SDA 6020
SDA 6000
SDA 5000
SDA 3000
Serial Data Analyzers

LEADING FEATURES
• 6, 5, or 3 GHz Bandwidth
• Data rates up to 3.5 Gb/s
• Automatic eye pattern testing with failure locator
• Random and Deterministic jitter measurement
• Deterministic jitter breakdown
• Bit error analysis
• 20 GS/s sampling rate on all four channels (SDA6020 only)
• 10 GS/s sample rate (20 GS/s dual channel mode)
• All-SiGe front end (75 ps rise time)
• 1 ps RMS jitter noise floor
• 1 ppm internal sample clock
• < 2.5ps RMS trigger jitter

SDA6000 showing four-quadrant summary screen. The display gives measurements of the eye pattern and jitter parameter of the signal.

A Powerful Easy-to-Use Analysis Tool for Serial Data
The SDA is the first fully integrated test system designed specifically for evaluating the physical layer characteristics of both optical and electrical serial data signals. The highest fidelity front-end in the industry coupled with LeCroy’s X-Stream Technology provide the foundation for this powerful analysis system that not only conducts Pass/Fail measurements but also traces the fault to the actual bit causing the error.

With 20GS/s maximum sampling rate, 6 GHz bandwidth, 1 ps jitter noise floor and long acquisition memory (up to 100M samples) the SDA brings unprecedented analysis capabilities for verifying and testing serial data according to a wide variety of standards. The SDA 6020 with its 20 GS/s sampling rate on all four channels enables multi-lane testing for standards such as PCI-Express and XAUI.

Locate Mask Violations Down to the Bit
Eye patterns are measured by using a continuous acquisition of up to 8 million bits of the input data stream and uses a numerical PLL to recover a reference clock from the captured waveform. This method completely eliminates trigger jitter to produce the ‘cleanest’ eye patterns. In fact, the SDA generates only 6 ps of peak to peak jitter which is 7x cleaner than similar clock recovery instruments.

The original bit sequence is stored along with the eye pattern allowing the user to locate the exact bit or bits that caused a mask failure. This type of analysis can directly indicate the source of mask failures, speeding up the debugging process.
Comprehensive Jitter Analysis

Characterizing jitter is critical to the measurement of serial data signals. The SDA is the most complete jitter measurement instrument in the industry, capable of measuring a full set of clock and timing jitter parameters as well as time interval error (TIE) measurements for serial data signals. The TIE measurements are performed using a numerical phase locked loop derived from the data waveform as the reference clock. Jitter measurements include total jitter, random and deterministic jitter. Deterministic jitter is also broken down into its components of periodic jitter and data dependent jitter.

A powerful, patent-pending algorithm evaluates data dependent jitter and shows a direct view of the eye pattern showing only the effects of data dependent jitter. The contribution of individual bit patterns can be viewed allowing the analysis of specific data-dependent problems.

Mask test with violation locator shows individual bits causing mask failures.

ISI plot shows data-dependent jitter as an eye pattern. Each trace in the eye is the contribution from a particular bit pattern in the data stream. The lower display allows the user to display specific patterns. Pattern lengths up to 10 bits are possible.

Bit Error Analysis

The SDA measures bit errors directly on the input signal by applying a threshold to the waveform and using the numerically recovered clock to sample the voltage level. The detected bits are compared to standard or user-defined sequences to determine the bit error rate. The detection threshold is variable so that lower error rates can be extrapolated from shorter data sets.
## SDA 6020/6000/5000/3000

