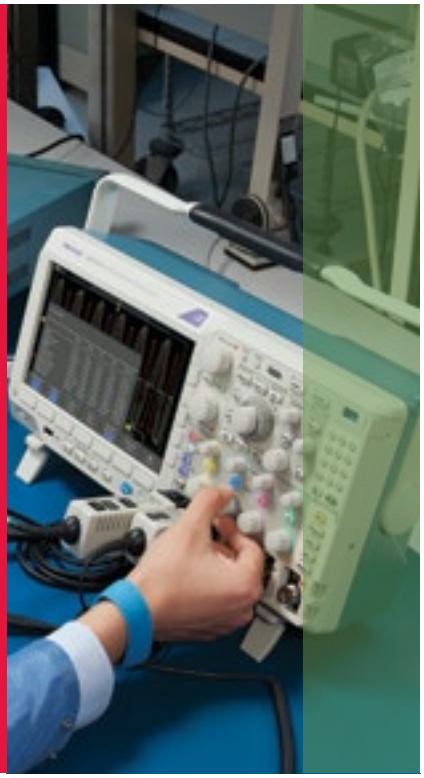
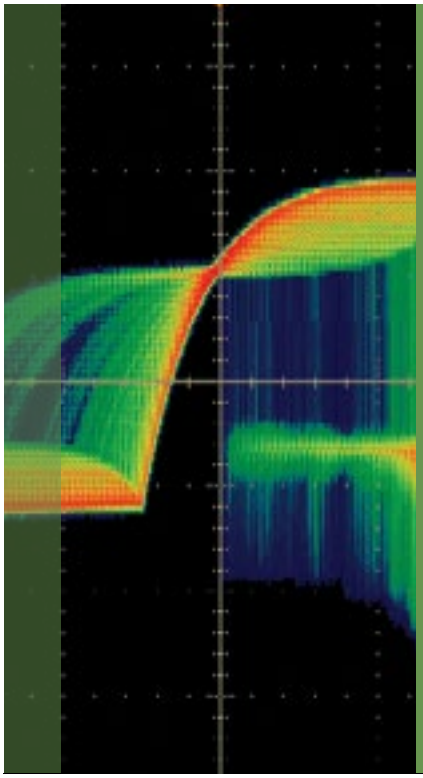
Product Catalog
2014, Volume 1

2014 Product Catalog

Test & Measurement Solutions





KEITHLEY
A Tektronix Company

Tektronix®

Support for the Latest Standards

Working on 100G / 400G communications?

Learn about:

- DSA8300 Series Sampling Oscilloscopes (Page 19)
- Optical Modulation Analyzers (Page 57)
- AWG70000 Series Arbitrary Waveform Generators (Page 41)

Need to test for compliance to standards like USB 3.1? DDR4? PCIe3?

Learn about:

- MSO/DPO70000DX Series Oscilloscopes (Page 18)
- Compliance Testing, Analysis and Debugging Software (Page 27)
- BSA Series Bit Error Rate Testers (Page 48)

Picosecond Pulse Labs

Earlier this year, Picosecond Pulse Labs became part of Tektronix. This move adds ultra-high-speed pattern generators, the world's fastest pulse generators, and the highest bandwidth sampler to Tektronix' offering of test solutions for 100G/400G optical data communications.

Tektronix and Keithley - From Nanovolts to Gigahertz.

SourceMeter® SMUs

Switch Systems

Semiconductor Test Systems

Digital Multimeters

Data Acquisition

Low-level Instruments

Power Supplies

As part of the Tektronix portfolio, Keithley Instruments brings the DC test tools you need to do your job better and with greater confidence. Take a look inside to see the capabilities we provide. Together Tektronix and Keithley address your measurement needs from low level precision measurements to powerful time and frequency domain measurements.

KEITHLEY
A Tektronix Company

Tektronix®

New Products

MDO3000 Mixed Domain Oscilloscope

6 Advanced Instruments in One

Designs have evolved, integrating analog, digital and RF technologies. Now, it's the oscilloscope's turn. Featuring a spectrum analyzer, function generator and more, it's the only scope that comes with the instruments you use most, built-in. It's also upgradeable, enabling you to add instruments and increase bandwidth as your needs grow. So you get unlimited versatility at a starting price that's anything but limiting.

TBS1000B/TBS1000B-EDU

The TBS1000B and TBS1000B-EDU are full featured instruments in a class all their own. Whether you're looking for an oscilloscope that's been specifically designed for teaching labs or one with extensive monitoring and analysis capability, the TBS Series of instruments are an excellent choice to handle everyday test challenges.

PA1000 Power Analyzer

The PA1000 measures power, energy and harmonics of power supplies and any single-phase product connected to the AC line. Best in class accuracy and connectivity make the PA1000 the ideal tool for proving energy efficient designs.

Model 2450 SourceMeter® SMU Instrument with Graphical Touchscreen

Offers the capabilities of analyzers, curve tracers, and I-V systems at a fraction of their cost. Source and measure voltage, current, and resistance with one tightly-coupled instrument. Capacitive touchscreen technology lets you get more done in less time. It's a whole new experience in DC source-measure testing.

For an in-depth look at all of our products, including demos and 360-degree product explorers, please visit www.tektronix.com.

All information on www.tektronix.com supersedes all other information.

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Resources for You

TekTV

From the Video Library you have easy access to nearly all the videos on the site. Browse by product, application, most popular or by video type. View a video, share it, and give us your feedback.

Tektronix Blog

Catch up on the latest information from Tektronix experts!

Special Offers

Check in frequently to find out the latest special promotions.

FAQ

Find answers to common (and not-so-common) questions.

Used Test Equipment

Don't let tight budgets interfere with your work. Tektronix and Keithley refurbished equipment is available at substantial savings, with:

- Guaranteed Quality
- Reliable Performance
- Fast Delivery

Downloads

Our library is full of information designed to enhance your understanding and help you solve measurement challenges.

Oscilloscopes

Oscilloscope Selection Guides, Pages 6 - 10

Choosing Your Oscilloscope

Tektronix offers oscilloscopes for many different applications and uses. To help you choose the right scope for your needs, the most common criteria for selecting a scope are listed below, along with helpful tips for determining your requirements.

1 Bandwidth

All oscilloscopes have a low-pass frequency response that rolls off at higher frequencies. Oscilloscope bandwidth is specified as being the frequency at which a sinusoidal input signal is attenuated to 70.7% of the signal's true amplitude – the -3 dB point. Your oscilloscope must have sufficient bandwidth to capture all relevant frequency components of your signal. If you regularly work with digital signals, it may be easier to consider bandwidth by comparing signal and oscilloscope rise time specifications. Use an oscilloscope with a rise time specification five times faster than your signal rise time to keep error below 2%.

Rule: Bandwidth > 5 X Highest Signal Frequency

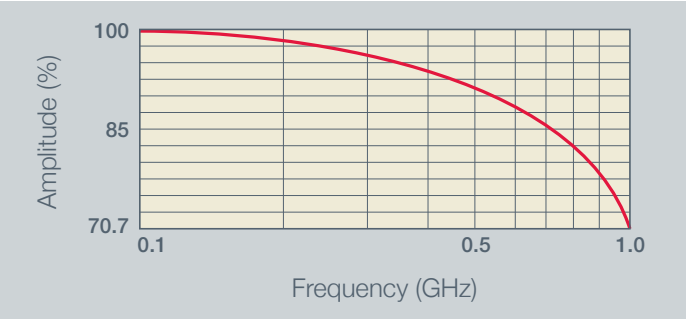


Figure 1: Typical frequency response curve for a general purpose oscilloscope

2 Sample Rate

The faster an oscilloscope samples, the greater the resolution and detail of the displayed waveform, and the less likely that critical information or events will be lost. Tektronix recommends at least 5X oversampling to ensure signal details are captured and to avoid aliasing.

Rule: Sample Rate > 5 x (Highest Frequency Component)

3 Record Length

Record length is the number of samples the oscilloscope can digitize and store in a single acquisition. Since an oscilloscope can store only a limited number of samples, the waveform duration – or length of "time" captured – will be inversely proportional to the oscilloscope's sample rate. A longer record length enables a longer time window to be captured with high resolution.

Rule: Captured Time = (Record Length) / (Sample Rate)

4 Digital Channels and Spectrum Analyzer Input

Today's oscilloscopes offer more than just analog channels for system-level troubleshooting of complex designs.

- If you need to analyze a parallel bus or multiple serial buses, the Tektronix MSO Series of mixed signal oscilloscopes and MDO Series of mixed domain oscilloscopes offer 16 digital channels and up to 4 analog channels for analyzing multiple signals at once.
- If you are working with RF signals, the Tektronix MDO Series of mixed domain oscilloscopes offers a built-in spectrum analyzer for time-correlated analysis of analog, digital and RF signals.

5 Features and Analysis Capability

Tektronix oscilloscopes offer a range of features and analysis capabilities. When choosing your scope, you should review available triggers, waveform search tools, automated measurements, and analysis packages such as serial bus analysis, jitter and power analysis to ensure they meet your needs.

Mixed Signal and Mixed Domain Oscilloscopes

	MSO/DPO2000B	MDO3000
Additional Resources	DATA SHEET	DATA SHEET, VIRTUAL TOUR
Channels	2, 4 analog channels; 16 digital channels (MSO2000B)	2, 4 analog channels; 16 digital channels (with MDO3MSO option)
Bandwidth	70 MHz to 200 MHz	100 MHz to 1 GHz
Spectrum Analyzer Frequency Range	--	Standard: 9 kHz to Analog Bandwidth Optional: 9 kHz to 3 GHz
Sample Rate	1 GS/s (analog); 1 GS/s (digital, only 1 pod); 500 MS/s (digital, both pods)	2.5 GS/s to 5 GS/s (analog); 121.2 ps (8.25 GS/s) MagniVu™ (digital)
Max Record Length	1 Mpoints	10 Mpoints
Trigger Types	Edge, Logic, Pulse Width, Runt, Set-up and Hold, Rise/Fall Time, Video, I²C*, SPI*, CAN*, LIN*, RS-232/422/485/UART*, Parallel (MSO2000B) *Optional	Edge, Sequence, Logic, Pulse Width, Runt, Timeout, Set-up and Hold, Rise/Fall Time, Video, Extended Video, I²C*, SPI*, CAN*, LIN*, FlexRay*, RS-232/422/485/UART*, I²S/LJ/RJ/TDM*, MIL-STD-1553*, USB 2.0*, Parallel (with MDO3MSO option) *Optional
Optional Serial Bus Decode and Analysis	DPO2AUTO: CAN and LIN DPO2COMP: RS-232/422/485/UART DPO2EMBD: I²C, SPI	MDO3AERO: MIL-STD-1553 MDO3AUDIO: I²S, LJ, RJ, TDM MDO3AUTO: CAN and LIN MDO3COMP: RS-232/422/485/UART MDO3EMBD: I²C, SPI MDO3FLEX: FlexRay MDO3USB: USB2.0
Connectivity	USB Host, USB Device, GPIB*, Optional DPO2CONN Module: LAN (10/100 Base-T Ethernet) and Video Out *Optional	USB Host (x2), USB Device, LAN (10/100 Base-T Ethernet), Video Out, GPIB* *Optional
Waveform Math and Analysis	29 Automated Measurements, Waveform and Screen Cursors: Arithmetic Waveform Math, FFT	30 Automated Measurements, Waveform and Screen Cursors, Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics **Optional:** MDO3PWR: Power Analysis MDO3LMT: Limit/mask test
Software	PC communications software: OpenChoice® Desktop	PC Communications Software: OpenChoice® Desktop
Battery Operation	--	--
Available Upgrades	▪ Add serial bus triggering and decode	▪ Increase bandwidth ▪ Add Arbitrary/Function generator ▪ Add 16 digital channels ▪ Increase spectrum analyzer maximum frequency to 3 GHz ▪ Add measurements and analysis (power, limit/mask) ▪ Add serial bus triggering and decode

	Mixed Signal and Mixed Domain Oscilloscopes	Advanced Signal Analysis Oscilloscopes
		
	MDO4000B; MSO/DPO4000B	MSO/DPO5000B
Additional Resources	DATA SHEET VIRTUAL TOUR DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR
Channels	4 analog channels; 16 digital channels; 1 spectrum analyzer input (MDO4000B only)	4 analog channels; 16 digital channels (MSO5000B)
Bandwidth	100 MHz to 1 GHz (analog)	350 MHz to 2 GHz
Spectrum Analyzer Frequency Range	9 kHz - 3 GHz or 9 kHz - 6 GHz (MDO4000B only)	--
Sample Rate	2.5 GS/s to 5 GS/s (analog); 60.6 ps (16.5 GS/s) MagniVu™ (digital)	5 GS/s to 10 GS/s (analog); 60.6 ps (16.5 GS/s) MagniVu™ (digital)
Max Record Length	20 Mpoints	Up to 250 Mpoints
Trigger Types	RF Power Level**, Edge, Sequence, Logic, Pulse Width, Runt, Timeout, Set-up and Hold, Rise/Fall Time, Video, Extended Video*, I²C*, SPI*, USB*, Ethernet*, CAN*, LIN*, FlexRay*, RS-232/422/485/UART*, I²S/LJ/RJ/TDM*, MILSTD-1553*, Parallel *Optional **With optional MDO4TRIG module, RF power level can be used as source for Pulse Width, Timeout, Runt, Logic, Sequence	Edge, Sequence, Logic, Pulse Width, Glitch, Runt, Timeout, Transition, Set-up and Hold, Rise/Fall Time, Video, I²C*, SPI*, USB (Low, Full, High)*, RS-232/422/485/UART*, Parallel (MSO5000B), Visual Trigger *Optional
Optional Serial Bus Decode and Analysis	DPO4AERO: MIL-STD-1553 DPO4AUDIO: I²S, LJ, RJ, TDM DPO4AUTO: CAN and LIN DPO4AUTOMAX: CAN, LIN and FlexRay DPO4COMP: RS-232/422/485/UART DPO4EMBD: I²C, SPI DPO4ENET: Ethernet DPO4USB: USB	SR-AERO: MIL-STD 1553 SR-AUTO: CAN/LIN/FlexRay SR-COMP: RS-232/422/485/UART SR-DPHY: MIPI D-PHY SR-EMBD: I²C, SPI SR-ENET: 10/100Base-T Ethernet SR-USB: USB VNM: CAN, LIN
Connectivity	USB Host (x4), USB Device, LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), Video Out, GPIB* *Optional	USB Host (x6), USB Device, LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), Video Out, GPIB* *Optional
Waveform Math and Analysis	44 Automated Measurements, Waveform and Screen Cursors, Arithmetic Waveform Math, Spectrum Math, FFT, Advanced Math, Measurement Statistics, Waveform Histograms **Optional:** DPO4LMT: Limit and Mask Testing MDO4TRIG: Adv. RF Power Level Trigger DPO4PWR: Power Analysis DPO4VID: HDTV and Custom Triggering	53 Automated Measurements, Waveform and Screen Cursors, Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics, Waveform Histograms, Waveform Limit Testing **Optional:** BRR: BroadR-Reach Compliance Test; DDRA: DDR Memory Bus Analysis; DJA: DPOJET Advanced Jitter and Eye Diagram Analysis; ET3: Ethernet Compliance Test Solution; MTM: Mask Testing; PWR: Power Analysis; SignalVu Vector Signal Analysis; USB: USB Compliance Test Solution; MOST: MOST 50/150 Compliance Test Solution; HSIC: HSIC Electrical Validation; USBPWR: USB Power Adapter/ EPS Compliance Automated Test Solution
Software	PC Communications Software: OpenChoice® Desktop **Optional:** Vector Signal Analysis Software: SignalVu-PC	--
Battery Operation	--	--
Available Upgrades	▪ Add measurements and analysis (power, limit/mask, video, RF trigger) ▪ Add serial bus triggering and decode	▪ Add 16 digital channels ▪ Add extended record length, up to 250 Mpoints ▪ Add serial bus compliance testing ▪ Add measurements and analysis (power, jitter, limit/mask) ▪ Add serial bus triggering and decode

Advanced Signal Analysis Oscilloscopes

	DPO7000C Series	MSO/DPO70000 Series
Additional Resources	DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR
Channels	4 analog channels	4 analog channels; 16 digital channels (MSO70000)
Bandwidth	500 MHz to 3.5 GHz	4 GHz to 33 GHz Analog
Sample Rate	10 GS/s to 40 GS/s	25 GS/s to 100 GS/s (analog); 80 ps (12.5 GS/s) (digital)
Max Record Length	Up to 500 Mpoints	Up to 1Gpoints
Trigger Types	Pinpoint™ Triggering, Edge, Glitch, Pulse Width, Runt, Time-out, Transition. Setup/Hold, Pattern, State, Window, Trigger Delay (by Time and by Event), I²C*, SPI*, USB (Low, Full)*, RS-232/422/485/UART*, Visual Trigger *Optional	Pinpoint™ Triggering, Edge, Glitch, Pulse Width, Runt, Time-out, Transition, Setup/Hold, Pattern, State, Window, Trigger Delay (by Time and by Event), I²C*, SPI*, USB (Low, Full)*, RS-232/422/485/UART*, Serial Pattern*, Visual Trigger* *Optional
Optional Serial Bus Decode and Analysis	SR-AERO: MIL-STD 1553 SR-AUTO: CAN/LIN/FlexRay SR-COMP: RS-232/422/485/UART SR-DPHY: MIPI D-PHY SR-EMBD: I²C, SPI SR-ENET: 10/100Base-T Ethernet SR-PCIE: PCI Express SR-USB: USB LSA: CAN, LIN	SR-AERO: MIL-STD 1553; SR-AUTO: CAN/LIN/FlexRay; SR-COMP: RS-232/422/485/UART; SR-DPHY: MIPI D-PHY; SR-EMBD: I²C, SPI; SR-ENET: 10/100Base-T Ethernet; SR-PCIE: PCI Express; SR-USB: USB; SR-810B: 8b/10b; 10G-KR: 10GBASE-KR/KR4
Connectivity	USB Host (x5), LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), GPIB, eSATA, DVI	USB Host (x5), LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), GPIB, eSATA, DVI
Waveform Math and Analysis	53 Automated Measurements, Waveform and Screen Cursors, Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics, Waveform Histograms, Waveform Limit Testing **Optional:** BRR: BroadR-Reach Compliance Test; DDRA: DDR Memory Bus Analysis; DJA: DPOJET Advanced Jitter and Eye Diagram Analysis; D-PHY: MIPI D-PHY Essentials; ET3: Ethernet Compliance Test Solution; MTM: Mask Testing; PWR: Power Analysis; SignalVu Vector Signal Analysis; USB: USB Compliance Test Solution; MOST: MOST 50/150 Compliance Test Solution; HSIC: HSIC Electrical Validation; USBPWR: USB Power Adapter/ EPS Compliance Automated Test Solution	53 Automated Measurements, Waveform and Screen Cursors, Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics, Waveform Histograms **Optional:** BRR: BroadR-Reach Compliance Test; DDR Memory Bus Analysis; DPOJET Advanced Jitter and Eye Diagram Analysis; Ethernet Compliance; Waveform Limit Testing; Mask Testing; Power Analysis; USB2 and USB3 Compliance and Analysis; USB Power Adapter/ EPS Compliance Automated Test Solution; MOST 50/150 Compliance Test; SignalVu Vector Signal Analysis; HDMI Compliance Test; HSIC Electrical Validation; MIPI D-PHY and M-PHY Characterization and Analysis; SAS Testing; SFP+ Compliance and Debug; Serial Data Link Analysis; 10G-KR Compliance and Debug; PCIe Compliance and Debug; Thunderbolt Characterization, Compliance and Debug; UHS Measurements
Software	--	--
Battery Operation	--	--

Available Upgrades		
	▪ Trade in older 7000 Series platforms for credit toward the newest C version ▪ Series Upgrade (Trade-in with 50% credit of the old scope price) ▪ Add extended record length, up to 500 Mpoints ▪ Add serial bus compliance testing ▪ Add measurements and analysis (power, jitter, mask) ▪ Add serial bus triggering and decode	▪ Increase bandwidth ▪ Add 16 digital channels ▪ Upgrade older platforms to the latest platforms ▪ Add extended record length, up to 1 Gpoints ▪ Add serial Compliance ▪ Add measurements and analysis (jitter, DDR, mask, RF) ▪ Add serial bus triggering and decode

Sampling Oscilloscopes

	DSA8300
Additional Resources	DATA SHEET
Channels	Six modules support up to 8 single ended or 4 differential channels and/or 2 optical channels
Bandwidth	Up to 70+ GHz Electrical bandwidth and 80+ Optical bandwidth modules available with intrinsic jitter as low as <100 fs RMS
Sample Rate	300 ks/s Maximum sample rate
Max Record Length	50 to 16,000 per channel native record length; with up to 1M points when using available IConnect Signal Integrity Software, 10M samples (100k unit intervals, 100 samples per unit interval) when equipped with available 80SJNB Jitter, Noise and BER Analysis software
Trigger Types	Clock Input/Prescale Trigger, TDR clock (generated internally), Clock Recovery from Optical Sampling modules and Electrical Clock Recovery modules, and Phase Reference time base supports acquisitions Free Run mode and Trigger Direct Input for <100 fs RMS intrinsic jitter typical
Optional Serial Bus Decode and Analysis	80SJNB Jitter, Noise, BER, and Serial Data Link Analysis Software; IConnect Signal Integrity Software
Connectivity	3 USB 2.0 Port(s) connector on the front panel, 4 USB 2.0 Ports on the rear panel; LAN PORT, RJ-45 connector, supports 10BASE-T, 100BASE-T, 1000BASE-T on rear panel; 1 Serial Port, DB-9 COM1, COM2 ports; 1 DVI IEEE488.2 connector on rear panel; 1 DVI connector, female on rear panel, DVI to VGA 15-pin D-sub connector adapter provided; PS2 Serial Ports Mouse and keyboard inputs; Audio Ports 1/8 in. microphone input and line output
Waveform Math and Analysis	Over 120 automated measurements include RZ,NRZ, and pulse signal types, and the following measurement types, plus 8 math waveforms using the following math functions: Add, Subtract, Multiply, Divide, Average, Differentiate, Exponential, Integrate, Natural Log, Log, Magnitude,Min, Max, Square Root, and Filter. In addition, measurement values can be utilized as scalars in math waveform definitions. Mask support for many applications, standard masks are available as predefined, built-in masks. Automated Masked Margin based on Mask Hit Ratio as required by many standards.
Software	Windows® 7 Ultimate (32-bit) Operating System IConnect Signal Integrity Software for frequency domain analysis, S-parameter measurements, and impedance characterization 80SJNB Jitter, Noise, BER, and Serial Link analysis including Cross-Talk aware TJ (BUJ) 80SJARB Jitter Analysis of Arbitrary Data with J2-J9 measurements, and support for pattern lengths to PRBS31
Battery Operation	--

Available Upgrades	▪ Modular architecture lets you add channels or bandwidth ▪ Add TDR, optical and electrical standards support ▪ Add advanced analysis, compliance test, frequency domain analysis software ▪ Add clock recovery trigger pickoff (CRTP) to select optical modules ▪ Enhance system jitter floor performance to <100 fs RMS

For more information on sampling topics:

1. Physical Layer Tests of 100 Gb/s Communications Systems
2. Equalization and Serial Data Link Analysis
3. Methods (SDLA) with 80SJNB Advanced Application Note
4. TDR and S-parameter Measurements - How Much Performance Do You Need?
5. TDR Impedance Measurements: A Foundation for Signal Integrity
6. Practices for Measurements on 25 Gb/s Signaling

	Basic Oscilloscopes		Battery Powered Oscilloscopes with Isolated Channels	
				
	TBS1000	TBS1000B/ TBS1000B-EDU	THS3000	TPS2000B
Additional Resources	DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR
Channels	4	2	4 (isolated)	2, 4 (isolated)
Bandwidth	60 MHz to 150 MHz	50 MHz to 200 MHz	100 MHz to 200 MHz	100 MHz to 200 MHz
Sample Rate	1 GS/s	1 GS/s to 2 GS/s	2.5 GS/s to 5 GS/s	1 GS/s to 2 GS/s
Max Record Length	2.5 k points	2.5 k points	10 k points	2.5 k points
Trigger Types	Edge, Pulse (width), Video	Edge, Pulse (width), Video	Edge, Pulse (width), Event, Video, Non-interlaced	Edge, Pulse (width), Video
Optional Serial Bus Decode and Analysis	--	--	--	--
Connectivity	USB Host, USB Device, GPIB* *Optional	USB Host, USB Device, GPIB* *Optional	USB Host, USB Device	RS-232 (includes RS-232-to-USB Host Serial Cable), Centronics, CompactFlash
Waveform Math and Analysis	16 Automated Measurements, Arithmetic Waveform Math, FFT, Waveform Limit Testing, Automated Datalogging	34 Automated Measurements, Arithmetic Waveform Math, FFT, Dual channel Frequency Counter, Waveform Limit Testing*, TrendPlot™ function*, Automated Datalogging* * Not available on EDU models	21 Automated Measurements, Arithmetic Waveform Math, FFT	11 Automated Measurements, Arithmetic Waveform Math, FFT **Optional:** TPS2PWR1: Power Measurement and Analysis
Software	PC Communications Software: OpenChoice® Desktop, Educator Classroom and Lab Resource CD	PC Communications Software: OpenChoice® Desktop Software, PC Courseware Editor Tool, Product Documentation and Lab Resource CD	PC Communications Software: OpenChoice® Desktop	PC Communications Software: OpenChoice® Desktop, NI LabVIEW SignalExpress™ Tektronix Edition LE
Battery Operation	--	--	One THSBAT Battery Pack Included Standard	One TPSBAT Battery Pack Included Standard

The World's First Dedicated Teaching Oscilloscope

The TBS1000B-EDU Digital Storage Oscilloscope Series is designed specifically to meet the needs of today's schools and universities. It's the first oscilloscope to use the innovative new courseware system that enables educators to seamlessly integrate teaching materials onto an oscilloscope. Along with a powerful PC Courseware Editor Tool and a courseware website the TBS1000B-EDU supports a complete education ecosystem that uncovers new ways of enhancing the teaching and learning experience.

TDS Series Oscilloscopes

	TDS2000C	TDS3000C
Additional Resources	DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR
Channels	2, 4	2, 4
Bandwidth	50 MHz to 200 MHz	100 MHz to 500 MHz
Sample Rate	500 MS/s to 2 GS/s	1.25 GS/s to 5 GS/s
Max Record Length	2.5 k points	10 k points
Trigger Types	Edge, Pulse (width), Video	Edge, Logic (Pattern, State), Pulse (Glitch, Width, Runt, Slew Rate), Video, Extended Video*, Comm* *Optional
Optional Serial Bus Decode and Analysis	--	--
Connectivity	USB Host, USB Device, GPIB* *Optional	USB Host, LAN (10Base-T Ethernet) **Optional:** TDS3GV Module: GPIB, RS-232, and Video Out
Waveform Math and Analysis	16 Automated Measurements, Arithmetic Waveform Math, FFT, Waveform Limit Testing, Automated Datalogging	25 Automated Measurements, Arithmetic Waveform Math, FFT **Optional:** TDS3LIM: Limit Testing TDS3TMT: Telecom Mask Testing TDS3VID: HDTV and Custom Video Triggering
Software	PC Communications Software: OpenChoice® Desktop, NI LabVIEW SignalExpress™ Tektronix Edition LE	PC Communications Software: OpenChoice® Desktop, NI LabVIEW SignalExpress™ Tektronix Edition LE
Battery Operation	--	Requires Optional TDS3BATC Battery Pack

Tektronix Reference Library

With over 20,000 items in our premium content library, it is likely you can find answers on our website to whatever questions you have. Here is a list of our most popular downloaded content for oscilloscopes. Visit www.tektronix.com to download your copy.

1. XYZs of Oscilloscopes Primer
2. ABCs of Probes Primer
3. Fundamentals of the MDO4000B Series Mixed Domain Oscilloscopes
4. Fundamentals of Signal Integrity Primer
5. Debugging Serial Buses in Embedded Systems Designs Application Note
6. Power Supply Measurement and Analysis Primer

DATA SHEET

MSO/DPO2000B Series

Test more, spend less with an oscilloscope that's packed with features and is also light on price. Measure as many as 20 channels of analog and digital signals. Speed debug with automated serial and parallel bus analysis. Search your entire record instantly with Wave Inspector®. Entry level has never been so powerful.

Product Highlights

- 1 Mpoint record length on all channels
- Over 125 available trigger combinations, including setup/hold, serial packet and parallel data
- Automated search and easy waveform navigation with Wave Inspector®
- 29 automated measurements and FFT analysis
- 5-year warranty

Quickly pan/zoom and automatically search your waveforms with Wave Inspector®.

Automatically trigger, decode and search your serial buses with optional analysis modules.

Models	Analog Channels	Digital Channels	Analog Bandwidth	Analog Sample Rate
DPO2002B	2	--	70 MHz	1 GS/s
MSO2002B	2	16	70 MHz	1 GS/s
DPO2004B	4	--	70 MHz	1 GS/s
MSO2004B	4	16	70 MHz	1 GS/s
DPO2012B	2	--	100 MHz	1 GS/s
MSO2012B	2	16	100 MHz	1 GS/s
DPO2014B	4	--	100 MHz	1 GS/s
MSO2014B	4	16	100 MHz	1 GS/s
DPO2022B	2	--	200 MHz	1 GS/s
MSO2022B	2	16	200 MHz	1 GS/s
DPO2024B	4	--	200 MHz	1 GS/s
MSO2024B	4	16	200 MHz	1 GS/s

Application Modules

Serial Bus Triggering and Protocol Analysis	
DPO2AUTO	Automotive (CAN, LIN)
DPO2COMP	Computer (RS-232)
DPO2EMBD	Embedded (I^2C, SPI)

Recommended Accessories

DPO2CONN	Ethernet and Video Out Connectivity Module
119-7465-xx	TekVPI External Power Supply
ACD2000	Soft Carrying Case

Recommended Probes

Passive Voltage Probes	
TPP0200	200 MHz, 300 V CAT II
Active Voltage Probes	
TAP1500*1	10X, 1.5 GHz, ± 8 V
Differential Voltage Probes	
TDP0500*1	500 MHz, ± 42 V/± 4.25 V
High Voltage Probes	
THDP0200*1	200 MHz, ± 1500 V/± 150 V
TMDP0200*1	200 MHz, ± 750 V/± 75 V
THDP0100*1	100 MHz, ± 6000 V/± 600 V
Current Probes	
TCP2020	50 MHz, 20 A DC/20 A RMS/ 100 A Peak/10 mA Min
TCP0030A*1	120 MHz, 30 A DC/30 A RMS/ 50 A Peak/1 mA Min
TCP0150*1	20 MHz, 150 A DC/150 A RMS/ 500 A Peak/5 mA Min

*1 Requires 119-7465-xx TekVPI External Power Supply

Another Product for Consideration

Need an arbitrary/function generator for your project? The MDO3000 Series features six integrated instruments to capture analog, digital and RF signals with one scope.

Need more bandwidth? The MDO3000 Series offers up to 1 GHz analog bandwidth.

Ships with Product

- One TPP0100 100MHz, 10X Passive Probe Per Analog Channel (70 MHz model)
- One TPP0200 200 MHz, 10X Passive Probe Per Analog Channel (100 MHz & 200 MHz models)
- One P6316 16 Channel Logic Probe (MSO only)
- OpenChoice® Desktop Software
- Calibration Certificate, Quick Reference Manual & Documentation on CD, Power Cord
- 5-year Warranty

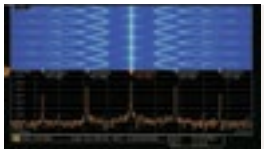
DATA SHEET

VIRTUAL TOUR

360° VIEW

Product Highlights

- Integrated 6-in-1 oscilloscope that offers a spectrum analyzer, arbitrary function generator, logic analyzer, protocol analyzer and digital voltmeter
- Spectrum Analyzer standard on all models
- 10 Mpoint record length on all channels
- >280,000 wfm/s max. waveform capture rate with FastAcq
- Automated search and waveform navigation with Wave Inspector®



Monitor slowly changing RF events at a glance with spectrogram display.

MDO3000 Series

This scope features six integrated instruments to capture analog, digital and RF signals with one scope. And add instruments, analysis functions and bandwidth as your needs change.

Models	Analog Channels	Digital Channels (Optional)	Analog Bandwidth	Analog Sample Rate	Digital Sample Rate Main/MagniVu™	Spectrum Analyzer Input	Spectrum Analyzer Frequency Range Standard/Optional
MDO3012	2	16	100 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 100 MHz / 9 kHz - 3 GHz
MDO3014	4	16	100 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 100 MHz / 9 kHz - 3 GHz
MDO3022	2	16	200 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 200 MHz / 9 kHz - 3 GHz
MDO3024	4	16	200 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 200 MHz / 9 kHz - 3 GHz
MDO3032	2	16	350 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 350 MHz / 9 kHz - 3 GHz
MDO3034	4	16	350 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 350 MHz / 9 kHz - 3 GHz
MDO3052	2	16	500 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 500 MHz / 9 kHz - 3 GHz
MDO3054	4	16	500 MHz	2.5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 500 MHz / 9 kHz - 3 GHz
MDO3102	2	16	1 GHz	5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 1 GHz / 9 kHz - 3 GHz
MDO3104	4	16	1 GHz	5 GS/s	500 MS/s / 8.25 GS/s	1	9 kHz - 1 GHz / 9 kHz - 3 GHz

Instrument Options**

MDO3AFG	Arbitrary function generator
MDO3MSO	16 digital channels; includes P6316 digital probe and accessories
MDO3SA	Increase spectrum analyzer input frequency range to 9 kHz – 3 GHz
MDO3SEC	Add password protected security to enable or disable all communication ports and firmware upgrades

Application Modules

Serial Bus Triggering and Protocol Analysis	
MDO3AERO	Aerospace (MIL-STD-1553)
MDO3AUDIO	Audio (I²S, LJ, RJ and TDM)
MDO3AUTO	Automotive (CAN, LIN)
MDO3COMP	Computer (RS-232)
MDO3EMBD	Embedded (I²C, SPI)
MDO3FLEX	Automotive (FlexRay)
MDO3USB*	USB 2.0 (LS, FS, HS)

Application Modules

Additional Analysis	
MDO3PWR	Power Analysis
MDO3LMT	Limit/Mask Test

Recommended Probes

Passive Voltage Probes	
TPP0502	2X, 500 MHz, 300 V CAT II
Active Voltage Probes	
TAP1500	10X, 1.5 GHz, 8V
High Voltage Probes	
TMDP0200	250X/25X, 200 MHz, ± 750 V / ± 75 V
THDP0200	1000X/100X, 100 MHz, ± 6000 V / ± 600 V
TPP0850	50X, 800 MHz, 2500 V Peak
P5100A	100X, 500 MHz, 2500 V Peak
Differential Voltage Probes	
TDP1000	50X/5X, 1 GHz, ± 42 V, ± 4.25 V

* USB 2.0 HS only available on 1 GHz analog bandwidth models and only for HS analysis.

** Can be preconfigured from the factory or ordered as stand-along upgrade kits.

Recommended Probes

Current Probes	
TCP0020	50 MHz, 20 A DC/20 A RMS/100 A Peak/10 mA Min
TCP0030A	120 MHz, 30 A DC/30 A RMS/50 A Peak/1 mA Min
TCP0150	20 MHz, 150 A DC/150 A RMS/500 A Peak/5 mA Min

Ships with Product

- One Low C Passive Probe Per Channel, TPP100 on 1 GHz Models, TPP0500B on 350 and 500 MHz Models, TPP0250 on all 100 and 200 MHz Models
- One P6316 16 Channel Logic Probe (with option MDO3MSO only)
- N-to-BNC Adapter
- OpenChoice® Desktop
- Calibration Certificate, Installation and Safety Manual, & Documentation on CD
- Accessory Bag
- Front Panel Lauguage Overlay (if other than English)
- Power Cord
- 3-year Warranty

DATA SHEET

VIRTUAL TOUR

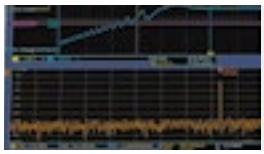
360° VIEW

MDO4000B Series

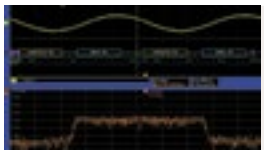
The new revolutionary oscilloscope with a built-in spectrum analyzer. Capture synchronized analog, digital and RF signals for a complete, time correlated system view of your device. See both time and frequency domains in one glance. View the RF spectrum at any point in time to see how it changes. Quickly and efficiently solve the most complicated design issues—with an oscilloscope as integrated as your designs.

Product Highlights

- The world's first oscilloscope with a built-in spectrum analyzer
- Up to 3 GHz capture bandwidth on the spectrum analyzer input
- Integrated spectral analysis tools: automated and manual markers, spectrogram display, RF vs. time traces
- Advanced modulation analysis: MDO4000B with SignalVu-PC offers industry's widest bandwidth vector signal analyzer
- Built on the MSO4000B Series mixed signal oscilloscope platform



Use it as an oscilloscope OR a spectrum analyzer OR combined to capture synchronized analog, digital and RF signals.



See how your RF spectrum changes over time or device state.

Models	Analog Channels	Digital Channels	Analog Bandwidth	Analog Sample Rate	Digital Sample Rate Main/MagniVu™	Spectrum Analyzer Input	Spectrum Analyzer Frequency Range
MDO4014B-3	4	16	100 MHz	2.5 GS/s	500 MS/s /16.5 GS/s	1	9 kHz – 3 GHz
MDO4034B-3	4	16	350 MHz	2.5 GS/s	500 MS/s /16.5 GS/s	1	9 kHz – 3 GHz
MDO4054B-3	4	16	500 MHz	2.5 GS/s	500 MS/s /16.5 GS/s	1	9 kHz – 3 GHz
MDO4054B-6	4	16	500 MHz	2.5 GS/s	500 MS/s /16.5 GS/s	1	9 kHz – 6 GHz
MDO4104B-3	4	16	1 GHz	5 GS/s	500 MS/s /16.5 GS/s	1	9 kHz – 3 GHz
MDO4104B-6	4	16	1 GHz	5 GS/s	500 MS/s /16.5 GS/s	1	9 kHz – 6 GHz

Application Modules

Serial Bus Triggering and Protocol Analysis	
DPO4AE-RO	Aerospace (MIL-STD 1553)
DPO4 AUDIO	Audio (I^2S, LJ, RJ and TDM)
DPO4AUTO	Automotive (CAN, LIN)
DPO4-AUTOMAX	Automotive (CAN, LIN, FlexRay)
DPO4COMP	Computer (RS-232)
DPO4EMBD	Embedded (I^2C, SPI)
DPO4ENET	Ethernet (10BASE-T, 100BASE-TX)
DPO4USB*1	USB 2.0 (LS, FS, HS)
Additional Analysis	
MDO4TRIG	Adv. RF Power Level Triggering
DPO4PWR	Power Analysis
DPO4LMT	Limit and Mask Testing
DPO4VID	HDTV & Custom Video Triggering
SignalVu-PC-SVE	Vector Signal Analysis Software

*1 USB 2.0 HS only available on 1 GHz analog bandwidth models.

