

See a World Others Don't: The Story Behind DPO



▶ DPO Provides Unprecedented Signal Insight

Perfect Vision

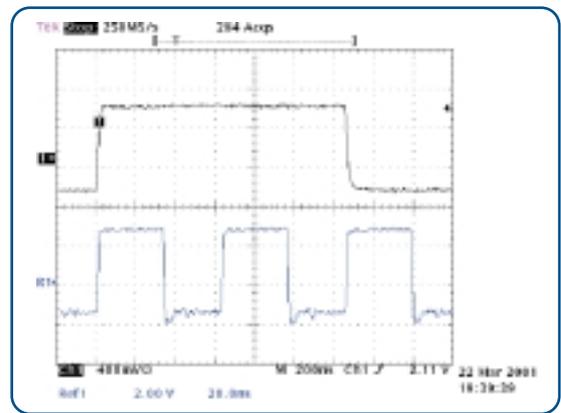
Imagine a world where your oscilloscope lets you see a signal anomaly, pinpoint the nature of the fault and trigger on the event to isolate it; all in a matter of minutes. Imagine debugging in hours, not days. Imagine having total confidence and trust that you're seeing the entire signal. That world exists. Tektronix created it. It's called the Digital Phosphor Oscilloscope (DPO).

Capture Intermittent and Elusive Events in Seconds

DPOs provide an unprecedented level of signal insight using a Tektronix proprietary acquisition technology, DPX™. With capture rates greater than 400,000 waveforms per second, engineers can be confident they have maximum insight into signal activity. This performance results in the highest probability of witnessing transient problems that occur in digital systems, including runt pulses, glitches and transition errors.



▶ Digital Phosphor Oscilloscope (DPO)



▶ Digital Storage Oscilloscope (DSO)

▶ 100 Million Points per Second

A DPO can capture and display up to twice the magnitude of data than traditional DSOs. Elusive glitches, runt pulses and other infrequent signal anomalies are easy to see.

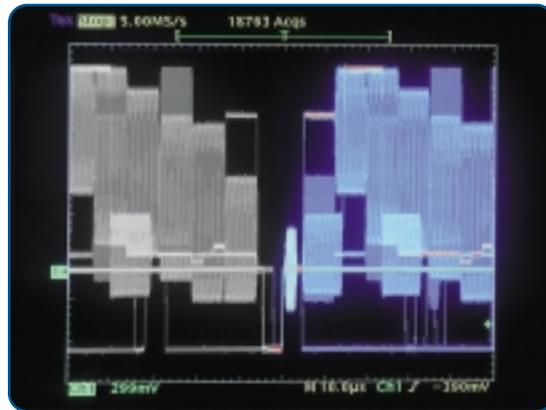
Three Dimensions of Signal Information

A DPO provides increased confidence in capturing all the information about waveform behavior. This increased confidence is achieved by accelerating waveform capture rates well beyond those of even the most advanced DSOs.

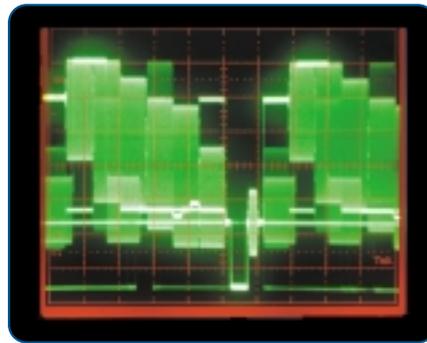
DPOs display, store and analyze complex signals in real time using three dimensions of signal information:

- ▶ Amplitude
- ▶ Time
- ▶ Distribution of amplitude over time

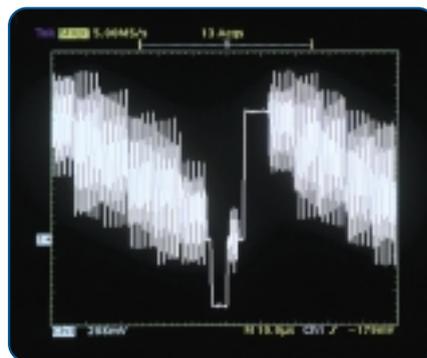
The result is a live-time display that duplicates the feature-rich nature of the signal. Plus, it provides designers with unmatched insight into subtle patterns of behavior and dynamic characteristics of the signal.