### Serial Data Analyzers Specifications

<table>
<thead>
<tr>
<th>Vertical System</th>
<th>SDA 6020</th>
<th>SDA 6000</th>
<th>SDA 5000</th>
<th>SDA 3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Bandwidth</td>
<td>6 GHz</td>
<td>6 GHz</td>
<td>5 GHz</td>
<td>3 GHz</td>
</tr>
<tr>
<td>Rise Time (Typical)</td>
<td>75 ps</td>
<td>75 ps</td>
<td>90 ps</td>
<td>150 ps</td>
</tr>
<tr>
<td>Input Channels</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Bandwidth Limiters</td>
<td>25 MHz, 250 MHz</td>
<td>1 GHz, 3 GHz, 4 GHz</td>
<td>25 MHz, 250 MHz, 1 GHz</td>
<td></td>
</tr>
<tr>
<td>Input Impedance</td>
<td>50 Ω ±2.0%</td>
<td>50 Ω ±2.0%</td>
<td>50 Ω ±2.0%</td>
<td>50 Ω ±2.0%</td>
</tr>
<tr>
<td>Input Coupling</td>
<td>DC, GND</td>
<td>DC, GND</td>
<td>DC, GND</td>
<td>DC, GND</td>
</tr>
<tr>
<td>Maximum Input Voltage</td>
<td>±4 Vpeak</td>
<td>±4 Vpeak</td>
<td>±4 Vpeak</td>
<td>±4 Vpeak</td>
</tr>
<tr>
<td>Channel-Channel Isolation</td>
<td>≥ 100:1 at 2 GHz, ≥ 40:1 at 3 GHz, ≥ 20:1 at 4 GHz</td>
<td>≥ 100:1 at 2 GHz, ≥ 40:1 at 3 GHz, ≥ 20:1 at 4 GHz</td>
<td>≥ 100:1 at 2 GHz, ≥ 40:1 at 3 GHz, ≥ 20:1 at 4 GHz</td>
<td>≥ 100:1 at 2 GHz, ≥ 40:1 at 3 GHz, ≥ 20:1 at 4 GHz</td>
</tr>
<tr>
<td>Vertical Resolution</td>
<td>8 bits, up to 11 bits with enhanced resolution (ERES)</td>
<td>8 bits, up to 11 bits with enhanced resolution (ERES)</td>
<td>8 bits, up to 11 bits with enhanced resolution (ERES)</td>
<td>8 bits, up to 11 bits with enhanced resolution (ERES)</td>
</tr>
<tr>
<td>DC Gain Accuracy</td>
<td>±1.5% of Full Scale</td>
<td>±1.5% of Full Scale</td>
<td>±1.5% of Full Scale</td>
<td>±1.5% of Full Scale</td>
</tr>
<tr>
<td>Offset Range</td>
<td>2 mV – 1 V/div fully variable</td>
<td>2 mV – 1 V/div fully variable</td>
<td>2 mV – 1 V/div fully variable</td>
<td>2 mV – 1 V/div fully variable</td>
</tr>
<tr>
<td>Offset Accuracy</td>
<td>±(1.5% of full scale + 1.5% of offset value + 2 mV)</td>
<td>±(1.5% of full scale + 1.5% of offset value + 2 mV)</td>
<td>±(1.5% of full scale + 1.5% of offset value + 2 mV)</td>
<td>±(1.5% of full scale + 1.5% of offset value + 2 mV)</td>
</tr>
</tbody>
</table>

### Horizontal System

| Timebases | Internal timebase common to 4 input channels, an external clock may be applied at the auxiliary input |
| Time/Division Range | 20 ps/div – 10 s/div |
| Math & Zoom Traces | 4 independent zoom and 4 math/zoom traces standard, 8 math/zoom traces available with XMAP (Master Analysis package) or XMATH (Advanced Math package) |
| Clock Accuracy | ± 1 ppm @ 0–40 degrees C |
| Time Internal Accuracy | ≤ 0.066 / SR + (1 ppm * Reading) (ms) |
| Sample Rate & Delay Time Accuracy | ±1 ppm ± 10% interval |
| Jitter Noise Floor | 1 ps rms (Typical) |
| Trigger & Interpolator Jitter | ≤ 2.5 ps (Typical) |
| Channel-Channel Deskew Range | ±4.5 ns |
| External Timebase Reference | 100 MHz, 50 Ω impedance; applied at the rear input |
| External Clock | 30 MHz – 2 GHz, 50 Ω impedance; applied at the auxiliary input |