Recommended Service

SILV900	5-year Extended Warranty

Recommended Probes

Passive Voltage Probes	
TPP1000	10X, 1 GHz, 300 V CAT II
TPP0500B	10X, 500 MHz, 300 V CAT II
TPP0502	2X, 500 MHz, 300 V CAT II
Active Voltage Probes	
TAP1500	10X, 1.5 GHz, ± 8 V
Differential Voltage Probes	
TDP0500	50X/5X, 500 MHz, ± 42 V/± 4.2 V
TDP1000	50X/5X, 1 GHz, ± 42 V/± 4.2 V
High Voltage Probes	
THDP0200	500X/50X, 200 MHz, ± 1500 V/± 150 V
TPP0850	50X, 800 MHz, 2500 V Peak
Current Probes	
TCP0030A	120 MHz, 30 A DC/30 A RMS/50 A Peak/1 mA Min

Ships with Product

- Four TPP0500B (≤500 MHz models) or TPP1000 (1 GHz models) Passive Voltage Probes
- One P6616 16 Channel Logic Probe
- N-to-BNC Adapter (103-0045-00)
- OpenChoice® Desktop Software
- Calibration Certificate, Quick Reference Manual & Documentation on CD
- Front Panel Cover, Accessory Bag, Power Cord
- 3-year Warranty

Learn more with "Wi-Fi: Overview of the 802.11 Physical Layer and Transmitter Measurements" primer.

DATA SHEET

VIRTUAL TOUR

360° VIEW

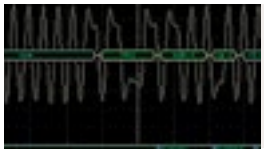
MSO/DPO4000B Series

Debug complex designs faster with an oscilloscope that's as versatile as it is powerful. Measure up to 20 channels of analog and digital signals. Analyze serial and parallel buses. Instantly search your entire record with the time-saving Wave Inspector®. Finally, an oscilloscope that multitasks as well as you do.

Product Highlights

- Up to 20 Mpoint record length on all channels
- >50,000 wfm/s max. waveform capture rate with DPO technology
- Over 125 available trigger combinations, including setup/hold, serial packet and parallel data
- Automated search and easy waveform navigation with Wave Inspector®
- 41 automated measurements and FFT analysis

Ships with one passive probe per analog channel, with up to 1 GHz bandwidth and an industry-best 3.9 pF of capacitive loading.



Automatically trigger, decode and search your serial and parallel bus.

Models	Analog Channels	Digital Channels	Bandwidth	Record Length (Max)	Analog Sample Rate (Max)	Digital Sample Rate Main/MagniVu™
DPO4014B	4	--	100 MHz	20M	2.5 GS/s	--
MSO4014B	Replaced by MDO4014B-3. All the capabilities of MSO + Spectrum Analyzer					
DPO4034B	4	--	350 MHz	20M	2.5 GS/s	--
MSO4034B	Replaced by MDO4034B-3. All the capabilities of MSO + Spectrum Analyzer					
DPO4054B	4	--	500 MHz	20M	2.5 GS/s	--
MSO4054B	Replaced by MDO4054B-3. All the capabilities of MSO + Spectrum Analyzer					
DPO4102B-L	2	--	1 GHz	5M	5 GS/s	--
DPO4102B	2	--	1 GHz	20M	5 GS/s	--
DPO4104B-L	4	--	1 GHz	5M	5 GS/s	--
DPO4104B	4	--	1 GHz	20M	5 GS/s	--
MSO4102B-L	2	16	1 GHz	5M	5 GS/s	500 MS/s /16.5 GS/s
MSO4102B	2	16	1 GHz	20M	5 GS/s	500 MS/s /16.5 GS/s
MSO4104B-L	4	16	1 GHz	5M	5 GS/s	500 MS/s /16.5 GS/s
MSO4104B[*1]	4	16	1 GHz	20M	5 GS/s	500 MS/s /16.5 GS/s

Application Modules

Serial Bus Triggering and Analysis	
DPO4AERO	Aerospace (MIL-STD 1553)
DPO4-AUDIO[*2]	Audio (I^2S, LJ, RJ and TDM)
DPO4AUTO	Automotive (CAN, LIN)
DPO4-AUTOMAX	Automotive (CAN, LIN, FlexRay)
DPO4COMP	Computer (RS-232)
DPO4EMBD[*3]	Embedded (I^2C, SPI)
DPO4ENET	Ethernet (10Base-T, 100Base-Tx)
DPO4USB[*4]	USB 2.0 (LS, FS, HS)
DPO4PWR	Power Analysis
DPO4LMT	Limit and Mask Testing
DPO4VID	HDTV & Custom Video Triggering

Recommended Probes

Passive Voltage Probes	
TPP1000	1 GHz, 300 V CAT II
TPP0502	2X, 500 MHz, 300 V CAT II
Active Voltage Probes	
TAP1500	10X, 1.5 GHz, ± 8 V
Differential Voltage Probes	
TDP0500	500 MHz, ± 42 V/± 4.25 V
TDP1000	1 GHz, ± 42 V/± 4.25 V
High Voltage Probes	
TMDP0200	200 MHz, ± 750 V/± 75 V
TPP0850	50X, 800 MHz, 2500 V Peak
Current Probes	
TCP0030A	120 MHz, 30 A DC/30 A RMS/50 A Peak/1 mA Min

Another Product for Consideration

Working with RF? The MDO4000B Series is the world's only oscilloscope with a built-in spectrum analyzer for capturing and analyzing synchronized analog, digital and RF signals.

Ships with Product

- One TPP0500B (≤ 500 MHz models) or TPP1000 (1 GHz models) Passive Voltage Probe Per Analog Channel
- One P6616 16 Channel Logic Probe (MSO only)
- OpenChoice® Desktop Software
- Calibration Certificate, Quick Reference Manual & Documentation on CD
- Front Panel Cover, Accessory Bag, Power Cord
- 3-year Warranty

[*1] See the MDO4104B-3 for an MSO + Spectrum Analyzer.
[*2] Not available on DPO4102B, DPO4102B-L models.
[*3] For SPI, only 2-wire support is available on DPO4102B, DPO4102B-L.
[*4] USB 2.0 HS only available on 1 GHz analog bandwidth models.

DATA SHEET

VIRTUAL TOUR

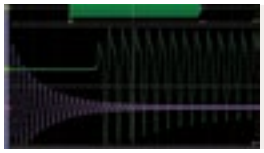
360° VIEW

MSO/DPO5000B Series

Today's faster data rates and tighter timing margins requires an oscilloscope with outstanding signal acquisition performance and analysis capabilities. Tektronix MSO/DPO5000B Series oscilloscopes provide exceptional signal fidelity, with 2 GHz and 10 GS/s sample rate, along with advanced analysis and math capabilities. MSO models include 16 digital timing channels, and all models can be equipped to decode common serial protocols, to provide a comprehensive view of your systems.

Product Highlights

- 350 MHz, 500 MHz, 1 GHz,and 2GHz models
- >250,000 wfm/s max. waveform capture rate with FastAcq™ technology
- 10 GS/s max sampling and 250 Mpoints memory (optional)
- Extensive analysis including jitter/timing and user defined math (i.e. MATLAB)
- Visual tirggering standard with search and mark



Achieve greater than 11 bits vertical resolution with Hi-Res sampling and reduce unwanted noise while capturing signal details.

Perform advanced protocol triggering and decode on mid-speed and low-speed serial and buses (optional).

Models	Analog Channels	Digital Channels	Analog Bandwidth	Analog Sample Rate (4 Channels/2 Channels)	Digital Sample Rate Main/MagniVu™
DPO5034B	4	--	350 MHz	5 GS/s	--
MSO5034B	4	16	350 MHz	5 GS/s	500 MS/s /16.5 GS/s
DPO5054B	4	--	500 MHz	5 GS/s	--
MSO5054B	4	16	500 MHz	5 GS/s	500 MS/s /16.5 GS/s
DPO5104B	4	--	1 GHz	5 GS/s /10 GS/s	--
MSO5104B	4	16	1 GHz	5 GS/s /10 GS/s	500 MS/s /16.5 GS/s
DPO5204B	4	--	2 GHz	5 GS/s /10 GS/s	--
MSO5204B	4	16	2 GHz	5 GS/s /10 GS/s	500 MS/s /16.5 GS/s

Software Packages

Serial Bus Triggering and Protocol Analysis	
SR-AERO	MIL-STD-1553B
SR-AUTO	CAN/LIN/FlexRay
SR-COMP	Computer (RS-232)
SR-DPHY	MIPI D-PHY
SR-EMBD	Embedded (I^2C, SPI)
SR-ENET	Ethernet
SR-USB	USB 2.0 (LS, FS, HS)
Compliance Test	
BRR	BroadR-Reach
ET3	Ethernet
MOST	MOST50/150
USB	USB 2.0
Additional Analysis	
DDRA	DDR Memory
DJA	Advanced Jitter Analysis
HSIC	HSIC Electrical Characterization
PS2, 3	Power Solution Bundles
PWR	Power Analysis
SVE	SignalVu RF Analysis
USBPWR	USB Power Compliance

Additional software packages are available. For a complete listing, please visit www.tektronix.com/mso5000

Recommended Probes

Passive Voltage Probes	
TPP1000	10X, 1 GHz, 300 V CAT II
TPP0502	2X, 500 MHz, 300 V CAT II
Active Voltage Probes	
TAP1500	10X, 1.5 GHz, ± 8 V
TAP2500	10X, 2.5 GHz, ± 4 V
Differential Voltage Probe	
TDP0500	500 MHz, ± 42 V/± 4.2 V
TDP1000	1 GHz, ± 42 V/± 4.2 V
TDP1500	1.5 GHz, ± 8.5 V/± 850 mV
High Voltage Probes	
TMDP0200	200 MHz, ± 750 V/± 75 V
THDP0200	200 MHz, ± 1500 V/± 150 V
THDP0100	100 MHz, ± 6000 V/± 600 V
TPP0850	50X, 800 MHz, 2500 V Peak
Current Probes	
TCP0020	50 MHz, 20 A DC/20 A RMS/100 A Peak/10 mA Min
TCP0030A	120 MHz, 30 A DC/30 A RMS/50 A Peak/1 mA Min
TCP0150	20 MHz, 150 A DC/150 A RMS/500 A Peak/5 mA Min

Ships with Product

- Four TPP0500B (350 MHz and 500 MHz models) or TPP1000 (1 GHz and 2 GHz models) Passive Voltage Probes
- One P6616 16 Channel Logic Probe (MSO only)
- Calibration Certificate, Quick Reference Manual & Documentation on CD
- Front Panel Cover, Accessory Bag, Power Cord
- 1-year Warranty

Instrument Options

Record Length	
Opt. 5RL	50M/Ch
Opt. 10RL	125M/Ch

Limitations apply. See data sheet for full details.

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty

DATA SHEET

VIRTUAL TOUR

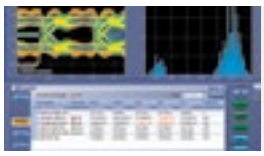
360° VIEW

DPO7000C Series

Complex designs tremble before this oscilloscope. Packed with features like DPX® technology for fast waveform capture rates, advanced Pinpoint® triggering, and over 30 application software packages, it speeds debug and analysis of performance devices. It's a time-strapped engineer's dream come true.

Product Highlights

- 500 MHz,1 GHz, 2.5 GHz, and 3.5 GHz models
- Windows 7 Ultimate 64-bit operating system and touch-screen display
- >250,000 wfm/s max. waveform capture rate with FastAcq™ technology
- Over 1400 available trigger combinations with Pinpoint® triggering
- Automated search and mark for waveform events
- 53 automated measurements and FFT analysis



Includes the DPOJET essentials jitter and eye pattern analysis software package - free.

Over 30 optional software packages available for specialized applications.

Models	Analog Channels	Bandwidth	Record Length (1/2/4 Channels)	Analog Sample Rate
DPO7054C	4	500 MHz	125/50/25 M	20/10/5 GS/s
DPO7104C	4	1 GHz	125/50/25 M	20/10/5 GS/s
DPO7254C	4	2.5 GHz	125/50/25 M	40/20/10 GS/s
DPO7354C	4	3.5 GHz	125/50/25 M	40/20/10 GS/s

Software Packages

Serial Bus Triggering and Protocol Analysis	
SR-AERO	MIL-STD-1553B
SR-AUTO	CAN/LIN/FlexRay
SR-COMP	Computer (RS-232)
SR-DPHY	MIPI D-PHY
SR-EMBD	Embedded (I^2C, SPI)
SR-ENET	Ethernet
SR-PCIE	PCI Express
SR-USB	USB 2.0 (LS, FS, HS)
Compliance Test	
BRR	BroadR-Reach
ET3	Ethernet
MOST	MOST50/150
USB	USB 2.0
Additional Analysis	
DDRA	DDR memory
DJA	Advanced Jitter Analysis
HSIC	HSIC Electrical Characterization
PS2, 3	Power Solution Bundles
PWR	Power Analysis
SVE	SignalVu RF Analysis
USBPWR	USB Power Compliance

Additional software packages are available. For a complete listing, please visit www.tektronix.com/dpo7000

Recommended Probes

Active Voltage Probes	
TAP1500	10X, 1.5 GHz, ± 8 V
TAP2500	10X, 2.5 GHz, ± 4 V
TAP3500	10X, 3.5 GHz, ± 4 V
Differential Voltage Probe	
TDP0500	500 MHz, ± 42 V/± 4.2 V
TDP1000	1 GHz, ± 42 V/± 4.2 V
TDP1500	1.5 GHz, ± 8.5 V/± 850 mV
TDP3500	3.5 GHz, ± 2 V
High Voltage Probes	
TMDP0200	200 MHz, ± 750 V/± 75 V
THDP0200	200 MHz, ± 1500 V/± 150 V
THDP0100	100 MHz, ± 6000 V/± 600 V
Current Probes	
TCP0020	50 MHz, 20 A DC/20 A RMS/100 A Peak/10 mA Min
TCP0030A	120 MHz, 30 A DC/30 A RMS/50 A Peak/1 mA Min
TCP0150	20 MHz, 150 A DC/150 A RMS/500 A Peak/5 mA Min

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty

Ships with Product

- Four P6139B 500 MHz, 10X Passive Voltage Probes
- Calibration Certificate, Quick Reference Manual & Documentation on CD
- Front Panel Cover, Power Cord
- 1-year Warranty

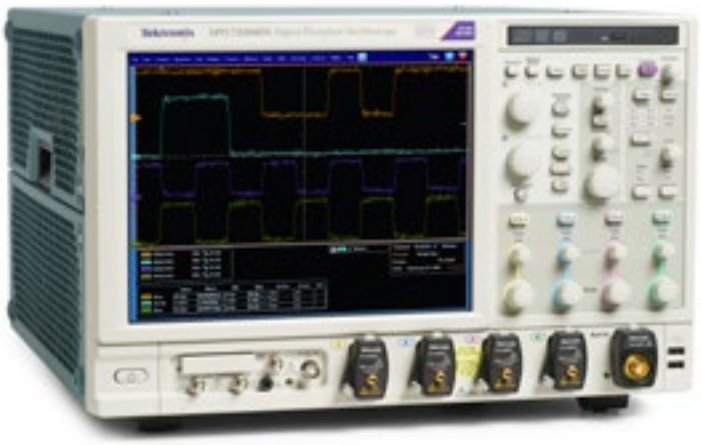
Instrument Options

Record Length	
Opt. 5RL	50M/Ch
Opt. 10RL*1	125M/Ch

Limitations apply. See data sheet for full details.

*1 Not available on DPO7054C, DPO7104C

Learn more with "Understanding and Characterizing Timing Jitter" primer.



DATA SHEET

VIRTUAL TOUR

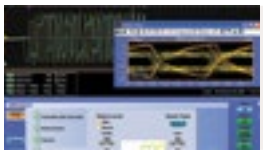
360° VIEW

MSO/DPO70000C and DX Series

Whether you're at first power-up on your latest design, verifying compliance to the fastest standards, or researching fundamentals of the universe, you have the performance, precision, and tools to get your job done faster.

Product Highlights

- 4 to 33 GHz true analog bandwidth for measurements on the latest high-speed serial standards
- 100 GS/s Sample Rate on 2 Channels
- 16 Logic Channels with 80 ps Timing Resolution for Debug of Digital and Analog Signals (MSO70000 models)
- iCapture – One Connection for both Analog and Digital Signals (MSO70000 models)
- Fastest Waveform Capture Rate with >300,000 wfms/s Maximum
- Up to 1 Gpoints Record Length with MultiView Zoom™ for Quick Navigation
- Visual Trigger to Precisely Qualify Triggers and Find Unique Events in Complex Waveforms



Nearly 50 Application-specific Solutions Enable Standard-specific Certification, Measurement Automation, and Extended Signal Analysis.

Models	Analog Channels + Digital Channels	Analog Bandwidth	Sample Rate (2/4 Channels)	Record Length (Std/Opt)
MSO/DPO70404C	4 (DPO), 4 + 16 (MSO)	4 GHz	25 GS/s	31 Mpoints/125 Mpoints
MSO/DPO70604C	4 (DPO), 4 + 16 (MSO)	6 GHz	25 GS/s	31 Mpoints/125 Mpoints
MSO/DPO70804C	4 (DPO), 4 + 16 (MSO)	8 GHz	25 GS/s	31 Mpoints/125 Mpoints
MSO/DPO71254C	4 (DPO), 4 + 16 (MSO)	12.5 GHz	100/50 GS/s	31 Mpoints/250 Mpoints
MSO/DPO71604C	4 (DPO), 4 + 16 (MSO)	16 GHz	100/50 GS/s	31 Mpoints/250 Mpoints
MSO/DPO72004C	4 (DPO), 4 + 16 (MSO)	20 GHz	100/50 GS/s	31 Mpoints/250 Mpoints
MSO/DPO72304DX	4 (DPO), 4 + 16 (MSO)	23 GHz	100/50 GS/s	31 Mpoints/1 Gpoints
MSO/DPO72504DX	4 (DPO), 4 + 16 (MSO)	25 GHz	100/50 GS/s	31 Mpoints/1 Gpoints
MSO/DPO73304DX	4 (DPO), 4 + 16 (MSO)	33 GHz	100/50 GS/s	31 Mpoints/1 Gpoints

Software Packages

Serial Bus Triggering and Protocol Analysis	
SR-AERO	MIL-STD-1553B
SR-AUTO	CAN/LIN/FlexRay
SR-COMP	Computer (RS-232)
SR-DPHY	MIPI D-PHY
SR-EMBD	Embedded (I^2C, SPI)
SR-ENET	10/100Base-T Ethernet
SR-PCIE	PCI Express
SR-USB	USB 2.0 (LS, FS, HS) , USB 3.0
Compliance Test	
DisplayPort, Ethernet, HDMI, HSIC, MDL, MIPI D-PHY/M-PHY, SATA/SAS, SFP+, Thunderbolt, MOST50/150, USB 2.0/ USB 3.0/USB 3.1, USB Power Adapter/ EPS, 10GBASE-KR/KR4	
Additional Analysis	
MTH	Communications Mask Testing
DDRA	DDR Memory
DJA	Advanced Jitter and Eye Diagram
PWR	Power Analysis
SDLA64	Serial Data Link Analysis Visualizer
SVE	SignalVu RF Analysis
VET	Visual Trigger/Search

Recommended Probes

P7600	25 GHz to 33 GHz TriMode with Remote Head Design
P7500	4 GHz to 25 GHz TriMode
P7300	4 GHz to 13 GHz Z-Active
P6780	Differential Input Digital Probe (MSO Models)
P6750	D-Max Technology Digital Probe (MSO Models)
P6717A	General-purpose Digital Probe (Included with MSO Models)
P6250/ P6251	500 MHz/1 GHz 42 V Differential
TCPA300/ TCPA400	Series Current Measurement Systems

Recommended Service

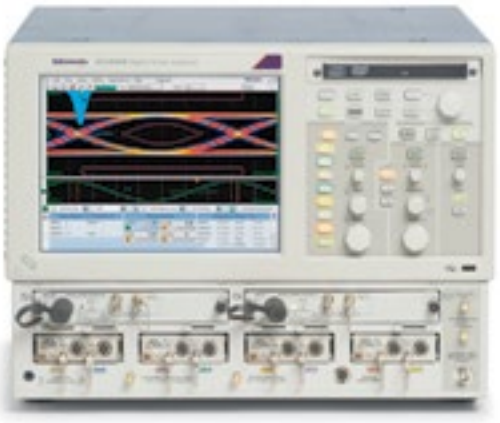
G3	Gold Care 3-year Extended Warranty
G5	Gold Care 5-year Extended Warranty
R3	3-year Extended Warranty
R5	5-year Extended Warranty

Instrument Options

Opt. ERRDT	Frame and Bit Error Rate Detector for High-speed Serial Standards
Opt. ST6G	Protocol Triggering and Decoding for 8b/10b-encoded Serial Signals up to 6.25 Gb/s
Opt. SSD	Solid State Drive (Standard on DX models)
Opt. 5XL	62.5M/Ch Record Length (Standard on MSO Models)
Opt. 10XL	125M/Ch Record Length
Opt. 20XL	250M/Ch Record Length
Opt. 50XL	500M/Ch Record Length/1G on 2 Channels (DX Models Only)

Ships with Product

- Accessory pouch, front cover, mouse, keyboard, quick start user manual, (4) TekConnect® to 2.92 mm adapters and (1) TekConnect-to-BNC adapter, DVI to VGA adapter, static protection wrist strap, MSO/DPO70000 software/GPIB reference on instrument HDD, performance verification procedure PDF file, calibration certificate documenting NIST traceability, Z 540-1 compliance and ISO9001, power cord, one-year warranty, MSO Models Include: P6717A Logic Probe, Logic Probe Deskew Fixture



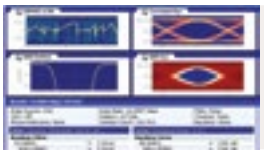
DSA8300 Series

DATA SHEET

With an industry-leading intrinsic jitter of less than 100 femtoseconds for extremely accurate device characterization, the DSA8300 Series provides comprehensive support for Optical Communications Standards, Time Domain Reflectometry and S-parameters. The DSA8300 Digital Sampling Oscilloscope is a complete high-speed PHY Layer testing platform for data communications from 155Mb/sec to 100G.

Product Highlights

- High Optical Sensitivity, Low Noise, and Wide Dynamic Range of the Optical Sampling Modules
- Remote Samplers* or Compact Sampling Extender Module Cables allowing the Sampler to be located at the DUT
- Fully Calibrated Clock Recovery Solutions – No need to manually calibrate for data pick-off losses



SSC support: Analysis of systems with spread spectrum clocking, with profile and frequency

Easily Analyze Sources of Interconnect Jitter, Losses, Crosstalk

Optical Modules	Channels	Bandwidth	Clock Recovery (Min/Max)	Filter Rates Supported (Min/Max)
80C07B	1	2.5 GHz	155 Mb/s - 2.666 Gb/s	155 Mb/s - 2.5 Gb/s
80C08D	1	12.5 GHz	9.8 Gb/s - 12.6 Gb/s	9.953 Gb/s - 12.5 Gb/s
80C10C	1	80+ GHz	Provided by Opt. CRTP and CR286A	25.8 Gb/s - 43.018 Gb/s
80C11B	1	30 GHz	9.8 Gb/s - 12.6 Gb/s	9.953 - 12.5 Gb/s
80C12B	1	12 GHz	Provided by CR125A	155 Mb/s - 11.3 Gb/s
80C14	1	14 GHz	Provided by CR175A or CR286A	8.500 Gb/s - 14.025 Gb/s
80C15	1	32 GHz	NA	25.781 Gb/s - 28.05 Gb/s

TDR / Electrical Modules	Channels	Vertical Resolution	Bandwidth	TDR System Incident Rise Time (10%-90%)	TDR System Reflected Rise Time (10%-90%)	Monolithic or Remote
80E04	2	16 bits	20 GHz	23 ps	28 ps	Monolithic
80E08B	2	16 bits	30 GHz	18 ps	20 ps	Remote (2 meter)
80E10B	2	16 bits	50 GHz	12 ps	15 ps	Remote (2 meter)

Electrical Modules	Channels	Vertical Resolution	Bandwidth	Rise Time (10%-90%)	Monolithic or Remote
80E02	1	16 bits	50 GHz	7 ps	Monolithic
80E03	2	16 bits	20 GHz	17.5 ps	Monolithic
80E06	1	16 bits	70+ GHz	5 ps	Monolithic
80E07B	2	16 bits	30 GHz	11.7 ps	Remote (2 meter)
80E09B	2	16 bits	60 GHz	5.8 ps	Remote (2 meter)
80E11	2	16 bits	70+ GHz	5 ps	Monolithic
80E11X1	1	16 bits	70+ GHz	5 ps	Monolithic

Accessories Modules	Description	Functionality
82A04B	Phase Reference Module	<100 fs RMS timebase jitter
80A02	EOS/ESD Protection Module	EOS/ESD protection
80A03	Probe Adapter Module	Sampling Scope Probe Connectivity
80X01	1 Meter Extender Cable	Clock Recovery Phase Alignment
80X02	2 Meter Extender Cable	Position Module Close To DUT
80A05	Clock Recover Module	Trib. Rate and 10G Clock Recovery, Fixed Rates
80A08	Accessory Kit	Connection to DUT and CRU @ 25G
CR125A, CR175A, CR286A	Clock Recovery Instrument	Continues Clock Recovery, 150 Mb/s to 28.6 Gb/s

DATA SHEET

VIRTUAL TOUR

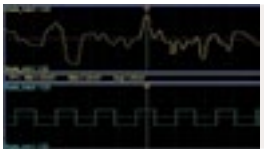
360° VIEW

TBS1000B Series

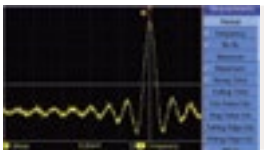
More features, more scope; the TBS1000B is in a class all its own. With up to 200 MHz bandwidth, 34 automated measurements, limit testing, data logging, dual channel frequency counters, waveform trending and sample rates of up to 2 GS/s; the TBS1000B series is designed for extensive monitoring and analysis activities. It can handle everyday test challenges without challenging your budget.

Product Highlights

- Two channel instruments
- Extensive monitoring capability using TrendPlot™ testing
- Pass/Fail analysis with built in waveform limit testing
- Automated data logging feature
- Up to 2 GS/s sample rate on all channels
- Dual channel frequency counters
- Front-panel USB host port and rear-panel USB device port



Use the TrendPlot™ function to evaluate signal behavior over extended time periods.



Thoroughly analyze your waveforms with convenient math tools and 34 automated measurements.

Models	Analog Channels	Analog Bandwidth	Analog Sample Rate (per channel)
TBS1052B	2	50 MHz	1 GS/s
TBS1072B	2	70 MHz	1 GS/s
TBS1102B	2	100 MHz	2 GS/s
TBS1152B	2	150 MHz	2 GS/s
TBS1202B	2	200 MHz	2 GS/s

Recommended Probes

Passive Voltage Probes	
TPP0201	10X, 200 MHz, 300 V CAT II
TPP0101	10X, 100 MHz, 300 V CAT II
TPP0051	10X, 50 MHz, 300 V CAT II
P2220	10X/1X, 200 MHz/6 MHz, 300 V CAT II/150 V CAT II
High Voltage Probes	
P5200A	500X/50X, 50 MHz, ± 1300 V/± 130 V
P5100A	100X, 500 MHz, 2500 V Peak
P6015A	1000X, 75 MHz, 20 kV Peak

Recommended Probes

Current Probes	
P6021A	60 MHz, 10.6 A RMS/250 A Peak/10 mA Min
P6022	120 MHz, 4 A RMS/100 A Peak/1 mA Min
A621	5 Hz to 50 kHz, 1000 A RMS/2000 A Peak/10 mA Min
A622	100 kHz, 100 A DC/71 A RMS/100 A Peak/10 mA Min

Recommended Accessories

TEK-USB-488	GPIB-to-USB converter
AC2100	Soft Carrying Case

Another Product for Consideration

Need an oscilloscope that simplifies the way you distribute lab work to students? The TBS1000B-EDU models have many of the same features and include integrated courseware capabilities.

Ships with Product

- Two TPP0xx1 200 MHz, 100 MHz or 50 MHz Passive Probes
- Certificate of Calibration
- CD with Customer Documentation
- Installation & Safety Manual
- Power Cord
- 5-year Warranty

Learn why a TBS1000B or TDS2000C instrument can be your most reliable and cost effective scope with the "Reliability by Design" technical brief.

DATA SHEET

VIRTUAL TOUR

360° VIEW

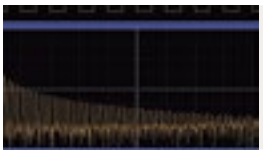
TBS1000B-EDU Series

Meet the world's first dedicated teaching oscilloscope; the TBS1000B-EDU. Not only does it deliver the performance you expect to see in a Tektronix scope; it also comes with an innovative courseware feature that allows students to review lab material, perform step by step instructions and document results, all on the oscilloscope. We couldn't make engineering easier, so we made it easier to teach and learn.

Product Highlights

- Two channel instruments
- Integrated courseware feature - perform labs directly on the oscilloscope
- Autoset enable/disable capability
- Included PC editor tool for easy lab creation
- Up to 2 GS/s sample rate on all channels
- Dual channel frequency counters
- 34 automated measurements and FFT analysis

The Courseware Resource Center is an interactive, multi-lingual website where educators can share lab material and ideas.



The FFT function can show both frequency and time domain waveforms simultaneously.

Models	Analog Channels	Analog Bandwidth	Analog Sample Rate (per channel)
TBS1052B-EDU	2	50 MHz	1 GS/s
TBS1072B-EDU	2	70 MHz	1 GS/s
TBS1102B-EDU	2	100 MHz	2 GS/s
TBS1152B-EDU	2	150 MHz	2 GS/s
TBS1202B-EDU	2	200 MHz	2 GS/s

Recommended Probes

Passive Voltage Probes	
TPP0201	10X, 200 MHz, 300 V CAT II
TPP0101	10X, 100 MHz, 300 V CAT II
TPP0051	10X, 50 MHz, 300 V CAT II
P2220	10X/1X, 200 MHz/6 MHz, 300 V CAT II/150 V CAT II
High Voltage Probes	
P5200A	500X/50X, 50 MHz, ± 1300 V/± 130 V
P5100A	100X, 500 MHz, 2500 V Peak
P6015A	1000X, 75 MHz, 20 kV Peak

Recommended Probes

Current Probes	
P6021A	60 MHz, 10.6 A RMS/250 A Peak/10 mA Min
P6022	120 MHz, 4 A RMS/100 A Peak/1 mA Min
A621	5 Hz to 50 kHz, 1000 A RMS/2000 A Peak/10 mA Min
A622	100 kHz, 100 A DC/71 A RMS/100 A Peak/10 mA Min

Recommended Accessories

TEK-USB-488	GPIB-to-USB converter
AC2100	Soft Carrying Case

Another Product for Consideration

Need more analysis features? The TBS1000B models offer the same great performance and include Trendplot™, data logging and limit test capability.

Ships with Product

- Two TPP0xx1 200 MHz, 100 MHz or 50 MHz, Passive Probes
- Certificate of Calibration
- CD with Customer Documentation
- Education CD with Course Editor SW and Lab Examples
- Installation & Safety Manual
- Power Cord
- 5-year Warranty

Help students master the use of an oscilloscope with the included courseware software and labs.

DATA SHEET

VIRTUAL TOUR

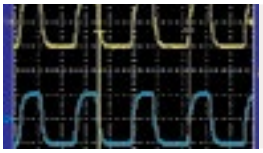
360° VIEW

TBS1000 Series

Usually, entry-level instruments are as light in features as they are in price. But Tektronix TBS1000 Series aren't usual instruments. Ideal for students, hobbyists or any person or organization on a tight budget, TBS1000 Series oscilloscopes deliver outstanding performance, including best-in-class digital real-time sampling, pass/fail testing, and familiar, easy-to-use controls. All at a price that's equally impressive.

Product Highlights

- Four channel instruments
- 1 GS/s sample rate on all channels
- 7 inch WVGA high-res display
- 16 automated measurements, and FFT analysis
- Built-in waveform limit testing
- Built-in help system and probe check wizard
- Front-panel USB host port and rear-panel USB device port



Accurately capture signals with at least 10X oversampling on all channels with Digital Real-Time Sampling technology.

Quickly store and transfer your waveforms and settings with the front panel USB port.

Models	Analog Channels	Analog Bandwidth	Analog Sample Rate (per channel)
TBS1064	4	60 MHz	1 GS/s
TBS1104	4	100 MHz	1 GS/s
TBS1154	4	150 MHz	1 GS/s

Recommended Probes

Passive Voltage Probes	
TPP0201	10X, 200 MHz, 300 V CAT II
TPP0101	10X, 100 MHz, 300 V CAT II
P2220	10X/1X, 200 MHz/6 MHz, 300 V CAT II/150 V CAT II
High Voltage Probes	
P5200A	500X/50X, 50 MHz, ± 1300 V/± 130 V
P5100A	100X, 500 MHz, 2500 V Peak
P6015A	1000X, 75 MHz, 20 kV Peak

Recommended Probes

Current Probes	
P6021A	60 MHz, 10.6 A RMS/250 A Peak/10 mA Min
P6022	120 MHz, 4 A RMS/100 A Peak/1 mA Min
A621	5 Hz to 50 kHz, 1000 A RMS/2000 A Peak/10 mA Min
A622	100 kHz, 100 A DC/71 A RMS/100 A Peak/10 mA Min
TCP2020	50 MHz, 20 A DC/20 A RMS/100 A Peak/10 mA Min

Recommended Accessories

1103	TEKPROBE Power Supply
AC2100	Soft Carrying Case

Another Product for Consideration

Need a Life Time Warranty? The TDS2000C Series offers the same great performance as the TBS1000 and includes a Lifetime Warranty.

Ships with Product

- Four TPP0x01 100 MHz or 200 MHz, 10X Passive Probes
- OpenChoice® Desktop Software
- Educator Classroom and Lab Resource CD
- Calibration Certificate, Quick Reference Manual, & Documentation on CD
- Power Cord
- 5-year Warranty

Learn how to accurately capture your signals with the “Be Sure to Capture the Complete Picture” technical brief.

DATA SHEET

VIRTUAL TOUR

360° VIEW

THS3000 Series

Affordable performance in a rugged, portable design. This handheld, battery-powered oscilloscope is packed with features and analysis tools. With up to 5 GS/s sampling rate and four isolated channels that can measure up to 1000 Volts you can quickly, reliably and accurately evaluate your signal characteristics on the bench or in the field.

Product Highlights

- 4 fully isolated and floating channels
- 21 automated measurements
- 600 VRMS CAT III, 1000 VRMS CAT II rated inputs
- Measurement data logging with Trendplot™ testing
- 7 hours of continuous battery operation

Four isolated input channels easily handle any type of mixed signal inputs.

User-defined limit testing can automatically monitor your signals and output Pass or Fail results.

Models	Analog Channels	Analog Bandwidth	Analog Sample Rate
THS3014	4	100 MHz	2.5 GS/s
THS3014-TK	4	100 MHz	2.5 GS/s
THS3024	4	200 MHz	5 GS/s
THS3024-TK	4	200 MHz	5 GS/s

Recommended Probes

Passive Voltage Probes	
THP0301 - Y/B/M/G	300 MHz, 10X, 300 V CAT III
High Voltage Probes	
P5150[*1]	50X, 500 MHz, 2500 V Peak, 1000 V RMS CAT II
P5122	100X, 200 MHz, 1000 V RMS CAT II
Current Probes	
P6021A	60 MHz, 10.6 A RMS/250 A Peak/10 mA Min
P6022	120 MHz, 4 A RMS/100 A Peak/1 mA Min
A621	5 Hz to 50 kHz, 1000 A RMS/2000 A Peak/10 mA Min
A622	100 kHz, 100 A DC/71 A RMS/100 A Peak/10 mA Min
TCP2020	50 MHz, 20 A DC/20 A RMS/100 A Peak/10 mA Min

[*1] The P5150 is compatible with THS oscilloscopes, but 50X vertical scaling is not offered.

Recommended Accessories

THSBAT	Additional Spare Battery
THSCHG[*2]	Battery Charger
119-7900-00	AC Power Adapter

[*2] Does not include AC power adapter.

Recommended Service

SILV400	5-year Extended Warranty

Another Product for Consideration

For very accurate ripple measurements on high voltage signals, the P5122 probe offers high impedance with minimal capacitive loading.

Ships with Product

- Four THP0301-Y/B/M/G 300 V CAT III, 300 MHz 10X Passive Probes
- OpenChoice® Desktop Software
- USB-A to Mini USB-B Cable for PC Communication
- Lithium-ion Battery with 7 Hour Battery Life
- Calibration Certificate, Installation/Safety Manual, Documentation on CD
- Carrying Handle, Hanging Strap
- ACHHS Soft-sided Carry Case[*3], AC Power Adapter with Power Cord
- Hard-sided Travel Case[*4]
- Soft-sided Probe Case, Two Probe Replacement Accessory Kits[*4]
- 3-year Warranty

[*3] Non-TK models only
[*4] TK models only

Learn more with the "Fundamentals of Floating Measurements and Isolated Input Oscilloscopes" application note.

DATA SHEET

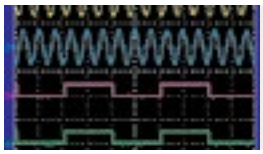
VIRTUAL TOUR

TPS2000B Series

Great performance goes beyond the lab. Make floating or differential measurements with up to four isolated channels. Tackle challenging environments with backlit buttons and optional power analysis software. Capture signals with Digital Real-Time Sampling.

Product Highlights

- 10x oversampling on all channels
- 4 isolated analog channels
- 11 automated measurements and FFT analysis
- Optional power analysis software



Safely and easily make floating measurements with the four isolated channels.

Battery pack gives you up to 4 hours of portable operation. Hot-swap the pack for 4 more hours!

Models	Analog Channels	Analog Bandwidth	Analog Sample Rate
TPS2012B	2	100 MHz	1 GS/s
TPS2014B	4	100 MHz	1 GS/s
TPS2024B	4	200 MHz	2 GS/s

Application Modules

TPS2PBND2	TPS2PWR1 Module and Four P5122 Probes
TPS2PWR1	Power Measurement and Analysis Module

Recommended Accessories

1103	TEKPROBE Power Supply
AC2100	Soft Carrying Case
TPSBAT	Additional Lithium-Ion Battery Pack (one included standard with instrument)
TPSCHG	External Battery Charger

Recommended Service

SILV200	5-year Extended Warranty

Recommended Probes

Passive Voltage Probes	
TPP0201	10X, 200 MHz, 300 V CAT II
TPP0101	10X, 100 MHz, 300 V CAT II
P2220	10X/1X, 200 MHz/6 MHz, 300 V CAT II/150 V CAT II
High Voltage Probes	
P5150	50X, 500 MHz, 2500 V Peak, 1000 V RMS CAT II
P5122	100X, 200 MHz, 1000 V RMS CAT II
Current Probes	
P6021A	60 MHz, 10.6 A RMS/250 A Peak/10 mA Min
P6022	120 MHz, 4 A RMS/100 A Peak/1 mA Min
A621	5 Hz to 50 kHz, 1000 A RMS/2000 A Peak/10 mA Min
A622	100 kHz, 100 A DC/71 A RMS/100 A Peak/10 mA Min
TCP2020	50 MHz, 20 A DC/20 A RMS/100 A Peak/10 mA Min

Another Product for Consideration

For very accurate power measurements, the PA1000 Power Analyzer offers 0.05% basic accuracy.

