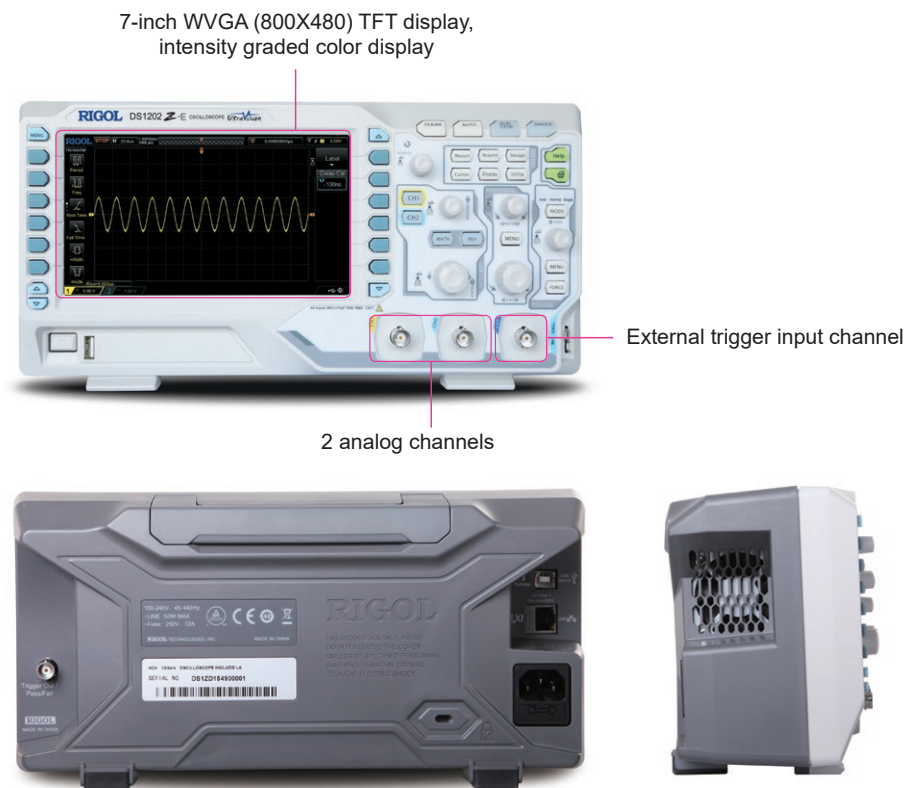
DS1000Z-E Series Digital Oscilloscope

UltraVision

- Analog channel bandwidth: 200 MHz (DS1202Z-E): 100 MHz (DS1102Z-E)
- 2 analog channels
- Real-time sample rate up to 1 GSa/s
- Memory depth up to 24 Mpts(Std.)
- Up to 30,000 wfms/s waveform capture rate
- Up to 60,000 frames hardware real-time waveform recording and playback functions
- Innovative "UltraVision" technology
- Various trigger and bus decoding functions
- Low noise floor, vertical scale range: 500 uV/div to 10 V/div
- Various interfaces: USB Host&Device, LAN (LXI), AUX
- Novel and delicate industrial design, easy to use
- 7-inch WVGA (800x480) TFT LCD, intensity graded color display

DS1000Z-E series is a high-performance and economic digital oscilloscope designed for the designing, debugging and educational requirements of the mainstream digital oscilloscope market. This manual takes DS1202Z-E as an example to introduce DS1000Z-E series.

DS1000Z-E Series Digital Oscilloscope



Product Dimensions: Width×Height×Depth=313.1 mm×160.8 mm×122.4 mm
Weight: 2.9 kg ± 0.2 kg(Without Package)

► Innovative UltraVision Technology(Analog Channel)



- Deep Memory Depth (up to 24 Mpts, std.)
- Higher Waveform Capture Rate (up to 30,000 wfms/s)
- Real-time Waveform Recording&Playback (up to 60,000 frames)
- Intensity Graded Color Display

