**Data Sheet**

# Digital Storage Oscilloscope
## Model 2194


The 2194 combines performance and value all in one portable solution. This oscilloscope provides 100 MHz of bandwidth in a 4-channel configuration with a maximum sample rate of 1 GSa/s and a maximum memory depth of 14 Mpts. Equipped with a 7" LCD display and a waveform update rate of 100,000 waveforms per second, this device is able to capture infrequent glitches with excellent signal fidelity.

Increase productivity with free PC software for remote connectivity through LAN or USBTMC-compliant device ports. Access all the oscilloscopes functions without the need for programming and conveniently capture, save, and analyze measurement results.

Select from a variety of trigger modes including serial bus triggering with decoding support for I²C, SPI, UART, CAN and LIN protocols. In applications where signals are transmitted over long periods of time, segmented acquisition mode and history can extend waveform recording up to 80,000 segments.

Collect data using automatic measurements for 38 different parameters including statistical analysis. Display signals in the frequency domain using the FFT math operation with a maximum memory depth of 128 kpts. Rich in features for its class, the 2194 is the ideal solution for educational settings and hobbyists.

| Model | 2194 |
|---|---|
| Bandwidth | 100 MHz |
| Channels | 4 Analog |
| Sampling Rate | 1 GSa/s (Single channel active) |
| Memory | 14 Mpts (Single channel active) |

USB LAN

### Features and benefits

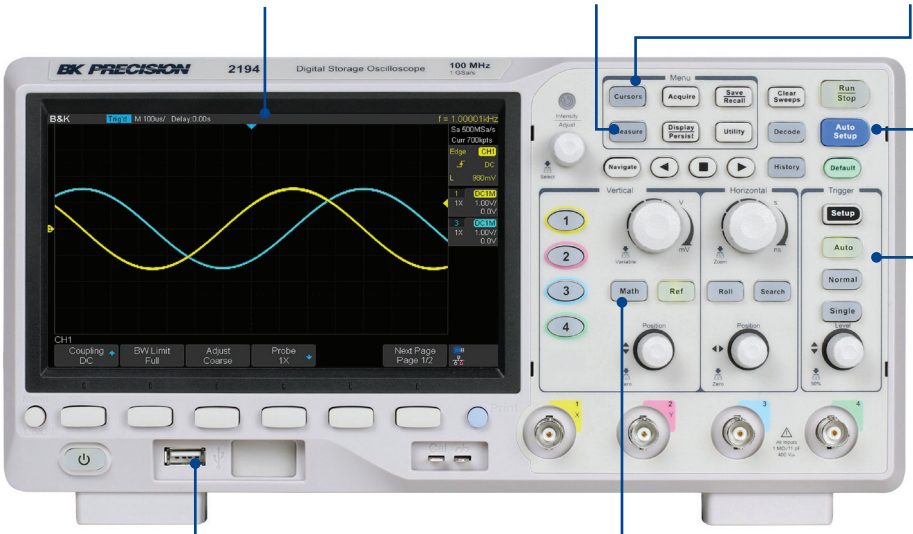
- 100 MHz bandwidth
- 4 analog channels
- Maximum sample rate of 1 GSa/s
- 14 Mpts memory depth
- Maximum waveform update rates of 100,000 (normal mode) and 400,000 (sequence mode) waveforms per second
- 7" TFT-LCD with 800 x 480 resolution
- Color temperature display mode and 256 level intensity grading
- Trigger types: Edge, Slope, Pulse Width, Window, Runt, Interval, Dropout, Pattern and Serial
- Segmented acquisition and history function (up to 80,000 segments)
- Automatic measurements for 38 parameters and statistics feature
- FFT and 7 additional math operations
- Masking tool with adjustable limits for pass/fail testing
- USB host port for saving and recalling setups, data, and screenshots
- USBTMC-compliant device port and LAN interfaces standard
- Multi-language support

## Front panel

**7-inch TFT-LCD Display**
800 x 480 resolution with 256 level intensity grading and color temperature mode.

**Measure**
Access a library of 38 built-in automatic measurements and an acquisition statistics feature.

**Cursors**
Acquire custom measurements easily using up to four cursors.




**Auto Setup**
Vertical, horizontal, and trigger controls are automatically adjusted for fast signal acquisition.

**Advanced Triggering**
Isolate the signal with various triggers including video and serial bus trigger types.

**USB Host Port**
Connect USB flash drive to conveniently store and recall waveform data, setups and screenshots.

**Waveform analysis with math and FFT**
Access a menu with math operators including an FFT function to view the signal in the frequency spectrum.

