Digitizing Signal Analyzers

DSA 601A/602A

The DSA 600A Series Analyzers provide the ultimate combination of signal acquisition, processing and display performance for repetitive and highspeed transient-capture applications.

Applications

- Research
- Design & Debug
- Characterization
- Automated Testing

DSA 601A and DSA 602A

The DSA 600A Series Digitizing Signal Analyzers provide the ultimate combination of signal acquisition, processing and display performance for repetitive and high-speed transient-capture applications. The DSA 600A Series Digitizing Signal Analyzers provide the ultimate combination of signal acquisition, processing and display performance for repetitive and high-speed transient-capture applications.

Their 1 GHz bandwidth, 2 GS/s single-shot sample rate, long waveform memory, 1 to 8 channel versatility and superb amplifier performance capture events with unsurpassed accuracy. Sophisticated signal processing features transform and combine signals to reveal key phenomena at visually live speeds. The DSA often replaces combinations of instruments through its plug-in flexibility and high-speed signal processing and display features.

In research applications, the DSA provides the bandwidth, sample rate and signal fidelity necessary to deliver accurate results. Signal processing features such as FFT and histograms present the data in the most revealing formats. For circuit design and system debugging, the sophisticated trigger system quickly isolates anomalies such as runt pulses, metastable logic states, setup/hold time violations, and slew-rate errors.

In sequential event applications such as pulsed-laser, radar and ultrasonics, partitioned, non-volatile memory captures each event for further analysis. Display-scan events from memory to find and analyze significant features or examine statistics of the entire collection to determine trends. Transport publication-ready results with the built-in floppy disk.

Figure 1. Isolate setup/hold time violations, metastable states and glitches quickly with time-qualified triggering. Apply the window time base to zoom in for more details. Signal paths are time-matched to probe tips for accuracy.

Figure 2. Capture periodic or transient current and voltage signals and accurately compute instantaneous power. Apply FFT to examine harmonics or switching noise. The TVC 501 directly demodulates pulse-by-pulse PWM.
Figure 3. Analyze digital communications using variable persistence display modes. View in X-Y format for constellation display. Apply horizontal or vertical histograms to analyze jitter. Use cross-correlation for accurate propagation time measurements in extreme-noise environments.

Figure 4. Apply signal processing to perform simulations. Edit the frequency spectrum of a live signal by multiplying its FFT by a filter function. Transform the result back to time-domain using IFFT and see the effects of the digital filter on the live signal. Convolution is also available for filtering.

Figure 5. Rapidly capture a sequence of transient events and store them in non-volatile memory. Scan for significant events and apply measurements to individual waveforms or the entire collection. Annotate, hardcopy and transport publication-ready results on 1.44M MS-DOS compatible floppy disk.

Figure 6. Simultaneously view time and frequency-domain displays of signals at live speeds. Apply harmonic or peak-search cursors for efficient, high-accuracy readout of spectral magnitudes and frequencies. Display magnitude and phase information for repetitive or transient events.

QUICKSTART TRAINING PACKAGE
QuickStart contains application examples, and is a complete and portable training package. It can serve several users for thorough self-study or as a quick, easy reference. The package comes complete with the QuickStart board, workbook, board reference, and power plug. This package is available to purchasers at no additional charge.

Characteristics

VERTICAL SYSTEM
Delta DC Volt Accuracy – ≤1% for an 8-division signal.
Vertical Resolution – 8-Bits. Resolution can be increased to 14-Bits with signal averaging or smoothing.
Bandwidth – To 1 GHz. Determined by the plug-in used. See page 78.
Wide Dynamic Range – 1 mV/div to 10 V/div.