► Models and Key Specifications

| Model | DS1202Z-E | DS1102Z-E |
|--|---|--|
| Analog BW | 200 MHz | 100 MHz |
| Number of Analog Channels | 2 | |
| Max. Real-time Sample Rate | 1 GSa/s (single-channel), 500 MSa/s (dual-channel) | |
| Max. Memory Depth | standard 24 Mpts (single-channel), 12 Mpts (dual-channel) | |
| Max. Waveform Capture Rate | 30,000 wfms/s | |
| Hardware Real-time Waveform Recording and Playback Functions | Up to 60,000 frames | |
| Standard Probes | Two PVP2350 350 MHz passive HighZ probes | Two PVP3150 150 MHz passive HighZ probes |

► Features and Benefits

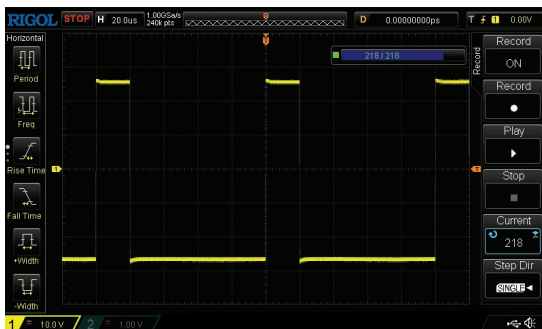
UltraVision: up to 30,000 wfms/s waveform capture rate



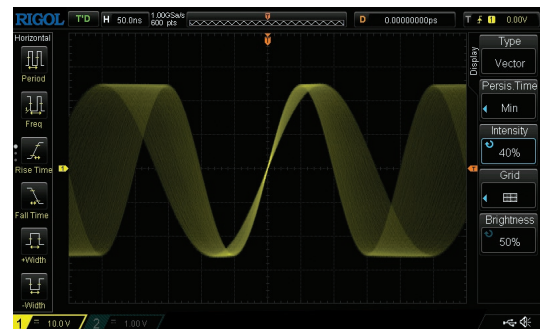
UltraVision: deep memory (up to 24 Mpts, std.)



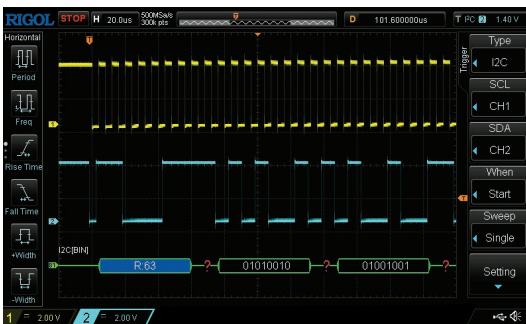
UltraVision: waveform recording and playback functions



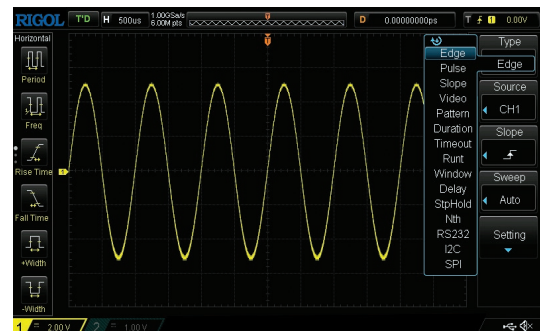
UltraVision: intensity graded color display



Serial bus trigger and decoding functions (RS232/UART, I2C, SPI)











A variety of trigger functions












RIGOL Probes and Accessories Supported by DS1000Z Series

► RIGOL Passive Probes

| Model Number | Type | Description |
|--|--------------------|---|
|  PVP2150 | High Z Probe | 1X: DC to 35 MHz 10X: DC to 150 MHz Compatibility: all RIGOL scopes. |
|  PVP3150 | HighZ Probe | 1X: DC to 20 MHz 10X: DC to 150 MHz Compatibility: all RIGOL scopes. |
|  PVP2350 | High Z Probe | 1X: DC to 35 MHz 10X: DC to 350 MHz Compatibility: all RIGOL scopes. |
|  RP3500A | High Z Probe | DC to 500 MHz Compatibility: all RIGOL scopes. |
|  RP1300H | High Voltage Probe | DC to 300 MHz CAT I 2000 V (DC+AC), CAT II 1500 V (DC+AC) Compatibility: all RIGOL scopes. |
|  RP1010H | High Voltage Probe | DC to 40 MHz DC: 0 to 10 kV DC, AC: pulse ≤ 20 kVp-p, AC: sine wave ≤ 7 kVrms Compatibility: all RIGOL scopes. |
|  RP1018H | High Voltage Probe | DC to 150 MHz DC+AC Peak: 18 kV CAT II AC RMS: 12 kV CAT II Compatibility: all RIGOL scopes. |
|  RT50J | Adapter | 50 Ω impedance adapter (2 W, 1 GHz) |