Ships with Product

- One TPP0101 100 MHz, 10X Passive Probe Per Analog Channel (TPS2012B & TPS2014B)
- One TPP0201 200 MHz, 10X Passive Probe Per Analog Channel (TPS2024B)
- OpenChoice® Desktop and NI LabVIEW SignalExpress™ TE (LE version) Software
- RS-232 to USB Adapter Cable
- One Lithium-Ion Battery with 4-hour Battery Life
- Calibration Certificate, Quick Reference Manual, & Documentation on CD
- Front Panel Cover, AC Adapter with Power Cord
- 3-year Warranty

Learn more with the "Fundamentals of Floating Measurements and Isolated Input Oscilloscopes" application note.

DATA SHEET

VIRTUAL TOUR

360° VIEW

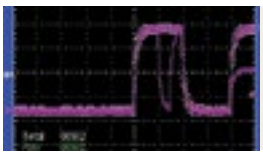
TDS2000C Series

Big performance has never been so small. Featuring Digital Real-Time Sampling, you can trust your scope to accurately capture your signal. Add in USB connectivity, 16 automated measurements and even a built-in help system, this compact oscilloscope helps you get more done in less time. It's true: big things do come in small packages.

Product Highlights

- 10x oversampling on all channels
- Bright color display
- 16 automated measurements and FFT analysis
- Built-in help system and probe check wizard
- Front-panel USB host port and rear-panel USB device port
- Lifetime Warranty*1

Accurately capture signals with at least 10X over-sampling on all channels with Digital Real-Time Sampling technology.



Easily check if your waveforms pass or fail your specifications with built-in waveform limit testing.

Models	Analog Channels	Analog Bandwidth	Analog Sample Rate
TDS2001C	2	50 MHz	500 MS/s
TDS2002C	2	70 MHz	1 GS/s
TDS2004C	4	70 MHz	1 GS/s
TDS2012C	2	100 MHz	2 GS/s
TDS2014C	4	100 MHz	2 GS/s
TDS2022C	2	200 MHz	2 GS/s
TDS2024C	4	200 MHz	2 GS/s

Recommended Probes

Passive Voltage Probes	
TPP0201	10X, 200 MHz, 300 V CAT II
TPP0101	10X, 100 MHz, 300 V CAT II
P2220	10X/1X, 200 MHz/6 MHz, 300 V CAT II/150 V CAT II
High Voltage Probes	
P5200A	500X/50X, 50 MHz, ± 1300 V/± 130 V
P5100A	100X, 500 MHz, 2500 V Peak
P6015A	1000X, 75 MHz, 20 kV Peak

Recommended Probes

Current Probes	
P6021A	60 MHz, 10.6 A RMS/250 A Peak/10 mA Min
P6022	120 MHz, 4 A RMS/100 A Peak/1 mA Min
A621	5 Hz to 50 kHz, 1000 A RMS/2000 A Peak/10 mA Min
A622	100 kHz, 100 A DC/71 A RMS/100 A Peak/10 mA Min
TCP2020	50 MHz, 20 A DC/20 A RMS/100 A Peak/10 mA Min

Recommended Accessories

1103	TEKPROBE Power Supply
AC2100	Soft Carrying Case

Ships with Product

- One TPP0x01 100 MHz or 200 MHz, 10X Passive Probe Per Analog Channel
- OpenChoice® Desktop and NI LabVIEW SignalExpress™ TE (LE version) Software
- Calibration Certificate, Quick Reference Manual & Documentation on CD
- Power Cord
- Lifetime Warranty*1

*1 For complete details visit www.tektronix.com/lifetimewarranty

TDS2000 Series

The **TDS2000 Series** is one of the most popular oscilloscopes of all time. It has a proven track record and comes with a lifetime warranty. We are pleased to continue to offer it.

For new applications, make sure you learn about:

MSO/DPO2000B Series Oscilloscopes

- 70, 100 and 200 MHz models
- 2 or 4 analog channels
- 16 digital channels (MSO models)
- 1 Mpoint record length
- Serial bus decoding and triggering options
- 5 year warranty

DATA SHEET

VIRTUAL TOUR

360° VIEW

TDS3000C Series

Performance meets portability. Featuring up to 500 MHz bandwidth and optional battery-powered operation, this oscilloscope is as capable as it is convenient. Capture fast-changing signals with Digital Real-Time Sampling. Maximize efficiency with WaveAlert® Anomaly Detection and 25 automated measurements. Performance and versatility. Turns out, you can take it with you.

Product Highlights

- 10 kpoints record length on all channels, all the time
- 3,600 wfm/s max. waveform capture rate with DPO technology
- 25 automated measurements and FFT analysis
- Front-panel USB host port and optional rear-panel Ethernet, GPIB, and RS-232 ports

Optional battery pack gives you up to 3 hours of portable operation.

Accurately capture signals with at least 5X over-sampling on all channels with Digital Real-Time Sampling technology.

Models	Analog Channels	Analog Bandwidth	Analog Sample Rate
TDS3012C	2	100 MHz	1.25 GS/s
TDS3014C	4	100 MHz	1.25 GS/s
TDS3032C	2	300 MHz	2.5 GS/s
TDS3034C	4	300 MHz	2.5 GS/s
TDS3052C	2	500 MHz	5 GS/s
TDS3054C	4	500 MHz	5 GS/s

Application Modules

TDS3LIM	Limit Testing
TDS3TMT	Telecom Mask Test Triggering
TDS3VID	HDTV and Custom Video Triggering

Recommended Accessories

1103	TEKPROBE Power Supply
TDS3GV	GPIB, RS-232, and VGA Communications Module
TDS3BATC	Lithium-ion Battery
TDS3ION	Battery Charger
AC3000	Soft Carrying Case
HCTEK4321	Hard Carrying Case (requires AC3000)

Recommended Service

SILV400	5-year Extended Warranty

Recommended Probes

Passive Voltage Probes	
P6139B	10X, 500 MHz, 300 V CAT II
Active Voltage Probes	
P6243	10X, 1 GHz, ± 8 V
Differential Voltage Probes	
P6246[*1]	10X/1X, 400 MHz, ± 8.5 V/± 850 mV
High Voltage Probes	
P5205A	500X/50X, 100 MHz, ± 1300 V/± 130 V
P5210A	1000X/100X, 50 MHz, ± 5600 V/± 560 V
P5100A	100X, 500 MHz, 2500 V Peak
Current Voltage Probes	
TCP202A	50 MHz, 15 A DC/10.6 A RMS/50 A Peak/10 mA Min

[*1] Requires 1103 TEKPROBE Power Supply

Ships with Product

- One P6139B 500 MHz, 10X Passive Probe Per Analog Channel
- OpenChoice® Desktop and NI LabVIEW SignalExpress™ TE (LE version) Software
- Calibration Certificate, Quick Reference Manual, & Documentation on CD
- Front Panel Cover, Power Cord
- 3-year Warranty

TDS3000 Series

The **TDS3000C Series** performs reliably in test stations around the world. It is also available with a battery pack, making it especially well-suited for field applications that require high bandwidth. We are pleased to continue to offer it.

For new applications, make sure you learn about:

MDO3000 Series Mixed Domain Oscilloscopes

- 100, 200, 350, 500 MHz, and 1 GHz models
- 2 or 4 analog channels
- 16 digital channels (optional)
- 10 Mpoint record length
- Integrated arbitrary/function generator (optional)
- Serial bus decoding and triggering options

Application Software

The newest wireless, embedded systems technologies, serial data and video designs present you with unprecedented measurement challenges. Our standards expertise and measurement tools help you meet them all. You can shorten your design cycle, gain greater technical insight and improve team productivity to bring new products and services to market much faster.

Advanced Analysis Applications

Jitter and Eye Diagram Analysis

- DPOJET provides timing measurements, amplitude measurements, jitter decomposition and eye diagrams and plots to speed root cause analysis of timing issues

Serial Data Link Analysis

- SDLA Visualizer provides Channel de-embed, emulation and equilization tools required for next generatiion high speed designs

Vector Signal Analysis

- SignalVu allows users to characterize wideband spectral events and verify designs such as wideband radar, high datarate sattelite links and frequency hopping radios

Power Analysis

- DPOPWR provides Automated measurements for analyzing power quality, current harmonics, switching loss, slew rate, modulation and ripple

DDR Memory Bus Analysis

- DDRA provides a comprehensive validation and debug suite for most DDR versions speeding the resolution of complex memory signaling issues

Visual Trigger

- Precisely qualify triggers and find unique events in complex waveforms

Protocol Decode and Triggering

- Observe specific system behavior to isolate specific states or locate invalid bus sequences
- Automotive
- Wi-Fi

Compliance and Debug Applications

TekExpress Automation software provides automated instrument setup, multi-instrument control, test execution, and reporting to characterize Transmitter/ Receiver performance and easily verify designs comply to the latest High Speed Seial Standards. Additionally, standard specific DPOJet software allows the user to seamlessly debug designs in the event of compliance failure.

A sample of the supported technologies are:

Computer Peripherals

- PCI Express
- USB
- Thunderbolt

Storage

- SATA
- SAS

Mobile

- MIPI M-PHY
- MIPI D-PHY

Display

- HDMI
- MHL
- DisplayPort

Data Communications

- 10/100/1000 BaseT
- 10G BaseT
- SFP+,
- 10GKR
- 16G FibreChannel
- 100G/400G
- QSFP

Jitter/Noise Analysis

Solving Jitter Debug and Analysis Challenges Made Easy

Tektronix offers jitter measurement solutions for signals ranging from low-speed digital to ultra-high speed serial data. MSO/DPO70000 Series real-time oscilloscopes provide electrical measurement and debug capability to support standards up to 20 Gb/s.

For electrical standards above 20 Gb/s, Tektronix offers the DSA8300 Series sampling oscilloscope with optical and electrical capabilities for 40 Gigabit OC-768 and beyond as well as the BERTScope Bit Error Rate Analyzers for speeds up to 28.6 Gb/s.

For solving jitter problems on low level and low noise signals, or for measuring the very small amounts of jitter often found on clocks, Tektronix offers Real Time Spectrum Analyzers (RTSA) that enable engineers to measure and characterize jitter over a wide dynamic range.

Recommended Products

Oscilloscopes and Application Software:

- MSO/DPO70000, DPO7000, MSO/DPO5000 Series Real-time Oscilloscopes
- DPOJET Jitter, Timing and Eye Diagram and Analysis software
- DSA8300 Sampling Oscilloscopes
- 80SJNB Jitter, Noise and BER Analysis software
- IConnect® and MeasureXtractor™ Signal Integrity TDR and S-parameter software

Bit Error Rate Analyzers:

- BSA Series Bit Error Rate Analyzers
- CR Series Clock Recovery Modules

Probing:

- P7313/P7313SMA Differential Probes
- P7500 TriMode Probes

Real-Time Spectrum Analyzers:

- RSA5000 Series

For more information visit:
www.tektronix.com/jitter

Signal Integrity, Time Domain Reflectometry (TDR) and S-parameter Measurements

Improve Connector and Channel Visibility

Signal integrity measurements are a critical step in the process of developing digital systems. The task of isolating and eliminating signal integrity problems anywhere in the system is challenging. These solutions let you quickly locate and trace faults back to their source, eliminating schedule delays and reliability issues.

Recommended Products:

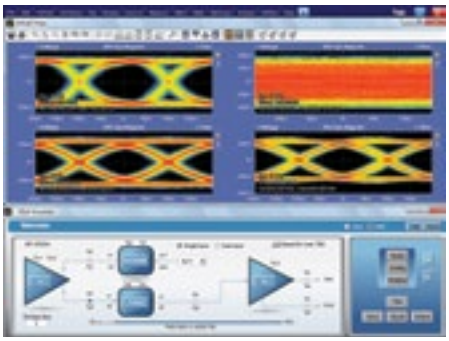
Oscilloscopes and Application Software:

- DSA8300 Sampling Oscilloscope
  - True-differential TDR up to 50 GHz bandwidth
  - 15 ps reflected rise time and 12 ps incident rise time
  - Up to 4 dual-channel TDR modules for fast, accurate multi-lane impedance and S-parameter characterization
- IConnect® advanced and MeasureXtractor™
- Signal Integrity TDR and S-parameter software
- 80SJNB Jitter, Noise and BER Analysis software

Probing:

- P8018 Single Ended/P80318 Differential Hand-Held TDR Probes

For more information visit:
www.tektronix.com/signal_integrity



Serial Data Link Analysis Solutions

Unmatched Visibility for Greater Insight into Your Design

Tektronix offers serial data link analysis solutions for high speed serial and memory interfaces for both real-time and sampling oscilloscopes. Reflections, loss, and cross-coupling resulting from the measurement setup can be accurately removed from the acquired signal using Serial Data Link Analysis (SDLA) Visualizer. SDLA Visualizer also provides the functionality to model transmitter equalization, embed channel models, and apply receiver equalization to open closed eyes. Jitter and Eye measurements can be taken at any point in the measurement or simulated link using DPOJET Jitter and Eye Analysis software. SDLA Visualizer and DPOJET are Tektronix' advanced analysis solutions for MSO/DPO70000 Series real-time oscilloscopes.

For those applications that require a sampling scope, Tektronix offers the DSA8300 sampling oscilloscope with 80SJNB Jitter, Noise, and BER analysis software. 80SJNB provides the capability to specify a de-embed filter, Time Domain Waveform or S-Parameter for channel de-embedding and DFE/FFE Equalization. 80SJNB analysis software also performs timing and noise-based analysis to get a 3-D view of the eye diagram performance for deep, accurate evaluation on signals with speeds up to and beyond 50 GHz.

Recommended Products:

Oscilloscopes and Application Software:

- MSO/DPO70000 Series Real-time Oscilloscopes
- SDLA Visualizer
- DPOJET Jitter and Eye Diagram Analysis Tools
- DSA8300 Sampling Oscilloscopes
- 80SJNB Jitter, Noise and BER Analysis software

For more information visit:
www.tektronix.com/sdla

PCI Express®

PCI Express Design Challenges Need Fast, Accurate Answers

PCI Express 3.0 testing requires dual-port acquisition and million unit interval analysis. Tektronix oscilloscopes provide full sample rate and deep record length on all channels required for compliance testing. The MSO/DPO70000 features channel emulation, equalization and up to 33 GHz Bandwidth which enables accurate measurements on 3rd generation data rates beyond 8 Gb/s.

Recommended Products:

Oscilloscopes and Application Software:

- MSO/DPO5000 Series
- DPO7000C Series
- MSO/DPO70000 Series Real Time Oscilloscopes
- Opt PCE3 Automated Compliance & Debug Software
- Opt DJA Advanced eye diagram, jitter and timing analysis
- Opt SDLA64 Serial Data Link Analysis
- Opt SLE Serial Data Link Analysis Essentials (no equalization)
- DSA8300 Sampling Oscilloscope with 80E08 module
- IConnect® S-parameters and Z-Line software 80SSPAR

Probing:

- P7300SMA Series SMA Differential Probing System
- P7300 and P7500 Series TriMode Differential Probes
- P80318 TDR hand Probes

Logic/Protocol Analyzers:

- TLA7012/16 Mainframes
- TLA7SA00 Series Logic Protocol Analyzer Modules
- P67SA00 Series of Slot Interposers, Midbus and Solder Down Probes

Bit Error Rate Analyzers:

- BSA C-Series Models, DPP125C Option ECM, BSAITS125, CR125A Opt PCIE8, BSAPCI3 SW

Signal Generators:

- AWG70000 Series, AWG7000 Series, AFG3000 Series

Spectrum Analyzers:

- RSA6000 Series

For more information visit:
www.tektronix.com/pci_express

Serial ATA/SAS

Powerful Serial ATA/SAS Automated Compliance Toolset Saves Time and Effort

Serial ATA/SAS test requirements are some of the most complex among current serial data standards. With a full toolset for characterization you will know how much margin your design really has.

Tektronix'one button SATA solution for device state control and test automation allows you to focus your attention on other priorities. SAS characterization and conformance testing requires voltage, equalization, and jitter analysis across multiple data rates and operating conditions. Tektronix' SAS test solution provides powerful design insight with end to end link analysis including ISI and crosstalk effects.

Recommended Products:

Oscilloscopes and Application Software:

- MSO/DPO70000 Series Real Time Oscilloscopes
- TekExpress SATA/SAS Compliance Automation software
- DPOJET Jitter and Eye Analysis software

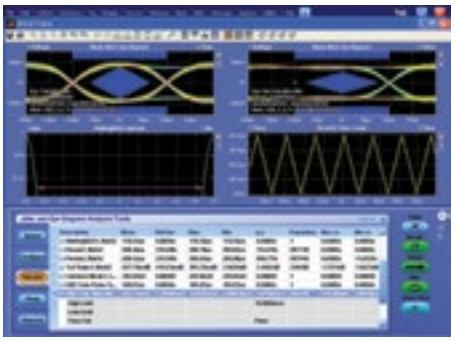
Signal Generators:

- AWG7000 Series Arbitrary Waveform Generators

Bit Error Rate Analyzers:

- BSA125C

For more information visit:
www.tektronix.com/technology/sata-sas



USB

Flexible Tools for Compliance and Debug of USB Hosts and Peripherals

Tektronix provides comprehensive tool sets to serve the validation and compliance needs of engineers designing USB2.0, USB3.0, and USB3.1 based systems, which are compliant to the USB-IF test standards. Integrated triggering, protocol decoding and analysis capabilities help speed the debug of your design.

Recommended Products:

Oscilloscopes and Application Software:

- MDO3000 Series
- MDO/MSO/DPO4000B Series
- MSO/DPO5000 Series
- DPO7000C Series
- MSO/DPO70000 Series Real Time Oscilloscopes
- TekExpress USB Compliance Automation Software
- DPOJET Jitter and Eye Analysis Software

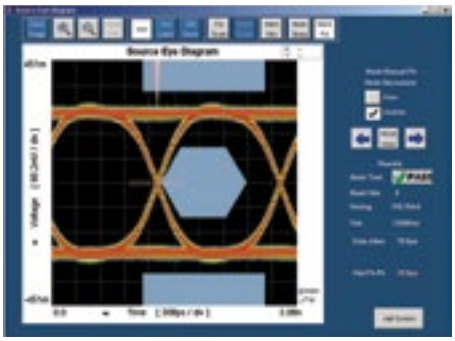
Signal Generators:

- AWG7000 Series Arbitrary Waveform Generators

Bit Error Rate Analyzers:

- BSA85C, DPP125C, CR125A

For more information visit:
www.tektronix.com/usb



HDMI, MHL and Displayport

Complete HDMI Compliance Test Solution for CTS V1.4b

Tektronix' comprehensive automated sink, source and cable test solution addresses all requirements of the latest revision of the HDMI test specification CTS V1.4b, 1.2/2.0 and Displayport 1.2b and MHL specifications. Four channel testing capability enables faster and more reliable testing with the results easily generated in a consolidated HTML report.

Recommended Products:

Oscilloscopes and Application Software:

- MSO/DPO70000 Series Real Time Oscilloscope with TDSHT3 Compliance Test software for HDMI, and Option DP12/ Option eDP DPOJET and Option MHD for MHL Compliance testing.
- DSA8300 Sampling Oscilloscope
- TDR and S-Parameter software 80SSPAR
- Pattern Sync Module 80A06
- Jitter Analysis software 80SJNB

Probing:

- P7313SMA for HDMI , MHL and Display Port
- P7240 for MHL clock
- P7380SMA for RBR and HBR Display port testing only
- P7380 for solder-in probing for RBR/HBR Display port testing
- P7313 for solder-in probing for RBR/HBR/HBR2 Display port

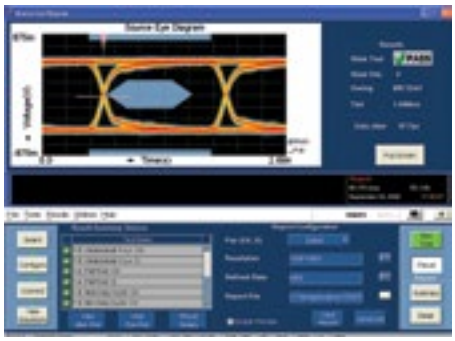
Signal Generators:

- AWG7000 Series Arbitrary Waveform Generator for HDMI and MHL
- BERTSCOPE for Displayport

Test Fixtures:

- HDMI:
  - TF-HDMI-TPA-S/STX
  - TF-HDMIC-TPA-S/STX
  - TF-HDMID-TPA-P/R
  - TF-HDMIE-TPA-KIT
  - TF-HEAC-TPA-KSET
- MHL:
  - TF-MHL-TPA-TEK
  - TF-DP-TPA-P/TF-DP-TPA-R

For more information visit:
HDMI: www.tektronix.com/technology/hdmi-dvi
MHL: www.tektronix.com/technology/mhl
Displayport: www.tektronix.com/technology/displayport



Memory

Comprehensive Tools for Memory Interface Verification and Debug

Each new generation of memory technology brings in higher speeds, lower I/O voltage for reduced power consumption, and form factors for different applications. These factors result in debug and validation challenges as new, more complex tests are required to validate and debug devices operating with tighter margins, faster edge rates, and more complex bus protocols.

The sophisticated triggering and analysis packages on the DPO Series oscilloscopes, provide broad coverage by supporting verification of multiple memory standards with each package.

The TLA7000 Series logic analyzers with their 20ps high speed timing combined with analog mux and various types of protocol views, enable logic debug and protocol validation of memory interfaces.

Easy signal access is provided by a wide variety of probing solutions that support various memory standards and package types with minimal signal loading.

Recommended Products:

Logic Analyzers:

- TLA7000 Series
- TLA7BB4 Logic Analyzer Module
- Memory Support Package
- Memory Compliance Software

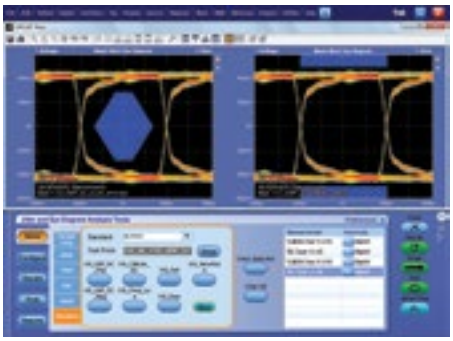
Oscilloscopes:

- MSO/DPO5000, DPO7000C, MSO/DPO70000 Series Real Time Oscilloscope
- Visual Trigger Option (Opt. VET)
- DDR Analysis Option (Opt. DDRA)
- DPOJET Jitter and Eye Diagram Analysis Tool
- SDLA Serial Data Link Analysis ToolKit

Probing Solutions:

- P7500 TriMode Differential Probes
- P6780 Differential Logic Probes
- Oscilloscope and Logic Analyzer Interposers for standard BGA and PoP packages, DIMM's and SODIMM's for all popular memory standards

For more information visit:
www.tektronix.com/memory



MIPI®

Simple Setups, with One-Button Automation to Fully-Customizable tools for M-PHY and D-PHY

M-PHY characterization and conformance testing requires more than 1000 tests, including Power Spectral Density, PWM measurements and Bit-Error counting, validated in different test configurations.

Tektronix M-PHY Transmitter Automated Solution provides Simple One-box setup, with Power Spectral Density tests performed on the Oscilloscope, along with Seamless Debug Analysis of failing tests. Tektronix M-PHY Receiver Automated Solution provides Simple Two-box setup, based on integrated Bit Error counting on the oscilloscope.

D-PHY characterization and conformance testing requires accurately identifying the low power and high speed test regions, for more than 50 tests across different test modes, multiple-lanes and temperature conditions. Tektronix D-PHY One-button automation allows you to test your designs faster and more accurately.

Recommended Products:

Oscilloscopes and Application Software:

- MSO/DPO70000 Series Real Time Oscilloscopes

M-PHY software:

- Opt.M-PHYRX, Opt.M-PHYTX, Opt.M-PHY, PGY-LLI, PGY-UPRO and MPHYVIEW.

D-PHY software:

- Opt.D-PHYTX, Opt.D-PHY, Opt.SR-DPHY.

Probing:

- P7300, and P7500 Series TriMode Differential Probes

P7300SMA Series SMA Differential Probes

Logic Analyzers:

- TLA7000 Series with DPHYPRE, and P6980 or P6982 probe

Signal Generators:

- AWG7000 Series Arbitrary Waveform Generators
- PG3A-B Series Patterns Generators with P338 probe

For more information visit:
www.tektronix.com/mipi

Data Communications

TWDPc measurement in SFP-TX software Option. Tektronix offers comprehensive, integrated tool sets for validating the physical layer of IEEE 802.3 Ethernet devices, and for developing and debugging Ethernet-based systems from 10BASE-T up to 40/100GB. Tektronix also provides comprehensive Compliance and Debug solutions for Technologies which don't fall into IEEE brackets like SFF 8431 SFP+ and FC-16G.

Recommended Products:

Software Solution:

- SR-ENET – Ethernet Decoding and Analysis
- TDSET3 – 10/100/1000BASE-T Ethernet Compliance Testing
- DPO4ENET – Ethernet Triggering and Analysis TekExpress
- 10GBASE-T Automated Compliance Software
- SFP-TX & SFP-WDP - Compliance and Debug solution for SFF 8431 SFP+
- 10G-KR - 10GBASE-KR/KR4 Compliance, Debug & Decode Solution
- FC-16G – Compliance and Debug solution for FC-PI-5 Clause 9 Electrical Physical Layer Testing
- DPOJET Jitter and Eye Diagram Analysis Tool
- SDLA Serial Data Link Analysis ToolKit

Oscilloscopes:

- MSO/DPO70000 Series Real Time Oscilloscopes
- DPO7000 Series Real Time Scopes
- MSO/DPO5000 Series Oscilloscopes
- MDO/MSO/DPO4000B Series

Test Fixtures:

- TF-GBE-ATP
- TF-GBE-EE
- TF-XGbT
- TF-SFP-TPA-HCB-PK

For more information visit:
www.tektronix.com/technology/ethernet-test

100G Rx/Tx Technology/ Application Solutions

Tektronix Comprehensive System and Physical layer validation solution for new 25/28 and 100 Gigabit standards.

IEEE802.3ba, 32GFibre Channel and OIF/VSR standards.

- High precision Jitter characterization and Impaired receiver stimulus system. This test solution is effective in silicon, systems and component/transceivers or transponder physical layer validation and debug.
- Sub 100 fs total jitter measurement capabilities on Tx systems as well as key standards specific measurements such as J2/J9.
- The DSA8300's exceptionally high dynamic range makes it well-suited for Vertical Eye Closure Penality (VECP) and low amplitude eye diagrams.
- DSA8300, CEI-VSR let's you easily automate measurements for CEI-28G-VSR testing. With simple measurement setup you can perform all their measurements with a single button click. CEI-VSR automation reduces measurement errors, helps reduce compliance verification testing time, and generate detailed reports.
- The BSA286C has similarly low jitter noise floor specifications which make it invaluable to generate stressed eyes and performing Bit Error Ratio analysis.

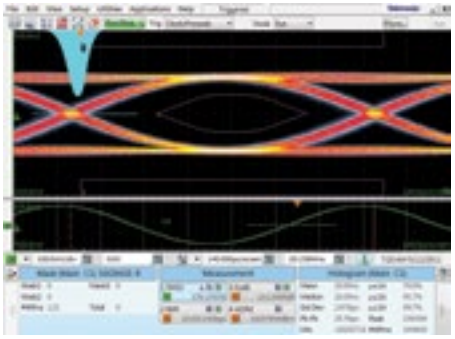
NRZ Chip-To-Chip and Silicon Characterization (Electrical)

- Requires stimulus and impairment capabilities as well as high bandwidth (70+GHz) , ultra low jitter (<100 fs) electrical / TDR acquisition and reference receivers, eye diagram mask testing, precision jitter and noise analysis.
- Ultra low noise BERT Signal Generation and comprehensive impairment capabilities (BUJ, RJ, SJ) at full data rates.
- IConnect provides S-parameters when needed
- All systems can be fully integrated into automation frameworks for PV characterization and test.

Recommended Products:

- BSA286C 28.6 Gb/s BERTScope
- DSA8300 Sampling Scope with low jitter electrical/ TDR moduels
- DSA8300 Opt. CEI-VSR
- CR286A 28.6Gbps Clock Recovery Instrument
- IConnect for S-Parameter and Time Domain Network Analysis.

For more information visit:
www.tektronix.com/dsa8300
www.tektronix.com/bertscope



Optical Testing

Tools and Analysis Software for Testing the Latest Short-Haul and Long-Haul Optical Standards and Technologies

The DSA8300 with its highly configurable mainframe and a wide variety of optical modules provide complete optical test solutions with superior system fidelity from 125 Mb/s to 100 Gb/s and beyond. The modules cover a range of wavelengths for both single- and multi-mode fibers. Each module can be optionally configured with a number of selectable Optical Reference Receiver (ORR) filters and/or a full bandwidth path.

Shown below is a brief description of each available optical sampling module as well as a selection guide with the key specifications for each module.

The ever-increasing demand for long-haul network bandwidth has driven network operators from the on-off keying used with today's 10G infrastructure to coherent optical modulation that can support 40G, 100G, 400G, and beyond. Coherent modulation is often achieved using formats such as DP-QPSK and 16QAM. Tektronix has hardware and analysis software to allow receiver, transmitter, and system manufacturers design and debug their next generation long-haul products.

Recommended Products:

Oscilloscopes:

- DSA8300 Series
- 80C10C 80+ GHz Optical Bandwidth Module
- 80C12B 10 Gb/s and Trib Rate Optical Module
- 80C14 14+ GHz Bandwidth Broad Wavelength Optical Module
- 80C15 32 GHz Broad Wavelength Module; supports both SMF and MMF
- 80SJNB Jitter and BER Analysis Software
- 80SJARB Arbitrary Data Jitter Analysis Software

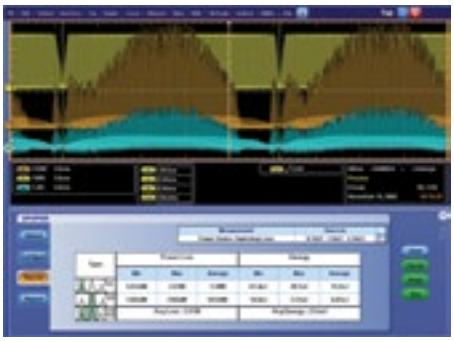
Coherent Optical Modulation Analyzers:

- OM5110 Series
- OM4000 Series
- OM2200 Series
- MSO/DPO70000 Series

Application Software:

- OM1106 Coherent Lightwave Signal Analyzer Software

For more information visit:
www.tektronix.com/optical



Power Measurements

Power Analysis and Compliance Solution with Tektronix oscilloscopes, probes, and power analyzers.

Today's power supplies achieve higher levels of efficiency in response to tighter regulations and consumer expectations. Specialized power mesurements and compliance tests are time-consuming and critical. Tektronix power measurement solutions help you achieve fast, accurate, repeatable results and compliance reports.

Recommended Products:

Oscilloscopes and Application Software:

- TPS2000 Series
  - TPS2PWR1 Power Measurement and Analysis Software
- MDO3000 Series
  - MDO3PWR
- MSO/DPO3000 Series
  - DPO3PWR Power Analysis Module
- MDO/MSO/DPO4000B Series
  - DPO4PWR Power Analysis Module
- MSO/DPO5000, DPO7000, MSO/DPO70000 Series
  - DPOPWR Power Measurement and Analysis software
  - USBPWR Automated Compliance testing for USB EPS Adapter

Probing:

- TCP0030A / TCP0150 / TCP202A AC/DC Current Probes
- TCPA300/400 Series Current Probes and Amplifiers
- TMDP0200/THDP0200/THDP0100 High Voltage Differential Probes
- P5100A Passive High Voltage Probe
- TDP0500B/TDP1000 Differential Probes

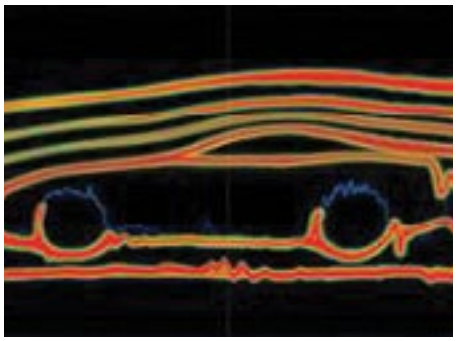
Power Analyzers:

- PA1000 Power Analyzer
- PA4000 Power Analyzer

Signal Generators:

- AFG3000 Series Arbitrary Function Generator

For more information visit:
www.tektronix.com/power



Automotive

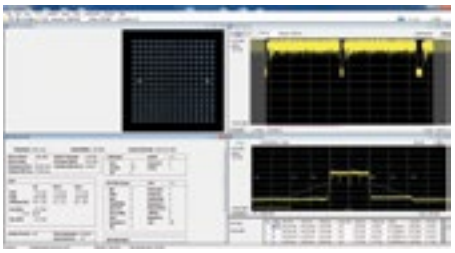
Intelligent embedded systems are the new driving force in today's automotive designs. The latest safety and efficiency technologies are made possible by the incorporation of an extensive variety of complex embedded devices that make thousands of decisions per second. Efficient verification and debug of common automotive serial buses like CAN, LIN, FlexRay, BroadR-Reach and MOST will speed integration of these embedded technologies and build confidence in test engineering.

Recommended Products:

Oscilloscopes and Application Software:

- MSO/DPO2000 Series
  - CAN, LIN
- MDO3000 Series
  - CAN, LIN
  - FlexRay
- MDO/MSO/DPO4000 Series
  - CAN, LIN
  - FlexRay
- MSO/DPO5000 Series
  - CAN, LIN
  - FlexRay
  - BroadR-Reach

For more information visit:
www.tektronix.com/industry/automotive



Wi-Fi (IEEE 802.11)

Whether you are testing a new chipset, designing a new WLAN module, or integrating a module into your latest design, Tektronix provides Wi-Fi testing solutions to help you get the job done. Speed up your testing with automatic transmitter measurements defined by the standard. Support is available for multiple 802.11 standards, including 802.11a/b/g/j/p/n/ac.

Recommended Products:

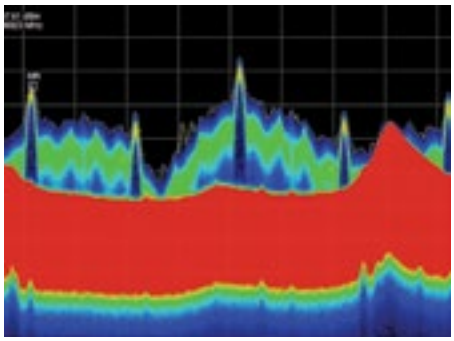
Instruments:

- RSA5000 Series Real Time Spectrum Analyzers
- RSA6000B Series Real Time Spectrum Analyzers
- MDO4000B Series Mixed Domain Oscilloscopes
- MSO/DPO70000 Series Oscilloscopes
- DPO7000 Series Oscilloscopes

Software Solutions:

- WLAN options for Real Time Spectrum Analyzers
- SignalVu Oscilloscope Software with WLAN options
- SignalVu-PC with WLAN options

For more information visit:
www.tektronix.com/wi-fi



EMI Diagnostics and Precompliance

Reduced time to solution for EMI problems

Time saving solutions for the EMI problems you never planned for. Today's biggest EMI challenges are identifying the location and source of an EMI problem and capturing a transient EMI event. Tektronix MDO4000B Series Mixed Domain Oscilloscopes combine the functionality of a mixed signal oscilloscope with a spectrum analyzer; capture synchronized analog, digital and RF signals, all time correlated for a complete system view of your device.

The MDO3000 Series also feature a built-in spectrum analyzer. Tektronix Real Time Spectrum Analyzers are able to view, trigger on and analyze the effects of the briefest of signals as they occur in frequency domain and include limit-line scans with pass/fail testing, EMI filter, detectors and averaging for high-confidence precompliance testing.

Recommended Products:

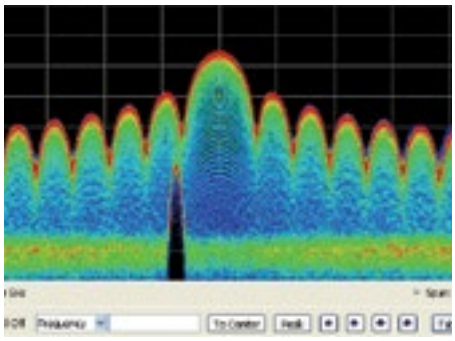
Diagnostics:

- MDO3000 Series Mixed Domain Oscilloscope
- MDO4000B Series Mixed Domain Oscilloscopes + Spectrum Analyzer
- RSA5000 Series Real Time Spectrum Analyzers
- RSA6000 Series Real Time Spectrum Analyzers

Precompliance:

- RSA5000 Series Real Time Spectrum Analyzers
- RSA6000 Series Real Time Spectrum Analyzers

For more information visit:
www.tektronix.com/rf



Radar/EW

Performance, Precision and Insight for Your Radar/Electronic Warfare Design

With today's rapid advances in radar/electronic warfare technology, developing and manufacturing highly specialized and innovative electronic products requires leading-edge technology and tools. Our innovative test equipment reduces uncertainty during the design process and delivers confidence in the integrity of increasingly complex designs.

Recommended Products:

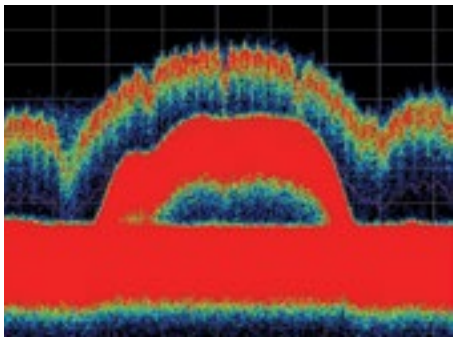
Receiver/Stimulus Test:

- AWG5000 Series Arbitrary Waveform Generator with RFXpress® software
- AWG7000 Series Arbitrary Waveform Generator with RFXpress® software
- AWG70000 Series Arbitrary Waveform Generator with RFXpress® software

Transmitter Analysis:

- RSA6100 Series Spectrum Analyzer
- RSA5000 Series Spectrum Analyzer
- MSO/DPO70000 Series Oscilloscope with SignalVu™ software
- MSO/DPO5000 and DPO7000 Series Oscilloscopes with SignalVu™ software
- MDO4000B Series Mixed Domain Oscilloscope

For more information visit:
www.tektronix.com/radar



Spectrum Management

Accuracy and Insight All Across the Spectrum

Solve today's demanding signal detection and exploitation challenges with world-class instrumentation for detection, identification, mapping, and hunting down signals or sources of interference. DPX™ Live RF spectrum display will change the way you search and discover elusive signals.