▶ Digital Phosphor Oscilloscope



▶ Analog Real Time (ART) Oscilloscope



▶ Digital Storage Oscilloscope

Information-Rich Display

Analog real-time (ART) oscilloscopes provide an information-rich display (middle right). Digital storage oscilloscopes (DSOs) provide a display in a flat, two-dimensional manner (lower right). DPOs (upper right) store waveform data points in a three-dimensional database to provide a live analog-like display.

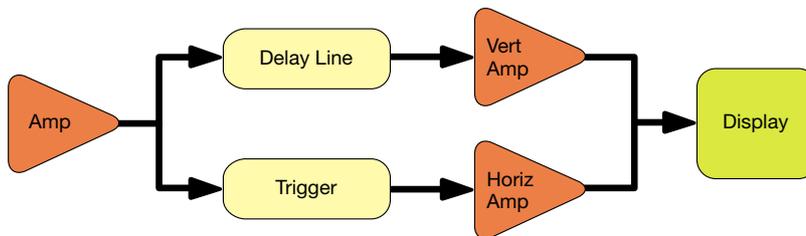
▶ Parallel Processing is Key to DPO

Unique Internal Architecture Powers DPO

The power of a DPO lies in its parallel architecture. The DPO rasterizes the digitized waveform data into a database called the digital phosphor. About every 1/30th of a second, nearly as fast as the eye can

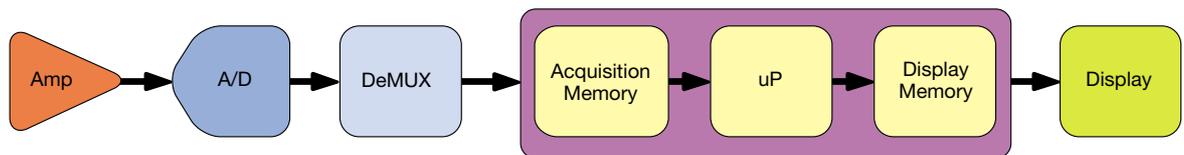
perceive it, a snapshot of the signal image stored in the digital phosphor is sent directly to the display system. This direct rasterization of waveform data, and direct copy-to-display memory, removes any slowdown in data processing.

Analog Processing



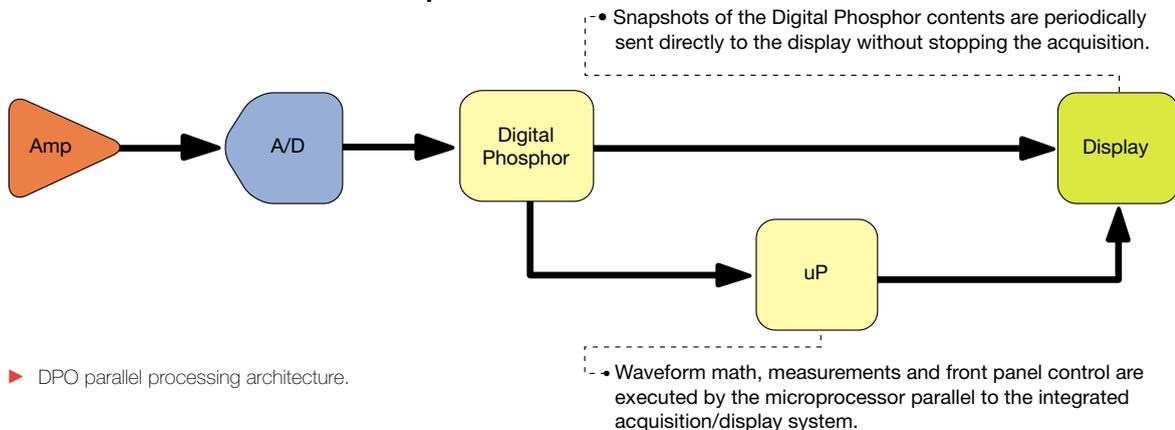
▶ Analog real time oscilloscope's short channel and the CRT (cathode ray tube) display technology provide real-time signal display update and gray-scaled intensity information about signal dynamics.