► RIGOL Active & Current Probes

| Model Number | Type | Description |
|--|---------------------------------|--|
|  RP1001C | Current Probe | BW: DC to 300 kHz Max. input DC: ± 100 A, AC P-P: 200 A, AC RMS: 70 A Compatibility: all RIGOL scopes. |
|  RP1002C | Current Probe | BW: DC to 1 MHz Max. input DC: ± 70 A, AC P-P: 140 A, AC RMS: 50 A Compatibility: all RIGOL scopes. |
|  RP1003C | Current Probe | BW: DC to 50 MHz Max. input AC P-P: 50 A (Noncontinuous), AC RMS: 30 A Compatibility: all RIGOL scopes. Must order RP1000P power supply. |
|  RP1004C | Current Probe | BW: DC to 100 MHz Max. input AC P-P: 50 A (Noncontinuous), AC RMS: 30 A Compatibility: all RIGOL scopes. Must order RP1000P power supply. |
|  RP1005C | Current Probe | BW: DC to 10 MHz Max. input AC P-P: 300 A (Noncontinuous), 500 A (@pulse width ≤ 30 us), AC RMS: 150 A Compatibility: all RIGOL scopes. Must order RP1000P power supply. |
|  RP1000P | Power Supply | Power supply for RP1003C, RP1004C and RP1005C, support 4 channels. |
|  RP1025D | High Voltage Differential Probe | BW: 25 MHz Max. Voltage ≤ 1400 Vpp Compatibility: all RIGOL scopes. |
|  RP1050D | High Voltage Differential Probe | BW: 50 MHz Max. Voltage ≤ 7000 Vpp Compatibility: all RIGOL scopes. |
|  RP1100D | High Voltage Differential Probe | BW: 100 MHz Max. Voltage ≤ 7000 Vpp Compatibility: all RIGOL scopes. |

► Specifications

All the specifications are guaranteed except parameters marked with "Typical" and the oscilloscope needs to operate for more than 30 minutes under the specified operation temperature.

Sample

| | |
|-----------------------|---|
| Sample Mode | Real-time sample |
| Real-time Sample Rate | 1 GSa/s (single-channel), 500 MSa/s (dual-channel) |
| Peak Detect | 4 ns |
| Averaging | After all the channels finish N samples at the same time, N can be 2, 4, 8, 16, 32, 64, 128, 256, 512 or 1024 |
| High Resolution | 12 bits (max.) |
| Interpolation | Sin(x)/x |
| Memory Depth | 24 Mpts (single-channel), 12 Mpts (dual-channel) |

Input

| | |
|-------------------------------|---|
| Number of Channels | 2 analog channels |
| Input Coupling | DC, AC or GND |
| Input Impedance | (1 MΩ±1%) (15 pF±3 pF) |
| Probe Attenuation Coefficient | 0.01X to 1000X, in 1-2-5 step |
| Maximum Input Voltage (1 MΩ) | CAT I 300 Vrms, CAT II 100 Vrms, transient overvoltage 1000 Vpk |

Horizontal

| | |
|--------------------------------------|---|
| Timebase Scale | 2 ns/div to 50 s/div |
| Maximum Record Length | 24 Mpts |
| Timebase Accuracy ^[1] | ≤±25 ppm |
| Clock Drift | ≤±5 ppm/year |
| Maximum Delay Range | Negative delay: ≥1/2 screen width Positive delay: 1 s to 500 s |
| Timebase Mode | YT, XY, Roll |
| Number of X-Ys | 1 |
| Waveform Capture Rate ^[2] | 30,000 wfms/s (dots display) |
| Zero Offset | ±0.5 div*minimum timebase scale |