## Rear panel


**Communication**
LAN and USB ports enable remote control from a PC

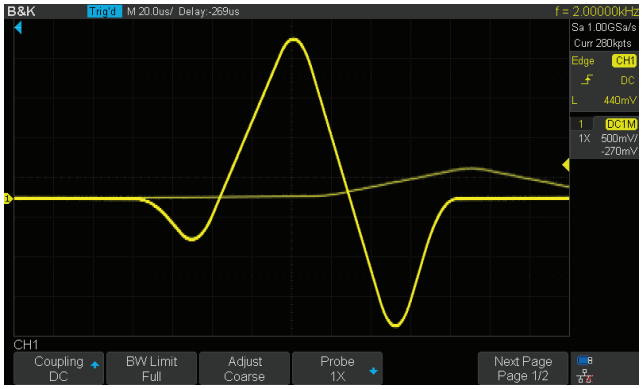
**Pass/Fail or Trig Out Output**

**Kensington Lock**
Helps secure oscilloscope and prevent theft

**AC Input and Fuse Holder**

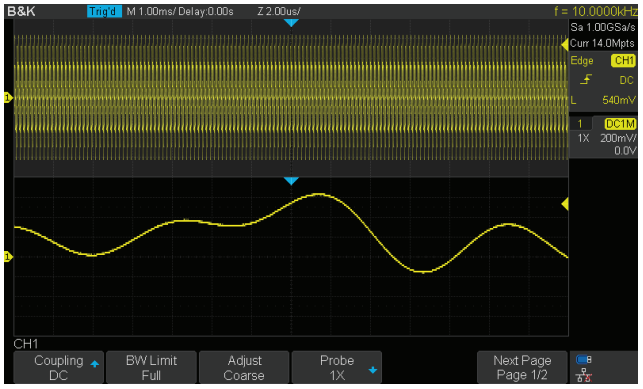
# Operation highlights

### 100,000 wfms/s Update Rate



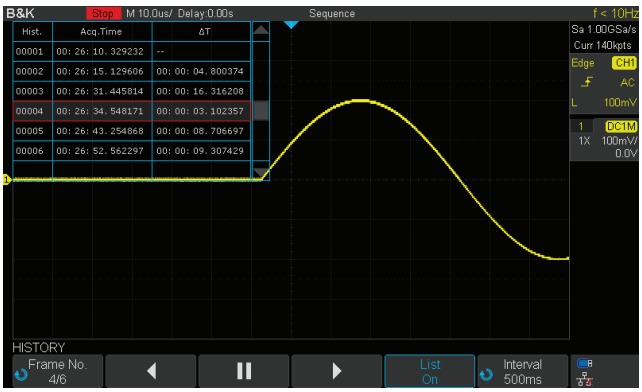

With update rates of 100,000 wfms/s, the 2194 captures infrequent glitches with excellent signal fidelity and reduces time spent debugging.

### Memory depth of up to 14 Mpts



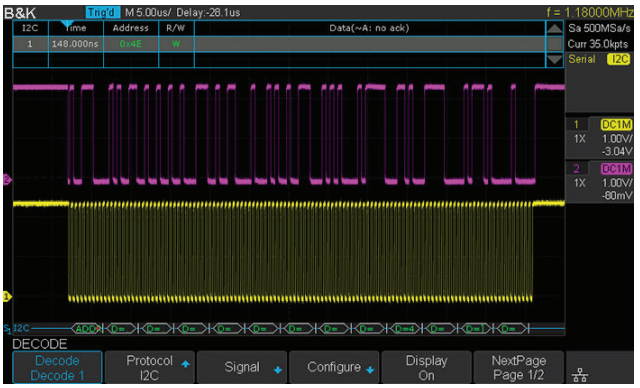

Capture longer time periods at higher resolution with a maximum memory depth of 14 Mpts. Enable zoom feature to display specific events in more detail.