HORIZONTAL SYSTEM
Time Bases (Main and Window) Sweep Speeds – 50 ps/div to 100 s/div.
Record duration – 512 ps to 1024 s in 1-2-5 sequence.
Time Base Accuracy – ±0.005%, ±0.015%: 0 to 45°C ±0.005% 20° to 30°.
Record Length – DSA 601A: 512 to 20,480 pts (single shot); 512 to 32,768 pts (repetitive); DSA 602A: 512 to 32,768 pts (both single shot and repetitive).
Sampling Rate – DSA 601A: 1 GS/s max; DSA 602A: 2 GS/s max.
Main Record Positioning – The main record is positioned with respect to the main trigger point. At maximum pretrigger, all points except the last point in the main record precede the trigger point. At maximum post trigger, all points except the first point in the main record follow the trigger point.
Window Time Base – The main record plus two window records may be acquired and displayed. The window records may be different lengths and can have a different time/div than the main record.
Window Record Positioning – The window records may be positioned with respect to their own trigger points on the main record. Window triggers may be delayed from the main trigger by time or events.
Multi-Trace Pan and Zoom – Multiple traces may be panned and zoomed simultaneously.
Display Interpolation – Zoomed waveforms can be displayed using either sin (x)/x or linear interpolation, or using a dots-only display without any interpolation.

Continued on next page.
Digitizing Signal Analyzers

**Waveform Memory** – More than 210K points of volatile memory shared between acquired and stored waveforms.

**Settings Memory** – Nonvolatile memory for approximately five settings.

**TRIGGERING SYSTEM**
- **Range** – s Full Screen.
- **Bandwidth** – 1 GHz max: 500 MHz for extended triggering.
- **Coupling and Sensitivity** – DC Coupled: 0.4 div from DC to 10 MHz, increasing to 1 div at maximum trigger bandwidth.
- **DC Noise Reject Coupled**: 1.2 divs from DC to 10 MHz, increasing to 3 divs at maximum trigger bandwidth.
- **DC HF Reject Coupled**: 0.5 divs from DC to 30 kHz.
- **AC Coupled**: 0.4 div from 60 Hz to 10 MHz, increasing to 1 div at maximum trigger bandwidth.
- **AC Noise Reject Coupled**: 1.2 divs from 60 Hz to 10 MHz, increasing to 3 divs at maximum trigger bandwidth.
- **AC HF Reject Coupled**: 0.5 div from 60 Hz to 30 kHz.
- **AC LF Reject Coupled**: 0.5 div from 80 kHz to 10 MHz, increasing to 1 div at maximum trigger bandwidth.

**Holdoff Range** – Main record min: 2 μs or less, max: 500 s. Window Record min: 35 ns; max: 1000 s.

**WAVEFORM PROCESSING**
- **Waveform Functions** – Absolute value, average (exponential & summation), convolution, correlation, delay, dejitter, differentiate, envelope, exponential, FFT filter, IFFT integrate, interpolate, logarithm, natural log, pulse, sigmoid, smooth, and square root. Live waveforms can be changed by using adjustable parameters.

**Arithmetic Operators** – Add, subtract, multiply, and divide.

**FFT** – Magnitude and phase; real and imaginary; inverse FFT, correlation, and convolution; six window functions; typical noise floor: -60 dB; -70 dB with averaging.

**Act on Delta** – Save, repeat, chime, SRQ, and hardcopy.

**Histograms** – Vertical or horizontal histograms generated from a user-defined portion of any waveform. Statistical information is provided for histogram data.

**MEASUREMENT SYSTEM**
- **Amplitude** – Min, max, mid, mean, p-p, gain, RMS, overshoot, undershoot, area, energy.
- **Timing** – Rise, fall, width, delay, main-to-window trigger time, period, propagation delay, cross, phase, frequency, duty cycle, and skew.
- **FFT** – Fundamental track, harmonic amplitude, frequency, and total harmonic distortion.
- **Statistics** – Available for any measurement listed above for both live acquisitions and groups of stored waveforms.
- **Cursors** – Single or dual dots, split or paired mode, horizontal and vertical bars, and measurement-zone delimiters. Delta volts, delta time, 1/delta time, and slope.