### Acquisition System

| Single-Shot Sample Rate/Ch | 20 GS/s | 10 GS/s |
| 2 Channel Max | 20 GS/s |
| Random Interleaved Sampling (RIS) | 200 GS/s for repetitive signals 20 ps/div – 1 μs/div |
| Maximum Trigger Rate | 150,000 waveforms/second (in Sequence Mode, up to 4 channels) |
| Intersegment Time | ≤ 6 μs |
| Maximum Acquisition Points/Ch | 4 Ch, (2 Ch) / (4 Ch) |
| Maximum Acquisition Points/Ch | (8 M) / (4 M) |
| Standard Memory | 8M |
| L – Memory Option | 16M |
| V – Memory Option | 32M |
| XL – Memory Option | 48M |
| XLL – Memory Option | N/A |
| Duration @ 20 GS/s | 0.4 μs |
| Segments (Sequence Mode) | 1,000 Segments |
| Segments (Sequence Mode) | 5,000 Segments |
| Segments (Sequence Mode) | 10,000 Segments |
| Segments (Sequence Mode) | 20,000 Segments |
| Segments (Sequence Mode) | 25,000 Segments |

### Acquisition Processing

| Averaging | Summed Averaging to 1 million sweeps, Continuous Averaging to 1 million sweeps |
| Enhanced Resolution (ERES) | From 8.5 to 11 bits vertical resolution |
| Envelope (Extrema) | Envelope, floor, roof for up to 1 million sweeps |

### Triggering System

| Modes | Normal, Auto, Single, and Stop |
| Sources | Any input channel, External, ExtXT10, Ext10/10, or line; slope and level unique to each source (except line trigger) |
| Coupling Mode | DC |
| Post-trigger Delay | 0 – 100% of horizontal time scale |
| Post-trigger Delay | 0 – 10,000 divisions |
| Hold-off by Time or Events | Up to 20 s or from 1 to 99,999,999 events |
| Internal Trigger Range | ±5 div from center |
| Max Trigger Frequency | 5 GHz w/Edge Trigger, 750 MHz w/SMART Trigger (8300A = 3 GHz w/Edge Trigger, 750 MHz w/SMART Trigger) |
| External Trigger Input Range | Aux (±0.4 V); Aux X10 (±0.004 V); Aux / 10 (±4 V) |
| Trigger Sensitivity (Edge) | 3 Divisions @ 5 GHz, 2 Divisions @ 4 GHz, 1.2 Divisions @ 3 GHz (Typical) |
**Basic Triggers**
- **Edge/Slope/Line Trigger**: Triggers when the signal meets the slope and level condition.

**SMART Triggers**
- **State or Edge Qualified**: Triggers on any input source only if a defined state or edge occurred on another input source.
- **Delay between sources is selectable by time or events**.
- **Dropout**: Triggers if the signal drops out for longer than the selected time between 2 ns and 20 s.
- **Pattern**: Logic combination (AND, NAND, OR, NOR) of 5 inputs (4 channels and external trigger input).
  - Each source can be high, low, or don’t care. The High and Low level can be selected independently.
  - Triggers at start or end of the pattern.

**SMART Triggers® with Exclusion Technology**
- **Glitch**: Triggers on positive or negative glitches with widths selectable from 600 ps to 20 s on intermittent faults.
- **Signal or Pattern Width**: Triggers on positive or negative pulse widths selectable from 600 ps to 20 s on intermittent faults.
- **Signal or Pattern Interval**: Triggers on intervals selectable between 2 ns and 20 s.

**Automatic Setup**
- **Auto Setup**: Automatically sets the timebase, trigger, and sensitivity to display a wide range of repetitive signals.
- **Vertical Find Scale**: Automatically sets the vertical sensitivity and offset for the selected channels to display a waveform with maximum dynamic range.

**Probes**
- **Probes**: A variety of optional passive and active probes is available.
- **Probe System**: Automatically detects and supports a variety of compatible probes; Supports ProLink-SMA and ProLink-BNC input adapters.
- **Scale Factors**: Automatically or manually selected depending on the probe used.

**Color Waveform Display**
- **Color**: 10.4” flat-panel TFT-LCD with high resolution touch screen.
- **Resolution**: SVGA, 800 x 600 pixels.
- **Realtime Clock**: Displays dates, hours, minutes, seconds with waveform. SNTP support to synchronize to precision internet clocks.
- **Number of Traces**: Displays a maximum of 8 traces; Simultaneously display channel, zoom, memory, and math traces.
- **Grid Styles**: Auto, Single, Dual, Quad, Octal, XY, Single + XY, Dual + XY.
- **Waveform Styles**: Sample dots joined or dots only.