Vertical

| | |
|---|--|
| Bandwidth (-3 dB) | DS1202Z-E: DC to 200 MHz DS1102Z-E: DC to 100 MHz |
| Single-shot Bandwidth | DS1202Z-E: DC to 200 MHz DS1102Z-E: DC to 100 MHz |
| Vertical Resolution | 8 bits |
| Vertical Scale (Probe ratio is 1X) | 500 uV/div to 10 V/div |
| Offset Range (Probe ratio is 1X) | 500 uV/div to 499 mV/div: ±2 V 500 mV/div to 10 V/div: ±100 V |
| Bandwidth Limit ^[1] | 20 MHz |
| Low Frequency Response (AC Coupling, -3 dB) | ≤5 Hz (on BNC) |
| Calculated Rise Time ^[1] | DS1202Z-E: 1.75 ns DS1102Z-E: 3.5 ns |
| DC Gain Accuracy | <10 mV: ±4% full scale ≥10 mV: ±3% full scale |
| DC Offset Accuracy | ±0.1 div ± 2 mV ± 1% offset value |

| | |
|------------------------------|---------------------------------|
| Channel to Channel Isolation | DC to maximum bandwidth: >40 dB |
|------------------------------|---------------------------------|

Trigger

| | | |
|---|----------------------|----------------------------------|
| Trigger Level Range | Internal | ±5 div from center of the screen |
| | External | EXT ±4 V |
| Trigger Mode | Auto, Normal, Single | |
| Holdoff Range | 16 ns to 10 s | |
| High Frequency Rejection ^[1] | 75 kHz | |
| Low Frequency Rejection ^[1] | 75 kHz | |

| | |
|------------------------------------|--|
| Trigger Sensitivity ^[1] | 1.0 div (below 5 mV or noise rejection is enabled) 0.3 div (above 5 mV and noise rejection is disabled) |
|------------------------------------|--|

Edge Trigger

| | |
|-----------|---------------------------------|
| Edge Type | Rising, Falling, Rising/Falling |
|-----------|---------------------------------|

Pulse Trigger

| | |
|-----------------|--|
| Pulse Condition | Positive Pulse Width (greater than, lower than, within specified interval) Negative Pulse Width (greater than, lower than, within specified interval) |
| Pulse Width | 8 ns to 10 s |

Runt Trigger

| | |
|-----------------------|--------------------|
| Pulse Width Condition | None, >, <, <> |
| Polarity | Positive, Negative |
| Pulse Width Range | 8 ns to 10 s |

Window Trigger

| | |
|------------------|---------------------------------|
| Window Type | Rising, Falling, Rising/Falling |
| Trigger Position | Enter, Exit, Time |
| Window Time | 8 ns to 10 s |

Nth Edge Trigger

| | |
|-------------|-----------------|
| Edge Type | Rising, Falling |
| Idle Time | 16 ns to 10 s |
| Edge Number | 1 to 65535 |

Slope Trigger

| | |
|-----------------|--|
| Slope Condition | Positive Slope (greater than, lower than, within specified interval) Negative Slope (greater than, lower than, within specified interval) |
| Time Setting | 8 ns to 10 s |

Video Trigger

| | |
|-----------------|-----------------------------|
| Signal Standard | NTSC, PAL/SECAM, 480P, 576P |
|-----------------|-----------------------------|

Pattern Trigger





| | |
|-----------------|--------------------------|
| Pattern Setting | H, L, X, Rising, Falling |
|-----------------|--------------------------|

Delay Trigger

| | |
|------------|-----------------|
| Edge Type | Rising, Falling |
| Delay Type | >, <, <>, >> |

| | |
|--------------------|--|
| Delay Time | 8 ns to 10 s |
| TimeOut Trigger | |
| Edge Type | Rising, Falling, Rising/Falling |
| Timeout time | 16 ns to 10 s |
| Duration Trigger | |
| Pattern | H, L, X |
| Trigger Condition | >, <, <> |
| Duration Time | 8 ns to 10 s |
| Setup/Hold Trigger | |
| Edge Type | Rising, Falling |
| Data Pattern | H, L |
| Setup Time | 8 ns to 1 s |
| Hold Time | 8 ns to 1 s |
| RS232/UART Trigger | |
| Polarity | Normal, Invert |
| Trigger Condition | Start, Error, Check Error, Data |
| Baud Rate | 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, 230400 bps, 460800 bps, 921600 bps, 1 Mbps and User |
| Data Bits | 5 bits, 6 bits, 7 bits, 8 bits |
| I2C Trigger | |
| Trigger Condition | Start, Restart, Stop, MissedAck, Address, Data, A&D |
| Address Bits | 7 bits, 8 bits, 10 bits |
| Address Range | 0 to 127, 0 to 255, 0 to 1023 |
| Byte Length | 1 to 5 |
| SPI Trigger | |
| Trigger Condition | Timeout, CS |
| Timeout Value | 100 ns to 1 s |
| Data Bits | 4 bits to 32 bits |
| Data Line Setting | H, L, X |