Recommended Products:

Spectrum Management:

- H500/SA2500 Series Handheld Spectrum Analyzer
- RSA5000 Series Spectrum Analyzer
- RSA6000 Series Spectrum Analyzer

For more information visit:
www.tektronix.com/surveillance

Probes and Accessories

Tektronix probes and accessories are perfectly matched to our industry-leading oscilloscopes. With over 100 choices available, you will find the probe you need.

Low Voltage Differential Probes

- Bandwidth up to 33 GHz Easily measure differential signals
- Low input capacitance: down to < 0.3 pF
- High common mode rejection ratio (CMRR)
- Wide range of probe tips for easier circuit access

www.tek.com/differential-probe-low-voltage

High Voltage Differential Probes

- Dynamic range to ± 6000 B
- Bandwidth up to 200 MHz
- Most extensive set of probe accessories

www.tek.com/differential-probe-high-voltage

Current Probes

- Easy to use and accurate AC/DC current measurements
- DC up to 2 GHz
- Amplitude measurements from 1 mA to 2,000 A
- Split core and solid core construction

www.tek.com/current-probe

Passive Probes

- Best-in-class bandwidth up to 1 GHz
- Best-in-class input capacitance as low as 3.9 pF which minimizes probe loading effects
- Dynamic range to 300 V CAT II
- Rugged and reliable

www.tek.com/passive-probe

Low Voltage Single-ended Probes

- Bandwidth up to 4 GHz
- True signal reproduction and fidelity
- Low input capacitance: down to < 0.8 pF
- Small compact probe heads for probing small geometry circuit elements

www.tek.com/low-voltage-probe-single-ended

High Voltage Single-ended Probes

- Bandwidth up to 800 MHz
- Dynamic range to 2500 V
- Best-in-class probe loading with input capacitance as low as 1.8 pF

www.tek.com/high-voltage-probe-single-ended

Optical

- Broad Wavelength Response 500 to 950 nm or 1100 to 1700 nm
- High-bandwidth DC up to 1.2 GHz
- High Gain 1 V/mW
- Low Noise <11 pW/√Hz

www.tek.com/optical-probe

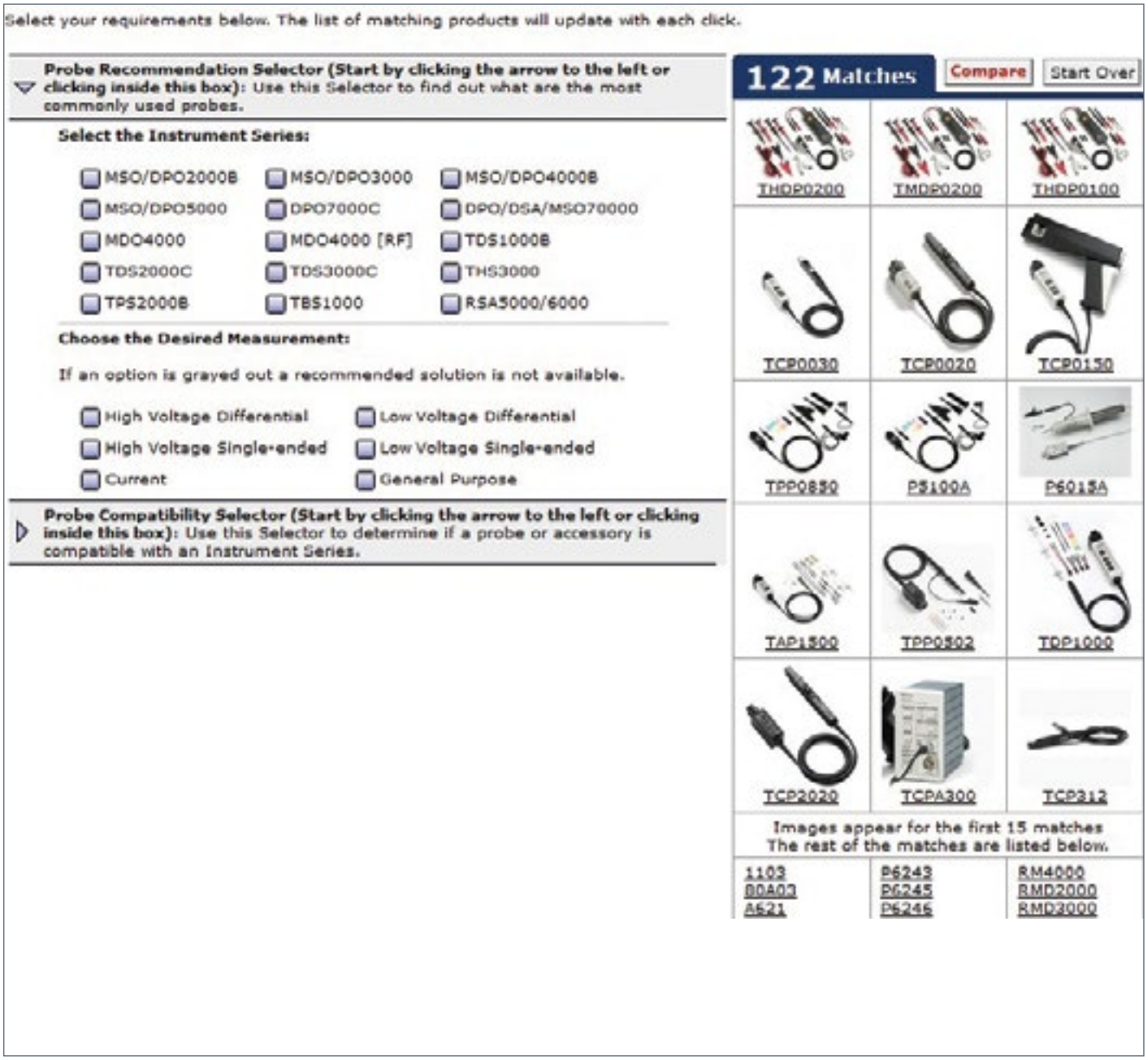
Carrying Cases and Accessories

- TekVPI Interface Adapter for TekProbe probes
- Probe holders and positioners
- Probe power supply
- Soft- and hard-sided cases

www.tektronix.com/probeaccessories

Interactive Probe Selector Tool

Need help finding the right probe for your application? The online Tektronix Probe Selector Tool will guide you through a few easy questions to match your need to the right probe. Visit us anytime, anywhere at: **www.tektronix.com/probes**



Signal Generators

The definition of versatility, Tektronix signal generators create a virtually unlimited range of standard and custom signals, from sine or pulse to ideal or distorted and anything in between.

	AWG70000 Series	AWG7000 Series	AWG5000 Series	AFG3000C Series	AFG2000
Bandwidth	20 GHz	9.6 GHz	480 MHz	240 MHz, 100 MHz, 50MHz, 25 MHz, 10 MHz	20 MHz
Channels	1 or 2	1 or 2	2 or 4	1 or 2 (independent or synchronized)	1
Memory Depth	up to 16 Gs	128 Ms	32 Ms	4 x 128 k points	4 x 128 k points
Standard Waveforms	sine, square, DC, triangle, Noise	sine, square, DC, Noise, Triangle, Clock, PRBS	sine, square, DC, Noise, Triangle, Clock, PRBS	Sine, Sine(x)/x, Square, DC, Ramp, Gaussian, Exponential Decay, Pulse, Lorentz, Noise, Arbitrary, Haversine, Exponential Rise	Sine, Sine(x)/x, Square, DC, Ramp, Gaussian, Exponential Decay, Pulse, Lorentz, Noise, Arbitrary, Haversine, Exponential Rise
Modulation	User Definable	User Definable	User Definable	AM, FM, PM, FSK, PWM, External	AM, FM, PM, FSK, PWM, External
Additional Modes	Multi-Unit Synchronization	Sequencing	32 digital outputs, Sequencing	Sweep, Burst, Add Noise Impairment	Sweep, Burst, Add Noise Impairment

Choosing Your Signal Generator

In electronic test and measurement, more often than not, a signal source is required to generate signals that are not available unless externally provided. Below is a list of common features that you may want to consider when choosing a signal generator for your application.

1 Sample (Clock) Rate

Sample rate, usually specified in terms of megasamples or gigasamples per second, denotes the maximum clock or sample rate at which the instrument can operate. The sample rate affects the frequency of the main output signal. In general, you should choose an instrument where the sampling frequency is twice that of the highest spectral frequency component of the generated signal to ensure accurate signal reproduction. The maximum sample rate also determines the smallest time increment that can be used to create waveforms. Typically this figure is simply the result of the calculation; T = 1/F, where T is the timing resolution in seconds and F is the sample rate.

2 Memory Depth (Record Length)

Memory depth, or record length, plays an important role in signal fidelity because it determines how many points of data can be stored to define a waveform. Deeper memory enables you to store more waveform detail and/or more cycles of the desired waveform.

3 Vertical (Amplitude) Resolution

Vertical resolution pertains to the binary word size, in bits, of the instrument's DAC, with more bits equating to higher resolution. The vertical resolution of the DAC defines the amplitude accuracy and distortion of the re-produced waveform. While more is better there is a general trade-off for most arbitrary waveform instruments, the higher the resolution the lower the sample rate.

4 Features and Capabilities

Tektronix signal generators offer a range of features and output capabilities. When choosing your signal generator, you should also evaluate standard waveforms, modulation capabilities, output amplitude and waveform editing software to ensure that the instrument meets your needs.

DATA SHEET

VIRTUAL TOUR

360° VIEW

AFG2000

Usually, generating a range of signals requires investment in a high-end signal generator. Introducing the Tektronix AFG2000. With 20 MHz bandwidth, 14-bit resolution, and 250 MS/s sample rate, the AFG2021 Arbitrary Function Generator can create simple and complex signals. But perhaps its most impressive feature is its entry-level price.

Product Highlights

- 12 standard waveforms – Sine, Square, Pulse, Ramp, Noise, DC, Sine(x)/x, Gaussian, Lorentz, Exponential Rise, Exponential Decay and Haversine
- Arbitrary waveform capability
- AM, FM, PM, FSK, PWM, sweep and burst modes
- Front-panel USB host port and rear-panel USB device port, optional Ethernet and GPIB ports (Opt. GL)

Wide frequency range (1 µHz to 20 MHz) supports amplifier and filter testing applications.

Quickly modify, create and transfer waveforms using the included ArbExpress® software.

Models	Analog Channels	Output Bandwidth	Analog Sample Rate	Memory Depth	Amplitude (into 50 Ω)
AFG2021	1	20 MHz	250 MS/s	4 x 128 k	10 mV_{p-p} to 10 V_{p-p}

Recommended Accessories

Cables	
012-0482-00	BNC cable shielded, 3 ft.
012-1256-00	BNC cable shielded, 9 ft.
012-0991-00	GPIB cable, double shielded
011-0049-02	50Ω BNC Terminator
Accessories	
RMU2U	Rackmount kit
013-0345-00	Fuse adapter, BNC-P to BNC-R
159-0454-00	Fuse set, 3pcs, 0.125 A

Instrument Options

Opt. GL	GPIB/LAN Interface (configured at time of purchase)

Recommended Service

SILV200	5-year Extended Warranty

Ships with Product

- User Manual
- Power Cord
- USB Cable
- CD-ROM with Programmer Manual, Service Manual, Labview and IVI Drivers
- CD-ROM with ArbExpress® Software
- NIST-traceable Calibration Certificate

Learn more about the time-saving features of ArbExpress with the “Replicating Real World Signals with an Arbitrary/ Function Generator” application note.

DATA SHEET

VIRTUAL TOUR

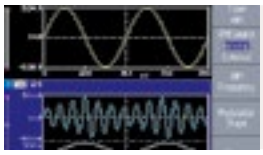
360° VIEW

AFG3000C Series

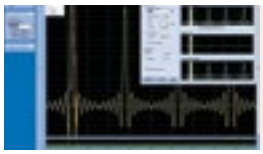
Test complex designs faster with a fully loaded function generator. Featuring 12 standard waveforms, plus arbitrary capability and many modulation options, this generator supports a wide range of application needs. Add in best-in-class performance and 25 shortcut keys and you have a generator that's loaded with features and light on complexity.

Product Highlights

- 12 standard waveforms - Sine, DC, Pulse, Exponential Decay, Sine(x)/x, Ramp, Lorentz, Haversine, Exponential Rise, Square, Gaussian, Noise
- Arbitrary waveform capability
- AM, FM, PM, FSK, PWM modulation, sweep and burst modes
- Front-panel USB host port and rear-panel Ethernet and GPIB ports



Large color display shows your settings and waveforms at a single glance.



Create and modify waveforms with ease with the included ArbExpress® software.

Models	Analog Channels	Output Bandwidth	Analog Sample Rate	Memory Depth	Amplitude (into 50 Ω)
AFG3011C	1	10 MHz	250 MS/s	4 x 128 k	20 mV_{p-p} to 20 V_{p-p}
AFG3021C	1	25 MHz	250 MS/s	4 x 128 k	10 mV_{p-p} to 10 V_{p-p}
AFG3022C	2	25 MHz	250 MS/s	4 x 128 k	10 mV_{p-p} to 10 V_{p-p}
AFG3051C	1	50 MHz	1 GS/s (<=16k), 250 MS/s (>16k)	4 x 128 k	10 mV_{p-p} to 10 V_{p-p}
AFG3052C	2	50 MHz	1 GS/s (<=16k), 250 MS/s (>16k)	4 x 128 k	10 mV_{p-p} to 10 V_{p-p}
AFG3101C	1	100 MHz	1 GS/s (≤16k), 250 MS/s (>16k)	4 x 128 k	20 mV_{p-p} to 10 V_{p-p}
AFG3102C	2	100 MHz	1 GS/s (≤16k), 250 MS/s (>16k)	4 x 128 k	20 mV_{p-p} to 10 V_{p-p}
AFG3251C	1	240 MHz	2 GS/s (≤16k), 250 MS/s (>16k)	4 x 128 k	50 mV_{p-p} to 5 V_{p-p}
AFG3252C	2	240 MHz	2 GS/s (≤16k), 250 MS/s (>16k)	4 x 128 k	50 mV_{p-p} to 5 V_{p-p}

Recommended Accessories

Cables	
012-0482-00	BNC cable shielded, 3 ft.
012-1256-00	BNC cable shielded, 9 ft.
012-0991-00	GPIB cable, double shielded
Accessories	
RM3100	Rackmount kit
013-0345-00	Fuse adapter, BNC-P to BNC-R
159-0454-00	Fuse set, 3pcs, 0.125A

Recommended Service

SILV400	5-year Extended Warranty

Ships with Product

- Quick-start User Manual
- power cord
- USB cable
- CD-ROM with Specifications and Performance Verification Manual, Programmer Manual, Service Manual, LabView and IVI Drivers
- CD-ROM with ArbExpress™ Software
- NIST-traceable Calibration Certificate

Learn more about the time-saving features of ArbExpress with the "Replicating Real World Signals with an Arbitrary/ Function Generator" application note.

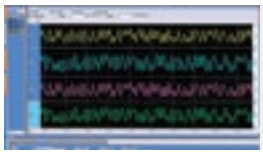
DATA SHEET

AWG5000 Series

With 14 Bit vertical resolution up to 1.2 GS/s, 4 analog, and 32 digital channel outputs, the AWG5000 Series Arbitrary Waveform Generator is the ideal solution for versatile mixed signal generation. The AWG5000 Series gives you a unique combination of analog and digital output performance allowing you to generate analog and digital IQ, as well as IF signals in a single instrument. With the addition of advance sequencing and dynamic jump capability, extremely complex waveforms can easily be created to more closely simulate real world environments.

Product Highlights

- I/Q modulator test
- Consumer electronics
- Serial data
- RF Baseband Signal Generation



4 synchronized channels in a single instrument.

Quickly modify, create and transfer waveforms using either RFXpress or SerialXpress.

Ships with Product

- Accessory pouch, front cover, USB mouse, compact USB keyboard, lead set for DC output, AWG5000C Series product software CD and instructions, documentation CD with browser, Quick Start User Manual and registration card, Certificate of Calibration, and power cable.

Models	Analog Channel	Analog Bandwidth	Digital Channel	Output Frequency	Record Length	Max Sample Rate	Vertical Resolution
AWG5002C	2	Up to 230 MHz	28	240 MHz	16M point per channel (32M optional)	600 MS/s	14 bits
AWG5012C	2	Up to 300 MHz	28	480 MHz	16M point per channel (32M optional)	1.2 GS/s	14 bits
AWG5014C	4	Up to 300 MHz	--	480 MHz	16M point per channel (32M optional)	1.2 GS/s	14 bits

Recommended Accessories

Cables	
012-1690-xx	Pin Header Cable, SMA Cable, 40 in. (102 cm)
012-1503-xx	SMB Cable, 20 in. (51 cm)
Accessories	
016-1983-xx	Rackmount kit
016-1979-xx	Front Removable HDD Bay

Recommended Service

R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Signal Generators Software

See page 49 for information

RFXpress® Software for the AWG5000, AWG7000, AWG70000 (RFX100)

If you are doing RF Designs requiring signal modulation, Tektronix' RFXpress software for the AWG series delivers advanced capabilities to synthesize digitally modulated baseband, IF and RF/microwave signals supporting a wide range of modulation schemes. RFXpress simplifies waveform creation. Special options are available for Radar, OFDM, S-Parameter, and UWB signals specifically.

www.tektronix.com/rfxpress

SerialXpress® Software for the AWG5000, AWG7000, AWG70000 (SDX100)

Recreate exact waveforms required for thorough and repeatable design validation, margin/characterization and conformance testing with SerialXpress and AWG Series signal generators. SerialXpress' easy to use graphical user interface allows for a combination of test signals and various impairments including Inter Symbol Interferences (ISI), Duty Cycle Distortion (DCD), Spread Spectrum Clocking (SSC), Pre-emphasis and noise.

www.tektronix.com/signal_generators

DATA SHEET

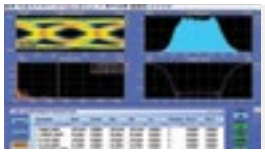
AWG7000 Series

The AWG7000 Series Arbitrary Waveform Generators, with up to 24 GS/s and 10 Bit vertical resolution, deliver the industry's best signal stimulus solution for ever-increasing measurement challenges. This allows for easy generation of very complex signals, complete with controllable jitter, noise and other signal impairments. The AWG7000 Series Arbitrary Waveform Generator is the ideal solution for wideband signal generation applications, receiver stress testing of high-speed serial data, or any application where complex signal creation is required.

Product Highlights

- Serial data validation and compliance testing
- Radar signal generation and environmental simulation
- Wideband analog and digital RF signal generation
- Disk drive validation and test

Radar pulses can be creating created using the AWG7000 and RFXpress.



Easily create digital data impairments with the AWG7000 ans SerialXpress.

Ships with Product

- Accessory pouch, front cover, USB mouse, compact USB keyboard, lead set for DC output, AWG7000C Series product software CD and instructions, documentation CD with browser, Quick Start User Manual and registration card, Certificate of Calibration, power cable, and 50 Ω SMA terminator (3 ea), one-year warranty.

Models	Analog Channel	Analog Bandwidth	Output Frequency	Record Length	Max Sample Rate	Vertical Resolution
AWG7082C	2	Up to 3.2 GHz, 5.6 GHz (optional)	Max = 3.2 GHz, 6.4 GHz (optional)	32M point, 64M point (optional)	10 MS/s - 8 GS/s (16 GS/s optional)	10 bits
AWG7122C	2	Up to 3.2 GHz, 5.6 GHz (optional)	Max = 4.8 GHz, 9.6 GHz (optional)	32M point, 64M point (optional)	10 MS/s - 12 GS/s (24 GS/s optional)	10 bits

Recommended Accessories

Cables	
012-1690-xx	Pin Header Cable, SMA Cable, 40 in. (102 cm)
012-1503-xx	SMB Cable, 20 in. (51 cm)
Accessories	
016-1983-xx	Rackmount kit
016-1979-xx	Front Removable HDD Bay

Recommended Service

C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R5DW	Repair Service Coverage 5 Years

Signal Generators Software

See page 49 for information

RFXpress® Software for the AWG5000, AWG7000, AWG70000 (RFX100)

If you are doing RF Designs requiring signal modulation, Tektronix' RFXpress software for the AWG series delivers advanced capabilities to synthesize digitally modulated baseband, IF and RF/microwave signals supporting a wide range of modulation schemes. RFXpress simplifies waveform creation. Special options are available for Radar, OFDM, S-Parameter, and UWB signals specifically.

www.tektronix.com/rfxpress

SerialXpress® Software for the AWG5000, AWG7000, AWG70000 (SDX100)

Recreate exact waveforms required for thorough and repeatable design validation, margin/characterization and conformance testing with SerialXpress and AWG Series signal generators. SerialXpress' easy to use graphical user interface allows for a combination of test signals and various impairments including Inter Symbol Interferences (ISI), Duty Cycle Distortion (DCD), Spread Spectrum Clocking (SSC), Pre-emphasis and noise.

www.tektronix.com/signal_generators

DATA SHEET

VIRTUAL TOUR

AWG70000A Series

AWG70000A series is the next generation of the industry leading Tektronix AWG portfolio, implementing advanced data rate technologies of up to 50 Gs/s with 10 bit vertical resolution.

Product Highlights

- Generate wide bandwidth signals at baseband, IF and RF frequencies with excellent dynamic range
- Accelerate designs and research by generating waveforms that cannot previously be created
- Add impairments to waveforms eliminating the need for additional hardware
- Ability to sync multiple units together to increase transmission bandwidth

Seamlessly import waveforms from Matlab, Excel and other software packages.

Waveforms captured on scopes or spectrum analyzers can be played back on the AWG.

	AWG70001A	AWG70002A
Sample Rate	1.5KS/s to 50 GS/s	1.5KS/s to 25 GS/s
Maximum Frequency	20.0 GHz	10.0 GHz
Analog Bandwidth	14 GHz	14 GHz
Rise Time	27 ps	22 ps
Dynamic Range (SFDR)	Up to -80 dBc	Up to -80 dBc
DAC Resolution	10 bits	10 bits
Output Voltage	1.0 Vpp (Differential)	1.0 Vpp (Differential)
Waveform Memory	Standard: 2 GSamples, Optional: 16GSamples	Standard: 2 GSamples, Optional: 8GSamples
Channels	1 (Differential)	2 (Differential)

Recommended Accessories

RFXpress
SerialXpress

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Keyboard
- Mouse
- Power Cord

Signal Generators Software

See page 49 for information

RFXpress® Software for the AWG5000, AWG7000, AWG70000 (RFX100)

If you are doing RF Designs requiring signal modulation, Tektronix' RFXpress software for the AWG series delivers advanced capabilities to synthesize digitally modulated baseband, IF and RF/microwave signals supporting a wide range of modulation schemes. RFXpress simplifies waveform creation. Special options are available for Radar, OFDM, S-Parameter, and UWB signals specifically.

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www.tektronix.com/signal_generators

Signal Generator Software

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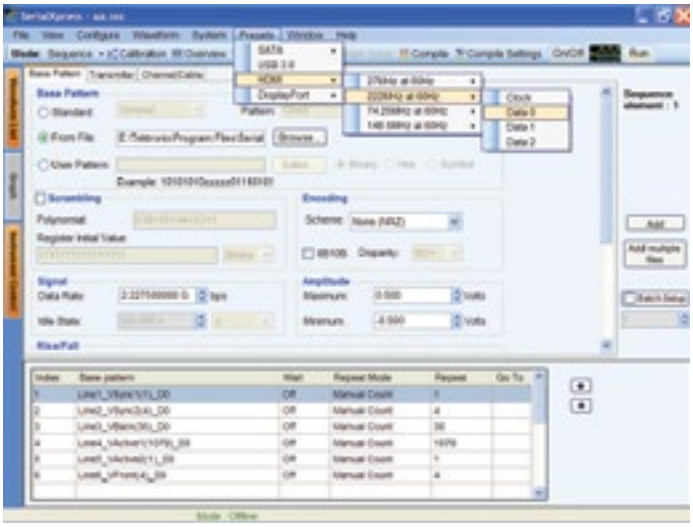

SerialXpress® Software for the AWG5000, AWG7000, AWG70000 (SDX100)

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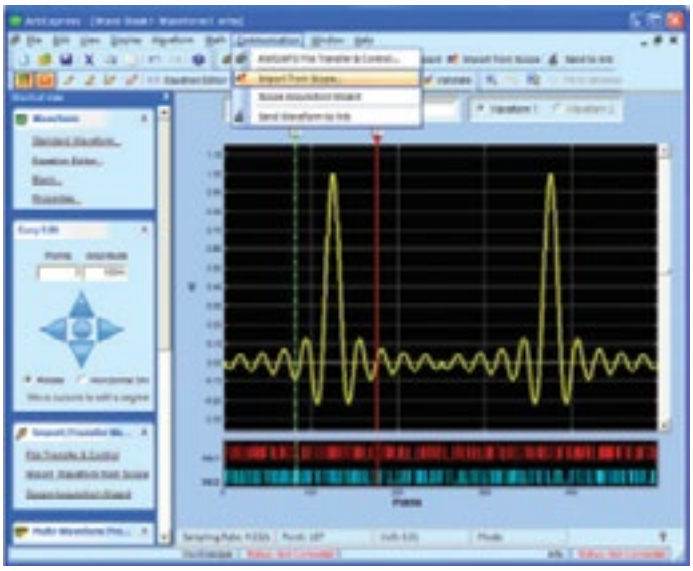


ArbExpress® Signal Generator Software for AFGA2000, AFG3000, WG5000, AWG7000, AWG70000

Designers often need to validate their designs under real-world conditions, requiring complex stimulus signals during test. With ArbExpress® software, waveforms can be quickly created and transferred to Tektronix arbitrary waveform and function generators to meet custom stimulus requirements.

Logic Analyzers

With Tektronix Logic Analyzers, you can acquire fast edges with the industry's highest acquisition speed. Support packages tuned to your specific application makes it easier for you to probe, acquire, decode, analyze, and validate the performance of your microprocessor, FPGA or memory design.

	TLA6400	TLA7000
Description	Pre-configured Portable Logic Analyzer	Modular Portable and Benchtop Logic Analyzers
Channels	34, 68, 102, 136	68, 102, 136 modules 2 – 6 modules per frame
Timing	1.6 GHz on all channels 3.2 GHz on ½ channels	500 MHz to 6.4 GHz (dependent on model)
MagniVu™ Timing	25 GHz	8 GHz or 50 GHz (dependent on model)
State Clock Rate	333 MHz (standard) 667 MHz (optional)	235 MHz to 1.4 GHz (dependent on model)
Maximum State Data Rate	1.33 Gb/s	1.25 Gb/s to 3.0 Gb/s (dependent on model)
Record Length	2Mb, 4Mb, 8Mb, 16Mb, 32Mb, 64Mb	2Mb to 128Mb (dependent on model)
Analog Mux	Available	Available

Choosing your Logic Analyzer

To help you choose the right logic analyzer for your needs, the most common selection criteria are listed below, along with helpful tips for determining your requirements.

1 Number of Channels

Logic Analyzers are available in both modular and pre-configured forms. A modular logic analyzer allows you to add additional acquisition cards to increase the number of available channels. A pre-configured logic analyzer has a fixed number of channels and can't be changed after purchase.

2 Timing Resolution

Timing resolution is simply the inverse of the sample rate of the logic analyzer. Higher timing resolution allows you to more precisely place the edges of signals relative to one another giving more accurate timing measurements

3 State Clock Rate

In addition to timing mode, logic analyzers have a second acquisition mode called state mode. In this mode, a clock from your circuit tells the logic analyzer when to sample the date. The state clock specification indicates the maximum frequency of clock that the logic analyzer can use.

4 Record Length

Record length, or memory depth, indicates the number of samples that can be stored. Longer record lengths can be helpful in troubleshooting problems whose cause and symptom are widely separated in time.

DATA SHEET

VIRTUAL TOUR

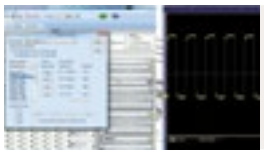
360° VIEW

TLA6400 Series

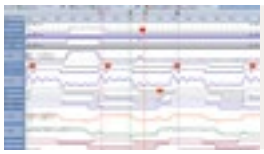
The affordable TLA6400 Series Logic Analyzer offers the performance needed to debug, validate, and optimize the functionality of your digital system. Quickly isolate, identify, and characterize elusive and hard-to-find problems with a comprehensive set of signal integrity debug tools.

Product Highlights

- 15 in. Display, with Optional Touch Screen to See More of Your Data and Navigate Efficiently through Your Data
- Drag-and-Drop Triggering – Simply drag any one of eight different trigger types onto the waveform
- Drag-and-Drop Measurements – Simply drag an icon from the measurement toolbar and drop it on your signal of interest



iCapture allows you to use one probe for both your logic analyzer and scope eliminating the need to double-probe.



Integrate the display of digital and analog data with iView.

Model	Channels	State Clock Rate	MagniVu Timing	Timing	Record Length
TLA6401	34	333 MHz (standard) 667 MHz (optional)	25 GHz	1.6 GHz on all channels 3.2 GHz on ½ channels	2Mb, 4Mb, 8Mb, 16Mb, 32Mb, 64Mb
TLA6402	68	333 MHz (standard) 667 MHz (optional)	25 GHz	1.6 GHz on all channels 3.2 GHz on ½ channels	2Mb, 4Mb, 8Mb, 16Mb, 32Mb, 64Mb
TLA6403	102	333 MHz (standard) 667 MHz (optional)	25 GHz	1.6 GHz on all channels 3.2 GHz on ½ channels	2Mb, 4Mb, 8Mb, 16Mb, 32Mb, 64Mb
TLA6404	136	333 MHz (standard) 667 MHz (optional)	25 GHz	1.6 GHz on all channels 3.2 GHz on ½ channels	2Mb, 4Mb, 8Mb, 16Mb, 32Mb, 64Mb

Recommended Probes

P5910	17-channel General Purpose Probe
P5934	34-channel Mictor Probe
P5960	34-channel DMAX Probe

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Recommended Accessories

PG3L-B	Stand-Alone Digital Pattern Generator
LACART	Accessory Cart
K4000	2 Shelf Accessory Cart
020-2664-xx	Rack Mount Kit

Ships with Product

- Power Cord
- Quick Start Guide
- Keyboard and Mouse
- Front Cover
- Documentation CD
- Calibration Certificate

Learn more with the "XYZs of Logic Analyzers" primer.

DATA SHEET

TLA7000 Series

The modular TLA7000 Logic Analyzer Series provides the speed and flexibility you need to capture logic detail on today's fastest microprocessors and memory designs.

Product Highlights

- Modular Mainframes provide flexibility and expandability
- Supports up to 6,528 Logic Analyzer Channels, 48 Independent Buses
- Trace Problems from Symptom back to Root Cause in Real Time across Multiple Modules by Viewing Time-correlated Data in a Wide Variety of Display Formats
- Choose from a variety of acquisition and stimulus modules

Debug and validate the latest DDR technology with the TLA7000 Series.

PCI Express Debug from Protocol to Physical Layer.

TLA7000 Mainframe Models	Description	Number of Modules	Built-In Computer	Display
TLA7012	Portable Mainframe	2	Yes	15”
TLA7016	Benchtop Mainframe	6	Requires an external computer	none

Acquisition Module Models	Channels	State Clock Rate	MagniVu Timing	Timing
TLA7ACx	68, 102, 136	235 MHz (standard) 450 MHz (optional)	8 GHz	500 MHz on all channels; 1 GHz on ½ channels; 2 GHz on ¼ channels
TLA7BBx	68, 102, 136	750 MHz (standard) 1.4 GHz (optional)	50 GHz	1.6 GHz on all channels; 3.2 GHz on ½ channels; 6.4 GHz on ¼ channels

Pattern Generator Model	Maximum Data Rate	Number of Channels	Memory Depth	Data Models
PG3ACAB-B	300 Mbps 600 Mbps with DDR Option	64 (mergeable to 256 channels)	32M Vectors	Flat or Block Based

Recommended Probes

Acquisition Probes	
P6910	34-channel General Purpose Probe
P6960	34-channel Single-Ended DMAX Probe
P6980	34-channel Differential DMAX Probe
Pattern Generator Probes	
P370	TTL Output
P373	LVDS Output
P375	Output Programmable from -2V to +6.5V

Recommended Accessories

LACART	Accessory Cart
K4000	2 Shelf Accessory Cart
020-2664-xx	Rack Mount Kit

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Power Cord
- Quick Start Guide
- Keyboard and Mouse
- Front Cover (TLA7012)
- Documentation CD
- Calibration Certificate

Learn how the TLA7012 can help in the debug of signal integrity problems with the “Fundamentals of Signal Integrity” primer.

PCI Express Logic Protocol Analyzers

The TLA7SAxx Series logic protocol analyzer modules provide an innovative approach to PCI Express validation that spans all layers of the protocol from the physical layer to the transaction layer. View statistical summary and protocol analysis using innovative Transaction and Summary Profile windows.

	TLA7SAxx
Description	PCI Express Logic Protocol Analyzer, Supports Gen3, Gen2, and Gen1 rates
Differential Inputs	8 or 16
Memory	8M/16M

Choosing your PCI Express Logic Protocol Analyzer

To help you choose the right PCI Express Logic Protocol Analyzer for your needs, the most common selection criteria are listed below, along with helpful tips for determining your requirements.

1 Probing

How you will access your PCIe signals is a critical consideration. There are three possible methods of probing your system: slot interposer, solder down probes, and midbus probes. A slot interposer is the most convenient method if you have access to a PCIe slot. A solder-down probe can be used if you are designing an embedded system where a slot is not available. Finally, a midbus probe can be an easy solution if you can design a probe footprint into your system.

2 Number of Lanes

PCI Express Logic Protocol Analyzers are available in different widths to provide cost-effective solutions no matter if you have x1 or a x16 system.

3 Triggering

The ability to trigger on packet details along with other resources like counters and timers can significantly speed your debug and validation effort. Consider also the ability to cross trigger with other events in your system such as a memory bus.

DATA SHEET

TLA7SAxx Series

The TLA7SAxx PCI Express Protocol Analyzer modules provide powerful trigger and filtering capabilities so you can quickly focus on the data of interest. A complete suite of probing solutions targeted for various form factors and applications.

Product Highlights

- Three probing options: solder-down, midbus, and interposer
- Resynchronization time <12 FTS1 (PCIe2) or <4 FTS2 (PCIe3) regardless of the Electrical Idle time for Advanced Power State Management performance
- Quickly build a trigger definition to trigger on the most elusive PCIe events occurring on Link

Quickly gain confidence that your setup is correct by routing any signal directly to a high bandwidth Oscilloscope.

Get visibility of system issues involving flow control with the Unique Bird's EyE View.

Model	Differential Inputs	Record Length
TLA7SA08	8	4 GB Physical Memory; 160M Symbols per Differential Input
TLA7SA16	16	8 GB Physical Memory; 160M Symbols per Differential Input

Recommended Probes

P67SA01S	x1 Slot Interposer Probe
P67SA04S	x4 Slot Interposer Probe
P67SA08S	x8 Slot Interposer Probe
P67SA16S	x16 Slot Interposer Probe
P67SA08	x4 Midbus Probe
P67SA16	x8 Midbus Probe
P67SA01SD	x1 Solder Down Probe
P67SA08G2	x4 Midbus Probe for TLA7SAxx Modules to Connect to PCIe2 Midbus Footprints
P67SA16G2	x8 Midbus Probe for TLA7SAxx Modules to Connect to PCIe2 Midbus Footprints

Recommended Accessories

P67UHDS-MA	x2 PCI Express Probe Lead Set for P67SA00 probe connections to oscilloscopes

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Statement of Compliance
- Reference Clock Cable (672-6285-xx)
- Reference Clock Jumper Cable (174-5392-xx)

Learn more about debugging PCIe Flow Control problems with the "Hunting PCIE Flow Control Bugs" application note.

Bit Error Rate Testers

Bridging the Information Gap

Each Tektronix Bit Error Rate Tester delivers unprecedented flexibility and performance to help compress your product development cycles and reduce verification testing costs. Quickly and confidently identify errors in digital bit streams with these highly advanced test and measurement instruments.

	BA Series	BSA Series	PPG/PED Series
Product Series	BA1500, BA1600	BSA85C, BSA125C, BSA175C, BSA286C	PPG3001, PPG3002, PPG3004, PPG3201, PPG3202, PPG3204, PED3201, PED3202
Channels	1	1	1 (PPG3001,PPG3201, PEG3001) 2 (PPG3002,PPG3202,PED3202) 4 (PPG3004, PPG3204)
Maximum Bitrate	1.5-1.6 Gbps	8.5-28.6 Gbps	30-32 Gbps
Maximum Native Error Detector Rate	1.6 Gbps	26 Gbps	32 Gbps
Maximum Patten Length	8Mbits	128Mbits	2Mbits/channel
Stress Impairments	External stressed clock	External stressed clock Internal: (STR) Rj, Sj, Si, Pj, BUJ	External stressed clock Internal: (JIT) Sj, Rj
Output Signal Amplitude	4V Differential	4V Differential	PPG300X 4V Differential PPG320X 1V (Fixed) Differential
Detector Functions	BER, BER Contour, BER Mask, Error Location, Eye Diagram, Jitter Peak	BER, BER Contour, BER Mask, Error Location, Eye Diagram, Jitter Peak, Jitter Map, Jitter Tolerance	BER, Auto Align
Input Sensitivity	40mV Typical	50mV Typical	20mV Typical
Applications	Digital Radio and Satellite test	PCIe, USB, Thunderbolt, SATA, SAS, FC, IEEE802.x , OIF, CEI	FC, IEEE802.x, OIF, CEI
Software		BSAUSB3: USB (Gen3) Automated loopback control, auto impairment calibration and receiver compliance test system; BSAPCI3: PCI Express (Gen3) Automated loopback control, auto impairment calibration and receiver compliance test system.	

BA/BSA/PPG Series, Bit Error Rate Testers

As high performance SERDES receiver validation is now frequently required as part of industrial conformance programs (SATA, PCIe, USB etc) or for the validation and comparison of silicon receiver sensitivity, the BERT is an essential piece of all silicon and system validation labs.