**Analog Persistence Display**
- **Analog & Color-Graded Persistence**: Variable saturation levels; stores each trace’s persistence data in memory.
- **Persistence Selections**: Select analog, color, or three-dimensional.
- **Trace Selection**: Activate persistence on all or any combination of traces.
- **Persistence Aging Time**: Select from 500 ms to infinity.
- **Sweeps Displayed**: All accumulated, or all accumulated with last trace highlighted.

**Zoom Expansion Traces**
- **Zoom Expansion Traces**: Display up to 4 Zoom and 4 Math/Zoom traces; 8 Math/Zoom traces available with XMAP (Master Analysis package) or XMATH (Advanced Math package).

**CPU**
- **Processor**: Intel Pentium 4 @ 2.53 GHz or better with MS Windows 2000.
- **Processing Memory**: Up to 2 GBytes.

**Internal Waveform Memory**
- **M1, M2, M3, M4 Internal Waveform Memory**: Stores full-length waveforms with 16 bits/data point or store to any number of files limited only by data storage media.

**Setup Storage**
- **Front Panel and Instrument Status**: Stores to the internal hard drive, floppy drive or to a USB-connected peripheral device.

Specifications are subject to change.
### Interface
- **Remote Control:** Via Windows Automation, or via LeCroy Remote Command Set.
- **GPIB Port (Optional):** Supports IEEE – 488.2
- **Ethernet Port:** 10/100Base-T Ethernet interface
- **Floppy Drive:** Internal, DOS-format, 3.5” high-density
- **USB Ports:** 4 USB ports support Windows compatible devices
- **External Monitor Port Standard:** 15-pin D-Type SVGA-compatible
- **Parallel Port:** 1 standard

### Auxiliary Output
- **Signal Types:** Select from calibrator or control signals output on front panel.
- **Calibrator Signal:** 5 Hz – 5 MHz square wave or DC Level; 0.0 to 0.5 V into 50 Ω (0–1 V into 1 MΩ), or TTL Volts (Selectable)
- **Control Signals:** Trigger enabled, trigger out, pass/fail status

### Auxiliary Input
- **Signal Types:** Select from External Trigger or External Clock input on front panel

### General
- **Auto Calibration:** Ensures specified DC and timing accuracy is maintained for 1 year minimum.
- **Power Requirements:**
  - 100–120 VAC at 50/60/400 Hz; 200–240 VAC at 50/60 Hz; Automatic AC Voltage selection.
  - Power consumption: < 800 VA

### Environmental
- **Temperature (Operating):** +5 °C to +40 °C including floppy disk and CD-ROM drives
- **Temperature (Non-Operating):** –20 °C to +60 °C
- **Humidity (Operating):** 5% to 80% relative humidity (non-condensing) up to +30 °C, Upper limit derates to 25% relative humidity (non-condensing) at +40 °C
- **Humidity (Non-Operating):** 5% to 95% relative humidity (non-condensing) as tested per MIL–PRF–28800F
- **Altitude (Operating):** up to 10,000 ft (3048 m) at or below +25 °C
- **Altitude (Non-Operating):** Up to 40,000 ft (12192 m)
- **Random Vibration (Operating):** 0.31 grms 5 Hz to 500 Hz, 15 minutes in each of three orthogonal axes
- **Random Vibration (Non-Operating):** 2.4 grms 5 Hz to 500 Hz, 15 minutes in each of three orthogonal axes
- **Functional Shock:** 20 g peak, half sine, 11 ms pulse, 3 shocks (positive and negative) in each of three orthogonal axes, 18 shocks total

### Physical Dimensions
- **Dimensions (HWD):** 264 mm x 397 mm x 491 mm; 10.4” x 15.6” x 19.3” (height excludes feet)
- **Weight:**
  - 6020: 23 Kg; 49 lbs.
  - 6000, 5000, 3000: 18 Kg; 39 lbs.
- **Shipping Weight:**
  - 29 Kg; 63 lbs.
  - 24 Kg; 53 lbs.