### Segmented acquisition



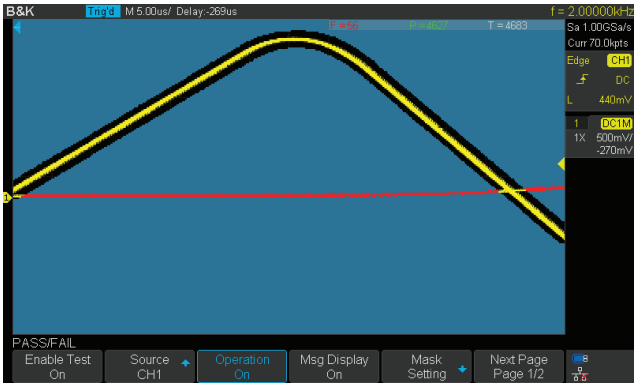

Segmented acquisition partitions the memory into multiple segments (up to 80,000) of the signal when trigger conditions are met. Recall stored segments using the History function.

### Serial decoding



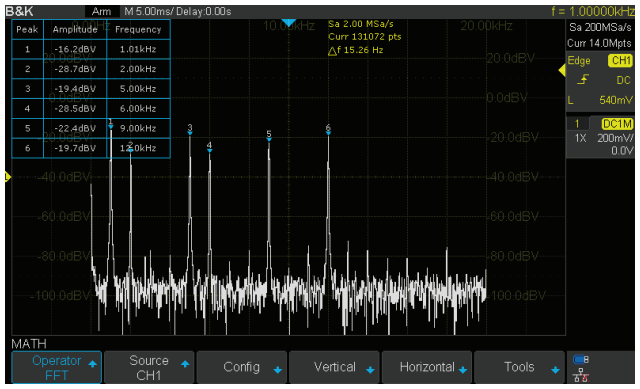

Serial bus decoding supports I²C, SPI, UART, CAN and LIN protocols. Information can be quickly displayed in a tabular format.

### Pass/Fail testing




Generate a mask based on user defined parameters to identify pass/fail test results. Useful in long term signal monitoring or automated production line testing applications.

### FFT function




Displays signal in the frequency domain to ease measuring wave harmonics or discovering applications potential noise induced by frequency dependent components.

# Specifications

Note: All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of 23 °C ± 5 °C. Specifications are valid for single unit operation only.

| Model | 2194 | |
|---|---|---|
| **Performance Characteristics** | | |
| Bandwidth (-3 dB) | 100 MHz | |
| Rise Time (10% to 90%) | < 3.5 ns | |
| Sampling Rate | Single Channel | 1 GSa/s |
| | Dual Channel | 500 MSa/s |
| | All Channel | 250 MSa/s |
| Memory Depth (timebase ≥ 1 ms/div) | Single Channel | 14 Mpts |
| | Dual Channel | 7 Mpts |
| | All Channel | 3.5 Mpts |
| Waveform Update Rate | Normal Mode | 100,000 wfms/s |
| | Sequence Mode | 400,000 wfms/s |
| Bandwidth Limit | 20 MHz ± 40% | |
| Input | Input Channels | 4 analog channels |
| | Input Coupling | DC, AC, GND |
| | Input Impedance | DC: 1 MΩ ± 2%, 11 pF ± 2 pF |
| | Ch to Ch Isolation | DC - Max bandwidth > 40 dB |
| | Probe Attenuation | 0.1x to 10000x |
| **Vertical System** | | |
| Vertical Resolution | 8 bits | |
| Sensitivity Range | 1 mV/div to 10 V/div (1-2-5 sequence) | |
| Bandwidth Flatness | DC to 10% (BW): ± 1 dB<br>10 to 50% (BW): ± 2 dB<br>50 to 100% (BW): + 2 dB / - 3 dB | |
| DC Gain Accuracy | ≤ ± 3.0%: 5 mV/div to 10 V/div<br>≤ ± 4.0%: ≤ 2 mV/div | |
| Maximum Input Voltage | 1 MΩ: ≤ 400 Vpk (DC + Peak AC ≤ 10 kHz) | |
| Offset Range | 1 mV to 200 mV: ± 2.000 V<br>206 mV to 10 V: ± 100.0 V | |
| Offset Accuracy | ± (1% of Offset+1.5% of div+2 mV): ≥ 2 mV/div<br>± (1% of Offset+1.5% of div+500 uV): 1 mv/div | |
| Noise | Std-dev ≤ 0.2 division (< 2 mV/div)<br>Std-dev ≤ 0.1 division (≥ 2 mV/div) | |
| SFDR Including Harmonics | ≥ 35 dB | |
| Overshoot (500 ps Pulse) | < 10% | |