**INPUT/OUTPUT SYSTEM**
- **Ports** – Centronics, GPIB, and RS-232C ports standards. Fully GPIB and RS-232C programmable.

**Data Transfer Rates** – Up to 100 waveforms per second. Up to 60 measurements per second.

**DISK DRIVE**
- One 3.5 inch microfloppy disk drive, 1.44 MB or 720 KB formatted capacity, depending on disk used. MS/OS compatible formatting.

**CRT AND DISPLAY FEATURES**
- **CRT** – 10 in. diagonal, color, magnetic deflection. Vertical raster-scan orientation.

**Resolution** – 552 horizontal by 704 vertical displayed pixels.

**POWER REQUIREMENTS**
- **Line Voltage Ranges** – 90 to 132 V RMS; 180 to 250 V RMS.
- **Line Frequency** – 48 to 72 Hz.
- **Maximum Power Consumption** – DSA 601A: 465 W max; DSA 602A: 585 W max.

**ENVIRONMENTAL AND SAFETY**
- **Temperature** – (Mainframe) – Operating: 0° to +45°C. Nonoperating: -40° to +75°C.
- **Disk Drive** – Operating: 5° to +45°C. Nonoperating: -22° to +60°C
- **Humidity** – (Mainframe) – Operating and Nonoperating: Up to 95% relative humidity; up to +45°C.
- **Altitude, Vibration, Shock, Bench Handling** – Operating and Nonoperating: meets MIL-T-28800C, Type III, Class 5.
- **Electromagnetic Compatibility** – Referenced to MIL-STD-461B. Meets FCC part 15, subpart J, class A. Meets VDE 0871/6.78 for Class “B.”
- **Safety** – Listed UL 1244; Certified to CSA-C22.2 No. 231-M89.

**PHYSICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Benchtop</th>
<th>Rackmount</th>
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<tbody>
<tr>
<td>Width</td>
<td>457 mm</td>
<td>482 in.</td>
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<tr>
<td>Height</td>
<td>328 mm</td>
<td>311 in.</td>
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<tr>
<td>Depth</td>
<td>678 mm</td>
<td>26.7 in.</td>
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<tr>
<td>Weight</td>
<td>30.9 kg</td>
<td>68.0 lb.</td>
</tr>
<tr>
<td>DSA 601A</td>
<td>30.9 kg</td>
<td>68.0 lb.</td>
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<tr>
<td>DSA 602A</td>
<td>32.7 kg</td>
<td>72.0 lb.</td>
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<td>Shipping</td>
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<td>107.0 lb.</td>
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<tr>
<td>DSA 601A</td>
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<tr>
<td>DSA 602A</td>
<td>49.4 kg</td>
<td>109.0 lb.</td>
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**SAMPLE SHOT ACQUISITIONS**

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<th>DSA 601A</th>
<th>DSA 602A</th>
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<tbody>
<tr>
<td>Sample Rate</td>
<td>500 MS/s</td>
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<tr>
<td>Number of Channels</td>
<td>2</td>
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<tr>
<td>Time Resolution</td>
<td>2 ns</td>
</tr>
<tr>
<td>Record Length</td>
<td>512 to 10K pts</td>
</tr>
</tbody>
</table>
Digitizing Signal Analyzers

- A C C E S S O R Y -

Low Cost, Four Color Plotting

HC100
- Compatible with GPIB, RS-232, Centronic interfaces.
- Plots both U.S. and A4 formats on paper, mylar, and overhead material.
- Graphics and text capability.
- Compact package.

For complete selection information on all Accessory products, see page 424.