### Certifications
- CE Approved, UL and cUL listed.
- Conforms to EN 61326-1, EN 61010-1, UL 3111-1, and CSA C22.2 No. 1010.1

### Warranty and Service
- 3-year warranty; calibration recommended annually.
- Optional service programs include extended warranty, upgrades, and calibration services.

Specifications are subject to change.
### Optical Reference Receiver (with OE425/OE455)

4th order Bessel-Thompson filter response at the following data rates:

<table>
<thead>
<tr>
<th>Standard</th>
<th>SDA 3000</th>
<th>SDA 5000 / SDA 6000 / SDA 6020</th>
</tr>
</thead>
<tbody>
<tr>
<td>SONET/SDH</td>
<td>OC-1/STM0 (51.84 Mb/s)</td>
<td>OC-1/STM0 (51.84 Mb/s) OC-3/STM1 (155.52 Mb/s)</td>
</tr>
<tr>
<td></td>
<td>OC-3/STM1 (155.52 Mb/s)</td>
<td>OC-12/STM4 (622.08 Mb/s)</td>
</tr>
<tr>
<td></td>
<td>OC-12/STM4 (622.08 Mb/s)</td>
<td>OC-48/STM16 (2488.3 Mb/s)</td>
</tr>
<tr>
<td>Fibrechannel</td>
<td>FC133 (132.7 Mb/s)</td>
<td>FC133 (132.7 Mb/s)</td>
</tr>
<tr>
<td></td>
<td>FC266 (265.6 Mb/s)</td>
<td>FC266 (265.6 Mb/s)</td>
</tr>
<tr>
<td></td>
<td>FC531 (531.2 Mb/s)</td>
<td>FC531 (531.2 Mb/s)</td>
</tr>
<tr>
<td></td>
<td>FC1063 (1063.5 Mb/s)</td>
<td>FC1063 (1063.5 Mb/s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FC2125 (2127 Mb/s)</td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>1.25 Gb/s</td>
<td>1.25 Gb/s</td>
</tr>
<tr>
<td>Infiniband</td>
<td>2.25 Gb/s (2127 Mb/s)</td>
<td>Any rate up to 3.5 Gb/s</td>
</tr>
<tr>
<td>User Defined</td>
<td>Any rate up to 2 Gb/s</td>
<td>Any rate up to 3.5 Gb/s</td>
</tr>
</tbody>
</table>

### Clock Recover System

<table>
<thead>
<tr>
<th>Channel</th>
<th>SDA 3000</th>
<th>SDA 5000 / SDA 6000 / SDA 6020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Software-based clock recovery using golden PLL for data rates up to 2.5 Gb/s</td>
<td>Software-based clock recovery using golden PLL for data rates up to 3.5 Gb/s</td>
</tr>
<tr>
<td>PLL Bandwidth</td>
<td>Single pole w/ adjustable cut-off frequency</td>
<td>Single pole w/ adjustable cut-off frequency</td>
</tr>
<tr>
<td>Jitter</td>
<td>Same as time base; 1 ps RMS typical</td>
<td></td>
</tr>
</tbody>
</table>