DATA SHEET

Model	Output Channels	Bit Rate	Maximum User Defined Pattern Length
BA1500	1	1.5 Gbps	8 Mbits
BA1600	1	1.6 Gbps	8 Mbits
BSA85C	1	8.5 Gbps	128 Mbits
BSA125C	1	12.5 Gbps	128 Mbits
BSA175C	1	17.5 Gbps	128 Mbits
BSA286C	1	28.6 Gbps	128 Mbits
PPG3001	1	30 Gbps	2 Mbits
PPG3002	2	30 Gbps	2 Mbits
PPG3004	4	30 Gbps	2 Mbits
PPG3201	1	32 Gbps	2 Mbits
PPG3202	2	32 Gbps	2 Mbits
PPG3204	4	32 Gbps	2 Mbits
PED3201	-	32 Gbps	2 Mbits
PED3202	-	32 Gbps	2 Mbits

Recommended Accessories

Digital Pre-Emphasis Processor	
DPP125C	1-12.5 Gb/s 3-Tap, opt. 4-Tap
Clock Recovery Instruments	
CR125A	1-12.5 Gb/s
CR175A	1-17.5 Gb/s
CR286A	1-28.6 Gb/s
BSA Interference Test System	
BSAITS125	Interference Test Set with interference insertion and ISI switching
Linear Equalizer	
LE160	16Gbps Linear Equalizer
LE320	32Gbps Linear Equalizer
Common Options	
9T	9 Tap User Configuration (Standard 4 Tap)
CDS	Channel Designer SW
SPM	S-Parameter Modeler
Software Packages	
BSAUSB3	USB3 Automation SW and accessories needed for compliance testing
BSAPCI3	PCI Express (Gen3) Automated SW for compliance testing

Recommended Accessories

Adapters

BARACK BA-Rack Mount Kits; BSA12500ISI Differential ISI Board; BSAITS125 Interference Test Set with interference insertion and ISI switching; BSARACK BSA-Rack Mount Kits; BSASATATEE BSA-SATA-Tee for OOB Signaling; BSASWITCH Hardware switch for receiver testing in applications such as USB3 compliance testing allowing attainment of loopback; PMCABLE1M Precision Phase Matched Cable Pair, 1m SMAPOWERDIV SMA Power Dividers

Instrument Options

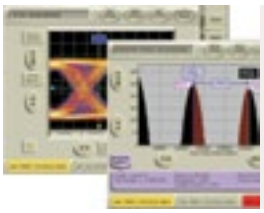
BA1500/BA1600: ECC: Error Correction and Coding Emulation; MAP: Error Mapping Analysis; PL: Physical Layer Test Suite Software.

BSA85C-BSA286C: F2: F/2 Jitter Generation (requires STR); STR Stressed Signal Generation; XSSC Extended Spread Spectrum Clocking; J-MAP Jitter Decomposition SW; ECC Error Correction Coding; LDA Live Data Analysis SW; MAP Error Mapping SW; PL Physical Layer Test Suite; SF Symbol Filtering SW; SLD Stressed Live Data SW

PPG/PED Series: JIT: 150ps Pk-pk of Sinusoidal and Random jitter

Product Highlights

- BA1500/BA1600:
  - 1.6Gbps performance and low entry cost with full featured analysis capabilities key for telecommunications and satellite systems testing
- BSA85C-BSA286C:
  - 8.5 to 28.6Gbps performance and the industry's most comprehensive precision signal impairments, jitter measurement and error location analysis tools make this family of products key to all validation labs
  - Ultra low noise floor (<300fs RMS Rj) coupled with 28.6Gbps performance makes these instruments key for all forms of receiver characterization and debug.
- PPG/PED Series
  - Driving modern 100G communications system links mandate the ability to operate up to 32Gbps coupled with precision controlled alignment of channel phase over 4 outputs
  - The PPG3204 offers 4 synchronous (user controlled) channels with sub 10pSec edge rates for blazing performance



The BSA offers a complete and continuous analysis of any given bit stream, allowing in-depth BER contouring and examinations of very low probability and in-frequent errors which others instruments overlook.

System validation for coherent QPSK systems and 100G Ethernet testing require precision four channel capable BERTS and complimentary error detectors.

Ships with Product

- All Models Include:
  - Quick Start user manual, power cord, mouse, three (3) short low-loss SMA cables, DVI adapter
  - Standard 1 year warranty
- Certifications:
  - EU EMC Directive (CE-Marked)*
  - LVD Low Voltage Directive
  - US Listed UL61010-1
  - Canada Certified CAN/CSA 61010-1

*BSA models only.

Recommended Service

G3	Gold Care 3-year Extended Warranty
G5	Gold Care 5-year Extended Warranty
R3	3-year Extended Warranty
R5	5-year Extended Warranty

Spectrum Analyzers

Delivering confidence to confront the most challenging microwave and RF designs.

Each Tektronix Spectrum Analyzer is equipped with the DPX™ Live RF spectrum display to effectively characterize time-variant signals and solve unexpected problems.

If you need both an oscilloscope and spectrum analyzer functionality, the new MDO4000 Series Mixed Domain Oscilloscope is the world's only oscilloscope with a built-in spectrum analyzer, you can capture time-correlated analog, digital and RF signals for a complete system view of your device.

	RSA6000 Series	RSA5000 Series	H500/SA2500 Series	SPECMON	MDO4000B Series
Frequency Range	9 kHz to 20 GHz	1 Hz to 26.5 GHz	10 kHz to 6.2 GHz	1 Hz to 3/6.2 GHz	9 kHz to 6 GHz
Capture Bandwidth	Up to 110 MHz	Up to 165 MHz	20 MHz	Up to 165 MHz	≥ 1 GHz
Minimum Event Duration for 100% Probability of Intercept (POI)	As brief as 3.7 µs	As brief as 2.7 µs	As brief as 125 µs	As brief as 2.7 µs	N/A
SFDR at Max. BW (typical)	-75 dBc at 110 MHz	-75 dBc at 165 MHz	-70 dBc at 20 MHz	-78 dBc	-65 dBc
DANL (equivalent at 1 Hz RBW)	Down to -170 dBm/Hz	Down to -167 dBm/Hz	Down to -163 dBm/Hz	Down to -167 dBm/Hz	Down to -162 dBm/Hz with TPA-N-PRE preamp
Phase Noise (typical at 10 kHz offset)	≤ -110 dBc/Hz	≤ -112 dBc/Hz	≤ -95 dBc/Hz	≤ -112 dBc/Hz	< -111 dBc/Hz
Third Order Intercept at 2 GHz	+17 dBm	+17 dBm	Not Specified	≤ -139 dBc/Hz	Not Specified
DPX Live RF Spectrum Display	up to 292,000 spectrums/sec	up to 390,625 Spectrums/s	> up to 10,000 Spectrums/s	up to 292,000 spectrums/sec	N/A

Choosing your Real Time Spectrum Analyzer

Key items for consideration in selecting your spectrum analyzer

1 Frequency Range

Of course, the analyzer chosen must cover all of the frequencies you need to measure. Consider harmonics and spurious when making your selection. For example, your fundamental signal may be at 2.4 GHz, but perhaps you will want to see up to 10 harmonics of the signal to meet all the needs of your design.

2 Acquisition/Real Time Bandwidth

In a real time spectrum analyzer, this sets the maximum bandwidth for guaranteed capture and triggering on brief signals, and is also the limiting factor in modulation measurements. For example, 802.11n signals require a minimum acquisition bandwidth of 40 MHz so that all signal elements can be acquired and demodulated. However, the entire operating frequency of your signal of interest may need to be considered. For example, a Bluetooth signal is relatively narrow band, and may be demodulated with the standard acquisition bandwidth of an RTSA, but you may want to observe the full hopping pattern of the Bluetooth transmitter as it operates, requiring at least 85 MHz bandwidth for your application.

3 Dynamic Range

This can be a complex subject. Your definition of dynamic range may be highly specific. Consideration of Adjacent Channel Power Ratio dynamic range, Spurious-free dynamic range in a particular frequency range, or harmonic distortion specifications may or may not be important to your application. For example, the RSA6100B series real time analyzer has our best ACLR specifications, but the low-frequency (1 Hz – 32 MHz) spurious free dynamic range of the RSA5100B is the best available.

4 Features and Capabilities

Tektronix RTSAs offer a range of features and capabilities, with a wealth of performance and analysis options. Optional features include preamplifiers, acquisition bandwidth options, and analysis options that include WLAN and general purpose modulation analysis, pulse measurements and mapping. Consulting with a Tektronix applications engineer can be the best way to learn which optional feature may be useful in your RTSA.

DATA SHEET

H500/SA2500 Handheld Real-Time Spectrum Analyzer

Interference troubleshooting has never been so easy.

The H500/SA2500 Handheld Spectrum Analyzer Series will help you to easily scan, classify and locate signals of interest in the field environment. Scan the environment to discover spectrum events other analyzers will miss, when using the unique DPX® Live RF spectrum display. Classify signals of interest with the built-in, user-defined signal database. Locate signals quickly using the integrated GPS mapping solution. The ruggedized design, with a hot swappable battery, is optimized to help you in the toughest of environments.

Product Highlights

- Spectrum Monitoring and Surveillance
- Interference Detection and Troubleshooting
- Signal Hunting
- Signal Identification
- Signals Intelligence (SIGINT)
- Homeland Security

Model	Capture Bandwidth	Frequency Range	Minimum Event Duration for 100% Probability of Intercept (POI)	SFDR at 20 MHz
SA2500	20 MHz	10 kHz - 6.2 GHz	125 µs - 500 µs	-70 dBc
H500	20 MHz	10 kHz - 6.2 GHz	125 µs	-70 dBc

Instrument Options (SA2500)

Option EP1	Enhances SA2500 DPX™ Live RF spectrum display to 10,000 spectrums/sec
Option EP2	Enhances SA2500 by adding signal classification to the Spectrum Notes capability

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Recommended Accessories

Beam Antennas	
119-6594-xx	824 to 896 MHz
119-6595-xx	896 to 960 MHz
119-6596-xx	1710 to 1880 MHz
119-6597-xx	1850 to 1990 MHz
Cables	
012-0482-xx	50 Ω, BNC (m) 3 foot
174-4977-xx	50 Ω, Straight Type-N (m) and angled Type-N (m) connector, 1.6 foot
174-5002-xx	50 Ω, Type-N (m) to Type-N (m) connector, 3 foot
Accessories	
119-6970-xx	Magnetic Mount Antenna, 824 to 2170 MHz
119-7246-xx	Pre-filter, General Purpose, 824 to 2500 MHz, Type-N (f) Connector
119-7426-xx	Pre-filter, General Purpose, 2400 to 6200 MHz, Type-N (f) Connector
119-6030-xx	External Battery Charger (2-slot, external)
119-7755-xx	AC Power Supply
146-0151-xx	Lithium-ion Battery
016-1882-xx	Display Protector Sheets

Ships with Product

- H500:
  User Manual (in PDF format), Installation Software, AC Power Adapter, Lithium-ion Battery, GPS Antenna, Flexible monopole antenna, Type-N (m) to BNC (f) adapter, USB A-B cable, Tilt Stand, Soft Carry Case, Audio Jack Mute Plug (mute all audio output from the instrument speaker), One-year Warranty
- SA2500:
  User Manual (in PDF format), Installation Software, AC Power Adapter, Lithium-ion Battery, GPS Antenna, Flexible monopole antenna, Type-N (m) to BNC (f) adapter, USB A-B cable, Tilt Stand, Soft Carry Case, Audio Jack Mute Plug (mute all audio output from the instrument speaker), One-year Warranty

DATA SHEET

RSA5000B Real-Time Spectrum Analyzer

The RSA5000 Series mid-range Real-Time Spectrum Analyzer combines the best-in-class RF performance up to 165 MHz bandwidth and 3rd Generation DPX® Technology. This provides the measurement confidence and functionality you demand for everyday tasks and gives you the dynamic range you expect for challenging spectrum analysis measurements.

Product Highlights

- DPX® Live RF spectrum display
- Triggering expertise
- Seamless data capture
- Multi-domain time correlation
- Automatic pulse measurement and detection

Model	Capture Bandwidth	Frequency Range	Minimum Event Duration for 100% POI	SFDR at 110 MHz BW (typical)
RSA5103B	25 MHz, 40 MHz, 85 MHz, 165 MHz	1 Hz - 3 GHz	2.7 µs	75 dBc
RSA5106B	25 MHz, 40 MHz, 85 MHz, 165 MHz	1 Hz - 6.2 GHz	2.7 µs	75 dBc
RSA5115B	25 MHz, 40 MHz, 85 MHz, 165 MHz	1 Hz - 15 GHz	2.7 µs	75 dBc
RSA5126B	25 MHz, 40 MHz, 85 MHz, 165 MHz	1 Hz - 26.5 GHz	2.7 µs	75 dBc

Instrument Options

Opt. 10	AM/FM/PM Modulation and Audio Measurements
Opt. 11	Phase Noise / Jitter Measurement
Opt. 12	Settling Time (Frequency and Phase)
Opt. 20	Advanced Signal Analysis
Opt. 21	General Purpose Modulation Analysis
Opt. 22	Flexible OFDM Analysis
Opt. B25	25 MHz Acquisition Bandwidth (no charge option)
Opt. B40	40 MHz Acquisition Bandwidth
Opt. 52	Frequency Mask Trigger (no cost option)
Opt. 53	Memory Extension, 4 GB Acquisition Memory Total
Opt. 55	Digital I and Q output
Opt. 85	85 MHz Acquisition Bandwidth
Opt. B16x	165 MHz Acquisition Bandwidth

Recommended Accessories

RTPA2A	Spectrum Analyzer Probe Adapter
RSAVu	Software Enables Offline Analysis of Data Captures
SignalVu-PC	Vector Signal Analysis Software for your PC

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Quick-start Manual, Application Guide, Printable Online Help File, Programmer's manual (on CD), power cord, BNC-N adapter, USB Keyboard, USB Mouse, Front Cover, One-year Warranty

Learn more about Advanced Radar Analysis with the "Tools for Measuring Modern Radar" application note.

DATA SHEET

RSA6000B Real-Time Spectrum Analyzer

The high-performance RSA6000 Real-Time Spectrum Analyzer Series will help you easily discover design issues that other spectrum analyzers will miss. Its industry-leading dynamic range and bandwidth combination, coupled with the unique DPX™ Live RF spectrum display, gives you immediate confidence in the stability of your design, or instantly displaying a fault when it occurs.

Product Highlights

- DPX® Live RF spectrum display
- Triggering expertise
- Seamless data capture
- Multi-domain time correlation
- Automatic pulse measurement and detection

Model	Capture Bandwidth	Frequency Range	Minimum Event Duration for 100% POI	SFDR at 110 MHz BW (typical)
RSA6106B	40 MHz - 110 MHz	9 kHz - 6.2 GHz	3.7 µs	75 dBc
RSA6114B	40 MHz - 110 MHz	9 kHz - 14 GHz	3.7 µs	75 dBc
RSA6120B	40 MHz - 110 MHz	9 kHz - 20 GHz	3.7 µs	75 dBc

Instrument Options

Opt. 05	Digital IQ Output and 500 MHz Analog IF Output
Opt. 10	AM/FM/PM Modulation and Audio Measurements
Opt. 11	Phase Noise and Jitter Measurement
Opt. 12	Settling Time Measurements (Frequency and Phase)
Opt. 20	Advanced Signal Analysis
Opt. 21	General Purpose Digital Modulation Analysis
Opt. 22	Flexible OFDM
Opt. 24	WLAN analysis 802.11a/b/g/j/p
Opt. 25	WLAN analysis 802.11n
Opt. 26	WLAN analysis 802.11ac
Opt. 50	Preamp, 1 MHz - 6.2 GHz, 20 dB Gain (RSA6106B only)
Opt. 51	Preamp, 100 kHz - 20 GHz, 30 dB Gain (RSA6114B and RSA6120B only)
Opt. 52	Frequency Mask Trigger
Opt. 53	Memory Extension, 4 GB Total Acquisition Memory

Recommended Accessories

RTPA2A	Spectrum Analyzer Probe Adapter
RSAVu	Software Enables Offline Analysis of Data Captures
SignalVu-PC	Vector Signal Analysis Software for your PC

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Product Documentation CD (Quick-start User Manual, Application Examples Manual, Printable Online Help, Programmer Manual, Service Manual, Specification and Performance Verification Manual, Declassification and Security Instructions), Front Cover, USB Keyboard, USB Mouse, Planar Crown™ RF Input Connector – Type-N (RSA6106B and RSA6114B) / 3.5 mm (RSA6120B only) / SMA (m) to SMA (f) adapter (RSA6120B only), and One-year Warranty

DATA SHEET

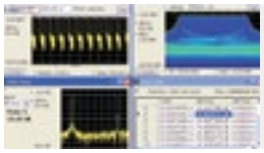
SPECMONB Real Time Spectrum Analyzer

Fast and Versatile Solution for Field Interference Hunting.

Discover, capture, locate and analyze elusive events in the field faster than ever before with the SPECMON Spectrum Analyzer.

Product Highlights

- Leading real time technologies help to troubleshoot the toughest transient interferences in the field
- Integrated solution design reduces total cost of ownership with lower initial purchase cost and annual maintenance cost
- Open data format improves asset utilization through compatibility with industry-standard products



Swept DPX and Advanced Triggering for the SPECMON Series.

Built-in Mapping for Interference Hunting in SPECMON Series.

Model	Capture Bandwidth	Frequency Range	Minimum Event Duration for 100% POI	SFDR at 110 MHz BW (typical)
SPECMON3B	25 MHz, 40 MHz, 85 MHz, 165 MHz	1 Hz - 3 GHz	2.7 µs	75 dBc
SPECMON6B	40 MHz, 85 MHz, 165 MHz	1 Hz - 6.2 GHz	2.7 µs	75 dBc
SPECMON26B	40 MHz, 85 MHz, 165 MHz	1 Hz - 26.5 GHz	2.7 µs	75 dBc

Recommended Accessories

RTPA2A Spectrum Analyzer Probe Adapter	Supports TekConnect® probes P7225, P7240, P7260, P7330, P7313, P7313SMA, P7340A, P7350, P7350SMA, P7360A, P7380A, P7380SMA, P7500 Series
RSAVu	Software based on the RSA3000 Series platform for analysis supporting 3G wireless standards, WLAN (IEEE802.11a/b/g/n), RFID, Audio Demodulation, and more measurements
119-4146-xx	E and H Near-field Probes for EMI troubleshooting

Recommended Accessories

065-0924-xx	Additional Removable Hard Drive. Windows 7 and instrument SW preinstalled.
016-2026-xx	Transit Case
RSA56KR	Rackmount Retrofit Kit
071-3064-xx	Additional Quick Start User Manual (Paper)

Recommended Service

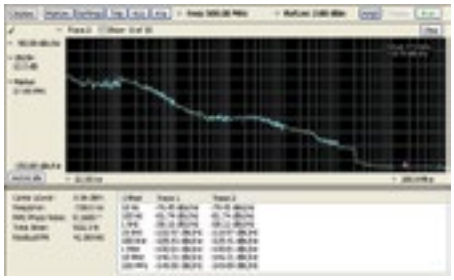
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Quick-start Manual (Printed), Application Guide (Printed), Printable Online Help File (on CD), Programmer's manual (on CD), power cord, BNC-N adapter, USB Keyboard, USB Mouse, Front Cover, 3-year Warranty.

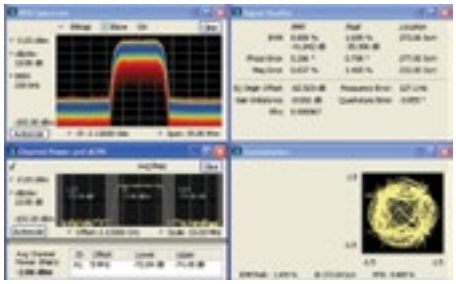
Learn more with SPECMON Series Real Time Spectrum Analyzers Datasheet.

Spectrum Analyzers RSA5000/6000 Series



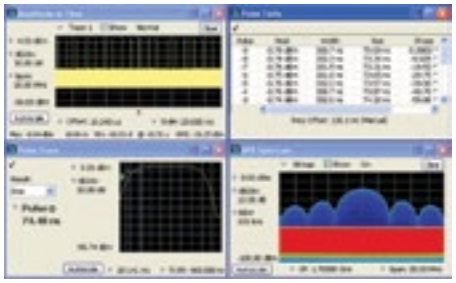
Phase Noise and Jitter Measurements for the RSA5000/6000 Series (Option 11)

Make important phase noise measurements faster than any other spectrum analyzer on the market. Identify timing issues with advanced jitter measurement capability like Timing Interval Error (TIE) and other jitter analysis plots.



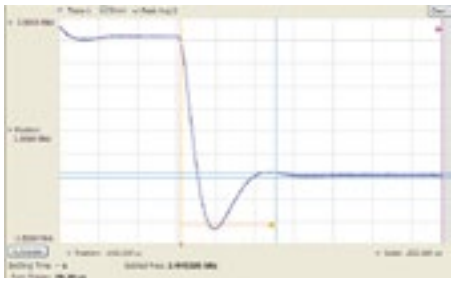
General Modulation Analysis for the RSA5000/ 6000 Series (Option 21)

Now you can have integrated Digital Signal Analysis on up to 22 different modulation types including QPSK, 128 QAM, and FSK - all loaded on your RSA5000 or RSA6000 Series spectrum analyzer. This also includes basic analysis on items such as Symbol Table and Constellation, Eye, Trellis, and Demodulated IQ Diagrams.



Pulse Analysis for the RSA5000/6000 Series (Option 20)

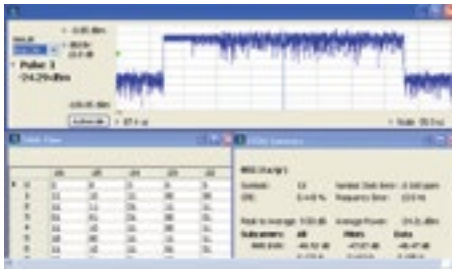
Characterize pulsed signals within a 110 MHz bandwidth with over 20 automatic pulse width measurements such as Rise Time, Duty Cycle, Pulse Ripple and Droop. Improve your ability to gain insight into important pulsed signals with a pulse table of all results, pulse traces of specific single pulse parameters, and pulse trend information on data for the whole pulse train. Includes vector measurement analysis as well with this integrated Pulse Measurement suite!



Settling Time (Frequency and Phase) Analysis RSA5000/6000 Series (Option 12)

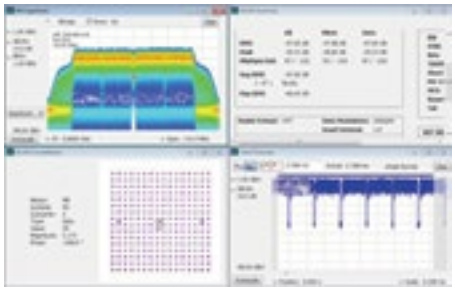
Easily select measurement bandwidth, tolerance bands, reference frequency (auto or manual), and establish up to 3 tolerance bands vs. time for Pass/Fail testing. Settling time may be referenced to external or internal trigger, and from the last settled frequency or phase.

Spectrum Analyzers RSA5000/6000 Series



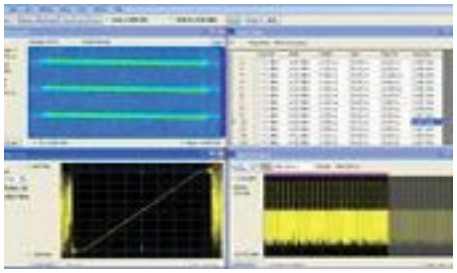
Flexible OFDM Analysis Software RSA5000/6000 Series (Option 22)

In addition to standards analysis for IEEE 802.11a/g/j and WiMax IEEE 802.16-2004, the integrated Flexible OFDM software enables customer defined modulation analysis. This includes controls of all carrier and subcarrier physical layer parameters. The analysis views include Constellation, Scalar Measurement summary, EVM or Power vs. Carrier and Symbol Table (Binary or Hexadecimal).



WLAN Analysis Option (24, 25, 26)

WLAN options are available for in depth analysis of 802.11a/b/g/j/p, 802.11n and 802.11ac standards. Here, an 802.11ac 80 MHz signal is analyzed, with displays of constellation, amplitude vs. time, summary of WLAN measurements, and the DPX spectrum of the analyzed signal. The density of the 'shoulders' of the WLAN signal are clearly seen in the DPX display, and a marker has been placed on the suppressed center carrier of the signal. An EVM of -47.65 dB and other signal measurements are seen in the summary panel.

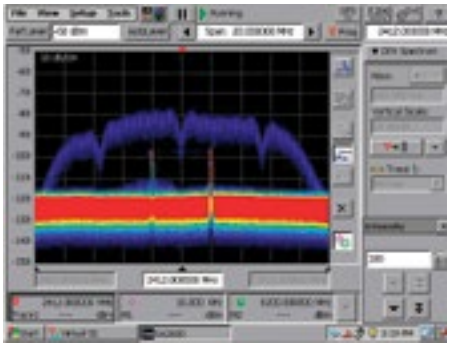


SignalVu-PC Vector Signal Analysis Software

SignalVu-PC vector signal analysis software helps you easily validate wideband designs. Using the signal analysis engine of the RSA5000 and RSA6000 Series real-time signal analyzer on an external computer or Windows tablet, you can now move your analysis of acquisitions off the instrument, and anywhere. Whether your design validation needs include wideband radar, high data rate satellite links, wireless LAN or frequency-hopping communications, SignalVu-PC vector signal analysis software can speed your time-to-insight by showing you the time-variant behavior of these wideband signals.

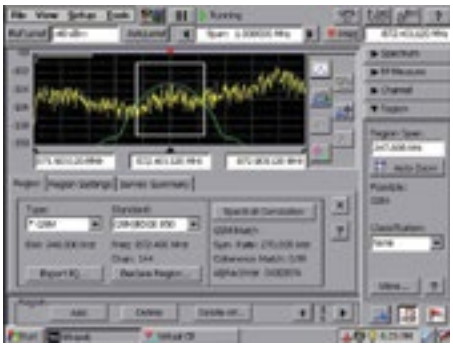
- PC-based multi-domain vector signal analysis for waveforms acquired by Tektronix real-time signal analyzers and oscilloscopes:
  - Tektronix real-time and mixed-domain oscilloscopes (MSO/ DPO3000, MDO/MSO/DPO4000, MSO/ DPO5000, DPO7000, DPO/ DSA/MSO70000 Series)
  - Tektronix real-time signal analyzers (RSA3000, RSA5000, RSA6000 Series)
  - Turn the MDO4000B into the industry's only 1 GHz Vector Signal Analyzer using the Live Link option (Option CON)
- Analyze without acquisition hardware present
- Analyze wideband designs
- Free up instruments for further use while analysis occurs offline
- Enable analysis at multiple sites without purchasing additional hardware
- Use your Windows tablet or your powerful PC workstation
  - Windows XP (32 bit), Windows 7 (64 bit), and Windows 8 (64 bit) versions available

H500/SA2500 Series



Enhanced DPX™ Live RF for the SA2500 Series (Option EP1)

Enhances SA2500 Series DPX™ Live RF spectrum display to 10,000 spectrums/s and 125 µs minimum signal duration for 100% Probability of Intercept (POI), typical.



Signal Classification for the SA2500 Series (Option SC1)

Enhances SA2500 Series by adding integrated signal classification capability.

Coherent Optical Solutions

Characterization of signals at 100 Gb/s, 400Gb/s, and beyond

As network demands increase, long-haul communications are becoming more complex. Advanced test tools are required to test the latest communication systems for 100G, 400G, 1Tb/s and beyond. Tektronix is the only test and measurement vendor that can offer a complete coherent optical test system from signal generation, to modulation, acquisition, and analysis.

	OM5110 46GBaud	OM4006D Coherent	OM4106D Coherent	OM2210 Coherent Receiver	OM2012 Tunable Laser
	Multi-Format Optical Transmitter	Lightwave Signal Analyzer	Lightwave Signal Analyzer	Calibration Source	Source
Bandwidth	23 GHz	23 GHz	33 GHz	N/A	N/A
Band Options	C or L	C, L, or C+L	C, L, or C+L	C, L, or C+L	C, L, or C+L
Description	Coherent optical transmitter capable of modulating binary and multi-level signals	Optical modulation analyzer compatible with both real-time and equivalent time oscilloscopes	Optical modulation analyzer compatible with both real-time and equivalent time oscilloscopes	Measures key performance parameters for receiver calibration	Low-noise, single-mode tunable laser source

Choosing your Optical Modulation Analyzer

Tektronix Optical Modulation Analyzer solutions enable efficient and accurate characterization of serial communications in fiber at 100 Gb/s and beyond. With coherent lightwave analysis capabilities, Tektronix provides the acquisition and display of constellation diagrams, Q plots, polarization analysis, and source laser stability to better understand fiber-based signal quality. The Tektronix Coherent Lightwave Signal Analyzer series are tightly coupled with the DPO70000 performance oscilloscopes series to enable comprehensive analysis and presentation of your data, so you're no longer in the dark.

1 Receiver Bandwidth

Receiver bandwidth determines the maximum baud rate that can be accurately measured by the optical modulation analyzer (OMA). A receiver bandwidth of 23GHz can accurately measure signals up to 40GBaud. Using the 33GHz OMA, signals as high as 60GBaud can be measured.

2 Frequency Band

100G communications typically occur in the C-band, however L-band is also supported. The Tektronix coherent optical products support testing in C-band, L-band, or both. Accompanying coherent receiver calibration sources also support flexible choices of frequency band.

3 Homodyne or Heterodyne Measurements

Homodyne measurements can often be conducted with equivalent-time oscilloscopes offering superior oscilloscope bandwidth and very low noise. When used in this mode and externally referenced local oscillator is required (option EXT). Heterodyne measurements do not require an external local oscillator and can utilize the high sample rate offered by real-time oscilloscopes. Tektronix is the only manufacturer that can offer both homodyne and heterodyne measurements with the same optical modulation analyzer.

DATA SHEET

Product Highlights

- Measure key performance parameters for coherent receivers such as quadrature phase angle, path gains, and channel skew.
- Obtain calibration data over wavelength for use in calibrated optical field measurements.
- Calibrate any sufficiently stable coherent receiver to make it capable of optical field measurements.
- Measure receiver hybrid parameters at any heterodyne frequency within the oscilloscope bandwidth.
- Measure optical hybrid properties in higher-level receiver modules.

OM2210 Coherent Receiver Calibration Source

The OM2210 Coherent Receiver Calibration Source includes the capability and software needed for coherent optical receiver calibration. Equipped with two independent free-running lasers and a precision polarization switch, the OM2210 is able to excite the coherent receiver with a known-polarization signal so that the receiver's linear transfer function can be extracted.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Optical Output Power Adjustment Range (BOL set points)	PcwBOL	+7	--	+13.5	dBm
Operating Frequency Range (50 GHz channel spacing on ITU grid)	ν (C-band)	196.25	--	191.50	THz
	ν (L-band)	190.95	--	186.35	nm
Operating Wavelength Range (50 GHz channel spacing on ITU grid)	λ (C-band)	1527.60	--	1565.50	nm
	λ (L-band)	1570.01	--	1608.76	nm
Wavelength Accuracy EOL	Δλacc	--	--	±2.5	GHz
Linewidth [FWHM (–3 dB), instantaneous]	Δλ	--	--	100	kHz
Side Mode Suppression Ratio	SMSR	40	55	--	dB
Polarization Extinction Ratio (Unconnectorized)	Er, p	20	--	--	dB

Instrument Options

Opt. C	Single C-band laser with polarization switch
Opt. L	Single L-band laser with polarization switch
Opt. CC	Dual C-band lasers with polarization switch
Opt. LL	Dual L-band lasers with polarization switch
Opt. CL	Coupled C- and L-band lasers with polarization switch
Opt. NL	No lasers, polarization switch only

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Coherent Receiver Calibration Source. Contains the laser source(s), polarization switch, optical power meter, power splitter, hardware control drivers, and calibration software needed for optical receiver characterization. It is used together with the OM4000 or OM1106 products to provide calibrated optical signal measurements.

DATA SHEET

OM4000 Coherent Lightwave Signal Analyzer

OM4106D Coherent Lightwave Signal Analyzer, tightly integrated with the DPO70000DX Series 33 GHz Oscilloscopes, uses coherent detection to acquire fiber signals carrying up to 240Gb/sec per wavelength, then analyzes both modulation and source properties using the power of optical-industry tested DSP, presenting a rich library of results and graphical plots with the ease of use offered by a dedicated graphical user interface.

Product Highlights

- Supports both real-time and equivalent-time oscilloscopes for the greatest system flexibility.
- Complete system for polarization-multiplexed QPSK, offset QPSK, QAM, differential BPSK/QPSK, and other advanced modulation formats.
- Displays constellation diagrams, phase eye diagrams, Q-factor, Q-plots, spectral plots, Poincaré sphere, signal vs. time, laser phase characteristics, BER, with additional plots and analyses available through the MATLAB interface
- Supports automated testing of multi-carrier "super-channels" with a user-definable number of carriers, carrier spacing, and modulation formats.
- User access to internal functions and full extensibility with a direct MATLAB interface.
- Coherent Lightwave Signal Analysis software available with the OM4000-series instruments or standalone via OM1106.

Model	Option	Description	Receiver Bandwidth	C-band Lasers Included	L-band Lasers Included	Wavelength Band
OM4006D	CC	23 GHz C-band Coherent Lightwave Signal Analyzer	23 GHz	2	0	1530 to 1570 nm
OM4006D	LL	23 GHz L-band Coherent Lightwave Signal Analyzer	23 GHz	0	2	1570 to 1610 nm
OM4006D	CL	23 GHz C- and L-band Coherent Lightwave Signal Analyzer	23 GHz	1	1	1530 to 1610 nm
OM4106D	CC	33 GHz C-band Coherent Lightwave Signal Analyzer	33 GHz	2	0	1530 to 1570 nm
OM4106D	LL	33 GHz L-band Coherent Lightwave Signal Analyzer	33 GHz	0	2	1570 to 1610 nm
OM4106D	CL	33 GHz C- and L-band Coherent Lightwave Signal Analyzer	33 GHz	1	1	1530 to 1610 nm
OM1106		Coherent Lightwave Signal Analyzer Software, stand-alone (included with OM4000-series instruments)				

Configuration Recommendations	Receiver Bandwidth	Receiver Options	Receiver Bandwidth	Recommended Scope Model	Scope Bandwidth
Real-time Systems	OM4006D	Recommended: Opt. CC, Opt. QAM, Opt. TSI, OMRACK	23 GHz	MSO/DPO72304DX	23 GHz
	OM4106D	Recommended: Opt. CC, Opt. QAM, Opt. TSI, OMRACK	33 GHz	MSO/DPO73304DX	33 GHz
Equivalent-time Systems	OM4006D	Recommended: Opt. CC, Opt. QAM, Opt. TSI, OMRACK; Required: Opt. EXT	23 GHz	DSA8300 with Opt. ADVTRIG and 2 each 80E07	30 GHz
	OM4106D	Recommended: Opt. CC, Opt. QAM, Opt. TSI, OMRACK; Required: Opt. EXT	33 GHz	DSA8300 with Opt. ADVTRIG and 2 each 80E09	60 GHz

Instrument Options

Opt. CC	C-band lasers (receiver tested over C-band)
Opt. LL	L-band lasers (receiver tested over L-band)
Opt. CL	Coupled C- and L-band lasers (receiver tested over C- and L-band)
Opt. NL	No lasers (receiver tested over C- and L-band)
Opt. EXT	Adds external connection for reference laser
Opt. QAM	Adds QAM and other software demodulators
Opt. MCS	Adds multi-carrier super-channel support

DATA SHEET

Product Highlights

- Multi-format optical transmitter supports modulation of formats such as BPSK, PM-QPSK, and PM-16QAM.
- Excellent linearity supports modulation of multi-level signals.
- Modulates single or dual-polarization signals.
- Built-in C or L-band lasers for setup convenience.
- Supports external laser sources.
- Supports manual and automatic bias control of amplifiers and modulator.
- All setup and operation controlled remotely via Ethernet.

OM5110 46GBd Multi-Format Optical Transmitter

The OM5110 Multi-format Optical Transmitter provides the flexibility to modulate all of the most common coherent optical formats at rates up to 46GBaud. The OM5110 Multi-Format Optical Transmitter is a C-and L-Band dual polarization transmitter capable of modulating the most common coherent optical modulation formats such as PM-QPSK and PM-16QAM.

Model	Description	Maximum Baud Rate	Modulator Bandwidth, 6dB	Supported Modulation Formats
OM5110	46GBaud Multi-Format Optical Transmitter	34GBaud: multi-level formats 46GBaud: binary formats	30 GHz	BPSK, PM-BPSK, QPSK, PM-QPSK, QAM, PM-QAM

Recommended Service

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. R3	Repair Service 3 Years
Opt. R5	Repair Service 5 Years

Instrument Options

Opt. C	Built-in C-band laser
Opt. L	Built-in L-band laser
Opt. NL	No built-in lasers. Requires external laser source

Long-haul Communications Solutions

From I & Q signal generation and coherent optical modulation to coherent optical detection, acquisition, and analysis, Tektronix offers a complete suite of instruments to test the latest developments in long-haul communications such as PM-QPSK and PM-16QAM.

Function	Model	Description
Signal Generation	AWG70001A	Arbitrary Waveform Gen erator
	PPG3204	Programmable Pattern Generator
Optical Modulation	OM5110	Multi-Format Optical Transmitter
Coherent Detection	OM4106D	Coherent Lightwave Signal Analyzer
Signal Acquisition	DPO73304DX	Digital Phosphor Oscilloscope

SourceMeter® SMU Instruments

Keithley Instruments SourceMeter® SMU instruments source current or voltage and simultaneously measure current, voltage and resistance with high speed and accuracy. SourceMeter® SMU instruments offer a smart alternative to separate power supplies and DMMs, saving money and limited test bench space.

	Model 2450 Touchscreen SourceMeter® SMU Instrument	Series 2400 Bench SourceMeter® SMU Instruments	Series 2600B System SourceMeter® SMU Instruments	2650A High Power System SourceMeter® SMU Instruments
Channels	1	1	1-2 (optional expansion to 64 via TSP-Link®)	1 (optional expansion to 32 via TSP-Link®)
Accuracy	6½-digit measurements	6½-digit measurements	6½-digit measurements	6½-digit measurements
Max. Readings / Second	3,000	2,000	20,000	38,500 1µSec/pt., 18-bit digitizer
Interface	GPIB, USB 2.0, LXI/Ethernet, Digital I/O	GPIB, RS-232, Digital I/O	GPIB, LAN (LXI), USB, RS-232, Digital I/O	GPIB, LAN (LXI), RS-232, Digital I/O
Application Features	Capabilities of analyzers, curve tracers, and I-V systems at a fraction of their cost; touchscreen and icon menu system; built-in graphing	Convenient DMM-like user interface; 2/4/6 wire resistance with force I or V source modes, V-Force from 1ΩV to 1.1KV, 10pA to 5A cont., 10A pulsed, 2W to 110W	True multi-channel parallel test via TSP-Link. Up to 0.1 fA resolution.	2 pairs of A/D converters for simultaneous V and I measurement; up to 2000W pulsed power
Test Sequencing / Scripting	TSP® (Test Script Processing) technology embeds complete test programs inside the instrument for unmatched system-level speed	Built-In ramp generator and list sweep modes, 100 point global machine state sequencer for fast test setup and execution	TSP® (Test Script Processing) technology embeds complete test programs inside the instrument for unmatched system-level speed	TSP® (Test Script Processing) technology embeds complete test programs inside the instrument for unmatched system-level speed
Included Software	Test Script Builder and KickStart Startup Software, LabVIEW and IVI Drivers.	LabTracer 2.0 I-V curve utility and IVI and LabVIEW drivers included.	Built-in, web browser-based characterization software, IVI, LabVIEW, and ICCAP drivers.	Built-in, web browser-based characterization software, IVI, LabVIEW, and ICCAP drivers.

