Tektronix®

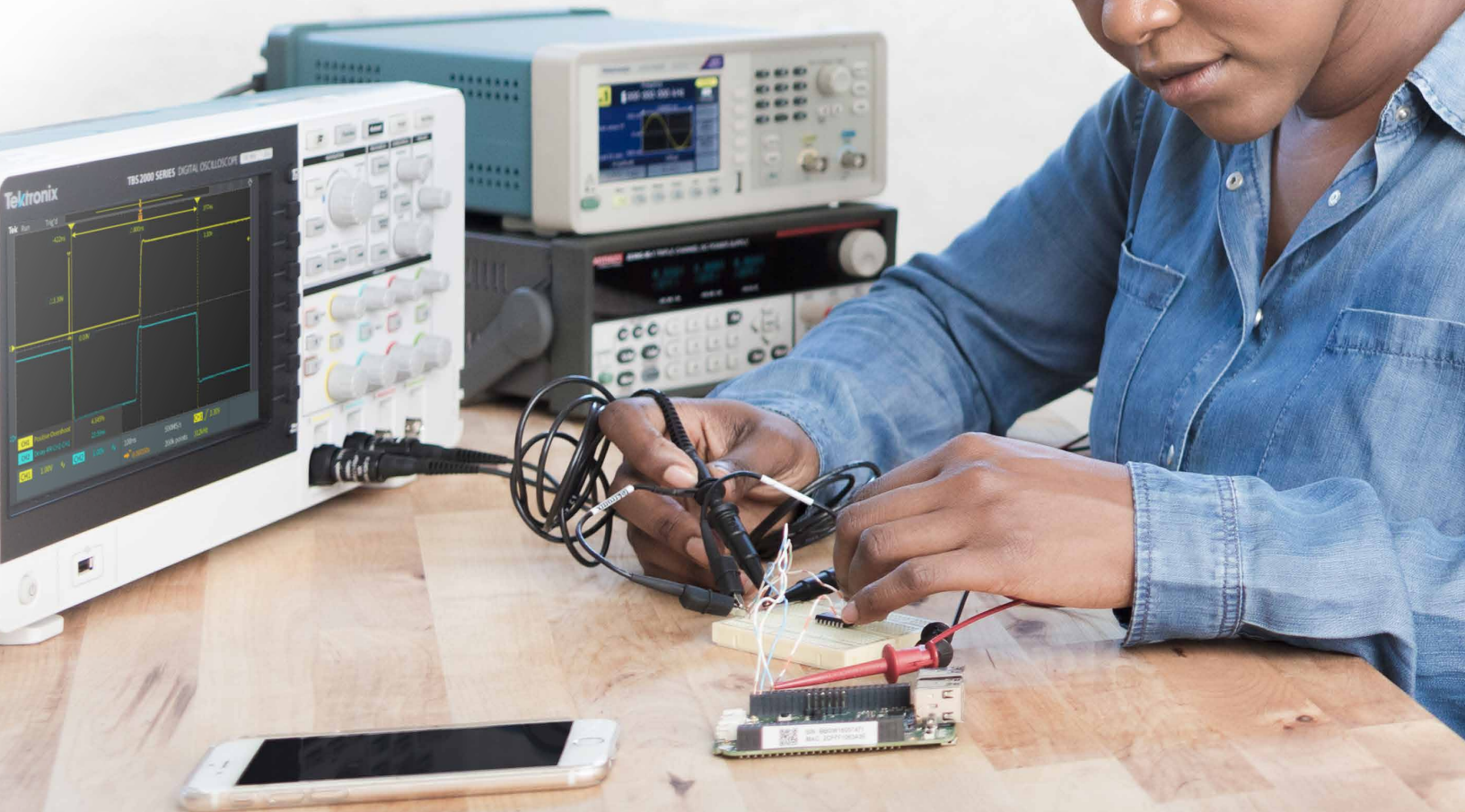**KEITHLEY**
A Tektronix Company

PRODUCT CATALOG

2019 – VOL. 1

TEST & MEASUREMENT SOLUTIONS

For Engineers by Engineers

CONTENTS

Tektronix®

DRIVE INNOVATION FASTER

We celebrate this Age of the Engineer. Our experts will help you frame the future. With regular updates on applications and technology trends to achieve measurement insight, Tektronix will boost your productivity and accelerate your time to market.

Power

ENERGIZE »

The desire for smaller and more powerful batteries is increasing complexity within power management and measurement. Congruently, power efficiency and density are becoming increasingly critical to design considerations. Engineers from fab to end-product are thinking about safe, precise and fast lab and wafer test environments; testing challenges resulting from the adoption of SiC and GaN into designs and how to solve them; and how to minimize power draw and maximize battery life for end-products. Learn how to address the complexities within power management and measurement.

3D Sensing

DISCOVER »

Many depth sensing technologies use structured light or Time of Flight (ToF). Learn more about Laser Diode Array Test for 3D Sensing and also about enhancing Trigger Synchronization for High Volume Production Testing of VCSELs.

Wired Communication

CONNECT »

As data rates increase, get the measurement insight to get ahead. Accelerate PCIe, SAS, SATA Compliance Testing with a single test solution including automation and debug capabilities. Speed up your 400G product development with PAM4 testing to efficiently validate your technology advances. Get to compliance faster with your Type-C devices.

Connected Car

MOBILIZE »

Get the insight and tools to test confidently in today's world of advanced automotive electronics. Speed through validation, debugging and compliance testing your Automotive Ethernet PHY design. Reduce ECU validation and debug time with automated protocol analysis of important standards like CAN and CAN FD.

Next Gen Media

SEE »

Simplify your 4K HDR Video test and monitoring. Get true visibility into your cloud video delivery network for more efficient quality control and compliance. Close the knowledge gap between SDI and IP worlds and foster collaboration between broadcast engineers and IT experts. Accelerate your video delivery or creation evolution with the most robust test and monitoring tool sets in the industry.

Military and Government

ADVANCE »

Accurately simulate threat radar in operational environments while measuring ECM Techniques. Utilize powerful DSP technology to characterize spectrum and identify signals of interest. Integrate, scale and deploy low Swap, high fidelity RF sensors to characterize spectrum. Ensure complex modulation techniques used in Satcom systems are low in bit error rate and provide secure, reliable communications.

TOGETHER WE CAN DEFINE THE NEXT GENERATION OF DESIGNS

We are the measurement insight company committed to performance, and compelled by possibilities. Together we empower engineers to create and realize technological advances with ever greater ease, speed and accuracy. Tektronix solutions have supported many of humankind's greatest advances of the past 70 years. Health. Communication. Mobility. Space. **We are committed to the scientists, engineers and technicians around the world who will define the future.**

REVOLUTIONEERING.