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>ACCESSORY</th>
<th>DSA 601A</th>
<th>DSA 602A</th>
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<tbody>
<tr>
<td>Digitizing Signal Analyzer</td>
<td>$27,000</td>
<td>$32,635</td>
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<tr>
<td></td>
<td>Opt. 1C - Cable Feedthrough Connectors.</td>
<td>+$200</td>
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<td>Opt. 1R - Rackmount</td>
<td>+$300</td>
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<td></td>
<td>Opt. 4C - Non-Volatile RAM. Adds over 450,000 points of non-volatile storage</td>
<td>+$1,500</td>
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<tr>
<td></td>
<td>Opt. 1P - HC100 Four-Color Plotter with Opt. 01</td>
<td>+$1,260</td>
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INTERNATIONAL POWER PLUG OPTIONS

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<thead>
<tr>
<th>Option</th>
<th>A1 - Universal Euro 220 V, 50 Hz</th>
<th>NC</th>
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<tbody>
<tr>
<td>Option</td>
<td>A2 - United Kingdom 240 V, 50 Hz</td>
<td>NC</td>
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<tr>
<td>Option</td>
<td>A3 - Australian 240 V, 50 Hz</td>
<td>NC</td>
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<tr>
<td>Option</td>
<td>A4 - North American 240 V, 60 Hz</td>
<td>NC</td>
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<tr>
<td>Option</td>
<td>A5 - Switzerland 220 V, 50 Hz</td>
<td>NC</td>
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See General Customer Information Section for additional description.

WARRANTY-PLUS SERVICE OPTIONS

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<th>DSA 601A</th>
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<tr>
<td>Option</td>
<td>M9 - Repair Protection</td>
<td>DSA 602A</td>
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RECOMMENDED ACCESSORIES

See page 424 for complete selection information.

PROBES

Passive Probe (1 MΩ input) -
- 400 MHz, 11.3 pF/10 MΩ, 1.5 m (11A32, 11A33, 11A34 only). Order P6134C.
- 6 MHz, 105 pF/1 MΩ, 6 ft.; 200 MHz, 14 pF/10 MΩ, 6 ft. (11A32, 11A33, 11A34 only). Order P6063B.

50 Ω Divider (Zo) Probe Set -
Includes: 3.5 GHz, 1 pF/500 MΩ, 10X; 3 GHz, 1.1 pF/5000 MΩ, 10X; 1.5 m. Order P6156 Opt. 29.

Bias/Offset Probe - 10X, 1.5 GHz, 1.6 pF/500 Ω, 1.5 m. Order P6231.

Active Probes -
- 10X, 750 MHz, 2 pF/1 MΩ, 1.5 m. Order P6205.
- 10X, 1 GHz, 1.9 pF/10 MΩ, 1.5 m. Order P6204.
- 10X, 4 GHz, 0.4 pF/100 kΩ, 1 m. Order P6217.

Differential Probe - 10X, 150 MHz Differential Pair, 1.5 m. Order P615A.
- FET 1X/10X, DC - 100 MHz, 1000:1 CMRR. Order P6046.

Current Probe - (1A16 only)
- DC - 50 MHz, 0-20 A (DC + peak AC). Order A6302.
- DC - 15 MHz, 0-100 A (DC + peak AC). Order A6303.

Optical-to-Electrical Converters
- DC - 1 GHz, 1100-1700 mm. Order P6703A.
- DC - 700 MHz, 450-1050 mm. Order P6701A.
- DC - 300 MHz, 1000-1700 mm, High Gain. Order P6713.
- DC - 250 MHz, 450-1050 mm, High Gain. Order P6711.

Cart - Order K473.


Cables -
GPIB, 2 m. Order 012-0630-00.
GPIB, 2 m. Order 012-0991-00.
RS-232, 10 ft. Order 012-0931-00.
Centronics, 10 ft. Order 012-0555-00.

Blank Panels - Plug-in. Order 016-0829-00.

CAMERA/HARD COPY OUTPUT PRINTER
Pen Plotter - Four Color. Order HC100 with Opt. 01.
Camera - Order C9 with Opt. 11.

CAMERA/HARD COPY OUTPUT PRINTER
- * Contact your Tektronix representative for price information.
- ** See page 283 for complete selection information.