Choosing Your Source Measure Unit (SMU) Instrument

A SMU instrument integrates precision power supply and digital multimeter (DMM) capabilities in one instrument while covering a wide dynamic range. SMUs source and measure simultaneously, making them ideal for characterizing and testing semiconductors and other non-linear devices and materials.

1 System-Level Speed or Throughput

The true measure of speed is how quickly a final measurement or set of measurements (such as a suite of current vs. voltage parameters) is returned to the PC controller. This involves not only the number of readings/second, but also range and function change times.

2 Sourcing Resolution and Output Stability

An SMU's usable maximum resolution depends on its overall accuracy and the resolution of its analog-to-digital converter (ADC). In general, the higher the resolution is, the higher the bit count on the ADC and the higher the accuracy will be.

3 Measurement Settling Time, Offset Error, and Noise

When choosing between instruments, compare the time it takes a SMU to settle the specified offset error. This can be seen in the "bumpiness" of the resulting data curve which indicates measurement noise; the smoother the data curve the less measurement noise. SMUs having a fast, flat, and noise-free settling time achieve more consistent results during a series of measurements taken over time.

4 Cabling

Triaxial cables offer significant advantages over coaxial cables when making low current measurements. Triaxial cables have an extra shield that ensures lower leakage, better response, and greater noise immunity.

Model 2450 Advanced Touchscreen SourceMeter® SMU Instrument

Touch, Test, Invent™ with the intuitively smart, interactive SMU Instrument. The Model 2450 SMU Instrument is an innovative, compact I-V solution that offers the capabilities of I-V systems, curve tracers, and semiconductor analyzers at a fraction of their cost. With the intuitive touchscreen and icon-based control that novice SMU users can appreciate and the exceptional versatility that experienced users need, the Model 2450 enables users to learn faster, work smarter, and invent easier. Its user experience, performance, and application versatility, combined with proven Keithley precision and accuracy, will make the 2450 the favorite go-to instrument in the lab for years to come.

A Smart Toolkit Beyond the Touchscreen

Speed, ease-of-use, and learnability don't stop with the 2450 advanced touchscreen. Its front panel features a context-sensitive HELP system, rotary navigation/control knob, front/rear input selector button, and banana jacks for basic bench applications. A USB 2.0 memory I/O port makes it easy to store data, save instrumentation configurations, load test scripts, and upgrade the system.

Product Highlights

- Highly flexible, source and sink (four-quadrant) operation simultaneously measures voltage, current, and resistance in a single, integrated I-V instrument
- Advanced, five-inch touchscreen user interface with multi-point, pan-pinch-zoom-swipe operation minimizes the learning curve and improves productivity
- Graphical interface provides I-V curve tracing functionality for much less than the cost of traditional curve tracers
- Lower current and voltage measurements ranges (100nA, 10nA, 20mV) reduce need for additional expensive low level instruments
- Front panel banana jack inputs and rear panel triaxial connections optimize signal integrity and convenience and save money on adapter accessories
- PC-based instrument and control software enables instrument control without programming hassles
- KickStart non-programming software for quick I-V testing

Home page advanced source and measure display enables faster speed to answer.

Icon-based, flat menu system can reduce configuration steps by 50% and eliminates cumbersome, multi-layer menu structures.

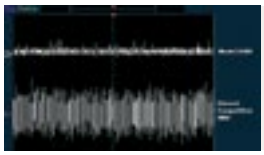
The Model 2450 is ideal for I-V functional test and characterization of a wide range of today's modern devices, including:

- Semiconductors
- LEDs
- Solar Cells
- Nanomaterials and Devices
- Graphene
- Printed/Flexible Electronics
- Batteries/Electrochemistry
- Sensors
- Biotechnology

Model 2450 Advanced Touchscreen SourceMeter® SMU Instrument

Trusted Precision, Accuracy, and Performance

The 2450 is based on the trusted analog performance of Keithley's Model 2400 SourceMeter SMU Instrument and offers a highly flexible, four-quadrant voltage and current source/load coupled with precision voltage and current meters. This fourth-generation member of Keithley's award-winning SMU family provides the superior precision, resolution, accuracy, and dependability that users have come to expect from Keithley SMU instruments.



With significantly lower wideband noise than its closest competitor, the 2450 is the perfect solution for I-V testing of next-generation devices.

Ships with Product

- 8608 High Performance Test Leads
- USB-B-1 USB Cable, Type A to Type B, 1m (3.3 ft)
- CS-1616-3 Safety Interlock Mating Connector
- CA-180-3A TSP-Link®/Ethernet Cable Documentation CD
- 2450 QuickStart Guide
- Test Script Builder Software (supplied on CD)
- KickStart Startup Software (supplied on CD)
- LabVIEW® and IVI Drivers (supplied on CD)

Model	Current Max / Min	Voltage Max / Min	Power
2450	1A / 10fA	200V / 10nV	20W
2450-NFP (with No Front Panel)	1A / 10fA	200V / 10nV	20W
2450-RACK (without Handle)	1A / 10fA	200V / 10nV	20W
2450-NFP-RACK (with No Front Panel or Handle)	1A / 10fA	200V / 10nV	20W

Recommended Service

2450-3Y-EW	1 Year Factory Warranty extended to 3 years from date of shipment
2450-5Y-EW	1 Year Factory Warranty extended to 5 years from date of shipment
C/2450-3Y-17025	KeithleyCare® 3 Year ISO 17025 Calibration Plan
C/2450-3Y-DATA	KeithleyCare 3 Year Calibration w/Data Plan
C/2450-3Y-STD	KeithleyCare 3 Year Std. Calibration Plan
C/2450-5Y-17025	KeithleyCare 5 Year ISO 17025 Calibration Plan
C/2450-5Y-DATA	KeithleyCare 5 Year Calibration w/Data Plan
C/2450-5Y-STD	KeithleyCare 5 Year Std. Calibration Plan

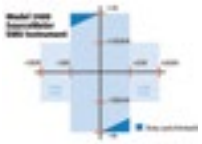
DATA SHEET

Series 2400 SourceMeter® SMU Instruments

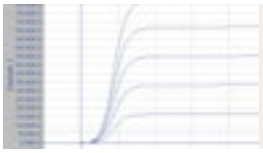
Series 2400 SourceMeter® SMU instruments are single-channel models with I-V capability from 1100V to 100nV and 10.5A pulse to 1pA. They offer a smart alternative to separate power supplies and digital multimeters (DMMs) and provide a convenient DMM-like user interface.

Product Highlights

- Wide I-V range from 1100V to 100nV and 10.5A pulse to 1pA
- 4-quadrant design simultaneously measures voltage, current, and resistance
- Remote sense on V-source and measure plus guarded ohms mode
- Built-In test sequencer
- Includes LabTracer 2.0 I-V curve utility and IVI and LabVIEW drivers
- Standard GPIB and RS-232 interfaces; Banana (front / rear) Connectors



Model 2400 four-quadrant operation characteristics, a feature of all SourceMeter SMU instruments.



Free LabTracer2 software for remote control and data sharing for applications ranging from the simple to complex.

Model	Current Max / Min	Voltage Max / Min	Power
2400 / 2401	1.05A /10pA	200V/1µV (20V 2401)	20W
2420 / 2425 / 2440	5.25A /100pA	100V/1µV	60W/100W/50W
2410	1.05A /10pA	1100V/1µV	20W
2430	10.5A pulse /100pA	200V/1µV	1100W

Recommended Accessories

C/2400-3Y-17025	(ISO-17025 accredited) calibrations within 3 years of purchase for Models 2400*
C/2401-3Y-17025	(ISO-17025 accredited) calibrations within 3 years of purchase for Model 2401*
C/2410-3Y-17025	(ISO-17025 accredited) calibrations within 3 years of purchase for Models 2410*
C/2420-3Y-17025	(ISO-17025 accredited) calibrations within 3 years of purchase for Models 2420*
C/2425-3Y-17025	(ISO-17025 accredited) calibrations within 3 years of purchase for Models 2425*
C/2430-3Y-17025	(ISO-17025 accredited) calibrations within 3 years of purchase for Models 2430*
C/2440-3Y-17025	(ISO-17025 accredited) calibrations within 3 years of purchase for Models 2440*

*Not available in all countries.

Ships with Product

- Model 8605 Test Leads
- LabVIEW Software Driver (downloadable)
- LabTracer Software (downloadable)
- Calibration Certificate (Basic)
- Manual CD
- Power Cord
- Warranty

Read the white paper, "Choosing the Optimal Source Measurement Unit Instrument for Your Test and Measurement Application."

DATA SHEET

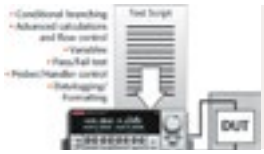
Series 2600B System SourceMeter® SMU Instruments

Series 2600B SourceMeter® SMU instruments are the industry's most powerful, fastest, and highest resolution SMU instruments. Now they're easier than ever to use with USB 2.0 connectivity, Model 2400 software emulation, and Java-based plug & play test software. Series 2600B models offer the industry's widest dynamic range: 10A pulse to 0.1fA and 200V to 100nV.

Product Highlights

- 4-quadrant design simultaneously sources and measures voltage, current, and resistance
- TSP® (embedded Test Script Processor) architecture enables industry-best system-level speed
- TSP-Link® for true SMU-per-pin and parallel test
- Built-in software for quick and easy I-V test through web browser
- GPIB, LAN (LXI), USB and RS-232

Built-in, Java-based test software runs directly from any web browser to boost productivity.



TSP technology executes complete test programs from the 2600B's non-volatile memory.

Model	Current Max / Min	Voltage Max / Min	Max readings / sec	No. of Channels
2601B	3A DC, 10A pulse/100 fA	40V/100nV	20,000	1
2602B	3A DC, 10A pulse/100 fA	40V/100nV	20,000	2
2604B	3A DC, 10A pulse/100 fA	40V/100nV	20,000	2
2611B	1.5A DC, 10A pulse/100 fA	200V/100nV	20,000	1
2612B	1.5A DC, 10A pulse/100 fA	200V/100nV	20,000	2
2614B	1.5A DC, 10A pulse/100 fA	200V/100nV	20,000	2
2634B	1.5A DC, 10A pulse/1fA	200V/100nV	20,000	2
2635B	1.5A DC, 10A pulse/0.1 fA	200V/100nV	20,000	1
2636B	1.5A DC, 10A pulse/0.1 fA	200V/100nV	20,000	2

Recommended Accessories

2600-BAN	Banana Test Leads Adapter
8606	Probe Kit for 2600-BAN
2600-Std-Res	Calibration Standard 1G ohm Resistor

Recommended Service

26XXB-3Y-EW_	3 Year Keithleycare Gold Plan
26XXB-5Y-EW_	5 Year Keithleycare Gold Plan
C/26xxB-3Y-XXXX	Calibration Service 3 Years (17025 or DATA or STD)
C/26xxB-5Y-XXXX	Calibration Service 5 Years (17025 or DATA or STD)

Ships with Product

- Operators and Programming Manuals
- 2600-ALG-2: Low Noise Triax Cable with Alligator Clips, 2m (6.6 ft.) (two supplied with 2634B and 2636B, one with 2635B)
- 2600-Kit: Mating Screw Terminal Connectors with strain relief and covers (2601B/2602B/2604B/2611B/2612B/2614B)
- CA-180-3A: TSP-Link/Ethernet Cable (two per unit)
- TSP Express Software Tool (embedded)
- Test Script Builder Software (supplied on CD)
- LabVIEW Driver
- ACS Basic Edition Software (optional)

DATA SHEET

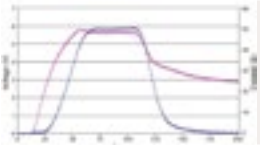
2650A High Power System SourceMeter® SMU Instruments

The high current Model 2651A and high voltage Model 2657A High Power System SourceMeter SMU instruments address such applications as testing power semiconductor devices, including diodes, FETs, and IGBTs, as well as characterizing newer materials such as gallium nitride, silicon carbide, and other compound semiconductor materials or devices.

Product Highlights

- Source and measure up to 3kV or 50A pulse, with best-in-class low current resolution
- Up to 2000W pulse or 200W DC power per instrument
- Optimized for characterizing and testing high power semiconductors,electronics, and materials

TSP and TSP-Link technology enables SMU per-pin-parallel testing without the channel limits of a mainframe-based system.



The dual digitizing A/D converters sample at up to 1µs/point, enabling full simultaneous characterization of both current and voltage waveforms.

Model	Power Characteristics	4 Quadrant Source or Sink Capabilities	Resolution	Applications
2651A	Up to 50A (or 100A with 2 units) and up to 2000W pulse / 200W DC power	Up to ±40V and ±50A	100fA/1µV resolution	High Current, High Power Device Testing
2657A	Up to 3,000V and up to 180W of power	Up to 3000V @ 20mA or 1500V @ 120mA	1fA/100µV resolution	High Voltage, High Power, Low Current Device Testing

Recommended Accessories

2600-KIT	Low Impedance Cable Assemble, 1m (3.3 ft)
ACS-BASIC	Component Charaterization Software
4299-6	Rack Mount Kit
8011	Test Socket Kit
8010	High Power Device Test Fixture (Model 2657A)
2657A-LIM-3	Low Interconnect Module (Model 2657A)
2657A-PM-200	200V Protection Module (Model 2657A)
SHV-CA-553-2	High Voltage Triax to SHV Cable (1, 2, 3m) (Model 2657A)
HV-CA-554-2	High Voltage Triax to Triax Cable (0.5, 1, 2, 3m) (Model 2657A)
HV-CA-571-3	High Voltage Triax to Unterminated Cable (Model 2657A)
HV-CS-1613	High Voltage Triax Feedthrough Connector (Model 2657A)

Recommended Service

2651A-3Y-EW	3 Year KeithleyCare Gold Plan
2657A-3Y-EW	3 Year KeithleyCare Gold Plan
C/2651A-3Y-STD	KeithleyCare 3 Yr Std Cal Plan
C/2657A-3Y-STD	KeithleyCare 3 Yr Std Cal Plan
C/2651A-5Y-STD	KeithleyCare 5 Yr Std Cal Plan
C/2657A-5Y-STD	KeithleyCare 5 Yr Std Cal Plan

Ships with Product

- 7709-308A Digital I/O and Interlock Connector
- CA-180-3A TSP-Link/Ethernet Cable
- Documentation CD
- Software Tools and Drivers CD
- 2651A-KIT-1A: Low Impedance Cable Assembly (1m) (Model 2651)
- CS-1592-2: High Current Phoenix Connector (male) (Model 2651)
- CS-1626-2: High Current Phoenix Connector (female) (Model 2651)
- CA-557-1: Sense Line Cable Assembly (1m) (Model 2651)

Learn more with the "Creating Multi-SMU Systems with High Power System SourceMeter Instruments" application note.

Power Analyzers

Fully characterize your power-electronics design from input to output with Tektronix power analyzers. Designed for precision measurement of power-electronics circuits and devices, these analyzers give you what you need to measure conversion efficiency and perform compliance testing on single-phase or 3-phase devices.

	PA4000 Multi-Channel	PA1000 Single-Phase
Multi-Channel Power Analyzer	PA4000_1CH, PA4000_2CH, PA4000_3CH, PA4000_4CH	PA1000
Power Input Modules	1 – 4 (factory configured)	1
Basic Accuracy (V & I)	0.01% of reading + 0.04% of range (45-850 Hz)	0.05% of reading + 0.05% of range
Measurement Bandwidth	DC, 0.1 Hz - 1 MHz	DC, 0.1 Hz - 1 MHz
Voltage Range	2V peak to 2000V peak	10V peak to 1000V peak
Current Range (internal shunts)	0.00025 A to 30 A RMS	0.0002 A to 20A RMS

Choosing Your Power Analyzer

Power analyzers are used for testing a wide range of power-electronics devices, from cell-phone chargers to 1000kW grid-connected inverters. To help you choose the best analyzer for your application, consider the criteria below.

1 Number of Inputs

Power analyzers are available in both fixed configurations (typically single-channel) and modular configurations. If your application is limited to single-phase devices, a single-channel analyzer may meet your needs. But if you need to measure conversion efficiency on these devices, a two-channel analyzer is required.

Testing of 3-phase devices of course requires a multi-phase analyzer. In many cases, two channels will be all you need for a two-wattmeter measurement on 3-wire inputs or outputs. A four- channel analyzer can measure both input and output simultaneously, to determine conversion efficiency.

2 Measurement Bandwidth

How much bandwidth is enough? The measurement bandwidth you need is usually determined by the switching speed of the device-under-test, or the highest-order harmonic that you are testing requires. Switching speeds of tens or hundreds of kHz are common in today's designs. But new semiconductor technologies promise to increase speeds up to 2x or more in the near future. Choose an analyzer that is capable of measuring your highest frequencies of interest, with some headroom for future-proofing.

3 Compliance Testing for Regulatory Standards

If your application requires you to know that your device is compliant with regulatory standards such as IEC61000 for harmonics, or ENERGY STAR™ for energy efficiency, you need an analyzer capable of meeting the test requirements specified by the standard. Even better, look for an analyzer supported by software applications that can automate instrument setup and reporting of test results in the exact format required for your application.

4 Current Shunts: Internal or External?

Will you be measuring milliamperes, or hundreds of amperes? Power analyzers vary in the features they offer for direct current inputs or connection to external current transducers. Ideally, the analyzer should have internal current shunts that allow you to connect your device directly, for best accuracy. If you will be testing a range of devices at different power levels, you may value both high and low-range shunts. Finally, if your application requires external current transducers (usually required for current >30Amps), make sure there are transducers available that are well-matched to the analyzer and offer the accuracy you need.

5 Remote Communication

Will you have a need to control the analyzer remotely, or transfer measurement data to your PC? If so, you will want to look for an instrument that features the communication ports you need. Depending on the analyzer model, some ports may be standard features or extra-cost options; be careful to choose the right instrument configuration that meets your requirements.

DATA SHEET

VIRTUAL TOUR

360° VIEW

PA1000 Power Analyzer

The Tektronix PA1000 is your best choice for making precision power measurements on single-phase power supplies and all types of products connected to the AC line. Whether you need to test for compliance with energy-usage regulations such as ENERGY STAR™, or simply need to characterize your product's overall power-conversion performance and efficiency, you will find the PA1000 offers the most modern and complete test solution with performance and features unmatched by other single- phase analyzers.

Product Highlights

- 0.05% basic reading accuracy
- Dual shunts maximize accuracy for low and high current measurements
- USB, Ethernet and GPIB interfaces.
- PWRVIEW PC software for measurement and control. Includes IEC62301 Ed.2 standby power.
- Harmonics, Inrush and Energy (W-h) measurements.

Color display for 4 or 14 measurements and waveform, harmonics and energy trend graphics.

PWRVIEW PC software for measurement and control. Includes IEC62301 Ed.2 standby power measurement reporting.

Model	Description	BasicAccuracy (V & I)	Voltage Input Range	Current Range (internal shunts)
PA1000	PA1000 Single-Phase Power Analyzer	0.05% (45-850 Hz)	10V peak to 1000V peak	0.0002 A to 20A RMS

Recommended Accessories

CL200	Current Clamp, 0.5A - 200A, for Tektronix Power Analyzers
CL1200	Current Clamp, 0.1A - 1000A, for Tektronix Power Analyzers
BALLAST-CT	Differential current transformer for lighting applications. 1A, 1MHz
BB1000-XX	Breakout Box simplifies connections to AC power cords. NA, EU and UK versions.
PA-LEADSET	Replacement Lead Set for Tektronix Power Analyzers (One Channel Lead Set)

Recommended Service

C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
D1	Calibration Data Report
D3	Calibration Data Report 3 Years (with Opt. C3)
D5	Calibration Data Report 5 Years (with Opt. C5)

Ships with Product

- Lead Set
- User Manual
- AC Power Cord
- Certificate of Traceable Calibration
- 5-year Product Warranty

Available for Free Download

- PWRVIEW PC Software for remote instrument setup, data transfer and offline analysis
- Application notes, whitepapers and videos at: **www.tek.com/application/power-measurement**

Learn more with "Power Supply Measurement with the PA1000 Power Analyzer", **click here.**

BB1000-NA Breakout Box

DATA SHEET

VIRTUAL TOUR

360° VIEW

PA4000 Power Analyzers

Tektronix PA4000 Power Analyzers provide you with highly accurate power, energy and efficiency measurements. Precisely-matched inputs and advanced signal processing deliver high measurement accuracy, even when power is distorted or noisy. The PA4000 performs all power measurements – and harmonics analysis, application-specific measurements, PC interfaces, and dual patent-pending Spiral Shunt™ current shunts per channel are all standard features. PWRVIEW for data transfer and PC analysis is available to download free from tektronix.com.

Product Highlights

- 1 to 4 input modules with precision phase-matched V & I inputs, 1000 Vrms, 30 Arms direct input
- Measurement BW: DC to 1 MHz
- 0.01% basic accuracy
- Application specific test modes for Motor Drives, Ballasts, Standby Power and Energy Integration
- Harmonics measurement to 100th harmonic
- Full-color TFT display with waveform graphics, vector, bar chart, trend

Each input module features both high- and low-range current shunts.

USB, Ethernet and RS-232 ports are standard.

Model	Description	BasicAccuracy (V & I)	Voltage Input Range	Current Range (internal shunts)
PA4000 1CH	PA4000 Power Analyzer with 1 input module	0.01% (45-850 Hz)	2V peak to 2000V peak	0.00025 A to 30 Arms
PA4000 2CH	PA4000 Power Analyzer with 2 input modules	0.01% (45-850 Hz)	2V peak to 2000V peak	0.00025 A to 30 Arms
PA4000 3CH	PA4000 Power Analyzer with 3 input modules	0.01% (45-850 Hz)	2V peak to 2000V peak	0.00025 A to 30 Arms
PA4000 4CH	PA4000 Power Analyzer with 4 input modules	0.01% (45-850 Hz)	2V peak to 2000V peak	0.00025 A to 30 Arms

Recommended Accessories

CT-60-S	Fixed-Core Current Transducer, High Accuracy, up to 60A
CT-200-S	Fixed-Core Current Transducer, High Accuracy, up to 200A
CT-400-S	Fixed-Core Current Transducer, High Accuracy, up to 400A
CT-1000-S	Fixed-Core Current Transducer, High Accuracy, up to 1000A (requires external power supply)
CT-100-M	Fixed-Core Current Transducer, Hall Effect, up to 100A
CT-200-M	Fixed-Core Current Transducer, Hall Effect, up to 200A
CT-500-M	Fixed-Core Current Transducer, Hall Effect, up to 500A
CT-1000-M	Fixed-Core Current Transducer, Hall Effect, up to 1000A

Recommended Accessories

CL200	Current Clamp, 0.5A - 200A, for Tektronix Power Analyzers
CL1200	Current Clamp, 0.1A - 1000A, for Tektronix Power Analyzers
BALLAST-CT	Differential current transformer for lighting applications. 1A, 1MHz
BB1000-XX	Breakout Box simplifies connections to AC power cords. NA, EU and UK versions.
PA-LEADSET	Replacement Lead Set for Tektronix Power Analyzers (One Channel Lead Set)

Recommended Service

C3	Calibration Service 3 Years
C5	Calibration Service 5 Years

Ships with Product

- Lead Set (1 set per input module)
- User Manual
- AC Power Cord
- Certificate of Traceable Calibration
- 5-year Product Warranty

Available for Free Download

- PWRVIEW PC Software for remote instrument setup, data transfer and offline analysis
- Application notes, whitepapers and videos at: **www.tek.com/application/power-measurement**

Learn more with "Power Analysis of PWM Motor Drives", **click here.**

Switch Systems

Keithley provides a wide array of high integrity switch systems to address the need for switching DC, RF, microwave, and digital I/O signals, whether in matrix, multiplexer, or a combination of configurations. Elsewhere in this catalog, you will also find data acquisition systems and digital multimeters with switching options.

	Series 3700A*	Models 7001 / 7002	System 46 /46T	707B / 708B
Max Channels / Crosspoints	576 / 2688	80 / 400	32	576 / 96
Card Slots	6	2 / 10	Not applicable	6 / 1
Unique optional card capabilities	High density switching, automatic CJC, long-life switching, FET switching	Hall effect, scanner cards, high/ low current and voltage switching	Not applicable	7072-HV provides 1kV and low current
Interface	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus	GPIB, RS-232	GPIB	GPIB, LAN (LXI), ACS software, 4200-SCS KTEI software

* Series 3700A Switch Systems are found elsewhere in this catalog under “Data Acquisition”.

Choosing Your Switches

To help you choose the appropriate switch mainframe for your application, the most common selection criteria are listed below.

1 Multiplex Switching

Multiplex switching can be used to connect one instrument to multiple devices (1:N) or multiple instruments to a single device (N:1). Multiplex switching permits: multiple simultaneous connections, and sequential or non-sequential switch closures.

2 Matrix Switching

The matrix switch configuration is the most versatile because it can connect multiple inputs to multiple outputs. A matrix is useful when connections must be made between several signal sources and a multi-pin device, such as an integrated circuit or resistor network.

3 Isolated Switch Configurations

The isolated, or independent, switch configuration consists of individual relays, often with multiple poles, with no connections between relays. Isolated relays are not connected to any other circuit, so the addition of external wiring makes them suitable for building very flexible and unique combinations of input/output configurations. Isolated relays are commonly used in power and control applications to open and close different parts of a circuit that are at substantially different voltage levels.

DATA SHEET

Models 7001 / 7002 Multi-Purpose Switch Systems

The two and ten slot, respectively, Model 7001 and Model 7002 multi-purpose switch systems for precision measurement, switching, and control support a wide range of signals, with more than 15 switch/control cards available. Also, see our Series 2700 and Model 3706A data acquisition and digital multimeter/switch systems.

Product Highlights

- Supports more than 15 switch/control cards
- Integrates easily with DMM and SourceMeter® SMU instruments
- Full channel status display
- Supports industry's broadest range of signals

The display of the Model 7001 makes it much easier to configure a test system, make modifications, or debug an existing program.

The interactive front panel display of the Model 7002 helps shorten the time required to configure the switch system and develop test software.

Model	Max. Channels or Crosspoints per Chassis	Card Slots	Front Panel	Built-in Digital I/O
7001	Up to 80 per mainframe	2	Full status display with programming control	1 input/4 outputs
7002	Up to 400 per mainframe	10	Full status display with programming control	1 input/4 outputs

Recommended Accessories

7011-C	Quad 1x10 Mux w/ Mass-Terminated Connector
7011-S	Quad 1x10 Mux w/ Screw Terminals
7012-C	4x10 Matrix Card w/ Mass-Terminated Connector
7012-S	4x10 Matrix Card w/ Screw Terminals
7013-C	Isolated, 20-Ch Relay Switch w/ Mass-Terminated Connector
7013-S	Isolated, 20-Ch Relay Switch w/ Screw Terminals
7015-C	Quad 1x10 Solid-State Mux Card w/ Mass-Terminated 96-Pin Connector
7015-S	Quad 1x10 Solid-State Mux Card w/ Detachable Screw Terminal Connector
7018-C	Dual 1x14 Mux Card w/ Mass-Terminated 96-Pin Connector

Recommended Accessories

7020	Digital I/O Card w/ 40 Inputs, 40 Outputs and Mass-Terminated 96-Pin Connector
7020-D	Digital I/O Card w/ 40 Inputs, 40 Outputs and Two 50-Pin D Subconnectors
7035	9-Bank, 1x4 Mux Card
7036	Single-Pole Relay Card w/ 40 Independent Switches and a Mass-Terminated 96-Pin Connector
7037-D	Single-Pole Relay Digital I/O Card w/ 30 Independent Switches, 10 Independent Digital Inputs, 10 Independent Digital Outputs and Two 50-Pin D-Subconnectors
7053	High-Current, 10-Ch Scanner Card w/ 5A Contacts
7065	Hall Effect Card
7111-S	40-Ch Form C Switch Card

Recommended Accessories

7152	4x5 Low-Current Matrix Card
7153	4x5 High-Voltage, Low-Current Matrix Card
7154	10-Ch, High-Voltage Scanner Card
7158	10-Ch, Low-Current Scanner Card w/ BNC Connectors
7168	Nanovolt Scanner Card

Ships with Product

- Power Cord
- User Manual

Learn more with the "Optimizing Switch/Read Rates with Series 2000 DMMs and 7001/7002 Switch Systems" application note.

DATA SHEET

System 46 RF Microwave Switch Systems

Both terminated and unterminated versions of the Model S46 Switch System are available for testing devices such as cellular and cordless phones, specialized mobile radios, base stations, and RF components, including RFICs. Series 2700 data acquisition systems also offer RF/microwave switch options.

Product Highlights

- Compact RF/microwave switching system only 2U high
- Built-in contact closure counter to monitor switch cycles
- Standard configuration allows up to 32 channels of switching
- Simple control with built-in GPIB/IEEE-488 interface bus
- Channel characterization (S-parameter) data storage

Maximum Configuration: (8) – Unterminated (S46) or Terminated (S46T) SPDT relays.

Maximum Configuration: (4) – Unterminated (S46) or Terminated (S46T) multi-pole relays (SP4T, SP6T).

Model	Max. Channels or Crosspoints per Chassis	Frequency Ranges	Relays
S46 (unterminated)	Up to 32 RF/microwave chs	Up to 40GHz	Up to 8 unterminated SPDT coaxial microwave relays and 4 unterminated multi-pole coaxial microwave relays
S46T (terminated)	Up to 32 RF/microwave chs	Up to 40GHz	Up to 8 terminated or unterminated SPDT coaxial microwave relays and 4 terminated or unterminated multi-pole coaxial microwave relays

Ships with Product

- Power Cord
- Instruction Manual
- Rack Mount Kit

Learn more with the “Configuring an Optimal RF/Microwave Switch System” application note.

DATA SHEET

Semiconductor Switch Matrix Mainframes

Models 707B/708B are specifically designed for semiconductor lab and production test environments, delivering ultra low current switching performance using standard triax connectors and cables. For smaller test systems, the Model 708B supports a single 8x12 switch card. For larger systems, the Model 707B can accommodate up to six 8×12 cards.

Product Highlights

- Remote and manual programming support
- Integrates seamlessly with the Model 4200-SCS and Series 2600B SourceMeter SMU instruments
- Stores hundreds of switching configurations and channel patterns
- LXI Class C interface supports remote programming and control
- 14 bits of digital I/O

Series 2600B SMUs have an on-board test script processor (TSP) that executes test scripts and controls the switch matrix via the TSPLink.

Models 707B and 708B support a family of matrices designed specifically for low-level semiconductor device testing.

Model	Max. Voltage/Current	Max. Offset Current	Rec. Frequency	Connection Type
7072	200V / 1A	<1pA	15 MHz	3-lug triax
7072-HV	1300V / 1A	<1pA	4 MHz	3-lug triax
7174A	200V / 2A	<100fA	30 MHz	3-lug triax
7073	200V / 1A	<200pA	30 MHz	BNC
7173-50	30V / 0.5A	<200pA	200 MHz	BNC

Recommended Accessories

CA-126-5A	25-pin Female Digital I/O to 25-pin Male Cable, 3m (10 ft)
2600-TLINK	Digital I/O to Trigger Link Cable, 1m (3.3 ft)
4299-6	Universal Full Rack Mount Kit (for Model 708B)
7007-1	Double-shielded GPIB Cable, 1m (3.3 ft)
7007-2	Double-shielded GPIB Cable, 2m (6.6 ft)
7072	Semiconductor Matrix Card
7072-HV	High Voltage Semiconductor Matrix Card
7072-TRT	Triax Fastening Tool
7079	Slide Rack Mount Kit (for Model 707B)
7173-50	High Frequency, 2-pole, 4×12 Matrix Card
7174A	Low Current Matrix Card

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Product Information CDs (Product Information, Quick Start Guide, Switching and Control Product Information, Test Script Builder User Suite)
- CA-180-4A: CAT 5 Ethernet Crossover Cable, 1m (3.3 ft)
- CA-179-2A: CAT 5 Ethernet Cable, 3m (10 ft)
- CO-7: Line Cord
- Rear Fixed Rack Mount Hardware (707B only)

Learn more with the "Designing a High Throughput Switch System for Semiconductor Measurements with the Model 707B or 708B Semiconductor Switch Matrix Mainframe" application note.

Semiconductor Test Systems

From lab to fab, Keithley continues to bring the next generation of semiconductors to market with the industry's most cost-effective, fully automatic parametric testers; parameter analyzers that increase test throughput, reduce time to market, and test more device types; and software for semiconductor device testing and analysis.

	4200-SCS	PCT Configurations	S500 & 530 Parametric Test Systems	Automation Characterization Suite (ACS), ACS Basic, Wafer Level Reliability Option
Definition	Parameter Analyzer for semiconductor devices and materials	Parametric Curve Trace configurations for power device characterization	Parametric Test Systems Used in Production and Lab Environments	Automated Semiconductor Device Characterization software
Typical Devices Tested	Devices and materials associated with CMOS, non-volatile memory, MEMS, III-V devices, TFTs, solar cells, nanoscale devices/ structures	Semiconductor components including: IGBTs, MOSFETs, BJTs, Triacs/SCRs, diodes, and other power control devices	Wafer-level testing of semiconductor devices associated with CMOS, LDMOS, III-V, MEMS, and TFT process technologies	Semiconductor Devices individually or at wafer level associated with CMOS, non-volatile memory, MEMS, III-V devices, TFTs, and power control devices
Applications	Semiconductor device characterization, materials research, device reliability, and failure analysis	Semiconductor component characterization, inspection, and failure analysis	Semiconductor process control monitoring, automated characterization, wafer level reliability analysis, and die sort testing	Semiconductor device characterization, wafer level reliability analysis, parametric testing, and die sort testing
Measurement Capabilities	I-V, C-V, Ultra-fast I-V, pulse	Low-power I-V, high-power I-V, and C-V	I-V, C-V, frequency, and pulse	Real-time plotting and results associated with Keithley 2600s, 4200, S500, and S530

Choosing Your Semiconductor Test System

The following is a brief overview of key aspects of Semiconductor Characterization Systems.

1 Parametric Test Systems

Semiconductor Parametric Test Systems are engineered to handle the DC and C-V measurements required in process control monitoring, process reliability monitoring, and device characterization and are used in production and lab environments that entail a broad range of devices and technologies.

2 Characterization Software

Characterization software automates semiconductor device characterization at the device, wafer, or cassette level, and when combined with source measure instrumentation or integrated test systems, can fill the gap between interactive lab-based set-ups and high-speed production test systems.

3 Parameter Analyzers

Parameter analyzers support all aspects of parametric testing, from basic DC I-V and C-V sweeps to advanced ultra-fast I-V, transient, waveform capture, and pulsed I-V measurements.

4 Curve Tracer Solutions

Complete solutions for power device characterization that are configured with a variety of high quality instruments, cables, test fixturing, and software.

DATA SHEET

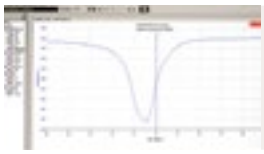
Model 4200-SCS Parameter Analyzer System

The modular, fully integrated 4200-SCS parameter analyzer performs electrical characterization of materials, semiconductor devices and processes. The software guides the user in performing complex characterization tests using I-V and C-V measurement sweeps, ultra-fast pulsed & transient I-V and arbitrary waveform to fully characterize their device under test.

Product Highlights

- Modular architecture - configurable and scalable to test needs
- 0.1fA and 1µV SMU/PA measure resolution
- Multi-frequency, Quasistatic and VLF C-V measurement capabilities
- Two-channel, Ultra-Fast Pulse I-V module for transient & self-heating analysis
- Includes software drivers for leading analytical probers

The 4200-SCS software and application tests are designed to let the user understand device behavior quickly.



C-V curve from a MOSFET transistor measured with the Model 4210-CVU.

Model	Total # of SMUs	Current range & Resolution	Voltage range & resolution	C – V Module	Ultra-Fast I-V
4200-SCS	Up to 9 high or medium power	1 A / 0.1 fA	± 210 V / 1 µV	Optional	Optional
4200-SCS-PK1	2 medium power	100 mA / 0.1 fA	210 V / 1µV	No	No
4200-SCS-PK2	2 medium power	100 mA / 0.1 fA	210 V / 1µV	Yes	No
4200-SCS-PK3	2 medium power 2 high power	1 A / 0.1 fA	± 210 V / 1 µV	Yes	No

Instrument Modules

4210-CVU	C-V Instrument
4225-PMU	Ultra-Fast I-V Module
4225-RPM	Remote Amplifier/Switch
4220-PGU	High Voltage Pulse Generator
4200-SMU	Medium Power Source Measure Unit
4210-SMU	High Power Source Measure Unit
4200-PA	Remote PreAmp Option for 4200-SMU and 4210-SMU
4210-MMPC/X	Multi-measurement Performance Cables
4200-SCP2	Dual-Channel Oscilloscope Card
4200-SCP2HR	200MS Dual-Channel Oscilloscope Card

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
R3DW	Repair Service Coverage 3 Years
R5DW	Repair Service Coverage 5 Years

Ships with Product

- Reference and User Manual on CD-ROM
- 236-ILC-3 Interlock Cable
- All Cables and Adapters

Learn about Keithley's bundled characterization solutions - an exceptional balance of performance and price for today's measurement and budget challenges!

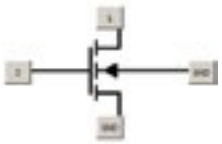
DATA SHEET

Parametric Curve Tracer (PCT) Configurations

Keithley's Parametric Curve Tracer configurations are complete solutions configured with a variety of high quality instruments, cables, test fixturing, and software for power device characterization. This building block approach offers the advantages of easy upgrading or modification to meet changing test needs.

Product Highlights

- Economical power device characterization that is field upgradeable and reconfigurable
- Highest accuracy and resolution
- DC or fast pulse capability
- High resolution 24-bit A/D converters and high speed 18-bit digitizers
- Trace mode for real-time control and parametric mode for parameter extraction
- Interlocked test fixture with safe access ports



Test libraries supplied for most device types.

ACS Basic Edition Software quickly captures output characteristics of an IGBT device.