| **Horizontal System** | | |
|---|---|---|
| Time Base Range | 2 ns/div to 100 s/div | |
| Timebase Accuracy | ± 25 ppm | |
| Channel Skew | < 100 ps | |
| Display Format | Y - T, X - Y, Roll<br>X: Channel 1, Y: Channel 2 | |
| Roll Mode | 50 ms/div to 100 s/div (1-2-5 sequence) | |
| **Trigger System** | | |
| Types | Edge, Slope, Pulse, Video, Window, Interval, Dropout, Runt, Pattern, and Serial | |
| Modes | Auto, Normal, Single | |
| Level | Internal: ± 4.5 div from center of screen | |
| Hold off Range | 80 ns to 1.5 s | |
| Coupling | DC | Passes all components of the signal |
| | AC | Blocks all DC components and attenuates signals < 8 Hz |
| | LFRJ | Blocks the DC component and attenuates components < 2 MHz |
| | HFRJ | Attenuates high-frequency components above 1.2 MHz |
| Source | CH1 to CH4, AC Line | |
| Accuracy (typical) | Internal: ± 0.2 div | |
| Sensitivity | DC to Max bandwidth 0.6 div | |
| Jitter | < 100 ps | |
| Displacement | Pre-Trigger: 0 to 100% Memory<br>Delay Trigger: 0 to 10,000 div | |
| **Acquisition Modes** | | |
| Peak Detect | Capture glitches as narrow as 2 ns at all time base settings | |
| Average | Waveform averaged selectable: 4, 16, 32, 64, 128, 256, 512, 1024 | |
| Enhance Resolution (ERES) | Enhance bits: 0.5, 1, 1.5, 2, 2.5, 3 | |
| Interpolation | Sin(x)/x, Linear | |

# Specifications (cont.)

| Waveform Measurements and Math | | |
|---|---|---|
| Source | CH1 to CH4, Zoom, Math, All references, History | |
| Measurement Range | Screen or Gate region | |
| Measurement Parameters | Vertical | Max, Min, Pk-Pk, Ampl, Top, Base, Mean, Cmean, Stdev, Cstd, VRMS, Crms, FOV, FPRE, ROV, RPRE, Level@X |
| | Horizontal | Period, Freq, +Width, -Width, Rise Time, Fall Time, Bwidth, +Dut, -Dut, Delay, Time@level |
| | Delay | Phase, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Skew |
| Statistics | Current, Mean, Min, Max, Std-Dev, Count | |
| Counter | Hardware 6-digit counter (Channels are selectable) | |
| Math Operations | Add, subtract, multiply, divide, FFT, derive, integrate, square root | |
| FFT | Window types: Rectangular, Blackman, Hanning, Hamming, Flattop | |
| **Cursors** | | |
| Mode | Manual, Tracking | |
| Measurements | Time: X1, X2, ΔX, 1/ΔX, Voltage: Y1, Y2, ΔY | |
| **Search** | | |
| Event | Edge, Slope, Pulse, Interval, Runt | |
| Event Number | Y – T: 700<br>Roll: No limitation<br>Stop After ROLL: 700 | |
| **Display System** | | |
| Display | 7" color TFT LCD, 24-bit, 800 x 480 pixels | |
| Intensity Grading | 256 levels | |
| Display Contrast (Typical State) | 500:1 | |
| Backlight Intensity (Typical State) | 300 nits | |
| Display Range | 8 x 14 divisions | |
| Persistence | Off, 1 sec, 5 sec, 10 sec, 30 sec, Infinite | |
| Waveform Display | Dot, Vector | |
| Screen Saver | 1 min, 5 min, 10 min, 30 min, 1 hour, Off | |
| Language | English, Simplified Chinese, Traditional Chinese, French, Japanese, Korean, German, Russian, Italian, Portuguese | |
| **I/O Interface** | | |
| Standard | USB Host, USB Device, LAN, Pass/Fail, Trig Out | |
| Pass/Fail | 3.3 V TTL Output | |