TEK.COM/DRIVE-INNOVATION-FASTER

POWER EFFICIENCY

- Safe, Precise, Fast MOSFET Testing for Si, SiC and GaN devices
- Wide power envelope
- Safely set up your test
- 2X Faster Device Characterization for improved time to market
- Avoid expensive overdesigning of your wide bandgap device

- Fully-automated HV Wafer-level testing
- Move from high voltage to low voltage without changing test setup
- Measure capacitance without manual reconfiguration Fast automation

- Overcome high common mode voltages
- Simultaneously measure multiple control and timing signals
- Faster automated power measurements
- Don't fail compliance

- Determine the load current profile
- Simulate any battery
- Model any type of battery

LEARN MORE

WIRED COMMUNICATIONS

- No more trial and error
- Automate to reduce calibration times and measure accurately

- Automate calibration
- Close the loop on loopback debug
- Superior signal integrity and debug

- Get to compliance faster for next gen USB, DisplayPort, HDMI
- Build confidence on the margin of devices
- Avoid expensive overdesigning

- Accelerate 400G product development
- Validate faster and increase yield

LEARN MORE

NEXT GEN MEDIA

- Meet Challenges of 4K HDR Production & Delivery
- Capturing in UHD
- Adapting to new color gamuts
- Simplifying quality and compliance checks

- Automated Live Stream Monitoring
- Maintaining quality in OTT environments
- Proactive automated monitoring
- Encryption and DRM

- Solutions for Live IP Video Production
- Diagnosing faults in an IP environment
- Bridging the gap from SDI to IP
- An invisible transition

LEARN MORE

CONNECTED CAR

- Debugging ECUs with Automated Decode & Trigger
- Debug the decoded protocol
- Troubleshoot signal faults
- Visualize multiple channels/sensors/actuators

- Achieving Reliability and Interoperability
- Validate your designs
- Speed through debugging and troubleshooting
- Get to compliance with confidence

- Overcome high common mode voltages
- Simultaneously measure multiple control and timing
- Faster automated power measurements
- Don't fail compliance

- Reduce EMI/EMC compliance design and test costs
- Accelerate debug time with automated test set-ups and reporting generation
- Advanced push-button support for EMI/EMC standards and regulations

LEARN MORE

MILITARY/GOVERNMENT

- Accurately recreate Electromagnetic and Physical Environments
- Evaluated ECM techniques – system testing with Hardware-in-the-loop

- System Level and Module Level Test
- Quickly and accurately measure SATCOM Channel Performance Vector Magnitude
- Create complex modulations schemes

- Monitor the sensing region and respond to unexpected events
- Perform wideband searches to identify signals of interest
- Execute narrow band searches to locate and classify violating signals
- Capture and record for a dditional analysis

- Detect advanced radar signals
- Create Signals that look real to radar

LEARN MORE

3D SENSING

Keithley Instruments Perform Electrical Testing on Diode-based Devices

Wavelength stability over the entire operating temperature of these devices is critical to maintaining precision and minimize noise in received signals. Electrical efficiency measurement through precision trigger and synchronization of pulse width and duty cycle further optimize the required intensity and resolution of illumination. These directly impact the heat dissipation, power consumption, and battery life of the end system.

Keithley performs electrical tests such as light intensity, forward voltage, lasing threshold current, quantum efficiency, dark current, the presence of "kink" or kink test, slope efficiency, thermistor resistance, temperature, capacitance, and L-I-V pulse testing.

3D Sensing Augments a Camera's Object and Facial Recognition

3D sensing is a depth sensing technology that augments camera capabilities for facial and object recognition in augmented reality, gaming, autonomous driving and a wide range of applications.

Access these Application Notes:

- Laser Diode Array Test: 3D Sensing
- Enhancing Trigger Synchronization for High Volume Production Testing of VCSELs

Diode-based Optical Devices Enable 3D Sensing

Diode-based devices such as laser diodes, high brightness LEDs (HBLED), and photodiodes (PD) are key optical devices that enable 3D sensing.

Learn 10 Tests for Laser Diodes

LEARN MORE

SERVICE SOLUTIONS

Premium and Extended Warranty Plans from Tektronix

Tektronix offers a diverse range of repair and calibration plans designed to safeguard your investment and extend the life of your products. With more than 70 years of experience in test and measurement solutions, Tektronix delivers the industry's highest level of quality calibration and repair services. TEK.COM/SERVICE

TEKTRONIX FACTORY CERTIFIED SERVICE PLANS:

TEK CARE AND KEITHLEY CARE	TOTAL PROTECTION	GOLD CARE	ANNUAL CALIBRATION
• Extends the life of your warranty (3 or 5 year plans available). • Quick and convenient. One phone call starts the repair process. • Covers equipment, parts, labor and transportation. • Includes applicable software, safety and reliability updates. • Reduces repair turnaround time.	• Choose between a 3 or 5 year extended warranty plan. • First and only plan in the industry to offer coverage for accidental damage. • Wear and tear protection. • Covers damage caused by electrostatic discharge and electrical overstress. • Free Factory certified calibration with repair (if necessary).	• Choose between a 3 or 5 year extended warranty plan. • Loaner product (of equal or higher performance) shipped within 48 hours. • Technical Support – Priority access to Global Tektronix Customer Call Center. • Covers damage caused by electrostatic discharge and electrical overstress. • Free Factory certified calibration with repair (if necessary)	• Choose from multi-year contracts or single-event calibrations. • Fast, accurate and accredited service. • Restored performance adjustments included. • Applicable software, safety, and reliability updates. • Calibration records retention using CalWeb®, a Tektronix web-based calibration management application.

TEKTRONIX SERVICE OPTION SUMMARY:

TYPE OF SERVICE	TEK CARE PLAN		KEITHLEY CARE PLAN		TOTAL PRODUCT PROTECTION	GOLD CARE
	REPAIR	CALIBRATION	REPAIR	CALIBRATION	REPAIR	REPAIR
Options available at Point of Sale	R3 R5	C3 C5	EW 3Y-EW 5Y-EW	3Y - STD 3Y - 17025 5Y - STD 5Y - 17025	T3 T5	G3 G5
Software firmware, safety, and reliability updates as applicable	✓	✓	✓	✓	✓	✓
Priority on-bench service	✓	✓	✓	✓	✓	✓
Provides for 2 or 4 calibration events		✓				
Provides for 3 or 5 calibration events				✓		
Includes adjustments as necessary to return product to near factory performance		✓		✓		
Extension of product warranty 2 or 4 additional years to maximum 5 years	✓				✓	✓
Extension of product warranty 1, 2 or 4 additional years to maximum 5 years			✓			
Free factory certified calibration with each repair (if necessary)	✓		✓		✓	✓
Free in-country shipping	✓		✓		✓	✓
Coverage of user-caused EOS and ESD damage					✓	✓
Coverage of accidental damage plus wear and tear					✓	
Loaner shipped within 48 hours[1]						✓

[1] Plan guarantees 90% immediate loaner availability or 99% availability within 5 days

MULTI-BRAND CALIBRATION AND ASSET MANAGEMENT

Global Reach & Comprehensive Calibration Service Capabilities

As the world's leading provider of multi-brand calibration services, we calibrate more than 140,000 instruments from 9,000 different manufactures using commercially available service documentation. Tektronix offers a variety of calibration service levels including ANSI/NCSL Z540.1, ISO/IEC 17025, ANSI/NCSL Z540.3, and ISO/IEC 9001 at our accredited laboratories.

- Electrical
- Pressure/Vacuum
- Physical/Dimensional
- Flow
- Mass
- Telecom

- RF/Microwave
- Xray/Radiography
- Fiber Optics
- Temperature
- Humidity
- Sound

- Light
- Magnetics
- Vibration
- and More!