Model	Type	Collector/Drain Supply High Voltage Mode	Collector/Drain Supply High Current Mode	Step Generator Base/ Gate Supply
2600-PCT-1	Low Power	200 V/10 A	200 V/10 A	200 V/10 A
2600-PCT-2	High Current	200 V/10 A	40 V/50 A	200 V/10 A
4200-PCT-2	High Current	200 V/1 A	40 V/50 A	200 V/1 A
2600-PCT-3	High Voltage	3 kV/120 mA	200 V/10 A	200 V/10 A
4200-PCT-3	High Voltage	3 kV/120 mA	200 V/1 A	200 V/1 A
2600-PCT-4	High Current / High Voltage	3 kV/120 mA	40 V/50 A	200 V/10 A
4200-PCT-4	High Current / High Voltage	3 kV/120 mA	40 V/50 A	200 V/1 A

Recommended Accessories

2651A	High Power System SourceMeter® SMU Instrument
2657A	High Power System SourceMeter® SMU Instrument
8010-CTB	Customizable Test Board
8010-DTB	Device Test Board with TO-247 Socket
70161-MSA	Keyboard/Monitor Arm for K420 and K475 Carts
HV-CA-554-1	High Voltage Triax Cables (three required for Model 2657A)
K475	Workstation Tower Mobile Cart for All PCT Configurations
K420	Workbench Cart Mobile Cart for Smaller PCT Configurations

Recommended Service

R3	3-year Extended Warranty
R5	5-year Extended Warranty
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years

Ships with Product

- ACS-Basic Component Test Software
- 8010 High Power Device Test Fixture (includes 8010-CTB, 8010-DTB, and 8010-DTB-220)
- KUSB-488B USB to GPIB Adapter (2600 configurations only)
- All Cables and Adapters
- Sample Parts
- 4200-CVU-PWR (4200 configurations only)

Learn more with the "Testing to 100A by Combining Keithley Model 2651A High Power SourceMeter Instruments" application note.

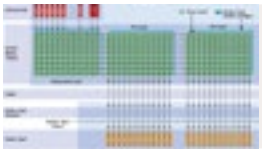
DATA SHEET

S530 Parametric Test Systems and S500 Integrated Test Systems

Keithley's S530 Semiconductor Parametric Test Systems are engineered to handle the DC and C-V measurements required in process control monitoring, process reliability monitoring, and device characterization. These parametric test systems are used in production and lab environments that entail a broad range of devices and technologies. For specialized applications, S500 Integrated Test Systems offer semi-custom configurability.

Product Highlights

- C-V measurements up to 1MHz
- Compatible with fully automatic probers
- 20W SMUs provide up to 1A or 200V
- 1kV SMU to any system pin (S530 High V)
- pA current measurement capability (S530 Low I)
- 24 pins full Kelvin (S530 High V), 48 pins full Kelvin (S530 Low I)



S530 systems five layers: instruments, switch pathways, cable interface, probe card adapter, and probe card.

The Model 9139A Probe Card Adapter combines low current performance and high voltage capability.

Model	Wiring & Pin Count	SMU Channels	Max Voltage	Max Current
S530 Low Current Parametric Test System	Up to 48 pins (4-wire or "Kelvin")	2 to 8	200V (2636B SMU)	1A
S530 High Voltage Parametric Test System	Up to 24 pins (4-wire or "Kelvin")	3 to 7	1000V (2410 SMU), 200V (2636B SMU)	1A
S500 Integrated Test System	Up to 60 pins with switch (2-wire), or 32pins (direct wiring from SMU)	1 to 8 with switch, or 1 to 32 without switch	1000V with 7072-HV switch, or Max voltage of SMU with no switch	1A with switch, or Max current of SMU with no switch

S530 Recommended Accessories

- Probe Card Adapter
- Capacitance-Voltage (C-V) Unit
- Pulse Generator Unit
- 7½-Digit Digital Multimeter (DMM) for use as a sensitive DC-voltmeter
- Frequency Measurement Option
- Switching Matrix (Standard in S530)

Ships with Product

- System Source Measure Units (SMUs)
- Switching Matrix (optional in S500)
- System Cabinet, Controller, and Integration
- System Software
- High-voltage Safety Interlock

Learn more with the "Programming and Erasing Flash Memory Devices" application note.

DATA SHEET

Product Highlights

- ACS is a flexible, interactive software test environment that supports many Keithley instruments and parametric test systems
- Model ACS-2600-RTM option with Series 2600B System SourceMeter® instruments provides a wafer level reliability solution.
- ACS Basic Edition is optimized for component and discrete device testing

ACS' hardware support ranges from bench-top instruments used in a QA lab to automated rack-based parametric testers.

For component and discrete device testing, ACS Basic Edition maximizes research and development productivity.

Automated Characterization Suite (ACS) Software, ACS Basic, ACS Wafer Level Reliability Option

Automated Characterization Suite (ACS) software automates semiconductor device characterization at the device, wafer, or cassette level. Combined with Keithley's wide range of source-measure instrumentation or S500 Integrated Test Systems, ACS-based solutions fill the gap between interactive lab-based set-ups and high-speed production test systems.

Model	Description
ACS	▪ Intuitive GUI simplifies test plan development, test execution, and results analysis ▪ Develop and execute tests at the device, site, wafer and cassette level ▪ Supports a wide range of instruments and system configurations including multi-SMU parallel test systems ▪ Full control of semi-automatic and fully automatic probers ▪ Interactive and real-time data plotting
ACS Basic Edition	▪ Easy-to-use GUI with a wide range of device libraries for characterizing MOSFETs, BJTs, IGBTs, diodes, resistors, etc. ▪ Supports wide range of instruments including 2600B SourceMeter® SMU Instruments and 2650A High Power SourceMeter® SMU instruments ▪ ACS Basic is included in Keithley's Parametric Curve Tracer configurations ▪ Interactive and real-time data plotting ▪ Use unlicensed copies on stand-alone PCs for test development
ACS-2600-RTM	▪ Wafer Level Reliability option for ACS ▪ Configurable from 2 to 44 source-measure channels ▪ Supports both sequential and parallel test ▪ Integrated multi-site capability ▪ Comprehensive JEDEC-compliant test suite ▪ Real-time plotting and wafer mapping

Recommended Accessories

4200-SCS	Semiconductor Characterization System
2602B	Dual-channel System SourceMeter Instrument (3A DC, 10A Pulse)
2612B	Dual-channel System SourceMeter Instrument (200V, 10A Pulse)
2636B	Dual-channel System SourceMeter Instrument (1fA, 10A Pulse)
2657A	Model 2657A High Power System SourceMeter Instrument (High Voltage)
2651A	Model 2651A High Power System SourceMeter Instrument (High Current)
707B	Six-slot Switch Mainframe
7174A	Low-current switch matrix for 707B

Ships with Product

- Software CD
- License Key

Learn more with the "ACS Basic Edition Semiconductor Parametric Test Software for Component and Discrete Devices" data sheet.

Digital Multimeters

Designed to save time and reduce headaches, Tektronix and Keithley Digital Multimeters are built to do more so you don't have to. Each one is loaded with time-saving features like automated measurements, built-in analysis modes and front-panel shortcut buttons. Keithley's highly regarded high performance digital multimeters (DMMs,) include 7½ or 8½-digit solutions as well as flexible broad-purpose DMMs.

	Keithley Model 2110	Tektronix Model DMM4020	Keithley Models 2000, 2100	Tektronix Models DMM4040/4050	Keithley Models 2001, 2010	Keithley Model 2002
Resolution	5½ digit	5½ digit	6½ digit	6½ digit	7½ digit	8½ digit
Basic Accuracy	0.012%	0.015%	0.0038% (Model 2100) 0.0030% (Model 2000)	0.0035% (DMM4040) 0.0024% (DMM4050)	0.0018%	0.0006%
Optional Switch Functions	Not Applicable	Not Applicable	10 Channel (Model 2000)	Not Applicable	10 Channel	10 Channel
Interface	USB-TMC GPIB Option	RS-232, RS-232 to USB Device Adapter Included	GPIB, RS-232 (Model 2000) USB-TMC (Model 2100)	USB host, RS-232, GPIB, Ethernet, RS-232 to USB Device Adapter Included	GPIB, RS-232 (Model 2010) GPIB (Model 2001)	GPIB

Choosing Your Digital Multimeter

To help you choose the right digital multimeter for your needs, the most common selection criteria are listed below, along with helpful tips for determining your requirements.

1 Resolution

Resolution refers to how fine a measurement a meter can make. By knowing the resolution of a meter, you can determine if it is possible to see a small change in your signal. The terms digits and counts are used to describe a meter's resolution. A 6.5-digit multimeter can display 6 full digits ranging from 0 to 9, and one "half" digit which displays only a 1 or is left blank. A 6.5-digit meter will display up to 1,999,999 counts of resolution.

2 Accuracy

Accuracy is the largest allowable error that will occur under specific operating conditions. In other words, it is an indication of how close the DMM's displayed measurement is to the actual value of the signal being measured. Accuracy is usually expressed as a percent of reading. An accuracy of one percent of reading means that for a displayed reading of 100 volts, the actual value of the voltage could be anywhere between 99 volts and 101 volts.

3 Measurements

Digital multimeters are capable of making a variety of different measurements. A basic DMM typically can measure voltage, current and resistance. Other measurements commonly supported are continuity and diode measurements. Continuity is a quick go/no-go resistance test that distinguishes between an open and a closed circuit. A diode test mode measures the actual voltage drop across a junction. Other possible measurement modes are frequency, period, temperature and capacitance.

4 Extra Channel Capacity

Most of Keithley's DMM's (excluding Models 2100 and 2110) include an option slot located in the rear, to accommodate a scanner card enabling automated multipoint measurements.

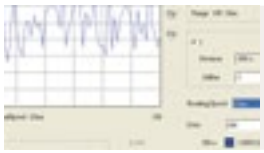
DATA SHEET

Models 2000, 2100, 2110

These cost effective, high precision instruments offer 5.5- and 6.5-digit accuracy and are ideal for a wide range of manual, semi-automatic, and production test applications. They can be used as stand-alone benchtop instruments and as components in test systems.

Product Highlights

- Exceptional 61/2-digit measurement integrity with high speed throughput (Model 2000)
- Built-in slot for scanner card (Model 2000)
- 15 built-in measurement functions including thermocouples (Model 2110)
- Full featured DMMs at a value price
- USB Test and Measurement Class (USBTMC) interface (Models 2110 and 2100)



The KI-Tool application for the Model 2100 provides charting and graphing capabilities without programming.

For multipoint measurement, plug a scanner card into the Model 2000.

Model	Resolution	Basic V DC Accuracy, 1 Year (% Reading + % Range)	Measurements	Interface
2000	6½	0.0030 + 0.0005	Vac, Vdc, Idc, Iac, 2WΩ, 4WΩ, Temp, Freq, Period, dB, dBm, Cont., Diode	GPIB, RS-232
2100	6½	0.0038 + 0.0006	Vac, Vdc, Idc, Iac, 2WΩ, 4WΩ, Temp, Freq, Period, Cont., Diode	USB
2110	5½	0.012 + 0.002	Vac, Vdc, Idc, Iac, 2WΩ, 4WΩ, Temp, Freq, Period, dB, dBm, Cont., Diode, Cap., Therm.	USB (GPIB Option)

Recommended Accessories

2000-SCAN	10-channel Scanner Card (Model 2000)
2001-SCAN	10-channel Scanner Card with Two High-speed channels (Model 2000)
2001-TSCAN	9-channel Thermocouple Scanner Card (Model 2000)
5808	Low cost, Single Pin, Kelvin Probes
5805	Kelvin Probes, 0.9m (3ft)
5805-12	Kelvin Probes, 3.6m (12ft)
5809	Low Cost, Kelvin Clip Lead Set

Recommended Accessories

7007-1	Shielded GPIB Cable, 1m (3.3ft)
7007-2	Shielded GPIB Cable, 2m (6.6ft)
KPCI-488LPA	IEEE-488 Interface/ Controller for the PCI Bus
KUSB-488B	IEEE-488 USB to GPIB Interface Adapter
4288-1	Single Fixed Rack Mount Kit (Model 2000, 2100)
4299-3	Single Rack Mount Kit (Model 2100 and 2110)
4299-4	Dual Rack Mount Kit (Model 2100 and 2110)

Ships with Product

- Safety Test Leads
- Product CD (Includes Users Manual, Drivers, Etc.)
- USB Cable (Models 2100/2110)
- KI Tool and KI Link Software (Models 2100/2110)
- Calibration Certificate
- Power Cord
- 1-year Warranty
- 3-year Warranty (Model 2110)

Learn more with the “Using the Dual Measurement Functionality and Dual Measurement Display on the Keithley Model 2110 5½-Digit Dual-Display Digital Multimeter” Application Note.

DATA SHEET

Models 2001, 2002, 2010

Each Model 2001, 2002, and 2010 digital multimeter (DMM) offers superior measurement precision, sensitivity, and traceability. They also support plug-in scanner cards that allow you to quickly and economically create multi-channel measurement systems.

Product Highlights

- Measurement functions include temperature, 4-wire resistance, peak detection, low ohms, and Agilent 3458A emulation (Model 2002)
- Built-in slot for scanner card
- Multiple measurement display (Models 2001 and 2002)
- Dry circuit measure function limits test voltage when testing contact or connector resistances (Model 2010)

Add a plug-in scanner card to turn any of these DMMs into a complete scan and measure system.

Use the multiple display capability (Model 2001/2002) to simultaneously display different aspects of one signal.

Model	Resolution	Basic V DC Accuracy, 1 Year (% Reading + % Range)	Measurements	Interface
2001	7½	0.0024 + 0.0004	Vac, Vdc, Idc, Iac, 2WΩ, 4WΩ, Temp, Freq, Period, Crest, Peak	GPIB
2002	8½	0.0010 + 0.00015	Vac, Vdc, Idc, Iac, 2WΩ, 4WΩ, Temp, Freq, Period, Crest, Peak	GPIB
2010	7½	0.0024 + 0.0004	Vac, Vdc, Idc, Iac, 2WΩ, 4WΩ, Temp, Freq, Period, Cont., Diode, Therm., Dry Circ.Ω, Ratio	GPIB, RS-232

Recommended Accessories

2000-SCAN	10-channel Scanner Card
2001-SCAN	10-channel Scanner Card with Two Highspeed Channels
2001-TSCAN	9-channel Thermocouple Scanner Card
5805	Kelvin Probes, 0.9m (3ft)
5805-12	Kelvin Probes, 3.6m (12ft)
5808	Low Cost, Single Pin, Kelvin Probes
5809	Low Cost, Kelvin Clip Lead Set
7007-1	Shielded GPIB Cable, 1m (3.3ft)
7007-2	Shielded GPIB Cable, 2m (6.6ft)
KPCI-488LPA	IEEE-488 Interface/ Controller for the PCI Bus
KUSB-488B	IEEE-488 USB to GPIB Interface Adapter
4288-1	Single Fixed Rack Mount Kit

Ships with Product

- Model 8605 High Performance Modular Test Leads (Models 2001, 2002)
- Model 1751 Safety Test Leads (Model 2010)
- Option Slot Cover (Models 2001, 2002)
- Calibration Data
- User Manual, Service Manual
- Power Cord
- 1-year Warranty

Learn more with the "Peak Detection with the Model 2001 DMM" Application Note.

DATA SHEET

VIRTUAL TOUR

360° VIEW

DMM4020

Make measurements, not compromises. Measure a variety of parameters— from volts, ohms and amps to frequency—with one instrument. Save time with front-panel shortcut keys and built-in limit testing. Performance. Reliability. Legendary ease-of-use. One instrument. Looks like you can have it all.

Product Highlights

- 5.5 digit resolution
- Basic V dc accuracy of up to 0.015%
- Volts, ohms, amps and frequency measurements
- Dedicated dc leakage current measurement
- CAT I 1000 V, CAT II 600 V

Make accurate 4-wire resistance measurements with only two test leads!

With the unique dual display, you can measure two different parameters of the same signal from one test connection.

Models	Display	Resolution (Digits)	Measurements	Basic V dc accuracy (% Reading + % Range)
DMM4020	Dual; Numeric	5.5	V ac, V dc, I dc, I ac, Ω, Cont, Diode, Freq	0.015 + 0.004 (yr.)

Recommended Test Leads

Test Leads	
196-3520-xx	Premium Test Leads (TL710 replacement/ spare)
TL705	2x4 Wire Ohm 1000V Test Lead
TL725	2x4 Wire Ohm SMD Test Tweezers

Recommended Accessories

Accessories	
ACD4000	Soft Carrying Case
HCTEK-4321	Hard Carrying Case
RMU2U	Rackmount Kit
013-0369-xx	Calibration Fixture 4-terminal short

Recommended Service

SILV100	5-year Extended Warranty

Another Product for Consideration

If you need greater accuracy, the DMM4050 provides 6.5 digits of resolution and up to 0.0024% basic V dc accuracy.

Ships with Product

- One Set TL710 Test Leads
- RS-232 to USB Adapter Cable
- NI LabVIEW SignalExpress™ TE (LE version) Software
- Statement of Calibration Practices
- User Manual & Documentation on CD
- Power Cord
- 3-year Warranty

Learn more with the "Using the DMM Series to Make Simple and Accurate Resistance Measurements" application note.

DATA SHEET

VIRTUAL TOUR

360° VIEW

DMM4040/4050

Meet the multimeter to rule them all. Make a wide range of measurements—from volts, ohms and amps to frequency, temperature and capacitance—with one instrument. Monitor and record measurements over time, or environmental changes with built-in histogram, TrendPlot™ testing and statistics analysis modes. Get unparalleled ease-of-use with a dual display and USB connectivity. Hello, efficiency. Goodbye, complexity.

Product Highlights

- 6.5 digit resolution
- Basic V dc accuracy of up to 0.0024%
- Volts, ohms, amps, frequency and period measurements
- Capacitance and temperature measurements (DMM4050)
- CAT I 1000 V, CAT II 600 V

Make accurate 4-wire resistance measurements with only two test leads!

See how your device is changing over time with built-in analysis modes – TrendPlot™, histograms and statistics.

Models	Display	Resolution (Digits)	Measurements	Basic V dc accuracy (% Reading + % Range)
DMM4040	Dual; Numeric & Graphical	6.5	V ac, V dc, I dc, I ac, Ω, Continuity, Diode, Freq, Period	0.0035 + 0.0005
DMM4050	Dual; Numeric & Graphical	6.5	V ac, V dc, I dc, I ac, Ω, Continuity, Diode, Freq, Period, Temp., Capacitance	0.0024 + 0.0005

Recommended Test Leads

Temperature Probes	
TP750	100 Ohm RTD Temperature Probe (DMM4050 only)
Test Leads	
196-3520-xx	Premium Test Leads (TL710 replacement/ spare)
TL705	2x4 Wire Ohm 1000V Test Lead
TL725	2x4 Wire Ohm SMD Test Tweezers

Recommended Accessories

Accessories	
ACD4000	Soft Carrying Case
HCTEK-4321	Hard Carrying Case
RMU2U	Rackmount Kit
013-0369-xx	Calibration Fixture 4-terminal short

Recommended Service

SILV100	5-year Extended Warranty

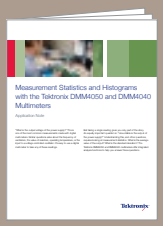
Another Product for Consideration

The PWS DC Power Supply Series is designed to stack with the DMM Series, saving you bench space.

Ships with Product

- One Set TL710 Test Leads
- RS-232 to USB Adapter Cable
- NI LabVIEW SignalExpress™ TE (LE version) Software
- Calibration Certificate
- User Manual & Documentation on CD
- Power Cord
- 3-year Warranty

Learn more with the "Measurement Statistics and Histograms with the Tektronix DMM4050 and DMM4040 Multimeters" application note.



Data Acquisition Systems

Keithley data acquisition systems combine precision measurement, switching, and control into a single, tightly integrated enclosure. They offer affordable alternatives to separate DMMs and switch systems, dataloggers/recorders, plug-in card data acquisition equipment, and VXI/PXI systems.

	Series 2700	Series 3700A
DMM Resolution	6½ Digits	7½ Digits
Switching Density	Up to 80, 2-pole channels (2700/2701) Up to 200, 2-pole channels (2750)	Up to 576, 2-pole channels
Special Features	Front panel DMM jacks, Non-volatile memory buffer, Solid State temperature scanning	USB Flash Drive support, 1 Ohm measure range, Solid State temperature scanning
Switch Features	Up to 40, 2-pole Channels and 12 card options	Up to 96, 2-pole Channels and 10 card options
Interface	GPIB, RS-232 (Models 2700 and 2750) LAN, RS-232 (Model 2701)	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus

Choosing Your Data Acquisition System

Designing the switching for an automated test system demands an understanding of the signals to be switched and the tests to be performed. The following is a cursory look at key decision points in the design of a switching system.

1 Switch Configuration

Multiplex switching can be used to connect one instrument to multiple devices or multiple instruments to a single device. Multiplex switching permits multiple simultaneous connections and sequential or non-sequential switch closures. A matrix switch configuration is the most versatile because it can connect multiple inputs to multiple outputs. The isolated, or independent, switch configuration consists of individual relays, often with multiple poles, with no connections between relays. For scanner (or multiplex) cards, the channel is used as a switched input in measuring circuits or as a switched output in sourcing circuits. For switch cards, each channel's signal paths are independent of other channels.

2 Relay Types

Three key relay types are used. Electromechanical offer the widest power range and a good life and speed at a relatively low cost. Reed relays cost more but offer less contact wear and bounce for a better life and speed than electromechanical. Solid state cost still more, but offer the best life and speed with no contact wear or bounce.

3 Systemization

Connection types found on switch cards include both screw terminals and mass-terminated connectors. At the instrument level, TSPLink master/slave connection offers easy system expansion between Series 3700A mainframes and to connect to Series 2600B SourceMeter instruments.

DATA SHEET

Series 2700

The Series 2700 System Switch/Multimeter combines precision measurement, switching, and control in a single, tightly integrated enclosure for either rack-mount or bench-top applications used by data loggers. The 2700 Series offers two- and five-slot models, as well as an Ethernet-based model for high speed and long distance communication.

Product Highlights

- 6½-digit measurement engine
- Front panel DMM jacks
- 300 volt isolation between channels and from any channel to ground to maintain signal integrity
- Mass terminated or screw terminal connector options
- Full per-channel card configurability
- Non-volatile memory buffer
- Choice of 12 switch/control plug-in modules

Install up to five switch/control modules in the 2750 mainframe or up to two in the 2700 and 2701 mainframes.

Screw terminals use oversize connectors for easier, mistake-free wiring. Removable terminals available for some models.

Model	Mainframe Size	Interfaces	Resolution (Digits), Accuracy	Advance Measure Functions
2700	2U, ½ Rack	GPIB, RS232	6½ Digits, 0.003%	Temperature, 4-Wire Resistance
2701	2U, ½ Rack	Ethernet, RS232	6½ Digits, 0.003%	Temperature, 4-Wire Resistance
2750	2U, Full Rack	GPIB, RS232	6½ Digits, 0.003%	Temperature, 4-Wire Resistance, Low Ohms

Plug-in Cards

7700	Dual 1x10 / Electromechanical Relay
7701	Dual 1x16 / Electromechanical Relay
7702	Dual 1x20 / Electromechanical Relay
7703	Dual 1x16 / Reed Relay
7705	40 Independent Relay / Electromechanical Relay

Recommended Accessories

7007-1	Shielded IEEE-488 Cable, 1m (2700, 2750)
7007-2	Shielded IEEE-488 Cable, 2m (2700, 2750)
7788	50-Pin D-Shell Connector Kit (for 7703 & 7705 Mods.)
7789	50-Pin/25-Pin D-Shell Kit
7790	50-Pin Male/Female, 25-Pin Male IDC D-Shell Con. Kit

Plug-in Cards

7706	16 Digital I/O, 2 Analog Outputs, 1x20 Multiplexer
7707	32 Digital I/O, 1x10 Multiplexer
7708	Dual 1x20 / Electromechanical Relay
7709	6x8 / Electromechanical Relay
7710	Dual 1x10 / Solid State Relay
7711	Dual 1x4, 2GHz / RF Relay
7712	Dual 1x4, 3.5GHz / RF Relay

Ships with Product

- Product CD (Includes Users Manual, Drivers, Etc.)
- Ethernet Crossover Cable (Model 2701 Only)
- Calibration Certificate
- Quick Reference Manual
- ExceLINX Software
- Power Cord
- 1-year Warranty

Learn more with the "Switching Handbook: A Guide to Signal Switching in Automated Test Systems".

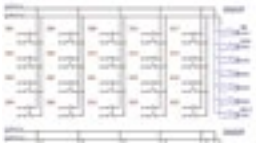
DATA SHEET

Series 3700A

The Series 3700A DMM/switch system offers a scalable, instrument grade switching and multi-channel measurement solution for automated testing of electronic devices. The system includes a high performance DMM with up to six switch/control cards and can support up to 576 two-wire multiplexer channels for unrivaled density and low per channel cost.

Product Highlights

- Mainframe variations (DMM and keypad/display optional)
- High performance (1 Ohm resistance, 10µA DCI range) 7.5 Digit multimeter
- High density switching (Up to 720 one-wire multiplexer channels, 2,688 one-wire matrix crosspoints)
- TSP control and TSP-Link for Intelligent distributed control
- Embedded startup/control software



Use the built-in web server interface to configure the system, build and run an automated scan list, and analyze data.

Model 3706A-NFP eliminates keypad and display for automated test rack applications.

Model (Mainframe)	DMM	Front Panel Keypad & Display	Resolution (Digits), Accuracy	Interface
3706A	Yes	Yes	7½ Digits, 0.0025%	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus
3706A-S	No	Yes	NA	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus
3706A-NFP	Yes	No	7½ Digits, 0.0025%	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus
3706A-SNFP	No	No	NA	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus

Plug-in Cards

3720	Dual 1x30 Multiplexer: 300V, 2A, Auto-CJC with 3720-ST accessory
3721	Dual 1x20 Multiplexer: 300V, 3A, Auto-CJC with 3721-ST accessory
3722	Dual 1x48 Multiplexer: 300V, 2A
3723	Dual 1x30 Multiplexer: 200V, 1.25A, Reed Relay
3724	Dual 1x30 Multiplexer: 200V, 0.12A, Solid State Relay, Auto-CJC with 3724-ST accessory

Plug-in Cards

3730	6x16 Matrix: 300V, 2A
3731	6x16 Matrix: 200V, 2A, Reed Relay
3732	Quad 4x28 Matrix: 200V, 1.2A, Reed Relay
3740	Independent Relay: 28 Form C: 300V, 3A; 4 Form A: 250VAC, 7A
3750	Control: 40 Digital I/O 2 Analog Outputs, 4 Counter
KUSB-488B	IEEE-488 USB to GPIB Interface Adapter
4288-1	Single Fixed Rack Mount Kit

Recommended Accessories

3706-BAN	DMM Adapter Cable
3706-TLK	Test Lead Kit

Ships with Product

- Test Script Builder Software Suite CD
- Series 3700A Product CD (Includes LabVIEW, IVI C, and IVI.COM Drivers)
- Ethernet Crossover Cable
- Calibration Certificate
- Quick Reference Manual
- Power Cord
- 1-year Warranty

Learn more with the "Optimizing Switched Measurements with the Series 3700 System Switch/Multimeter and Series 2600 System SourceMeter® Instruments Through the Use of TSP" application note.

Low-Level Instruments

Scientists and researchers worldwide rely on Keithley Electrometers, Picoammeters, and Nanovoltmeters for making low-level measurements beyond the capabilities of a typical digital multimeter. Keithley Electrometers and Picoammeters provide low current and high resistance measurements and Keithley Nanovoltmeters measure low voltages.

	2182A Nanovoltmeter	6220 / 6221 Current Sources	6485 / 6487 / 6482 Picoammeters / Picoammeter & Voltage Source	6514 / 6517B / 6430 Electrometers
Current Min/Max	--	100fA / 100mA	1fA / 20mA	10aA / 100mA
Voltage Min/Max	1nV / 100V	--	--	1mV / 200V
Resistance Min/Max	10nΩ /1G Ω (with Model 6220 or 6221)	10nΩ/1GΩ (with Model 2182A)	10Ω/1PΩ (with Model 6487)	10mΩ / 10PΩ
Resolution	7½ Digits	4½ Digits	5½ Digits (6485, 6487) 6½ Digits (6482)	5½ Digits (6514, 6517B) 6½ Digits (6430)
Input Connection / Interface	Low Thermal / GPIB, RS-232	3 Slot Triax / GPIB, RS-232 (LAN on 6221)	BNC (6485) 3 Slot Triax (6482, 6487) / GPIB, RS-232	3 Slot Triax / GPIB, RS-232

Choosing Your Specialized Low Level Instrument

To help you choose the appropriate specialized low level instrument for your application, the most common selection criteria are listed below, including helpful tips for determining the correct specialized low level instrument for your requirements.

1 Resolution

Resolution means how fine a meter's measurement is and lets you determine if it's possible to see a small change in the signal. Resolution is described by digits and counts. A 6.5-digit instrument can display six full digits ranging from 0 to 9, and one "half" digit that displays either a 1 or is left blank. A 6.5-digit instrument can display up to 1,999,999 counts of resolution.

2 Accuracy

Accuracy is the largest allowable error that will occur under specific operating conditions and is an indication of how close the instrument's displayed measurement is to the actual value of the signal measured. Accuracy is typically expressed as a percent of reading. For example, an accuracy of 1% of reading means that, for a displayed reading of 100 volts, the actual value of the voltage is between 99 volts and 101 volts.

3 Low Current/High Resistance Measurements

Low current/high resistance measurements evaluate the insulation qualities of materials or components. Typically, a voltage up to 500 or 1000 volts is applied and the resulting current is measured, which can be in the range of picoamperes (10E-12A) or lower. A digital multimeter may seem like the right instrument for these measurements. But if the current is below 1µA or the resistance is above 10MΩ, the correct solution is an Electrometer or Picoammeter.

4 Low Voltage/Low Resistance Measurements

Low resistance/low voltage measurements evaluate the conduction or contact qualities of materials or components. Typically, a current under 100mA but as low as 1µA is applied and the resulting voltage is measured, which can be in the range of microvolts and even nanovolts. For low voltage, choose a Nanovoltmeter or low noise multimeter. For low resistance, a Nanovoltmeter/current source combination or switch/multimeter is the correct solution.

DATA SHEET

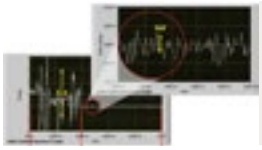
2182A Nanovoltmeter

The two-channel Model 2182A Nanovoltmeter is optimized for making stable, low noise voltage measurements and for characterizing low resistance materials and devices reliably and repeatably. It provides higher measurement speed and significantly better noise performance for voltage meters than alternative low voltage measurement solutions.

Product Highlights

- Low noise voltage measurements at high speeds
- Delta mode coordinates measurements with a reversing current source at up to 24Hz with 30nV p-p noise (typical) for one reading. Averages multiple readings for greater noise reduction
- Built-in thermocouple linearization and cold junction compensation
- Dual channels

Comparison of the Model 2182A's DC noise performance with a nanovolt/micro-ohmmeter's.



Results from a Model 2182A and Model 6220 using the delta mode to measure a 10mΩ resistor with a 20μA test current.

Model	Voltage	Temperature	Resistance	Channels	Buffer Size
2182A	1nV – 100V	-200°C – 1820°C	10nΩ to 200MΩ (requires 6220 or 6221)	2	1,024 rdgs

Recommended Accessories

6220	DC Precision Current Source (used with 2182A for low current/ voltage measurement)
6221	AC and DC Current Source (used with 2182A for low current/ voltage measurement)
4288-1	Single Fixed Rack Mounting Kit
4288-2	Dual Fixed Rack Mounting Kit
KPCI-488LPA	IEEE-488 Interface/ Controller for the PCI Bus
KUSB-488B	I EEE-488 USB-to-GPIB Interface Adapter
2107-30	Low Thermal Input Cable with spade lugs, 9.1m (30 ft)
2182-KIT	Low Thermal Connector with strain relief
2187-4	Input Cable with safety banana plugs

Recommended Accessories

2188	Low Thermal Calibration Shorting Plug
7007-1	Shielded GPIB Cable, 1m (3.2 ft)
7007-2	Shielded GPIB Cable, 2m (6.5 ft)
7009-5	Shielded RS-232 Cable, 1.5m (5 ft)
8501-1	Trigger Link Cable, 1m (3.2 ft)
8501-2	Trigger Link Cable, 2m (6.5 ft)
8503	Trigger Link Cable to 2 male BNC connectors

Ships with Product

- 2107-4 Low Thermal Input Cable with Spade Lugs, 1.2m (4 ft)
- User Manual
- Service Manual
- Contact Cleaner
- Power Cord
- Alligator Clips

Learn more with the "Low-Level Pulsed Electrical Characterization with the Model 6221/2182A Combination" application note.

DATA SHEET

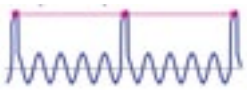
6220 / 6221 Current Sources

Keithley precision current sources include both broad-purpose Model 6220 and high-performance Model 6221. Their high sourcing accuracy and built-in control functions make them ideal for Hall Effect, resistance (using delta mode), pulsed, and differential conductance measurements. Programmable pulse widths limit power dissipation.

Product Highlights

- 10E+14 Ohms output impedance ensures stable current sourcing into variable loads
- 64k-point source memory for comprehensive test current sweeps
- (Model 6221) Source AC currents from 4pA to 210mA peak to peak for AC characterization of components and materials. The 10MHz output update rate generates smooth sine waves up to 100kHz

Perform, analyze, and display differential conductance measurements.



Measurements are line synchronized to minimize 50/60Hz interference.

Model	Current	Resistance	Sweep Points	PC Interface
6220	100fA – 100mA	10nΩ to 200MΩ (requires 2182A)	65,536 (64k)	GPIB, RS-232
6221	100fA – 100mA	10nΩ to 200MΩ (requires 2182A)	65,536 (64k)	GPIB, RS-232, Ethernet

Recommended Accessories

2182A	Nanovoltmeter (used with 6220/6221 for low current/voltage measurement)
237-ALG-2	Low Noise Triax Cable, 3-slot triax to alligator clips
7007-1	Shielded GPIB Cable, 1m (3.2 ft)
7007-2	Shielded GPIB Cable, 2m (6.5 ft)
7007-4	Shielded IEEE-488 Cable, 4m (13.1 ft)
7009-5	Shielded RS-232 Cable, 1.5m (5 ft)
7078-TRX-3	Low Noise Triax Cable, 3-Slot Triax Connectors, 0.9m (3 ft)
7078-TRX-5	Low Noise Triax Cable, 3-Slot Triax Connectors, 1.5m (5 ft)
7078-TRX-10	Low Noise Triax Cable, 3-Slot Triax Connectors, 3m (10 ft)
7078-TRX-20	Low Noise Triax Cable, 3-Slot Triax Connectors, 6m (20 ft)

Recommended Accessories

8501-1	Trigger Link Cable with male Micro-DIN connectors at each end, 1m (3.3 ft)
4288-1	Single Fixed Rack Mounting Kit
4288-2	Dual Fixed Rack Mounting Kit
KPCI-488LPA	IEEE-488 Interface/ Controller for the PCI Bus
KUSB-488B	I EEE-488 USB-to-GPIB Interface Adapter

Ships with Product

- 6.6 ft (2m), Low Noise, Input Cable with Triax-to-Alligator Clips
- 6.6 ft (2m) Trigger Link Cable to connect 622x to 2182A
- Ethernet Crossover Cable (6221 only)
- Communication Cable between 2182A and 622x
- Safety Interlock Connector
- Instruction manual on CD
- Getting Started manual (hardcopy)
- Software (downloadable)

Learn more with the "Determining Resisitivity and Conductivity Type using a Four-Point Collinear Probe and the Model 6221 Current Source" application note.

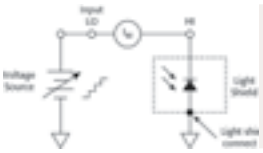
DATA SHEET

6485, 6487 Picoammeters, 6482 Picoammeter & Voltage Source

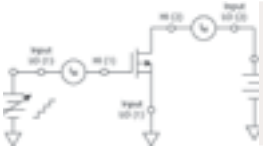
Keithley Picoammeters combine sensitive current measurement with high speed. The Model 6485 Picoammeter offers fast, sensitive current measurement. The Model 6487 offers improved measurement capability, and adds a high resolution 500V source. The Model 6482 offers two independent Picoammeter/voltage source channels.

Product Highlights

- Measure currents down to 1fA
- Voltage and resistance measurement options
- Voltage burden <200µV (most models)
- 5-1/2 to 6-1/2 digit resolution (most models)
- Feedback ammeter design for higher accuracy



Dark current characterization of a photodiode using Picoammeter and voltage source (such as the Model 6482).



MOSFET sub-threshold voltage test using Picoammeters and voltage sources (such as the Model 6482).

Model	Current	Resistance	Reading Rate	Input Connections
6482	1fA – 20mA	N/A	900 rdgs/s	3-slot triax, BNC (via included adapter)
6487	10fA – 20mA	10E+16 Ohms	1000 rdgs/s	3-slot triax
6485	10fA – 20mA	N/A	1000 rdgs/s	BNC

Recommended Accessories

4802-10	Low noise BNC Input Cable, 3m (10ft) (for 6485)
4803	Low Noise Cable Kit (for 6485)
6517-ILC-3	Interlock Cable for 8009 Resistivity Test Fixture (6487 Only)
7007-1	Shielded IEEE-488 Cable, 1m (3.3 ft)
7007-2	Shielded IEEE-488 Cable, 2m (6.6 ft)
7007-4	Shielded IEEE-488 Cable, 4m (13.1 ft)
7009-5	RS-232 Cable
7078-TRX-10	Low Noise Triax Cable, 3.0m (10 ft) (6487 Only)
7078-TRX-20	Low Noise Triax Cable, 6.0m (20 ft) (6487Only)
7754-3	BNC to Alligator Cable (for 6485)
8501-1	Trigger Link Cable with male Micro-DIN connectors at each end, 1m (3.3 ft)

Recommended Accessories

CS-565	BNC Barrel (for 6485)
237-TRX-BAR	Triax Barrel (for 6487)
7078-TRX-BNC	Triax-to-BNC Adapter
8009	Resistivity Test Fixture (for 6487)
4288-1	Single Fixed Rack Mounting Kit
4288-2	Dual Fixed Rack Mounting Kit
KPCI-488LPA	IEEE-488 Interface/ Controller for the PCI Bus
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter

Ships with Product

- 7078-TRX-BNCTriax-to-BNC Connector (2×) (Model 6482)
- CA-186-1B Ground Connection Cable, Banana to Screw-Lug (Model 6487)
- CAP-31 Protective Shield/Cap (3-lug) (Model 6487)
- CS-459 Safety Interlock Plug (Model 6487)
- 7078-TRX-3 Low Noise Triax Input Cable, 1m (3 ft) (Model 6487)
- 8607 High Voltage Banana Cable Set for Voltage Source Output (Model 6487)
- CAP-18 Protective Shield/Cap (2-lug) (Model 6485)
- 4801 Low Noise BNC Input (Model 6485)

Learn more with the “Low Current Measurements” application note.

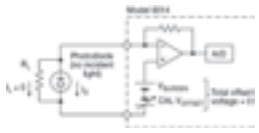
DATA SHEET

6514 / 6517B / 6430 Electrometers

Our high resistance Electrometers provide voltage source and high resistivity measurements for sensitive measurement. They combine flexible interfacing capabilities with current sensitivity, charge measurement capabilities, resolution, and speed. The Model 6430 offers unmatched low current sensitivity.

Product Highlights

- Measure low current & high voltage, resistance, and charge
- Resistance measurements to 10PΩ ohm
- Current sensitivity as low as 10aA (6430)
- Voltage burden as low as 200µV
- Superior accuracy and sensitivity



This illustrates how the Model 6514's measurement can be adjusted to reflect the true dark current of the photodiode.