Serial Processing

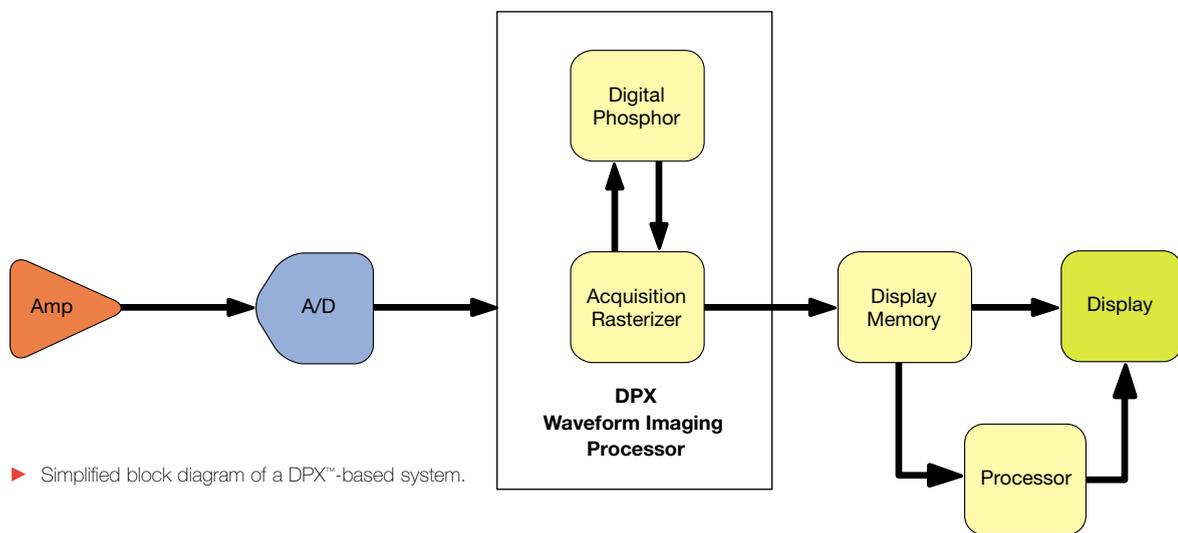


▶ Digital storage oscilloscope's serial processing architecture requires microprocessor intervention in the signal acquisition process. The microprocessor slows down the waveform capture rate.

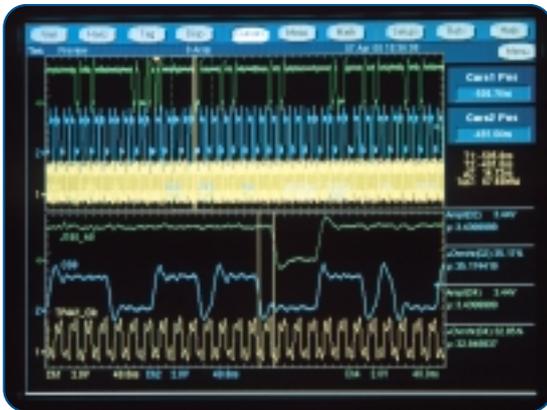
Parallel Architecture Frees Microprocessor



DPX™ Acquisition Technology Provides Maximum Performance



▶ DPX™ Increases Waveform Capture Rate

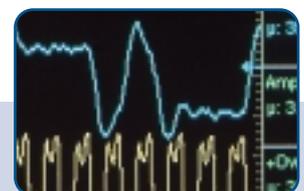
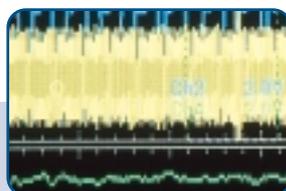
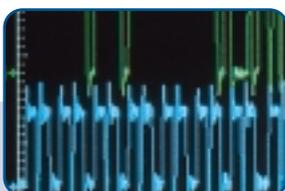


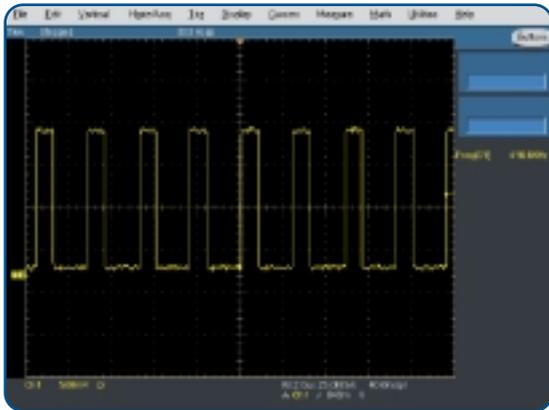
- ▶ DPO shows millions of waveforms in seconds to quickly pinpoint a fault location and trigger on the event.