Measure

| | | |
|------------------------|---|---|
| Cursor | Manual mode | Voltage deviation between cursors (ΔV) Time deviation between cursors (ΔT) Reciprocal of ΔT (Hz) ($1/\Delta T$) |
| | Track mode | Voltage and time values of the waveform point |
| | Auto mode | Allow to display cursors during auto measurement |
| Auto Measurement | Period, Frequency, Rise Time, Fall Time, Positive Pulse Width, Negative Pulse Width, Positive Duty Cycle, Negative Duty Cycle, t_{Vmax} , t_{Vmin} , Positive Rate, Negative Rate, Delay 1→2  , Delay 1→2  , Phase 1→2  , Phase 1→2  , Maximum, Minimum, Peak-Peak Value, Top Value, Bottom Value, Amplitude, Upper Value, Middle Value, Lower Value, Average, Vrms, Overshoot, Pre-shoot, Area, Period Area, Period Vrms, Variance | |
| Number of Measurements | Display 5 measurements at the same time. | |
| Measurement Range | Screen or cursor | |
| Measurement Statistic | Average, Max, Min, Standard Deviation, Number of Measurements | |

| | |
|---------|--|
| Counter | Hardware 6-digit counter (channels are selectable) |
|---------|--|

Math Operation

| | |
|------------------------------|---|
| Waveform Operation | A+B, A-B, A×B, A/B, FFT, A&B, A B, A^B, !A, Intg, Diff, Sqrt, Lg, Ln, Exp, Abs, Filter |
| FFT Window | Rectangle, Hanning, Blackman, Hamming, Flat Top, Triangle |
| FFT Mode | Trace, Memory |
| FFT Display | Half, Full |
| FFT Vertical Scale | dB/dBm, Vrms |
| Filter | Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop Filter |
| Number of Buses for Decoding | 2 |
| Decoding Type | Parallel, RS232/UART, I2C, SPI |

Display

| | |
|--------------------|---|
| Screen Type | 7.0-inch TFT LCD display |
| Display Resolution | 800 horizontal × RGB × 480 vertical pixel |
| Display Color | 16 million color (24-bit true color) |
| Persistence Time | Min, 100 ms, 200 ms, 500 ms, 1 s, 5 s, 10 s, Infinite |
| Display Type | Dots, Vector |

I/O

| | |
|----------------|--|
| Standard Ports | USB Host, USB Device, LAN, Aux Output (TrigOut/PassFail) |
|----------------|--|

General Specifications

| Probe Compensation Output | | |
|--|---|-----------------|
| Output Voltage ^[1] | About 3 V, peak-peak | |
| Frequency ^[1] | 1 kHz | |
| Power | | |
| Power Voltage | 100 V to 240 V, 45 Hz to 440 Hz | |
| Power | Maximum 50 W | |
| Fuse | 2 A, T degree, 250 V | |
| Environment | | |
| Temperature Range | Operating: 0°C to +50°C | |
| | Non-operating: -40°C to +60°C | |
| Cooling Method | Fan cooling | |
| Humidity Range | 0°C to +30°C: ≤95% relative humidity | |
| | +30°C to +40°C: ≤75% relative humidity | |
| | +40°C to +50°C: ≤45% relative humidity | |
| Altitude | Operating: under 3,000 meters | |
| | Non-operating: under 15,000 meters | |
| Mechanical | | |
| Dimensions ^[3] | Width × Height × Depth = 313.1 mm × 160.8 mm × 122.4 mm | |
| Weight ^[4] | Without Package | 2.9 kg ± 0.2 kg |
| | With Package | 3.5 kg ± 0.5 kg |
| Calibration Interval | | |
| The recommended calibration interval is 18 months. | | |