### Communications Mask Testing

<table>
<thead>
<tr>
<th>Standard</th>
<th>SDA 3000</th>
<th>SDA 5000 / SDA 6000 / SDA 6020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet IEEE Std 802.3 and 4</td>
<td>OC-1/STM0</td>
<td>OC-1/STM0</td>
</tr>
<tr>
<td></td>
<td>OC-3/STM1</td>
<td>OC-3/STM1</td>
</tr>
<tr>
<td></td>
<td>OC-12/STM4</td>
<td>OC-12/STM4</td>
</tr>
<tr>
<td></td>
<td>OC-48/STM16</td>
<td>OC-48/STM16</td>
</tr>
<tr>
<td>Ethernet IEEE Std 802.3 and 4</td>
<td>1000 Base-SX Short Wave Optical</td>
<td>1000 Base-SX Short Wave Optical</td>
</tr>
<tr>
<td></td>
<td>1000 Base-LX Long Wave Optical</td>
<td>1000 Base-LX Long Wave Optical</td>
</tr>
<tr>
<td>Fibre Channel Electrical</td>
<td>FC133E, FC266E, FC531E, FC1063E</td>
<td>FC133E, FC266E, FC531E, FC1063E, FC2125</td>
</tr>
<tr>
<td>(ANSI X3.303-1997)</td>
<td>S400 Optical</td>
<td>S400 Optical</td>
</tr>
<tr>
<td></td>
<td>S400bT1</td>
<td>S400bT1</td>
</tr>
<tr>
<td></td>
<td>S400bT2</td>
<td>S400bT2</td>
</tr>
<tr>
<td></td>
<td>S800 Optical</td>
<td>S800 Optical</td>
</tr>
<tr>
<td></td>
<td>S800bT1</td>
<td>S800bT1</td>
</tr>
<tr>
<td></td>
<td>S800bT2</td>
<td>S800bT2</td>
</tr>
<tr>
<td></td>
<td>S1600 Optical</td>
<td>S1600 Optical</td>
</tr>
<tr>
<td></td>
<td>S1600bT1</td>
<td>S1600bT1</td>
</tr>
<tr>
<td></td>
<td>S1600bT2</td>
<td>S1600bT2</td>
</tr>
<tr>
<td>Serial Data ATA (draft)</td>
<td>G1, G1 Rx, G1 Tx</td>
<td>G1, G1 Rx, G1 Tx</td>
</tr>
<tr>
<td></td>
<td>G2, G2 Rx, G2 Tx</td>
<td>G2, G2 Rx, G2 Tx</td>
</tr>
<tr>
<td>CM (rev. 1.0)</td>
<td>Transmit normalized, Receiver Low/high</td>
<td></td>
</tr>
<tr>
<td>InfiniBand (draft)</td>
<td>2.5 Gb/s Optical</td>
<td>2.5 Gb/s Electrical</td>
</tr>
<tr>
<td>PCI-Express</td>
<td>TX transition</td>
<td>TX de-emphasized</td>
</tr>
<tr>
<td></td>
<td>RX</td>
<td></td>
</tr>
<tr>
<td>XAUI</td>
<td>TX near end</td>
<td>TX far end</td>
</tr>
</tbody>
</table>

### Jitter Testing

#### Data Measurements

- Period, Frequency, TIE, N-Cycle

#### Clock Measurements

- Frequency, Period, Half Period, Cycle-Cycle, N-Cycle, Positive Cy-Cy Duty, Negative Cy-Cy Duty, Clock TIE

### Analysis

- Tj, Rj, DJ, DCD, D0, Dj, Pj

### Bit Error Rate

#### Data Rate

<table>
<thead>
<tr>
<th>SDA 3000</th>
<th>SDA 5000 / SDA 6000 / SDA 6020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>&lt;= 2 Gb/s</td>
</tr>
<tr>
<td>Maximum capture buffer size (bits)</td>
<td>20 Gb/s at 1.25 Gb/s data rate (16 samples/bit)</td>
</tr>
<tr>
<td>Capture size in bits: Std.</td>
<td>200k</td>
</tr>
<tr>
<td>L (16M)</td>
<td>1M</td>
</tr>
<tr>
<td>VL (32M)</td>
<td>2M</td>
</tr>
<tr>
<td>XL (50M)</td>
<td>3M</td>
</tr>
<tr>
<td>XXL (100M)</td>
<td>6.25M</td>
</tr>
</tbody>
</table>
Standard

Math Tools
Display up to four math function traces (1 – 4). The easy to use graphical interface simplifies setup of up to four operations on each function trace and function traces can be chained together to perform math-on-math:

- absolute value
- average (summed)
- average (continuous)
- derivative
- deskew (resample)
- difference (-)
- enhanced resolution (to 11 bits vertical)
- envelope
- exp (base e)
- exp (Base 10)
- ft (power spectrum, magnitude, phase, up to 25 kpts)
- floor
- histogram of 1000 events
- integral

- inverse (negative)
- log (base e)
- log (base 10)
- product (x)
- ratio (/)
- reciprocal
- rescale (with units)
- roof (x/sqrt(x))
- square
- square root
- sum (+)
- trend (datalog) of 1000 events
- zoom (identity)