Find Elusive Faults in Seconds with Exclusive DPX™ Waveform Image Processing

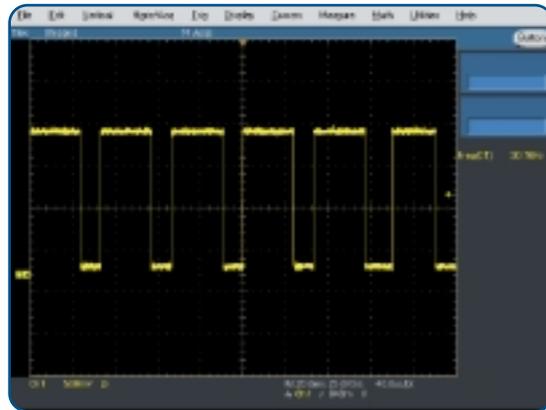
Proprietary Tektronix DPX™ waveform image processing significantly increases the waveform capture rate, thereby increasing the ease of finding rare or random glitches. To truly understand the importance of the DPO's waveform capture rate and signal processing capabilities, consider the way an oscilloscope is used.

Typically, the probe is moved from circuit location to circuit location in the suspected area of the fault, while waveform behavior is observed on the oscilloscope display. The time that the probe remains at any one circuit location varies somewhat but is rarely more than a few seconds. If the oscilloscope does not capture the fault in these few brief moments, then minutes, hours or even days may be spent needlessly looking elsewhere for the source of the elusive fault.





▶ TDS7404's unprecedented trigger rate, at over 400,000 times per second, provides details not available with traditional DSOs.



▶ DSO trigger rates vary between 30 to 700 times per second. DSOs add valuable waveform capture, storage and analysis capabilities for high-speed single-shot, multi-channel acquisition.

DPX™ Technology Reveals Subtle Modulation Patterns

With this kind of power and live-time you can detect runt pulses, glitches and transition errors in seconds that could otherwise take hours with other oscilloscopes. DPX™ technology also reveals subtle modulation patterns in dynamic shaded images. Complex characteristics within eye diagrams and I-Q patterns are easy to see.

Faster Fault Identification with DPOs

The trigger rate of an oscilloscope is driven by two factors; first the *acquisition time* and secondly the *holdoff time* (sometimes referred to as re-arm or dead time). DPOs greatly reduce the holdoff time, resulting in waveform capture rates of up to 400,000 waveforms per second. Simply stated, a DPO acquires and displays as much as two orders of magnitude more waveform information than traditional DSOs to significantly reduce the time it takes to identify elusive faults.

▶ DPO Meets Your Signal Challenges

An Ideal Solution

A DPO is an ideal test and measurement solution for designers working in the computer, communications and video business sectors. Today's complex dynamic signals demand the exceptional live-time, deep signal insight and sophisticated oscilloscope trigger capabilities that a DPO provides.



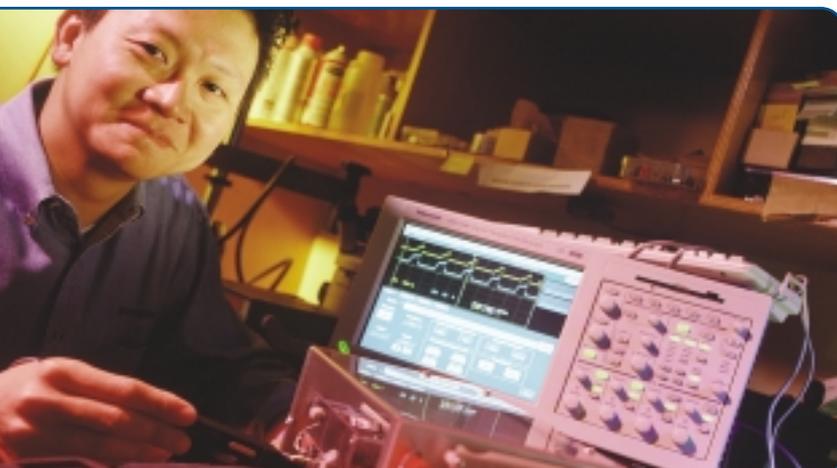
▶ A DPO provides sophisticated processing, analysis and display functions for disk drive measurements.