*Capabilities may vary by region

LEARN MORE »

Equipment Management Tools for Global Organizations
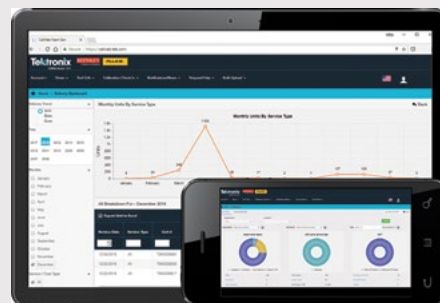
Calweb® Cloud-Based Asset Management

Track equipment and service events to maximize utilization and maintain compliance.

- Compliant with the FDA's 21 CFR Parts 11 and 820
- Cloud-Based with Flexible Configurations
- Multi-layered Security
- Excellent Reliability with 99.5% Uptime
- Global Support in 10 Languages

Learn more at tek.com/calweb

Managed Services

Focus on your job, not servicing your equipment. Tektronix Managed Services includes options such as storage and staging of equipment for deployment and distribution to your teams, or replacing equipment to be serviced with fully calibrated instruments to keep your people productive. Scheduled or on-demand equipment requests can be handled through our managed services to streamline your process.

Active Exchange: Make sure your team has the right equipment at the right time. Remove the hassle of tracking down equipment for service so they can focus on their jobs.

Assets On Demand: Maximize equipment utilization. Pain-free management of new equipment requests, demo equipment, loaners and replacements.

Field Fulfillment Store: Eliminate redundant procedures and automate your equipment and supplies request processes on the same platform where you manage your assets.

Learn more at tek.com/managed-services

OSCILLOSCOPES

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.

Choosing Your Oscilloscope

Engineers, technicians and educators all have different workloads, different measurement needs, and different environments. To meet your needs Tektronix offers a wide range of oscilloscopes. This guide gives an overview of the various types of oscilloscopes currently available, along with high-level specifications that you can use for comparison.

For more information about oscilloscope specifications, download the XYZs of Oscilloscopes Primer.
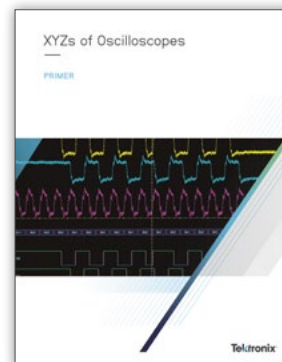
1 Bandwidth

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
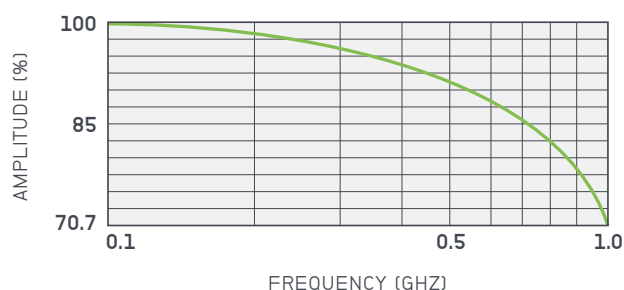
FIG 01 /
Typical frequency response curve for a general purpose oscilloscope

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.
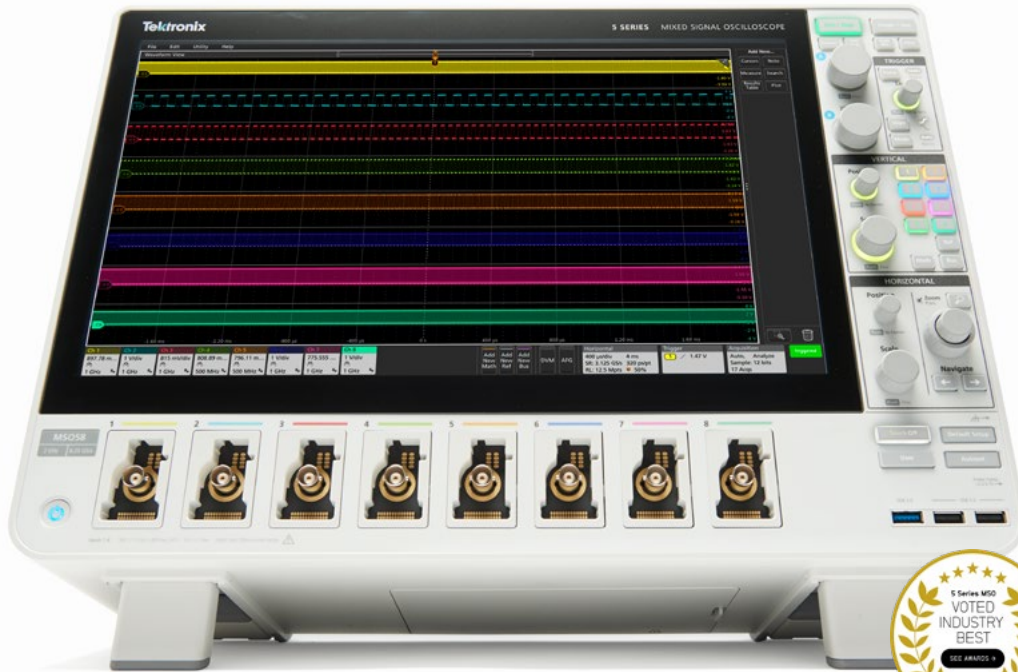
This Changes Everything

With a remarkably innovative pinch-swipe-zoom touchscreen user interface, the industry's largest high-definition display, and 4, 6, or 8 FlexChannel® inputs that let you measure one analog or eight digital signals, the 5 Series MSO is ready for today's toughest challenges, and tomorrow's too. It sets a new standard for performance, analysis, and overall user experience.

LEARN MORE

TYPES OF OSCILLOSCOPES

Mixed Domain Oscilloscopes – 100 MHz to 1 GHz

The new standard for design and debug work. They offer the same capabilities as mixed signal oscilloscopes, but also offer a built-in spectrum analyzer, adding RF debugging to the analog/digital capabilities.

Mixed Signal Oscilloscopes – 70 MHz to 8 GHz

The engineer's choice for design and debug. They combine traditional oscilloscope input channels with digital input channels, long record length with powerful search features, and protocol support for serial buses.

Advanced Signal Analysis Oscilloscopes – 350 MHz to 70 GHz

The emphasis is on analysis. They provide high acquisition performance and run Windows, thus supporting a wide range of analysis software. MSO versions include digital channels. They can be equipped for serial data analysis, jitter analysis, standards testing, and serial decoding capability.

Low Profile Oscilloscopes

When performance, channel density and cost-per-channel are critical, these low-profile instruments are a great fit. They offer the same performance as bench instruments in a rack-friendly form factor.

Sampling Oscilloscopes – DC to 80 GHz

For very high speed signal analysis, both electrical and optical, our sampling oscilloscopes support jitter and noise analysis with ultra-low jitter acquisitions. They also perform TDR and S-parameter measurements.

Basic Oscilloscopes – 30 MHz to 200 MHz

For basic signal visualization and more, these instruments are solid performers with ample supporting materials, and generous warranties. Special features for education.