A Model 6517B is well suited for application where the volume resistivity needs to be measured.

Model	Current	Voltage	Resistance	Charge	Input Connections
6517B	100aA – 20mA	10µV – 200V	100Ω – 10PΩ	10fC – 2µC	3-slot triax
6514	100aA – 20mA	10µV – 200V	10mΩ – 200GΩ	10fC – 20µC	3-slot triax
6430	10aA – 100mA	1µV – 200V	1µΩ – >20TΩ	--	3-slot triax

Recommended Accessories

237-ALG-2	Low Noise Triax Cable, 3-slot triax to alligator clips
6517B-ILC-3	Interlock Cable (For 6517B only)
7078-TRX-3	Low Noise Triax Cable, 3-Slot Triax Connectors, 0.9m (3 ft)
7007-1	Shielded IEEE-488 Cable, 1m (3.2 ft)
8501-1	Trigger Link Cable, 1m (3.3 ft)
8503	Trigger Link Cable to 2 male BNCs, 1m (3.3 ft)
8607	1kV Source Banana Cables (for 6517B only)
6517-RH	Humidity Probe with Extension Cable (6517B only)
6517-TP	Temperature Bead Probe (included with 6517B) (6517B only)
8009	Resistivity Test Fixture (for 6517B)

Recommended Accessories

237-BNC-TRX	Male BNC to 3-Lug Female Triax Adapter (for 6517B)
237-TRX-NG	Triax Male-Female Adapter with Guard Disconnected
7078-TRX-BNC	3-Slot Male Triax to BNC Adapter
7078-TRX-GND	3-Slot Male Triax to BNC Adapter with guard removed (for 6517B)
4288-1	Single Fixed Rack Mounting Kit
4288-2	Dual Fixed Rack Mounting Kit
6521	Low Current Scanner Card (for 6517B)
6522	Voltage/Low Current Scanner Card (for 6517B)
KPCI-488LPA	IEEE-488 Interface/ Controller for the PCI Bus
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter

Ships with Product

- Low Noise Triax Cable, 3-slot triax to alligator clips (6514, 6517B)
- 6430-322-1B Low noise Triax Cable, 3-slot triax to alligator clips (20cm)
- Dual Test Leads (6430)
- 6517-TP Thermocouple Bead Probe (6517B)
- CS-1305 Interlock Connector (6517B)
- PreAmp Cable 2m (6.6ft)

Learn more with the “Volume and Surface Resistivity Measurements of Insulating Materials Using the Model 6517A Electrometer/High Resistance Meter” application note.

Power Supplies

Tektronix and Keithley power supplies offer a wide range of performance. Get single channel models with superior accuracy and 0.1mA current measurement resolution. New high voltage power supplies combine high voltage with sensitive, low current measurement for high voltage device testing and characterization and high voltage research. For multiple source needs, select a dual channel or triple channel supply. All channels are isolated and fully programmable. For testing battery-operated devices, consider a battery simulator.

	Tektronix PWS2000 Series (4 models)	Tektronix PWS4000 Series (5 models)	Keithley Models 2200 (5 models)	Keithley 2220/2230 Series (4 models)	Keithley Models 2290-5, 2290-10	Keithley Models 2302, 2306, 2308	Keithley Models 2303, 2304A
Description	Manual	USB Programmable Single Channel	USB and GPIB Programmable Single Channel	USB Multi-Channel; USB & GPIB Multi-Channel	High Voltage	Battery Simulator	Fast Transient Response
Channels	1	1	1	2 (2220 Series) 3 (2230 Series)	Single Output	1 (2302) 2 (2306, 2308)	Single Output
Max Voltage / Max Current	18V-72V / 1.5A-6A	20V-72V / 1.2A-5A	20V-72V / 1.2A-5A	2-30V / 1.5A (2220-30-1) 2-30V / 1.5A, 1-6V / 5A (2230-30-1)	5kV / 5mA (2290-5) 10kV / 1mA (2290-10)	15V / 5A	15V / 5A (2303) 20V / 5A (2304A)
Resolution	10mV, 10mA	1mV, 0.1mA	1mV, 0.1mA	1mV, 1mA	1V, 1µA	1mV, 100nA	1mV, 100nA
Voltage Accuracy	0.05%	0.03%	0.03%	0.03%	±0.01% (2290-5), ±6V (2290-10)	0.05%	0.05%
Current Accuracy	0.2%	0.05%	0.05%	0.1%	±0.01% (2290-5), ±5µA (2290-10)	0.2%	0.2%
Interface	Not Applicable	USB	GPIB, USB	USB USB & GPIB (-G versions)	GPIB (2290-5), GPIB, RS-232 (2290-10)	GPIB	GPIB

Choosing Your Programmable Power Supply

To help you choose the appropriate power supply for your application, the most common selection criteria are listed below.

1 Output Voltage, Current, and Power

Ensure that the power supply has sufficient voltage output and current output to meet your needs. Also ensure that the supply can deliver the required power. Some power supply V-I output characteristics offer a trade-off between maximum voltage and maximum current (hyperbolic V-I output).

2 Setting Resolution and Accuracy

Voltage and current settings (sometimes called limits or programmed values) each have resolution and accuracy specifications associated with them. The resolution of these settings determines the minimum increment in which the output may be adjusted. The accuracy describes the extent to which the value of the output matches international standards and is typically expressed as ± (% of reading + offset).

3 Ripple and Noise

Spurious AC components on the output of a DC supply are called ripple and noise. The term “ripple” refers to periodic AC on the output. When viewed in the frequency domain, ripple shows up as spurious responses. Unlike ripple, which is periodic, noise is random. A power supply’s ripple and noise is specified within a bandwidth, and should be specified for both current and voltage.

4 Features and Programmability

When selecting your power supply, select the supply that has the functionality you need. Consider a multiple-channel supply as a cost-effective solution for applications requiring multiple power sources. For maximum accuracy, consider supplies that have remote sensing. When developing and testing battery-operated devices, consider a special purpose battery-simulating supply.

DATA SHEET

360° VIEW

PWS2000 Series Single Channel Power Supplies

More power. More features. More value. Support many different applications with wide output voltage and current ranges, and down to 10 mV/10 mA resolution. Save time with a numeric keypad for fast and accurate voltage/current selection. Strain less with a bright, large readout digital display. All backed by Tektronix reliability.

Product Highlights

- Linear regulation
- 0.05% basic DC voltage accuracy
- 0.2% basic DC current accuracy
- Less than 3 mVp-p ripple and noise
- 20 user-defined setup memories

The numeric keypad makes it easy to specify a precise current limit before you start your test.

PWS Series power supplies are designed to be stacked with other Tektronix bench instruments to save you valuable bench space.

Models	Output Voltage	Output Current	Programmable
PWS2185	18 V	5 A	No
PWS2323	32 V	3 A	No
PWS2326	32 V	6 A	No
PWS2721	72 V	1.5 A	No

Recommended Accessories

RMU2U	Rackmount Shelf Kit for 1 or 2 Units
386-7598-xx	Rackmount Cosmetic Filler Panel

Recommended Service

R5	5-year Extended Warranty

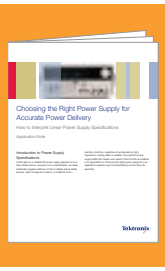
Another Product for Consideration

The PWS4000 Series offers greater accuracy, additional features and programmability.

Ships with Product

- Calibration Certificate
- Technical Reference Manual & Documentation on CD
- Power Cord
- 3-year Warranty

Learn more with the "Choosing the Right Power Supply for Accurate Power Delivery" application note.



DATA SHEET

360° VIEW

PWS4000 Series USB Programmable, Single Channel Power Supplies

Precision. Now available at the touch of a button. Generate the power you need with down to 1 mV/0.1 mA resolution and a basic voltage accuracy of 0.03%. Accelerate complex tests with list mode and a USB port for remote programming. Save time with a numeric keypad for fast and accurate voltage/current selection. Performance. Accuracy. Affordability. Meet your new power supply.

Product Highlights

- Linear regulation
- 0.03% basic DC voltage accuracy; 0.05% basic DC current accuracy
- USB interface for remote programming
- Less than 5 mVp-p ripple and noise
- Remote sense, list mode and 40 user-defined setup memories

The numeric keypad makes it easy to specify a precise current limit before you start your test.

PWS Series power supplies are designed to be stacked with other Tektronix bench instruments to save you valuable bench space.

Models	Output Voltage	Output Current	Programmable
PWS4205	20 V	5 A	Yes
PWS4305	30 V	5 A	Yes
PWS4323	32 V	3 A	Yes
PWS4602	60 V	2.5 A	Yes
PWS4721	72 V	1.2 A	Yes

Recommended Accessories

RMU2U	Rackmount Shelf Kit for 1 or 2 Units
386-7598-xx	Rackmount Cosmetic Filler Panel

Recommended Service

SILV100	5-year Extended Warranty

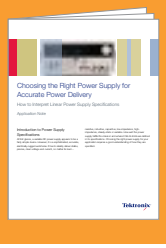
Another Product for Consideration

The DMM Series offers accurate voltage, current and resistance measurements for AC and DC signals.

Ships with Product

- NI LabVIEW SignalExpress™ TE (LE version) Software
- Calibration Certificate
- Technical Reference Manual & Documentation on CD
- Power Cord
- 3-year Warranty

Learn more with the "Choosing the Right Power Supply for Accurate Power Delivery" application note.



DATA SHEET

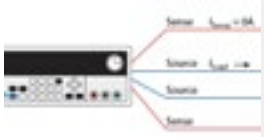
2200 Programmable Single Channel DC Power Supplies with Remote Sensing

Keithley programmable single-channel DC power supplies offer an excellent combination of performance, versatility, and ease of use including 0.03% basic accuracy, 0.1mA measurement resolution, and keypad data entry. Select from a variety of DC power supplies with voltages from 20V to 72V.

Product Highlights

- Low noise, linear regulation
- 0.03% basic voltage output
- 0.05% basic current accuracy
- 1mV and 0.1mA output and measurement resolution
- Seven programmable output lists with up to 80 steps/list
- GPIB and USB interfaces

Series 2200 rear panel.



Remote sensing compensates for voltage drops in the test leads by extending the power supply feedback loop to the input of the load.

Model	Max Output Voltage	Max Output Current	Power	Ripple and Noise
2200-20-5	20V	5A	100W	<1mV$_{RMS}$, <3mVP-P
2200-30-5	30V	5A	150W	<1mV$_{RMS}$, <4mVP-P
2200-32-3	32V	3A	96W	<1mV$_{RMS}$, <4mVP-P
2200-60-2	60V	2.5A	150W	<1mV$_{RMS}$, <5mVP-P
2200-72-1	72V	1.2A	86W	<1mV$_{RMS}$, <3mVP-P

Recommended Accessories

CS-1638-12	Rear Panel Mating Connector, Single Channel
USB-B-1	USB Cable
4299-7	Fixed Rack Mount Kit
KPCI-488LPA	IEEE-488 Interface Board for PCI Bus
7007-05	Double Shielded IEEE-488 Cable, 0.5m (1.6ft)
7007-1	Double Shielded IEEE-488 Cable, 1m (3.2 ft)
7007-2	Double Shielded IEEE-488 Cable, 2m (6.5 ft)
7007-3	Double Shielded IEEE-488 Cable, 3m (10 ft)
7007-4	Double Shielded IEEE-488 Cable, 4m (13 ft)

Ships with Product

- User Documentation and Driver CD
- Rear Panel Mating Connector
- Calibration Certificate
- Power Cord
- 3-year Warranty

Learn more with the “Understanding Linear Power Supply Specifications” application note.

Product Highlights

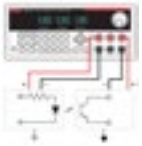
- Dual and triple channel models
- Two 30V/1.5A channels
- One 6V/5A channel (on triple channel model)
- All channels are isolated and programmable
- USB interface, USB and GPIB on G versions

DATA SHEET

2220/2230 Programmable Multiple Channel DC Power Supplies with Remote Sensing

Keithley programmable multi-channel DC power supplies offer an excellent combination of performance, versatility, and ease of use including fully isolated channels, fully programmable channels, and all channel measurements displayed simultaneously. Choose either the dual channel DC power supply or the triple channel DC power supply.

Model 2230G-30-1 rear panel.



Power two isolated circuits with isolated output channels.

Model	Max Output Voltage	Max Output Current	Power	Ripple and Noise
2220-30-1 2220G-30-1*	Ch 1: 30V, Ch 2:30V	Ch1: 1.5A, Ch 2: 1.5A	45W/channel; 90W total	<1mVRMS, <3mV P-P
2230-30-1 2230G-30-1*	Ch1: 30V, Ch 2: 30V, Ch 3: 6V	Ch1: 1.5A, Ch 2: 1.5A, Ch 3: 5A	Ch 1 and Ch 2: 45W each Ch 3: 30W, 120W total	<1mVRMS, <3mV P-P

*G versions include a GPIB interface.

Recommended Accessories

CS-1655-15	Rear Panel Mating Connector, Multi-Channel
USB-B-1	USB Cable
4299-7	Fixed Rack Mount Kit

Ships with Product

- User Documentation and Driver CD
- Rear Panel Mating Connector
- Calibration Certificate
- Power Cord
- 3-year Warranty

Learn more with the "Ensuring that Power Supply Performance Meets Your Requirements" application note.

DATA SHEET

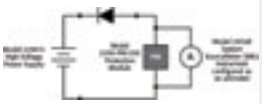
2290 High Voltage Power Supplies

2290 Series High Voltage Power Supplies facilitate high voltage device and material testing, as well as high energy physics experimentation. The Model 2290-5 5kV Power Supply provides voltage outputs up to 5000V, and the Model 2290-10 10kV Power Supply offers up to 10,000V. These supplies measure both output voltage with 1V resolution and output current with 1µA resolution.

Product Highlights

- Source voltages up to 5kV and 10kV
- 1µA current measurement resolution
- Low noise for precision sourcing and sensitive measurements; selectable filters reduce noise to less than $3mV_{RMS}$ on the 5kV supply
- Safety interlock controls high voltage output
- GPIB programmable
- Protection module prevents damage to low voltage instrumentation

The Model 2290-PM-200 Protection Module protects low voltage measurement equipment from voltages greater than 200V.



Reverse breakdown testing of a high voltage diode using a Keithley SourceMeter® SMU instrument to measure leakage currents down to pA levels. The Model 2290-PM-200 SMU Protection Module protects the SourceMeter SMU instrument from high voltage when the diode breaks down.

Model	Max Output Voltage	Max Output Current	Power	Ripple
2290-5	5kV	5mA	25W	$3mV_{RMS}$ maximum with filter
2290-10	10kV	1mA	10W	$1V_{RMS}$

Recommended Accessories

For 2290-5	
2290-5-SHV	5kV SHV Female–SHV Female Cable, 3m (10 ft)
2290-5-MHV	5kV SHV Female–MHV Male Cable, 3m (10 ft)
2290-5-SHVBH	5kV SHV Male Bulkhead Connector
2290-5-RMK-1	Single Fixed Rack Mount Kit for 5kV Power Supply
2290-5-RMK-2	Dual Fixed Rack Mount Kit for 5kV Power Supply
For 2290-10:	
2290-10-SHVUC	10kV SHV Male to Unterminated Cable, 3m (10ft)
2290-10-SHV	10kV SHV Male–SHV Male Cable, 3m (10 ft)
2290-10-SHVBH	10kV SHV Female Bulkhead Connector
2290-10-RMK-1	Single Fixed Rack Mount Kit for 10kV Power Supply
2290-10-RMK-2	Dual Fixed Rack Mount Kit for 10kV Power Supply

Recommended Accessories

For both:	
2290-PM-200	10kV Protection Module
2290-INT-CABLE	3-Pin Connector to Unterminated Interlock Cable
4299-7	Fixed Shelf Rack Mount Kit
KPCI-488LPA	IEEE-488.2 Interface Board for the PCI Bus
KUSB-488B	IEEE-488.2 USB-GPIB Interface Adapter for USB port with built-in 2m (6.6 ft) cable
7007-05	Double Shielded Premium IEEE-488 Interface Cable, 0.5m (1.6 ft)
7007-1	Double Shielded Premium IEEE-488 Interface Cable, 1m (3.2 ft)
7007-2	Double Shielded Premium IEEE-488 Interface Cable, 2m (6.5 ft)
7007-3	Double Shielded Premium IEEE-488 Interface Cable, 3m (10 ft)
7007-4	Double Shielded Premium IEEE-488 Interface Cable, 4m (13 ft)

Ships with Product

- CD with User Manual, Software Drivers, and Accessory Information
- Power Cord

DATA SHEET

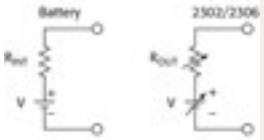
2300 Portable Device Battery/Charger Simulators

Keithley's battery simulating power supplies can simulate a battery's output characteristics and its discharged state. These supplies can measure low, sleep mode load current and pulsed output load current. Dual channel models facilitate testing portable device, charge control circuitry with a battery channel and a charger simulator channel.

Product Highlights

- Optimized for battery-powered device testing
- 100nA current measurement sensitivity
- Load pulse current measurement: 33µs - 833µs
- Variable output resistance: 0 - 1Ω with 10mΩ resolution
- Measure sleep, currents, standby currents, and full load currents to determine power consumption
- Sink current to simulate a discharged battery

Model 2306 Rear Panel.



Simplified schematic of a battery and the 2302/2306.

Model	Channels	Max Output Voltage / Current	Power	Transient Response to a 10X Load Current Change	Current Sink Capacity
2302	1	15 V / 5 A	42W	<40µs recovery time and <75mV voltage drop	3A
2306	2	15 V / 5 A	45W	<40µs recovery time and <75 mV voltage drop	3A
2308	2	15 V / 5 A	45W	<35µs recovery time and <90 mV voltage drop	3A

Recommended Accessories

2306-DISP	Remote Display (2302, 2306, 2308)
CS-846	Mating Output Connector
SC-182	Low Inductance Coaxial Cable
4288-1	Single Fixed Rack Mount Kit
4288-2	Dual Fixed Rack Mount Kit
KPCI-488LPA	IEEE-488 Interface Board for PCI Bus
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter

Recommended Accessories

7007-05	Double Shielded IEEE-488 Cable, 0.5m (1.6ft)
7007-1	Double Shielded IEEE-488 Cable, 1m (3.2 ft)
7007-2	Double Shielded IEEE-488 Cable, 2m (6.5 ft)
7007-3	Double Shielded IEEE-488 Cable, 3m (10 ft)
7007-4	Double Shielded IEEE-488 Cable, 4m (13 ft)

Ships with Product

- User Documentation
- Rear Panel Mating Connector
- Calibration Certificate
- Power Cord
- 1-year Warranty

Learn more with the "Simulating Battery Impedance with the Models 2302 and 2306 Battery Simulators/ Chargers" application note.

DATA SHEET

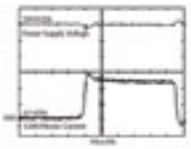
2300 High Speed Power Supplies

The Model 2303/2304A Power Supplies provide both voltage control and power consumption monitoring for automated testing of portable, battery-operated devices. They are optimized for testing battery-operated, wireless communication devices such as cellular phones that undergo substantial load changes for very short time intervals.

Product Highlights

- Ultra-fast response times to load changes
- Optimized for battery-powered device testing
- 100nA current measurement sensitivity
- Load pulse current measurement: 33µs - 833µs
- Measure sleep, standby currents, and full load currents to determine power consumption
- Sink current to simulate a discharged battery

Model 2303 or 2304A rear panel.



Keithley's high speed power supplies maintain a stable voltage during large load changes.

Model	Channels	Max Output Voltage / Current	Power	Transient Response to a 10X Load Current Change	Current Sink Capacity
2303	Single Output	15V/3A or 9V/5A	45W	<40µs recovery time and <100mV voltage drop	2A
2304A	Single Output	20V/5A	100W	<40µs recovery time and <100mV voltage drop	3A

Recommended Accessories

2304-DISP	Remote Display (2303, 2304A)
CS-846	Mating Output Connector
SC-182	Low Inductance Coaxial Cable
4288-1	Single Fixed Rack Mount Kit
4288-2	Dual Fixed Rack Mount Kit
KPCI-488LPA	IEEE-488 Interface Board for PCI Bus
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter

Recommended Accessories

7007-05	Double Shielded IEEE-488 Cable, 0.5m (1.6ft)
7007-1	Double Shielded IEEE-488 Cable, 1m (3.2 ft)
7007-2	Double Shielded IEEE-488 Cable, 2m (6.5 ft)
7007-3	Double Shielded IEEE-488 Cable, 3m (10 ft)
7007-4	Double Shielded IEEE-488 Cable, 4m (13 ft)

Ships with Product

- User Documentation
- Rear Panel Mating Connector
- Calibration Certificate
- Power Cord
- 1-year Warranty

Learn more with the "Stabilizing Fast Transient Response Power Supply/Load Circuits" application note.

Frequency Counter/Timers

Featuring the precision and intuitive operation you've come to expect from our oscilloscopes, Tektronix counter/timers are built with performance and convenience in mind. Featuring industry-leading resolution, built-in measurement and analysis modes.

	FCA3000	FCA3100	MCA3000
Frequency Range	400 MHz, 3 GHz, 20 GHz	400 MHz, 3 GHz, 20 GHz	27 GHz, 40 GHz
Resolution	▪ 100 ps (time) ▪ 12 digits/s (freq)	▪ 50 ps (time) ▪ 12 digits/s (freq)	▪ 100 ps (time) ▪ 12 digits/s (freq)
Data Transfer	▪ 250 k Samples/sec (internal) ▪ 5 k Samples/sec (block)	▪ 250 k Samples/sec (internal) ▪ 15 k Samples/sec (block)	▪ 250 k Samples/sec (internal) ▪ 5 k Samples/sec (block)
Measurements	13 Automated Measurements Frequency, Period, Ratio, Time Interval, Time Interval Error, Pulse Width, Rise/Fall Time, Phase Angle, Duty Cycle, Vmax, Vmin, Vp-p	14 Automated Measurements Frequency, Period, Ratio, Time Interval, Time Interval Error, Pulse Width, Rise/Fall Time, Phase Angle, Duty Cycle, Vmax, Vmin, Vp-p, Totalize	13 Automated Measurements Frequency, Period, Ratio, Time Interval, Time Interval Error, Pulse Width, Rise/Fall Time, Phase Angle, Duty Cycle, Vmax, Vmin, Vp-p + An Integrated Power Meter
Analysis Modes	TrendPlot™, Measurement Statistics, Allan Deviation, Histogram	TrendPlot™, Measurement Statistics, Allan Deviation, Histogram	TrendPlot™, Measurement Statistics, Allan Deviation, Histogram
Connectivity	Rear panel: USB device port, GPIB PC communications software: NI LabVIEW SignalExpress™ Tektronix Edition (LE Version)	Rear panel: USB device port, GPIB PC communications software: NI LabVIEW SignalExpress™ Tektronix Edition (LE Version)	Rear panel: USB device port, GPIB PC communications software: NI LabVIEW SignalExpress™ Tektronix Edition (LE Version)

Choosing Your Counter/Timer

To help you choose the right counter/timer for your needs, the most common selection criteria are listed below, along with helpful tips for determining your requirements.

1 Frequency Resolution

The frequency resolution is the smallest change the counter/timer can detect in closely spaced frequencies. The resolution is influenced by the time setting on the instrument, i.e., longer time settings (averaged) will display more digits. In general this feature is expressed as the number of digits per second shown on the instrument's display (e.g. 12 digits/s). More digits indicate a higher frequency resolution.

2 Time Resolution

For timing measurements this feature represents the smallest "time" change that the instrument can detect. Time resolution is sometimes described as "single shot" resolution and is generally measured in pico seconds, e.g. 50 ps. The lower the number the better the time resolution feature.

3 Time Base Stability

The internal time base establishes the reference against which input signals are measured. The better the time base, the more accurate your measurements can be. Most counters employ a quartz crystal as the internal time base element which comes in 3 basic types; Room Temperature (RTXO), Temperature Compensated (TCXO) and Oven Control (OCXO). TCXO and OCXO devices are more stable and when used as the internal time base the instrument will consistently yield accurate and reliable results.

4 Analysis Capability

When choosing your counter/timer, you should review available analysis modes, such as trend plotting, measurement statistics, histograms and modulation domain analysis to ensure your needs are met.

DATA SHEET

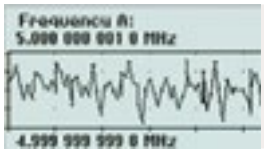
360° VIEW

FCA3100/3000 Series

Looking to capture small frequency and time changes? Look no further than this Timer/Counter/Analyzer. Capture small changes in your signal with industry-leading frequency and time resolution. Quickly and accurately analyze signals with 13 automated measurements and comprehensive built-in analysis modes, including measurement statistics, histograms and trending. Get unparalleled ease-of-use with intuitive operation and USB connectivity. It's everything you need in a Timer/Counter/Analyzer. And more.

Product Highlights

- 12 digit/sec frequency resolution
- 50 ps (FCA3100) or 100 ps (FCA3000) single-shot time resolution
- 0.001° phase resolution
- 250 k readings/sec data transfer rate to internal memory
- 13 automated frequency, time, phase and voltage measurements



See how your device is changing over time with built-in analysis modes – TrendPlot™, histograms and statistics.

Easily connect to a PC with the USB and GPIB ports.

Models	Max. Frequency	Channels	Time Resolution	Frequency Resolution
FCA3000	400 MHz	2	100 ps	12 digit/s
FCA3003	3 GHz	2 – 400 MHz 1 – 3 GHz	100 ps	12 digit/s
FCA3020	20 GHz	2 – 400 MHz 1 – 20 GHz	100 ps	12 digit/s
FCA3100	400 MHz	2	50 ps	12 digit/s
FCA3103	3 GHz	2 – 400 MHz 1 – 3 GHz	50 ps	12 digit/s
FCA3120	20 GHz	2 – 400 MHz 1 – 20 GHz	50 ps	12 digit/s

Recommended Accessories

174-4401-xx	USB Host to Device Cable, 3 Feet
012-0991-xx	GPIB Cable, Double Shielded
012-1256-xx	BNC Male to BNC Male, 9 Feet
ACD4000	Soft Carrying Case
HCTEK-4321	Hard Carrying Case
RMU2U	Rackmount Shelf Kit for 2 Units
TVA3000	TimeView™ Modulation Domain Analysis Software
SIGEXPTE	NI LabVIEW SignalExpress™ Tektronix Edition Software – Full Version

Instrument Options

MS	Medium Stability OCXO Timebase, 2 X 10^{-7}
HS	High Stability OCXO Timebase, 5 X 10^{-8}
RP	Rear-panel Connectors

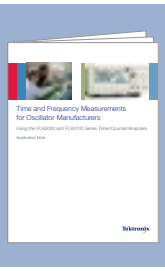
Recommended Service

SILV200	5-year Extended Warranty (FCA3000, FCA3003, FCA3100, FCA3103)
SILV400	5-year Extended Warranty (FCA3020, FCA3120)

Ships with Product

- Trial Version of TimeView™ Software and NI LabVIEW SignalExpress™ TE (LE version) Software
- Calibration Certificate
- User Manual on CD
- Programmers Guide & Technical Specifications
- Power Cord
- 3-year Warranty

Learn more with the "Time and Frequency Measurements for Oscillator Manufacturers" application note.



DATA SHEET

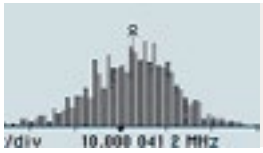
360° VIEW

MCA3000 Series

Feature-rich. Fully loaded. No matter how you say it, this microwave timer/counter is packed with functionality. Measure up to 40 GHz signals. And, get two extra 300 MHz timer/counter ports for added versatility. Quickly and accurately analyze signals with 13 automated measurements and comprehensive analysis modes, including statistics, histograms and trending. Get unparalleled ease-of-use with intuitive operation and USB connectivity. Finally, fully-loaded comes standard.

Product Highlights

- 12 digit/sec frequency resolution
- 100 ps single-shot time resolution
- 250 k readings/sec data transfer rate to internal memory
- 13 automated frequency, time, phase and voltage measurements
- Integrated power meter



See how your device is changing over time with built-in analysis modes – TrendPlot™, histograms and statistics.

Easily connect to a PC with the USB and GPIB ports.

Models	Max. Frequency	Channels	Time Resolution	Frequency Resolution
MCA3027	27 GHz	2 – 300 MHz 1 – 27 GHz	100 ps	12 digit/s
MCA3040	40 GHz	2 – 300 MHz 1 – 40 GHz	100 ps	12 digit/s

Recommended Accessories

174-4401-xx	USB Host to Device Cable, 3 Feet
012-0991-xx	GPIB Cable, Double Shielded
012-1256-xx	BNC Male to BNC Male, 9 Feet
AC4000	Soft Carrying Case
HCTEK-4321	Hard Carrying Case
RMU2U	Rackmount Shelf Kit for 2 Units
TVA3000	TimeView™ Modulation Domain Analysis Software
SIGEXPTE	NI LabVIEW SignalExpress™ Tektronix Edition Software – Full Version

Instrument Options

HS	High Stability OCXO Timebase, 5 X 10^{-8}
US	Ultra High Stability OCXO Timebase, 1.5 X 10^{-8}

Recommended Service

SILV600	5-year Extended Warranty

Ships with Product

- Trial Version of TimeView™ Software and NI LabVIEW SignalExpress™ TE (LE version) Software
- Calibration Certificate
- User Manual on CD
- Programmers Guide & Technical Specifications
- Power Cord
- 3-year Warranty

Learn more with the "Measurement Statistics, Histograms and TrendPlot™ Analysis Modes" application note.

RF Power Meters

Tektronix PSM Power Meter Series delivers the precision accuracy you need and the features you want, including exceptional temperature stability and throughput. Plus, with 13 models to choose from, it also delivers exceptional versatility.

	PSM3000	PSM4000	PSM5000
Description	Power Meter Average Power	Power Meter Average / Peak / Pulse	Power Meter Average / Peak / Pulse + Profiling
Frequency Range	10 MHz - 8 / 18 / 26.5 GHz	10 MHz - 8 / 18.6 / 20 GHz	50 MHz - 8 / 18.6 / 20 GHz
Dynamic Range	-55 to +20 dBm	-60 to +20 dBm	-60 to +20 dBm
Data Transfer Rate	2000 Reads/sec	2000 Reads/sec	2000 Reads/sec
Measurements	True Average Power; Duty Cycle Corrected Pulse Power; Measurement Logging	Average Power (CW); Duty Cycle Corrected Pulse Power; Peak Power, Duty Cycle; Peak and Average Burst Power; Measurement Logging	Average Power (CW); Duty Cycle Corrected Pulse Power; Peak Power, Pulse Power, Duty Cycle; Peak and Average Burst Power; Measurement Logging; Pulse Width, Rise/Fall, Overshoot, Droop, Time Gated Measurements, Pulse Waveform Display with Markers

Choosing Your RF Power Meter

Power measurements are fundamental to the development cycle of any RF or microwave product, from radios to radars. To help you choose the right Power Sensor/Meter combination, the most common selection criteria are listed below, along with helpful tips for determining your requirements.

1 Measurement Integrity

Measurement integrity is a combination of the cumulative measurement uncertainty and instrument stability. While the measurement uncertainty is usually specified, the instrument stability includes several factors. By providing calibration over the entire temperature operating ranges and not requiring zeroing prior to measurement, the improved stability of the power sensor/meter reduces possible human errors and assures the integrity of measured results.

2 Performance and Functionality

Basic power measurements of continuous wave (CW) signals are fundamental to power sensor/meters. However, today's modern signals include modulation, pulses, or other time-varying attributes. Being able to correct for duty cycle, measure peak power, signal statistics, and triggering inputs and outputs increase the utility of the power sensor/meter combination.

3 Speed and Connectivity

Power measurements tend to dominate the test process of wireless device test. The speed of measurement should remain constant over the entire dynamic range of the sensor. USB connectivity and power enable high speed measurement throughput and help reduce system rack space.

4 Analysis

When integrating power measurements into a full system measurement process, you should review the available analysis software and hardware capabilities to determine if equipment redundancies can be eliminated. Advanced measurement analysis, like trend graphing, statistical measurements, measurement logging, and pulse profiling can replace more complex and expensive equipment needs and simplify device test.

DATA SHEET

VIRTUAL TOUR

360° VIEW

Product Highlights

- 8 GHz, 18 GHz, 20 GHz, and 26.5 GHz Models
- Models Available with N and 3.5 mm Connectors
- Dynamic Range as Low as –60 dBm and as High as +20 dBm
- Uncertainty as Low as 2.6%
- Reading Rates up to 2000 Readings/sr

PSM3000, 4000 and 5000 Series

The PSM3000, PSM4000, and PSM5000 Series are compact power sensors/meters that deliver fast, accurate RF and microwave power measurements. A broad range of CW and pulse modulation measurements are available, depending on the series you choose.

Models	Description	Frequency Range	Dynamic Range	Connector Style
PSM3110	True RMS Average	10 MHz - 8 GHz	-55 to +20 dBm	3.5mm male
PSM3120	True RMS Average	10 MHz - 8 GHz	-55 to +20 dBm	N-Male
PSM3310	True RMS Average	10 MHz - 18 GHz	-55 to +20 dBm	3.5mm male
PSM3320	True RMS Average	10 MHz - 18 GHz	-55 to +20 dBm	N-Male
PMS3510	True RMS Average	10 MHz - 26.5 GHz	-55 to +20 dBm	3.5mm male
PSM4110	Power Meter (Avg / Peak / Pulse)	10 MHz - 8 GHz	-60 to +20 dBm	3.5mm male
PSM4120	Power Meter (Avg / Peak / Pulse)	10 MHz - 8 GHz	-60 to +20 dBm	N-Male
PSM4320	Power Meter (Avg / Peak / Pulse)	50 MHz - 18.6 GHz	-40 to +20 dBm	N-Male
PSM4410	Power Meter (Avg / Peak / Pulse)	50 MHz - 20 GHz	-40 to +20 dBm	3.5mm male
PSM5110	Power Meter (Avg / Peak / Pulse + Profiling)	100 MHz - 8 GHz	-60 to +20 dBm	3.5mm male
PSM5120	Power Meter (Avg / Peak / Pulse + Profiling)	100 MHz - 8 GHz	-60 to +20 dBm	N-Male
PSM5320	Power Meter (Avg / Peak / Pulse + Profiling)	50 MHz - 18.6 GHz	-40 to +20 dBm	N-Male
PSM5410	Power Meter (Avg / Peak / Pulse + Profiling)	50 MHz - 20 GHz	-40 to +20 dBm	3.5mm male

Recommended Accessories

174-6150-xx	USB Cable, 2 m, 20 AWG
174-6164-xx	SMB Female to BNC Male, 1 m Trigger Cable
348-2013-xx	Replacement Rubber Boot

Recommended Service

SILV200	5-year Extended Warranty (PSM3110, PSM3120)
SILV400	5-year Extended Warranty (PSM3310, PSM3320)
SILV600	5-year Extended Warranty (PSM3510)

Ships with Product

- 2-meter USB Cable
- Calibration Certificate, USB flash drive with User and Safety Manual, Technical Reference Manual and the Programmer Manual
- 3-year Warranty

The Tektronix Service Advantage

Tektronix offers unequalled expertise, global reach and a customer-centric approach with every service option. From our full suite of Factory-Certified service plans for Tektronix equipment to our Multi-Vendor Service (MVS) calibration, we can ensure optimal performance for your entire inventory of test and measurement instruments.

Tektronix Service Highlights

- **Tektronix Factory Experts**
  Access to the engineering expertise that designed and built your products to ensure they are in peak performance. Our support engineers hold an average of 20 years of training and experience.
- **Comprehensive and Thorough Treatment**
  Software updates, safety and reliability modifications, and cosmetic enhancements are included if applicable. Products are returned to you in "like-new" condition. The Tektronix network of service centers offers worldwide support.
- **Efficiency and Convenience**
  Our team of professionals focus on getting your instruments back to you as soon as possible, minimizing your downtime and increasing your operating efficiency.
- **Flexible Repair and Calibration Service**
  Tektronix offers you the choice of a cost effective, flexible service package to meet your specific business needs.

Tektronix Factory-Certified Service Plans

Silver Care

- Choose between a 3 or 5 year extended warranty plan
- No purchase orders, quotes, or approval delays – one phone call away starts the repair process
- Covers equipment, parts, labor and transportation
- Includes applicable software, safety and reliability updates
- Faster repair time than without coverage (average is 5 days faster

Silver Care Packages

- All the benefits of our popular Silver Care Plan in a convenient take-home package.
- Each package includes a unique activation code to effortlessly initiate and manage your service coverage online.
- May be purchased any time during the original warranty period

Gold Care

- Choose between a 3 or 5 year extended warranty plan
- Loaner product of equal or higher performance shipped within 24 hours
- Priority access to Global Tektronix Customer Call Center for technical support
- 30% discount on scheduled Factory-certified calibration
- Coverage of user-caused EOS and ESD damage
- Typical downtime of 48 hours or less

Platinum Care

- Custom-tailored plan with a typical downtime of less than 1 hour.
- Identically configured spare products dedicated to your facility
- On-site calibration event and repair coverage
- Priority access to technical support, and flexible contract duration and payment terms,

Calibration

- Choose from multi-year contracts and single event calibrations
- Accredited and traceable calibration
- Adjustments included to restore performance
- Applicable software, safety, and reliability updates
- Calibration records retention

Multi-Vendor Service

Comprehensive Calibration and Repair for All Your Test, Measurement and Control Equipment

- Service for more than 140,000 instruments from over 9,000 manufacturers
- Broadest scope of accreditation
- 100+ global points of service
- 1 million calibrations annually

Performance

Calibration is the cornerstone of measurement confidence. Now Tektronix can manage 100% of your calibration requirements, irrespective of product brand or origin. Our multi-vendor service tools simplify your calibration management program, minimizing downtime and improving operational efficiency.

Quality & Accuracy

Our comprehensive quality system is unmatched. Choose from multiple NIST traceable certificate options, including ANSI Z540.1, ISO/IEC 17025 and ISO 9001:2008. Our customers have direct access to the quality they expect from Tektronix' 65 years as an industry leader in test, measurement and monitoring solutions.

Optimize Asset Availability & Utilization

Tektronix provides industry-leading calibration and repair turnaround time on more than 140,000 products from over 9,000 manufacturers. The CalWeb® Asset Management System allows you to actively manage any downtime required for regular equipment maintenance and provides you with online, enterprise-wide instrument visibility.

Industry Leader

Tektronix is the industry leading provider of calibration services for the life science, aerospace, and defense industries. With consistent high quality and comprehensive service, customers have turned to Tektronix, making us their first choice for outsourced calibration needs.

Global Reach with Local Presence

Tektronix has the most extensive global network of resources. With more than 100 points of service and 1,100 highly trained experts, our unmatched suite of capabilities and services are available locally to most of the world's research and manufacturing centers.

For more information on Tektronix multi-vendor service, visit **service-solutions.tektronix.com**

Or call us at 1-800-438-8165

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