Pass/Fail Testing
Simultaneously test multiple parameters against selectable parameter limits or pre-defined masks. Pass or fail conditions can initiate actions including document to local or networked file, email the image of the failure, save waveforms, send a pulse out at the front panel auxiliary BNC output, or (with the GPIB option) send conditions can initiate actions including document to local or networked file, email the image of the failure, save waveforms, send a pulse out at the front panel auxiliary BNC output, or (with the GPIB option) send

Advanced Math Package (XMATH)
This package provides a comprehensive set of signal waveform analysis tools providing insight into the wave shapes of complex signals. Additional capability provided by XMATH includes:

- Intuitive Graphical Math Setup Processing (Web) with unlimited chaining of functions
- 8 math traces total (4 additional)
- Parameter math – add, subtract, multiply, or divide two different parameters
- Histograms expanded with 19 histogram parameters and up to 2 billion events
- Trend (datalog) of up to 1 million events
- FFT capability added to include power averaging, power density, real and imaginary components, frequency domain parameters, and FFT on up to 25 Mpts
- Narrow band power measurements
- Auto-correlation function
- Spans function
- Cubic and Quadratic Interpolation function

Jitter and Timing Analysis Package (JTA2)
This package provides jitter timing and analysis using time, frequency, and statistical views for common timing parameter, and also includes other useful tools. JTA2 includes:

- Jitter and timing parameters, with “Track” graphs of:
  - Cycle-Cycle Jitter
  - N-Cycle
  - N-Cycle with start selection
  - Frequency
  - Period
  - Half Period
  - Width

- Edged@lv parameter (counts edges)
- Histograms expanded with 19 histogram parameters and up to 2 billion events
- Trend (datalog) of up to 1 million events
- Track graphs of all parameters
- Persistence histogram, persistence trace (mean, range, sigma)

Measure Tools
Displays any 8 parameters together with statistics, including their average, high, low, and standard deviations. Histograms provide a fast, dynamic view of parameters and waveform characteristics.

- amplitude
- area
- base cycles
delay
- Δ delay
duty cycle
duration
- fall time (90–10%, 80–20%, @ level)
- frequency
- first
- last
- level @ x
- maximum
- mean
- median
- minimum
- number of points
- overshoot
- over-threshold
- period
- peak-to-peak
- phase
- risetime (10–90%, 20–80%, @ level)
- rms
- std deviation
- time @ minimum (min.)
- time @ maximum (max.)
- Δ time @ level
- Δ time @ level from trigger
- x @ max
- x @ min

Optional

Advanced Serial Data Analysis (ASDA)
This package includes advanced serial data analysis tools which enable the SDA to perform detailed analysis of eye patterns and bit errors. The package includes:

- Mark violation locator
- N-Cycle vs. N-Iter plot
- Bit error analysis with error map
- SI plot
- Filtered jitter analysis

LeCroy M1 Timing Tools
Your SDA acquires data, and calculates, displays, and analyzes jitter in clock and serial data. A wide variety of measurement tools are available including differential crossover point measurements. Jitter viewing tools include line graph, histogram, jitter spectrum, test, and eye diagram. Available in an advanced or basic version.

- LeCroy M1 Timing Tool (Advanced, 1 scope)
- LeCroy M1 Timing Tool (Advanced, 4 scopes)
- LeCroy M1 Timing Tool (Basic)

Advanced Customization Package (XDEV)
This package provides a set of tools to modify the scope and customize it to meet your unique needs. Additional capability provided by XDEV includes:

- Creation of your own measurement parameter or math function, using third party software packages, and display of the result in the scope. Supported third party software packages include –
  - VBScript - MATLAB - Excel - Mathcad

- CustomDSO – create your own user interface in a scope dialog box
- Adding macro of keys to run VBScript files
- Support of plug-ins

Disk Drive Measurements Package (DDM2)
This package provides disk drive parameter measurements and related mathematical functions for performing disk drive waveform analysis.