Battery Powered Oscilloscopes with Isolated Channels – 100 MHz to 200 MHz

Safely and easily make 4-channel floating measurements, including 3-phase power measurements

TDS Series Oscilloscopes – 50 MHz to 500 MHz

These capable industry-favorites have a large installed base, and thousands of companies rely on them as part of their test and measurement fleets. They continue to be fully supported.

MIXED SIGNAL AND MIXED DOMAIN OSCILLOSCOPES

	MSO/DPO2000B	MDO3000
Additional Resources		
Channels	2, 4 analog channels; 16 digital channels (MSO2000B)	2, 4 analog channels; 16 digital channels (MDO3MSO option) 1 spectrum analyzer input 1 Arbitrary/Function Generator (MDO3AFG 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, Setup 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, Setup and Hold, Rise/Fall Time, Video, Extended Video, I²C*, SPI*, CAN FD*, CAN*, LIN*, FlexRay*, RS-232/422/485/UART*, I²S/LJ/RJ/TDM*, MIL-STD-1553*, ARINC 429, 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 DPO2BND: Includes DPO2AUTO, DPO2COMP, DPO2EMBD	MDO3AERO: ARINC 429, MIL-STD-1553 MDO3AUDIO: I²S, LJ, RJ, TDM MDO3AUTO: CAN FD, CAN and LIN MDO3COMP: RS-232/422/485/UART MDO3EMBD: I²C, SPI MDO3FLEX: FlexRay MDO3USB: USB2.0 MDO3BND: Enables MDO3AERO, MDO3AUDIO, MDO3AUTO, MDO3COMP, MDO3EMBD, MDO3FLEX, MDO3LMT, MDO3PWR, MDO3USB
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, LXI Core 2011 Compliant), Video Out, GPIB* *Optional
Waveform Math and Analysis	29 Automated Measurements, Waveform and Screen Cursors: Arithmetic Waveform Math, FFT	44 Automated Measurements, Waveform and Screen Cursors, Advanced Math, FFT, Measurement Statistics, Waveform Histograms Optional: MDO3PWR: Power Analysis MDO3LMT: Limit/mask test MDO3BND: Enables MDO3AERO, MDO3AUDIO, MDO3AUTO, MDO3COMP, MDO3EMBD, MDO3FLEX, MDO3LMT, MDO3PWR, MDO3USB
Software	PC communications software: OpenChoice® Desktop	PC Communications Software: OpenChoice® Desktop
Upgrade	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 • Add security for password control of ports and firmware updates

MIXED SIGNAL AND MIXED DOMAIN OSCILLOSCOPES

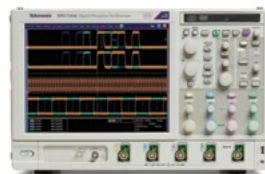|	MDO4000C
Additional Resources	
Channels	4 analog channels; 16 digital channels (with MDO4MSO option); 1 spectrum analyzer input (with SA3 or SA6 option); 1 Arbitrary/Function Generator (with MDO4AFG option)
Bandwidth	200 MHz to 1 GHz
Spectrum Analyzer Frequency Range	Optional: 9 kHz - 3 GHz or 9 kHz - 6 GHz
Sample Rate	2.5 GS/s to 5 GS/s (analog); 60.6 ps (16.5 GS/s) MagniVu™ (digital)
Max Record Length	20 Mpoints
Trigger Types	RF Power Level**, Edge, Sequence, Logic, Pulse Width, Runt, Timeout, Setup and Hold, Rise/Fall Time, Video, Extended Video*, I²C*, SPI*, USB*, Ethernet*, CAN FD*, CAN*, LIN*, FlexRay*, RS-232/422/485/UART*, I²S/LJ/RJ/TDM*, MIL-STD-1553*, ARINC 429, Parallel* **With optional MDO4TRIG module, RF power level can be used as source for Pulse Width, Timeout, Runt, Logic, Sequence
Optional Serial Bus Decode and Analysis	DPO4AERO: ARINC 429, MIL-STD-1553 DPO4AUDIO: I²S, LJ, RJ, TDM DPO4AUTO: CAN FD, CAN and LIN DPO4AUTOMAX: CAN FD, CAN, LIN and FlexRay DPO4COMP: RS-232/422/485/UART DPO4EMBD: I²C, SPI DPO4ENET: 10Base-T, 100Base-TX Ethernet DPO4USB: USB DPO4BND: Enables DPO4AERO, DPO4AUDIO, DPO4AUTO, DPO4COMP, DPO4EMBD, DPO4ENET, DPO4LMT, DPO4PWR, DPO4USB, DPO4VID
Connectivity	USB Host (x4), USB Device, LAN (10/100/1000 Base-T Ethernet, LXI Core 2011 Compliant), Video Out, GPIB* *Optional
Waveform Math and Analysis	44 Automated Measurements, Waveform and Screen Cursors, 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 DPO4BND: Enables DPO4AERO, DPO4AUDIO, DPO4AUTO, DPO4COMP, DPO4EMBD, DPO4ENET, DPO4LMT, DPO4PWR, DPO4USB, DPO4VID
Software	PC Communications Software: OpenChoice® Desktop Vector Signal Analysis Software: SignalVu-PC
Upgrade	• Increase bandwidth • Add Arbitrary/Function Generator • Add 16 digital channels • Add or upgrade spectrum analyzer channel • Add measurements & analysis (power, limit/mask, video, RF trigger) • Add serial bus triggering and decode • Add security for password control of ports and firmware updates