| Serial Decoder | | |
|---|---|---|
| Decoders | 2 | |
| $I^2C$ | Signal | SCL, SDA |
| | Address | 7-bit, 10-bit |
| | Threshold | - 4.5 to 4.5 div |
| | List | 1 to 7 lines |
| SPI | Signal | SCL, MISO, MOSI |
| | Edge Level | Rising, Falling |
| | Idle Level | Low, High |
| | Bit Order | MSB, LSB |
| | Threshold | - 4.5 to 4.5 div |
| | List | 1 to 7 lines |
| UART | Signal | RX, TX |
| | Data Width | 5-bit, 6-bit, 7-bit, 8-bit |
| | Parity Check | None, Odd, Even, Space, Mark |
| | Stop Bit | 1-bit, 1.5-bit, 2-bit |
| | Idle Level | Low, High |
| | Threshold | - 4.5 to 4.5 div |
| | List | 1 to 7 lines |
| CAN | Signal | CAN_H, CAN_L |
| | Source | CAN_H, CAN_L |
| | Threshold | - 4.5 to 4.5 |
| | List | 1 to 7 lines |
| LIN | Specification Package Revision | Ver1.3, Ver2.0 |
| | Threshold | -4.5 to 4.5 div |
| | List | 1 to 7 lines |
| **Environment** | | |
| Temperature | Operating: 0 °C to 40 °C, Storage: < -20 °C > 60 °C | |
| Humidity | Operating: 85% RH, 40 °C, 24 hrs.<br>Storage: 85% RH, 65 °C, 24 hrs | |
| Altitude | Operating: ≤ 3000 m, Storage: ≤ 15,000 m | |
| Electromagnetic Compatibility | EMC directive (2014/30/EU),<br>IEC 61326-1:2012/EN61326-1:2013 (Basic) | |
| Safety | UL 61010-1:2012/R: 2018-11; CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11. UL 61010-2-030:2018; CAN/CSA-C22.2 No. 61010-2-030:2018. | |
| **General** | | |
| AC Input | 100 to 240 VAC 50/60 Hz, 100 to 120 VAC 400 Hz | |
| Dimensions (W x H x D) | 12.28" x 5.94" x 5.22" (312 x 151 x 132.6 mm) | |
| Weight | 5.7 lbs (2.6 kg) | |
| Warranty | 3-Years | |
| Standard Accessories | Power cord (1), USB cable (1), passive probe (4), certificate of calibration | |