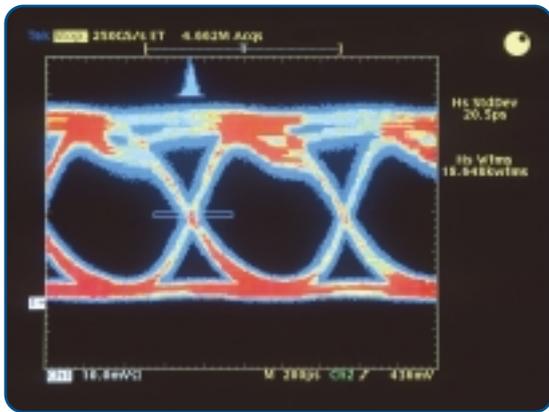
Computer

The challenge: ever-increasing signal rates, ascending clock rates and tighter timing margins. Jitter, asynchronous faults and transient problems are more difficult to see, and are more critical to find than ever before.

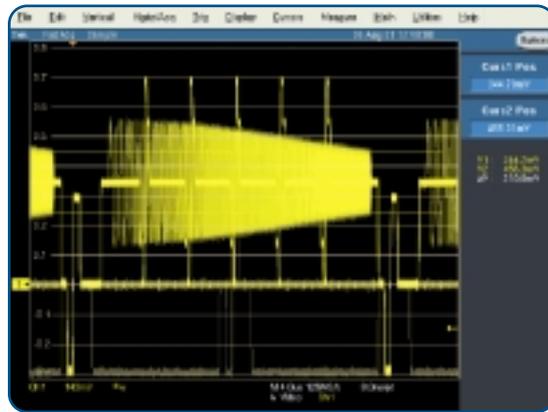
The DPO solution:

- ▶ Fast edge characterization with up to 4 GHz bandwidth and 20 GS/s maximum real-time sample rate.
- ▶ Visual insight into the distribution of edge jitter to the picosecond range.
- ▶ Rapid characterization of complex dynamic signals because millions of waveforms can be captured in seconds.





- ▶ Communications mask testing turns your DPO into a pass/fail test instrument for a wide range of communications standards compliance testing.



- ▶ A DPO brings out the live analog-like display for video measurements.

Communications

The challenge: accurate characterization of dynamic complex signals such as quadrature amplitude modulated (QAM) signals and asynchronous packetized data signals, along with increasing network telecommunications rates, increasing channel counts and higher volume demand.

The DPO solution:

- ▶ Rapid visualization of subtle modulation patterns due to the intensity-graded display.
- ▶ Full bandwidth and continuous acquisition capability for accurate XY and XYZ display.
- ▶ Precise duplication of feature-rich dynamic signals because waveform information is captured and displayed in real time.

Video

The challenge: multiple international broadcast standards, advances in compression technologies and requirements for both analog and digital video signal analysis.

The DPO solution:

- ▶ Analog-like real-time intensity grading for accurate display of familiar RF signal envelope.
- ▶ Smooth analog-style display undistorted by digital aliasing.
- ▶ Deep insight into composite and component waveforms.
- ▶ Line-by-line picture analysis.
- ▶ Qualitative and quantitative feedback on signal noise distribution.



Complete Family of DPOs to Meet Your Test and Measurement Needs

Tektronix' extensive family of DPOs provides enhanced precision and signal insight to engineers characterizing, testing and debugging digital designs. With up to 4 GHz bandwidth, 20 GS/s real-time sample rates and 32 MB record length, DPOs give you the power to acquire your fastest waveforms with crystal clarity, and quickly capture the most elusive random events with confidence. DPOs are equally

suitable for viewing high frequencies, low repetition waveforms, transients and signal variations in real time. Models are available in a range of performance levels to fit your applications, from portable to bench and rack mounted.