ADVANCED SIGNAL ANALYSIS OSCILLOSCOPES

	5 SERIES MSO	6 SERIES MSO
Additional Resources		
Channels	4, 6, or 8 FlexChannel® inputs; 8 digital channels per FlexChannel input (optional); 1 Arbitrary/Function Generator (with 5-AFG option)	4 FlexChannel® inputs; 8 digital channels per FlexChannel input (optional); 1 Arbitrary/Function Generator (with 6-AFG option)
Bandwidth	350 MHz to 2 GHz	1 GHz to 8 GHz
Sample Rate	6.25 GS/s (analog); 6.25 GS/s (digital)	25 GS/s / channel (analog); 25 GS/s / channel (digital)
Max Record Length	Up to 125 Mpoints	Up to 250 Mpoints
Trigger Types	Edge, Sequence, Logic, Pulse Width, Runt, Visual Trigger, Timeout, Window, Setup and Hold, Rise/Fall Time, I^2C*, SPI*, USB*, Ethernet*, CAN*, CAN FD*, LIN*, FlexRay*, RS-232/422/485/UART*, I^2S/LJ/RJ/ TDM*, MIL-STD-1553*, ARINC 429*, SENT*, SPMI*, Parallel *Optional	Edge, Sequence, Logic, Pulse Width, Runt, Visual Trigger, Timeout, Window, Setup and Hold, Rise/Fall Time, I^2C*, SPI*, USB*, Ethernet*, CAN*, CAN FD*, LIN*, FlexRay*, RS-232/422/485/UART*, I^2S/LJ/RJ/ TDM*, MIL-STD-1553*, ARINC 429*, SENT*, SPMI*, Parallel *Optional
Optional Serial Bus Decode and Analysis	5-SRAERO: MIL-STD-1553, ARINC 429 5-SRAUDIO: I^2S, LJ, RJ, TDM 5-SRAUTO: CAN, CAN FD, LIN, FlexRay 5-SRAUTOSEN: SENT 5-SRCOMP: RS-232/422/485/UART 5-SREMBD: I^2C, SPI 5-SRENET: Ethernet 5-SRPM: SPMI 5-SRUSB2: USB 2.0	6-SRAERO: MIL-STD-1553, ARINC 429 6-SRAUDIO: I^2S, LJ, RJ, TDM 6-SRAUTO: CAN, CAN FD, LIN, FlexRay 6-SRAUTOSEN: SENT 6-SRCOMP: RS-232/422/485/UART 6-SREMBD: I^2C, SPI 6-SRENET: Ethernet 6-SRPM: SPMI 6-SRUSB2: USB 2.0
Connectivity	USB Host (x7), USB 3.0 Device, LAN (10/100/1000 Base-T Ethernet, 1.4 LXI Core 2011 Compliant), Display Port, DVI-D, Video Out	USB Host (x7), USB 3.0 Device, LAN (10/100/1000 Base-T Ethernet, 1.4 LXI Core 2011 Compliant), Display Port, DVI-D, Video Out
Waveform Math and Analysis	36 Automated Measurements, Waveform and Screen Cursors, Arithmetic Waveform Math, FFT, Advanced Math, Measurement Statistics Optional: 5-CMENET: Ethernet Compliance; 5-CMAUTOEN: Automotive Ethernet Compliance; 5-CMUSB2: USB 2.0 Compliance; 5-DJA: Advanced Jitter and Eye Diagram Analysis; 5-PWR: Advanced Power Measurements	36 Automated Measurements, Waveform and Screen Cursors, Arithmetic Waveform Math, FFT, Advanced Math, Measurement Statistics Optional: 6-CMENET: Ethernet Compliance; 6-CMDPHY: MIPI D-PHY 1.2 Compliance; 6-CMAUTOEN: Automotive Ethernet Compliance; 6-CMUSB2: USB 2.0 Compliance; 6-DJA: Advanced Jitter and Eye Diagram Analysis; 6-PWR: Advanced Power Measurements; 6-DBDDR3: DDR3/LPDDR3 Memory Measurements
Software	Optional: TekScope Anywhere™	Optional: TekScope Anywhere™
Upgrade	• Add serial bus triggering and decode • Add serial bus compliance testing • Add digital channels with each TLP058 logic probe • Add extended record length, up to 125 Mpoints • Add advanced measurements and analysis (power, jitter)	• Add serial bus triggering and decode • Add serial bus compliance testing • Add digital channels with each TLP058 logic probe • Add extended record length, up to 250 Mpoints • Add advanced measurements and analysis (power, jitter)

ADVANCED SIGNAL ANALYSIS OSCILLOSCOPES

	MSO/DPO5000B	DPO7000C
Additional Resources		
Channels	4 analog channels; 16 digital channels (MSO5000B)	4 analog channels
Bandwidth	350 MHz to 2 GHz	500 MHz to 3.5 GHz
Sample Rate	5 GS/s to 10 GS/s (analog); 60.6 ps (16.5 GS/s) MagniVu™ (digital)	10 GS/s to 40 GS/s
Max Record Length	Up to 250 Mpoints	Up to 500 Mpoints
Trigger Types	Edge, Sequence, Logic, Pulse Width, Glitch, Runt, Timeout, Transition, Setup and Hold, Rise/Fall Time, Video, I²C*, SPI*, USB (Low, Full, High)*, RS-232/422/485/UART*, USB*, Ethernet*, CAN*, LIN*, FlexRay*, MIL-STD-1553*, Parallel (MSO5000B), 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*, I²C*, SPI*, USB*, Ethernet*, CAN*, LIN*, FlexRay*, RS-232/422/485/UART*, MIL-STD-1553*, 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-USB: 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-PCIE: PCI Express SR-USB: USB
Connectivity	USB Host (x6), USB Device, LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), Video Out, GPIB* *Optional	USB Host (x5), LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), GPIB, eSATA, DVI, VGA
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; ET3: Ethernet Compliance Test Solution; MTM: Mask Testing; PWR: Power Analysis; SignalVu Vector Signal Analysis; USB2: 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, 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; USB2: 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	Optional: TekScope Anywhere™	Optional: TekScope Anywhere™
Upgrade	• Add 16 digital channels • Add extended record length, up to 250 Mpoints • Add serial bus compliance testing • Add measurements and analysis (power, jitter, mask, RF) • Add serial bus triggering and decode	• Trade in older DPO7000 Series models for credit toward the newest DPO7000C version (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, RF) • Add serial bus triggering and decode

ADVANCED SIGNAL ANALYSIS OSCILLOSCOPES

	MSO/DPO70000	DPO70000SX
Additional Resources		
Channels	4 analog channels; 16 digital channels (MSO70000)	2 or 4 analog channels
Bandwidth	4 GHz to 33 GHz Analog	23 GHz to 70 GHz
Sample Rate	25 GS/s to 100 GS/s (analog); 80 ps (12.5 GS/s) (digital)	50 GS/s to 200 GS/s
Max Record Length	Up to 1 Gpoints	Up to 1 Gpoints
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*, Serial Pattern*, 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), 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; SR-810B: 8b/10b; 10G-KR: 10GBASE-KR/KR4	SR-COMP: RS-232/422/485/UART; SR-EMBD: I²C, SPI; SR-ENET: 10/100Base-T Ethernet SR-PCIE: PCI Express; SR-USB: USB; SR-810B: 8b/10b
Connectivity	USB Host (x5), LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), GPIB, eSATA, DVI, VGA	USB2.0 Host (4 on front)/3.0 Host (4 on rear), USB Device, LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), DVI, VGA, DisplayPort (2)
Waveform Math and Analysis	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; PAM4 Transmitter Analysis Software; SignalCorrect Cable, Channel and Probe Compensation Software	53 Automated Measurements, Waveform and Screen Cursors, Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics, Waveform Histograms **Optional:** DPOJET Noise, Jitter and Eye Analysis Tools; Frequency Counter-Timer; PAM4 Transmitter Analysis Software; Serial Data Link Analysis; 10G/40G/100G KR4/CR4 Transmitter Compliance; DDR Memory Bus Analysis; DisplayPort 1.2/1.4 Test Software; MIPI D-PHY Transmitter Debug and Compliance Test Solution; EDP Compliance Test Package; Ethernet Compliance Testing; Fiber Channel Essentials; HDMI 2.0 Analysis and Compliance; High Speed Serial Link Training Analysis; HDMI Compliance Testing; MIPI M-PHY Debug and Compliance Test; NBASE-T TekExpress Conformance and Debug Software; PCI Express Gen1/2/3/4 TekExpress Compliance/Debug; Power Measurement and Analysis Software; SAS-3 Tx Compliance Test; SATA PHY Transmitter Test; SignalCorrect Cable, Channel, and Probe Compensation Software; SFP+ Compliance and Debug Solution; Embedded Serial Triggering and Analysis (I²C, SPI); USB 2.0/3.0/3.1 Automated Compliance Test; SignalVu Vector Signal Analysis
Software	Optional: TekScope Anywhere™	Optional: TekScope Anywhere™
Upgrade	• Increase bandwidth • Add 16 digital channels • Upgrade older platforms to the latest platforms • Add extended record length, up to 1 Gpoints • Add serial bus compliance testing • Add measurements and analysis (jitter, DDR, mask, RF) • Add serial bus triggering and decode	• Increase bandwidth • Upgrade older platforms to the latest platforms • Add extended record length, up to 1 G points • Add measurements and analysis (jitter, mask, RF)