| Regulation Standards | | |
|-------------------------------|--|--|
| Electromagnetic Compatibility | Compliant with EMC DIRECTIVE 2014/30/EU, compliant with or higher than the standards specified in IEC 61326-1:2013/EN 61326-1:2013 Group 1 Class A | |
| | CISPR 11/EN 55011 | |
| | IEC 61000-4-2:2008/EN 61000-4-2 | ±4.0 kV (contact discharge), ±8.0 kV (air discharge) |
| | IEC 61000-4-3:2002/EN 61000-4-3 | 3 V/m (80 MHz to 1 GHz); 3 V/m (1.4 GHz to 2 GHz); 1 V/m (2.0 GHz to 2.7 GHz) |
| | IEC 61000-4-4:2004/EN 61000-4-4 | 1 kV power line |
| | IEC 61000-4-5:2001/EN 61000-4-5 | 0.5 kV (phase-to-neutral voltage); 1 kV (phase-to-earth voltage); 1 kV (neutral-to-earth voltage) |
| | IEC 61000-4-6:2003/EN 61000-4-6 | 3 V, 0.15-80 MHz |
| | IEC 61000-4-11:2004/EN 61000-4-11 | voltage dip: 0% UT during half cycle; 0% UT during 1 cycle; 70% UT during 25 cycles short interruption: 0% UT during 250 cycles |
| Safety | IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 NO. 61010-1-12+ GI1+ GI2 | |
| Vibration | Meets GB/T 6587; class 2 random Meets MIL-PRF-28800F and IEC60068-2-6; class 3 random | |
| Shock | Meets GB/T 6587-2012; class 2 random Meets MIL-PRF-28800F and IEC60068-2-27; class 3 random (in non-operating conditions: 30 g, half sine, 11 ms duration, 3 shocks along the main axis, a total of 18 vibrations) | |

Note^[1]: Typical.

Note^[2]: Maximum value. 50 ns, single-channel mode, dots display, auto memory depth.

Note^[3]: Supporting legs and handle folded, knob height included.

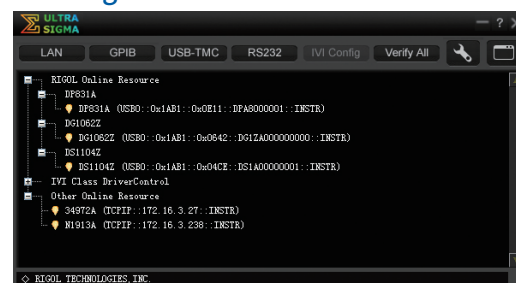
Note^[4]: Standard configuration.

► Ordering Information

| | Description | Order Number |
|----------------------|--|---------------------|
| Models | DS1202Z-E (200 MHz, 2 analog channels) | DS1202Z-E |
| | DS1102Z-E (100 MHz, 2 analog channels) | DS1102Z-E |
| Standard Accessories | Power cord conforming to the standard of the destination country | - |
| | USB cable | CB-USBA-USBB-FF-150 |
| | 2 passive probes (350 MHz PVP2350, only available for DS1202Z-E) | PVP2350 |
| | 2 passive probes (150 MHz PVP3150, only available for DS1102Z-E) | PVP3150 |
| | Rack mount kit | RM-DS1000Z |
| Optional Accessory | Rack mount kit | RM-DS1000Z |

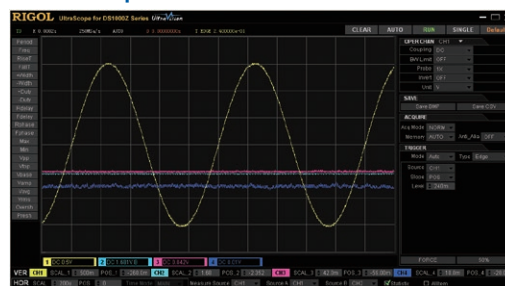
► Standard Software

Ultra Sigma



- **RIGOL** general PC software platform
- Multi-instrument and multi-interface resource management
- With SCPI remote command tool

Ultra Scope



- Real-time monitoring of waveform and status; supports multi-instrument and multi-window display
- With virtual panel feature
- Supports multi-interface remote control

Warranty

Three -year warranty, excluding probes and accessories.

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