A DPO lets you **see a world others don't.**

DPO Family

Model	Bandwidth	No. of Channels	Sample Rate GS/s (1 Ch/All Ch)	Maximum Record Length (1 Ch/All Ch)	Vertical Accuracy	Technology Type	Waveform Capture Rate
TDS7404	4 GHz	4	20/5	32M/8M	1.0%	DPX™ 3rd Generation	400,000 wfms/s
TDS7104	1 GHz	4	10/2.5	16M/4M	0.3%	DPX™ 3rd Generation	200,000 wfms/s
TDS7054	500 MHz	4	5/2.5	16M/4M	0.3%	DPX™ 3rd Generation	200,000 wfms/s
TDS794D	2 GHz	4	4/1	8M/2M	1%	DPX™	200,000 wfms/s
TDS784D	1 GHz	4	4/1	8M/2M	1%	DPX™	200,000 wfms/s
TDS754D	500 MHz	4	2/1	8M/2M	1%	DPX™	200,000 wfms/s
TDS724D	500 MHz	2 + 2	2/1	4M/2M	1%	DPX™	90,000 wfms/s
TDS5104	1 GHz	4	5/1.25	8M/2M	–	DPX™ 3rd Generation	100,000 wfms/s
TDS5052	500 MHz	2	2.5/1.25	4M	–	DPX™ 3rd Generation	100,000 wfms/s
TDS5054	500 MHz	4	5/1.25	8M/2M	1.5%	DPX™ 3rd Generation	100,000 wfms/s
TDS3054B	500 MHz	4	5/5	10K/10K	2%	DPO	3,600 wfms/s
TDS3052B	500 MHz	2	5/5	10K/10K	2%	DPO	3,600 wfms/s
TDS3034B	300 MHz	4	2.5/2.5	10K/10K	2%	DPO	3,600 wfms/s
TDS3032B	300 MHz	2	2.5/2.5	10K/10K	2%	DPO	3,600 wfms/s
TDS3014B	100 MHz	4	1.25/1.25	10K/10K	2%	DPO	2,500 wfms/s
TDS3012B	100 MHz	2	1.25/1.25	10K/10K	2%	DPO	2,500 wfms/s

▶ See a World Others Don't

Performance, Simplicity, Connectivity



▶ TDS7000 Series Applications

Validation/Characterization of High-Speed Digital Designs, Jitter Analysis, Disk Drive Measurements, Power Electronics

Keeping Pace



▶ TDS700D Series Applications

Communication Compliance Testing & Analysis, Video Design/Troubleshooting, Power Measurements

Unprecedented Value



▶ TDS5000 Series Applications

Verification, Debug and Characterization of Designs, Video Design, Jitter Analysis, Power Measurements

Powerful, Portable, Affordable



▶ TDS3000B Series Applications

Communications Mask Testing and Manufacturing, Digital Design/Troubleshooting, Video Service and Installation, Power Supply Design

The integrated tool set for superior measurement and analysis

Oscilloscopes

Whether you are working with semiconductors, computers, communications or other applications, Tektronix offers an oscilloscope ideal for every design, testing or debugging need.



Probes

Tektronix offers a broad range of advanced probes and interconnect devices which enable access to the device under test while maintaining maximum signal fidelity.



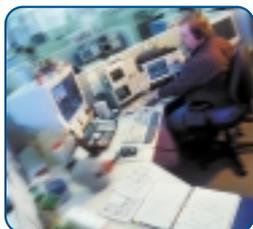
Signal Sources

Using Tektronix' complete line of advanced arbitrary waveform generators and logic sources, you will gain the control, flexibility, repeatability and precision to push your designs to the limits of performance and reliability – the perfect complement to our other leading-edge measurement tools.



Service and Support

When we deliver a Tektronix product to you, we provide support to complete your solution. Our flexible support services are designed to ensure your instruments operate at peak performance and our technical support experts offer application-specific solutions. For more information on our worldwide customer service and support, visit www.tektronix.com/Measurement/Service.



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