BASIC OSCILLOSCOPES

	TBS1000	TBS1000B/ TBS1000B-EDU	TBS2000
Additional Resources			
Channels	4	2	2, 4
Bandwidth	60 MHz to 150 MHz	30 MHz* to 200 MHz * 30 MHz TBS1032B available in North America and Europe	70 MHz, 100 MHz
Sample Rate	1 GS/s	500 MS/s to 2 GS/s	1 GS/s
Max Record Length	2.5 k points	2.5 k points	20 M points
Trigger Types	Edge, Pulse (width), Video	Edge, Pulse (width), Video	Edge, Pulse (width), Runt
Optional Serial Bus Decode and Analysis	–	–	–
Connectivity	USB Host, USB Device, **Optional:** GPIB	USB Host, USB Device, **Optional:** GPIB	USB Host, Wi-Fi adapter support, 10/100 Base-T Ethernet port
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	32 Automated Measurements, Arithmetic Waveform Math, FFT, Frequency Counter
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 Courseware Editor
Battery Operation	–	–	–

Teaching Oscilloscopes

TBS2000 and TBS1000B-EDU Oscilloscopes have unique features designed to meet the needs of schools and universities. They use an innovative courseware system that enables educators to build teaching materials into the oscilloscope. Along with a powerful PC Courseware Editor Tool and a courseware website, these oscilloscopes support a complete education ecosystem that makes it easier to teach engineering and easier to learn.

LEARN MORE

LOW PROFILE AND SAMPLING OSCILLOSCOPES

	5 SERIES MSO LOW PROFILE	DSA8300
Additional Resources		
Channels	8 FlexChannel® inputs; 8 digital channels per FlexChannel input (optional); 1 Arbitrary/Function Generator (5-AFG option); Aux trigger	Six modules support up to 8 single-ended or 4 differential channels and/or 2 optical channels
Bandwidth	1 GHz	Up to 70+ GHz Electrical bandwidth and 80+ Optical bandwidth modules available with intrinsic jitter as low as <100 fs RMS
Sample Rate	6.25 GS/s (analog); 6.25 GS/s (digital)	300 ks/s Maximum sample rate
Max Record Length	125 Mpoints	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	Edge, Sequence, Logic, Pulse Width, Runt, Visual Trigger, Timeout, Window, Setup and Hold, Rise/Fall Time, I²C*, SPI*, USB*, Ethernet*, CAN*, CAN FD*, LIN*, FlexRay*, RS-232/422/485/UART*, I²S/LJ/RJ/ TDM*, MIL-STD-1553*, ARINC 429*, SENT*, SPMI*, Parallel ***Optional**	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	5-SRAERO: MIL-STD-1553, ARINC 429 5-SRAUDIO: I²S, LJ, RJ, TDM 5-SRAUTO: CAN, CAN FD, LIN, FlexRay 5-SRAUTOSEN: SENT 5-SRCOMP: RS-232/422/485/UART 5-SREMBD: I²C, SPI 5-SRENET: Ethernet 5-SRPM: SPMI 5-SRUSB2: USB 2.0	80SJNB Jitter, Noise, BER, Serial Data Link and PAM4 Analysis Software; IConnect Signal Integrity Software; 100GBASE-SR4 Transmitter and Dispersion Eye Closure (TDEC) Automation Test Solution
Connectivity	USB Host (x6), USB 3.0 Device, LAN (10/100/1000 Base-T Ethernet, 1.4 LXI Core 2011 Compliant), DisplayPort, DVI-D, Video Out	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	36 Automated Measurements, Waveform and Screen Cursors, Arithmetic Waveform Math, FFT, Advanced Math, Measurement Statistics Optional: 5-DJA: Advanced Jitter and Eye Diagram Analysis; 5-PWR: Advanced Power Measurements	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	Optional: TekScope Anywhere™	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 and PAM4 Analysis); 80SJARB Jitter Analysis of Arbitrary Data with J2-J9 measurements, and support for pattern lengths to PRBS31; 100GBASE-SR4 (IEEE 802.3bm) optical transmitter characterization measurements, including TDEC, signaling rate, Average Launch Power, OMA, ER, Transmitter Eye Mask
Upgrade	• Add serial bus triggering and decode • Add digital channels with each TLP058 logic probe • Add advanced measurements and analysis	• 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

BATTERY POWERED OSCILLOSCOPES WITH ISOLATED CHANNELS AND TDS SERIES OSCILLOSCOPES

	THS3000	TPS2000B	TDS2000C	TDS3000C
Additional Resources				
Channels	4 (isolated)	2, 4 (isolated)	2, 4	2, 4
Bandwidth	100 MHz to 200 MHz	100 MHz to 200 MHz	50 MHz to 200 MHz	100 MHz to 500 MHz
Sample Rate	2.5 GS/s to 5 GS/s	1 GS/s to 2 GS/s	500 MS/s to 2 GS/s	1.25 GS/s to 5 GS/s
Max Record Length	10 k points	2.5 k points	2.5 k points	10 k points
Trigger Types	Edge, Pulse (width), Event, Video, Non-interlaced	Edge, Pulse (width), Video	Edge, Pulse (width), Video	Edge, Logic (Pattern, State), Pulse (Glitch, Width, Runt, Slew Rate), Video, **Optional:** Extended Video, Comm
Optional Serial Bus Decode and Analysis	—	—	—	—
Connectivity	USB Host, USB Device	RS-232 (includes RS-232-to-USB Host Serial Cable), Centronics, CompactFlash	USB Host, USB Device, **Optional:** GPIB	USB Host, LAN (10Base-T Ethernet) **Optional:** TDS3GV Module: GPIB, RS-232, and Video Out
Waveform Math and Analysis	21 Automated Measurements, Arithmetic Waveform Math, FFT	11 Automated Measurements, Arithmetic Waveform Math, FFT Optional: TPS2PWR1: Power Measurement 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 & Custom Video Triggering
Software	PC Communications Software: OpenChoice® Desktop	PC Communications Software: OpenChoice® Desktop	PC Communications Software: OpenChoice® Desktop	PC Communications Software: OpenChoice® Desktop
Battery Operation	One THSBAT Battery Pack Included Standard	One TPSBAT Battery Pack Included Standard	—	Requires Optional TDS3BATC Battery Pack

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.

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

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

- 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.