- Disk Drive Parameters are as follows:
  - amplitude asymmetry
  - local base
  - local baseline separation
  - local maximum
  - local minimum
  - local number
  - local peak-to-peak
  - local time between events
  - local time between peaks
  - local time between troughs
  - pulse width 50–
  - pulse width 50– resolution
  - track average amplitude
  - track average amplitude+ auto-correlation
  - non-linear transition shift

- Correlation function
- Trend (datalog) of up to 1 million events
- Histograms expanded with 18 histogram parameters and up to 2 billion events
### Ordering Information

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Product Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA 6020</td>
<td>6 GHz, 20 GS/s 4 Ch, 8 Mpts/Ch Standard</td>
</tr>
<tr>
<td>SDA 6000</td>
<td>6 GHz, 20 GS/s 2 Ch (10 GS/s 4 ch), 8 Mpts/2Ch, 4 Mpts/Ch Standard</td>
</tr>
<tr>
<td>SDA 5000</td>
<td>5 GHz, 20 GS/s 2 Ch (10 GS/s 4 ch), 8 Mpts/2Ch, 4 Mpts/Ch Standard</td>
</tr>
<tr>
<td>SDA 3000</td>
<td>3 GHz, 20 GS/s 2 Ch (10 GS/s 4 ch), 8 Mpts/2Ch, 4 Mpts/Ch Standard</td>
</tr>
</tbody>
</table>

**Included with Standard SDA 6020, SDA 6000 and SDA 5000 Configurations**
- ProLink Adapter SMA; 4 each
- ProLink Adapter BNC; 2 each
- Remote Control Manual
- Floppy Disk Drive
- CD ROM Drive
- Optical 3 button Wheel Mouse-USB
- Standard Ports; 10/100Base-T Ethernet, Parallel, SVGA Video Output, USB
- Protective Front Cover
- Standard Commercial Calibration and Performance Certificate
- 3 Year Warranty

**Included with Standard SDA 3000 Configurations**
- ProLink Adapter BNC; 5 each
- Remote Control Manual
- Floppy Disk Drive
- CD ROM Drive
- Optical 3 button Wheel Mouse-USB
- Standard Ports; 10/100Base-T Ethernet, Parallel, SVGA Video Output, USB
- Protective Front Cover
- Standard Commercial Calibration and Performance Certificate
- 3 Year Warranty

### Memory Options

<table>
<thead>
<tr>
<th>SDA 6020</th>
<th>SDA 6000 / SDA 5000 / SDA 3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Mpts/ch</td>
<td>16 Mpts/2 Ch, 8 Mpts/Ch ( L )</td>
</tr>
<tr>
<td>32 Mpts/ch</td>
<td>32 Mpts/2 Ch, 16 Mpts/ch ( V L )</td>
</tr>
<tr>
<td>48 Mpts/ch</td>
<td>48 Mpts/2 Ch, 24 Mpts/ch ( X L )</td>
</tr>
</tbody>
</table>

### Long Memory Models

<table>
<thead>
<tr>
<th>SDA 6000</th>
<th>SDA 5000</th>
<th>SDA 3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 GHz, 20 GS/s 2 Ch (10 GS/s 4 Ch), 100 Mpts/2Ch, 50 Mpts/Ch</td>
<td>SDA 5000</td>
<td>SDA 3000</td>
</tr>
<tr>
<td>5 GHz, 20 GS/s 2 Ch (10 GS/s 4 Ch), 100 Mpts/2Ch, 50 Mpts/Ch</td>
<td>SDA 5000</td>
<td></td>
</tr>
<tr>
<td>3 GHz, 20 GS/s 2 Ch (10 GS/s 4 Ch), 100 Mpts/2Ch, 50 Mpts/Ch</td>
<td>SDA 5000</td>
<td></td>
</tr>
</tbody>
</table>

### Software Options

- Disk Drive Measurement Package
- Advanced Serial Data Analysis

### Selected Accessories

- ProLink Adapter BNC; 1 each
- ProLink Adapter BNC, kit of 4
- Keyboard
- 1.5 GHz Differential WaveLink Probe
- 2 GHz Low Capacitance Passive Probe
- 3.5 GHz Active Voltage Probe
- 1.0 GHz Differential Probe
- AP-A Adapter
- Norton Anti-Virus
- Oscilloscope Cart
- Oscilloscope Cart with additional shelf and drawer
- Rackmount Kit - 27" Slide
- Rackmount Kit - 30" Slide
- WaveMaster Soft Carrying Case
- WaveMaster Hard Shell Transit Case

### Warranty & Calibration

A variety of extended warranty, certification, and calibration services are available. Contact LeCroy Sales and Service for details.