## Specifications (cont.)

| Trigger Types | |
|---|---|
| **Edge Trigger** | |
| Slope | Rising, Falling, Rising & Falling |
| Source | All Channels / AC Line |
| **Slope Trigger** | |
| Slope | Rising, Falling |
| Limit Range | <, >, < >, > < |
| Time Range | 2 ns to 4.2 s |
| Resolution | 1 ns |
| **Pulse Width Trigger** | |
| Polarity | +width, -width |
| Limit Range | <, >, < >, > < |
| Pulse Width Range | 2 ns to 4.2 s |
| Resolution | 1 ns |
| **Video Trigger** | |
| Signal Standard | NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom |
| Sync | Any, Select |
| Trigger Condition | Line, Field |
| **Window Trigger** | |
| Window Type | Absolute, Relative |
| **Interval Trigger** | |
| Slope | Rising, Falling |
| Limit Range | <, >, < >, > < |
| Time Range | 2 ns to 4.2 s |
| Resolution | 1 ns |
| **Dropout Trigger** | |
| Timeout | Edge, State |
| Slope | Rising, Falling |
| Time Range | 2 ns to 4.2 s |
| Resolution | 1 ns |
| **Runt Trigger** | |
| Polarity | +width, -width |
| Limit Range | <, >, < >, > < |
| Time Range | 2 ns to 4.2 s |
| Resolution | 1 ns |
| **Pattern Trigger** | |
| Pattern Setting | Invalid, Low, High |
| Logic | AND, OR, NAND, NOR |
| Limit Range | <, >, < >, > < |
| Time Range | 2 ns to 4.2 s |
| Resolution | 1 ns |

| Serial Trigger | |
|---|---|
| **I²C Trigger** | |
| Condition | Start, Stop, Restart, No Ack, EEPROM, 7-bit Address & Data, 10-bit Address & Data, Data Length |
| Source (SDA/SCL) | CH1 to CH4 |
| Data Format | Binary, Decimal, Hex, ASCII |
| Limit Range | EEPROM: =, >, < |
| Data Length | EEPROM: 1 byte<br>Address & Data: 1 to 2 bytes<br>Data Length: 1 to 12 bytes |
| R/W bit | Address & Data: Read, Write, Do not care |
| **SPI Trigger** | |
| Condition | Data |
| Source (CS/CL/Data) | CH1 to CH4 |
| Data Format | Binary, Decimal, Hex, ASCII |
| Data Length | 4 to 96 bits |
| Bit Value | 0, 1, X |
| Bit Order | LSB, MSB |
| **UART Trigger** | |
| Condition | Start, Stop, Data, Parity Error |
| Source (RX/TX) | CH1 to CH4 |
| Data Format | Binary, Decimal, Hex, ASCII |
| Limit Range | =, >, < |
| Data Length | 1 byte |
| Data Width | 5-bit, 6-bit, 7-bit, 8-bit |
| Parity Check | None, Odd, Even, Space, Mark |
| Stop Bit | 1-bit, 1.5-bit, 2-bit |
| Idle Level | High, Low |
| Baud Rate (Selectable) | 600/1200/2400/4800/9600/19200/38400/57600/115200 bit/s |
| Baud Rate (Custom) | 300 bit/s to 20 Mb/s |
| **CAN Trigger** | |
| Condition | Start, Remote, ID, ID + Data, Error |
| Source | CH1 to CH4 |
| ID | STD (11 bit), EXT(29 bit) |
| Data format | Binary, Decimal, Hex, ASCII |
| Data Length | 1 to 2 byte |
| Baud Rate (Selectable) | 5k/10k/20k/50k/100k/125k/250k/500k/800k/1 Mb/s |
| **LIN Trigger** | |
| Condition | Break, Frame ID, ID+Data, Error |
| Source | CH1 to CH4 |
| ID | 1 bytes |
| Data format | Binary, Decimal, Hex, ASCII |
| Data Length | 1 to 2 bytes |
| Baud Rate (Selectable) | 600/1200/2400/4800/9600/19200 bit/s |
| Baud Rate (Custom) | 300 bit/s to 20 Mb/s |

## About B&K Precision

For more than 70 years, B&K Precision has provided reliable and value-priced test and measurement instruments worldwide.

Our headquarters in Yorba Linda, California houses our administrative and executive functions as well as sales and marketing, design, service, and repair. Our European customers are most familiar with B&K through our French subsidiary, Sefram. Engineers in Asia know us through our B+K Precision Taiwan operation. The independent service center in Singapore services customers in Singapore, Malaysia, Vietnam, and Indonesia.


B&K Precision group member  Independent service center  Service center location

## Quality Management System

B&K Precision Corporation is an ISO9001 registered company employing traceable quality management practices for all processes including product development, service, and calibration.

ISO9001:2015

Certification body NSF-ISR
Certificate number 6Z241-IS8

NSF-ISR
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