SHIPS WITH PRODUCT

One Low C Passive Probe Per Channel, TPP1000 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 Language Overlay (if other than English); Power Cord; 3-year Warranty

INSTRUMENT OPTIONS
- Arbitrary/Function Generator
- MSO (16 digital channels)
- 3 GHz spectrum analyzer

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- Power analysis
- Limit and mask tests
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, and current probes
- Available hard case, soft case, and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

MDO4000C Series

The MDO4000C offers up to six built-in instruments, each with exceptional performance to address tough challenges. It's completely customizable and fully upgradable. Every MDO4000C features powerful triggering, search and analysis, and these are the only scopes to offer synchronized analog, digital and RF signal analysis at the same time – perfect for troubleshooting problems with EMI or wireless communications.

MODEL	MDO4024C	MDO4034C	MDO4054C	MDO4104C
Analog Channels	4	4	4	4
Digital Channels*	16	16	16	16
Analog Bandwidth	200 MHz	350 MHz	500 MHz	1 GHz
Analog Sample Rate	2.5 GS/s	2.5 GS/s	2.5 GS/s	5 GS/s
Digital Sample Rate Main/MagniVu™	500 MS/s / 16.5 GS/s	500 MS/s / 16.5 GS/s	500 MS/s / 16.5 GS/s	500 MS/s / 16.5 GS/s
Spectrum Analyzer Input*	1	1	1	1
Spectrum Analyzer Frequency Range*	9 kHz – 3 GHz or 6 GHz	9 kHz – 3 GHz or 6 GHz	9 kHz – 3 GHz or 6 GHz	9 kHz – 3 GHz or 6 GHz

*Optional

- 6-in-1 oscilloscope offers a spectrum analyzer, arbitrary/function generator, logic analyzer, protocol analyzer and digital voltmeter
- Spectrum analyzer available in 3 GHz or 6 GHz frequency ranges with up to 3.75 GHz capture bandwidth
- 20 Mpoint record length on all channels
- >340,000 wfm/s max. waveform capture rate with FastAcq
- Use it as an oscilloscope OR a spectrum analyzer OR combined to capture synchronized analog, digital and RF signals.

SHIPS WITH PRODUCT

Four TPP0500B (≤500 MHz models) or TPP1000 (1 GHz models) Passive Voltage Probes
OpenChoice® Desktop Software, SignalVu-PC Software
Calibration Certificate, Quick Reference Manual & Documentation on CD
Front Panel Cover, Accessory Bag, Power Cord
3-year Warranty

INSTRUMENT OPTIONS
- Arbitrary/Function Generator
- MSO (16 digital channels)
- 3 or 6 GHz spectrum analyzer

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- Power analysis
- Limit and mask tests
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, and current probes
- Available hard case, soft case, and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

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.

MODEL	DPO2002B	MSO2002B	DPO2004B	MSO2004B	DPO2012B	MSO2012B
Analog Channels	2	2	4	4	2	2
Digital Channels	—	16	—	16	—	16
Analog Bandwidth	70 MHz	70 MHz	70 MHz	70 MHz	100 MHz	100 MHz
Analog Sample Rate	1 GS/s	1 GS/s	1 GS/s	1 GS/s	1 GS/s	1 GS/s

MODEL	DPO2014B	MSO2014B	DPO2022B	MSO2022B	DPO2024B	MSO2024B
Analog Channels	4	4	2	2	4	4
Digital Channels	—	16	—	16	—	16
Analog Bandwidth	100 MHz	100 MHz	200 MHz	200 MHz	200 MHz	200 MHz
Analog Sample Rate	1 GS/s	1 GS/s	1 GS/s	1 GS/s	1 GS/s	1 GS/s

- 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.

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

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, and current probes
- Available hard case, soft case, and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

MSO/DPO5000B Series

Today's faster data rates and tighter timing margins require 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.

MODEL	DPO5034B	MSO5034B	DPO5054B	MSO5054B
Analog Channels	4	4	4	4
Digital Channels	—	16	—	16
Analog Bandwidth	350 MHz	350 MHz	500 MHz	500 MHz
Analog Sample Rate (4 Channels/ 2 Channels)	5 GS/s	5 GS/s	5 GS/s	5 GS/s
Digital Sample Rate Main/MagniVu™	—	500 MS/s / 16.5 GS/s	—	500 MS/s / 16.5 GS/s

MODEL	DPO5104B	MSO5104B	DPO5204B	MSO5204B
Analog Channels	4	4	4	4
Digital Channels	—	16	—	16
Analog Bandwidth	1 GHz	1 GHz	2 GHz	2 GHz
Analog Sample Rate (4 Channels/ 2 Channels)	5 GS/s /10 GS/s	5 GS/s /10 GS/s	5 GS/s /10 GS/s	5 GS/s /10 GS/s
Digital Sample Rate Main/MagniVu™	—	500 MS/s / 16.5 GS/s	—	500 MS/s / 16.5 GS/s

- 350 MHz, 500 MHz, 1 GHz, and 2 GHz models
- >250,000 wfm/s max. waveform capture rate with FastAcq™ technology
- 10 GS/s max sampling and 250 Mpoints memory (optional)
- Windows 10 Enterprise 64-bit operating system with touch-screen display
- Extensive analysis including jitter/timing and user defined math (i.e., MATLAB)
- Visual triggering standard with search and mark
- Achieve greater than 11 bits vertical resolution with HiRes 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).

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, Mouse, Stylus; Front Panel Cover, Accessory Bag, Power Cord; 1-year Warranty

INSTRUMENT OPTIONS
- 50M/ch or 125M/ch extended record length

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- Compliance testing for key serial standards
- Memory bus analysis
- Vector signal analysis
- Power analysis
- Jitter analysis
- Limit and mask testing
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, and current probes
- Available hard case, soft case, and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

5 Series MSO

With a remarkably innovative pinch-swipe-zoom touchscreen user interface, the industry's largest high-definition display, and 4, 6, or 8 FlexChannel® inputs that let you measure one analog or eight digital signals, the 5 Series MSO is ready for today's toughest challenges, and tomorrow's too. It sets a new standard for performance, analysis, and overall user experience.

MODEL	MS054	MS056	MS058
Input Channels	4 FlexChannel inputs	6 FlexChannel inputs	8 FlexChannel inputs
Digital Channels	8 to 32, in increments of 8 (optional)	8 to 48, in increments of 8 (optional)	8 to 64, in increments of 8 (optional)
Bandwidth	350 MHz to 2 GHz (optional)	350 MHz to 2 GHz (optional)	350 MHz to 2 GHz (optional)
Sample Rate	6.25 GS/s (analog); 6.25 GS/s (digital)	6.25 GS/s (analog); 6.25 GS/s (digital)	6.25 GS/s (analog); 6.25 GS/s (digital)

- 15.6 inch, HD capacitive touch display delivers unmatched signal visibility
- 4, 6 or 8 FlexChannel® inputs can each handle 1 analog or 8 digital signals
- 12-bit Analog-to-digital converters with enhanced resolution up to 16 bits
- Optional Arbitrary/Function Generator
- Get the big picture with a 15.6 HD display. Use the capacitive pinch-zoom-swipe touchscreen, front panel controls, or mouse to analyze multiple signals with ease.
- Don't run out of channel with 4, 6, or 8 FlexChannel inputs. Each can be used to look at 1 analog or 8 digital waveforms, just by changing the probe.

SHIPS WITH PRODUCT
One passive probe per FlexChannel input, TPP0500B (for models with 350 MHz or 500 MHz bandwidth) or TPP1000 (for models with 1 GHz or 2 GHz bandwidth)
Calibration certificate, Installation and safety manual
Accessory pouch with integrated front cover, Mouse, Power cord
3-year warranty

INSTRUMENT OPTIONS
- Bandwidth 200 MHz, 500 MHz, 1 GHz, 2 GHz
- 125 M/ch Extended Record Length
- Arbitrary/Function Generator
- SSD with Windows OS

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- Compliance testing for key serial standards
- Power analysis
- Jitter analysis
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, and current probes
- TLP058 general purpose logic probe supports 8 digital channels
- Available hard case and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

6 Series MSO

With the lowest input noise and up to 8 GHz analog bandwidth, the 6 Series MSO provides the best signal fidelity for analyzing and debugging systems with GHz clock and bus speeds. An intuitive pinch-swipe-zoom touchscreen user interface, coupled with a 15.6-inch high definition display, and FlexChannel® inputs make the 6 Series MSO ready for today's toughest challenges and tomorrow's too.

MODEL	MS064
Input Channels	4 FlexChannel inputs
Digital Channels	8 to 32, in increments of 8 (optional)
Bandwidth	1 GHz to 8 GHz (optional)
Sample Rate	25 GS/s (analog); 25 GS/s (digital)

- 15.6 inch, HD capacitive touch display delivers unmatched signal visibility
- 4 FlexChannel® inputs can each handle 1 analog or 8 digital signals
- Lowest noise at high sensitivity
- 12-bit Analog-to-digital converters with enhanced resolution up to 16 bits
- >70% reduction in noise from previous generation oscilloscopes.
- Get the big picture with a 15.6" HD display. Use the capacitive pinch-zoom-swipe touchscreen, front panel controls, or mouse to analyze multiple signals with ease.

SHIPS WITH PRODUCT
One 1 GHz TPP1000 passive probe per FlexChannel input
Calibration certificate, Installation and safety manual
Accessory pouch with integrated front cover, Mouse, Power cord
3-year warranty

INSTRUMENT OPTIONS
- Bandwidth 1 GHz, 2.5 GHz, 4 GHz, 6 GHz, 8 GHz
- 125 M/ch or 250M/ch Extended Record Length
- Arbitrary/Function Generator
- SSD with Windows OS

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- Compliance testing for key serial standards
- Power analysis
- Jitter analysis
- Memory bus analysis
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, TriMode, high voltage, isolated, and current probes
- TLP058 general purpose logic probe supports 8 digital channels
- Available hard case and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

5 Series MSO Low Profile

In applications that demand extreme channel density, the 5 Series MSO Low Profile sets a new standard for performance. This mixed signal oscilloscope offers 8 input channels (plus AUX Trig) and 12-bit analog-to-digital converters in a compact package, only 3.5 inches high (2U). Replace your oscilloscopes and fit six times more channels into your existing rack space.

MODEL	MSO58LP
Input Channels	8 FlexChannel inputs
Digital Channels	8 to 64, in increments of 8 (optional)
Bandwidth	1 GHz
Sample Rate	6.25 GS/s (analog); 6.25 GS/s (digital)

- 8 FlexChannel® inputs with 1 GHz bandwidth
- 12-bit Analog-to-digital with enhanced resolution up to 16 bits
- 125 Mpoints record length
- Only 2 rack units (3.5 inches) high
- Aux trigger input
- Designed for high channel count applications. Provides 6x improvement over the channel count density of a typical oscilloscope
- Easily transition from R&D to manufacturing

SHIPS WITH PRODUCT
Rackmount attachments, installed
Calibration certificate, Installation and safety manual
Power cord
3-year warranty

INSTRUMENT OPTIONS
- Arbitrary/Function Generator

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- Power analysis
- Jitter analysis
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, and current probes
- TLP058 general purpose logic probe supports 8 digital channels
- Available hard case and bench conversion kit
- See datasheet for a complete list of compatible probes and accessories

DPO7000C Series

Get into the details of critical high-speed signals and find the most elusive signal anomalies. These oscilloscopes offer measurement and decoding packages for many of today's communications and memory bus standards. Fast waveform capture rate, Pinpoint® triggering, and Visual Trigger & Search will help you solve the most frustrating troubleshooting mysteries, fast. And jitter analysis comes in every box.

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

- 500 MHz,1 GHz, 2.5 GHz, and 3.5 GHz models
- Windows 10 Enterprise 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.

SHIPS WITH PRODUCT
Four P6139B 500 MHz, 10X Passive Voltage Probes
Calibration Certificate, Accessory Pouch, Mouse
Front Panel Cover, Power Cord
1-year Warranty

INSTRUMENT OPTIONS
- 50M/ch or 125M/ch extended record length

ADVANCED ANALYSIS OPTIONS
- Decode/trigger/search for key serial buses
- Compliance testing for key serial standards
- Memory bus analysis
- Vector signal analysis
- Power analysis
- Jitter analysis
- Limit and mask testing
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, and current probes
- Available hard case and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

LEARN MORE ⌄ Download "Understanding & Characterizing Timing Jitter".
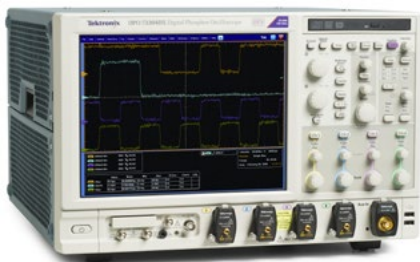
MSO/DPO70000 and DX Series

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.

MODEL	MSO/DPO70404C	MSO/DPO70604C	MSO/DPO70804C	MSO/DPO71254C	MSO/DPO71604C
Analog + Digital Channels	4 (DPO), 4 + 16 (MSO)	4 (DPO), 4 + 16 (MSO)	4 (DPO), 4 + 16 (MSO)	4 (DPO), 4 + 16 (MSO)	4 (DPO), 4 + 16 (MSO)
Analog Bandwidth	4 GHz	6 GHz	8 GHz	12.5 GHz	16 GHz
Sample Rate (2/4 Channels)	25 GS/s	25 GS/s	25 GS/s	100/50 GS/s	100/50 GS/s
Record Length (Std/Opt)	31 Mpoints/ 125 Mpoints	31 Mpoints/ 125 Mpoints	31 Mpoints/ 125 Mpoints	31 Mpoints/ 250 Mpoints	31 Mpoints/ 250 Mpoints

MODEL	MSO/DPO72004C	MSO/DPO72304DX	MSO/DPO72504DX	MSO/DPO73304DX
Analog + Digital Channels	4 (DPO), 4 + 16 (MSO)	4 (DPO), 4 + 16 (MSO)	4 (DPO), 4 + 16 (MSO)	4 (DPO), 4 + 16 (MSO)
Analog Bandwidth	20 GHz	23 GHz	25 GHz	33 GHz
Sample Rate (2/4 Channels)	100/50 GS/s	100/50 GS/s	100/50 GS/s	100/50 GS/s
Record Length (Std/Opt)	31 Mpoints/ 250 Mpoints	31 Mpoints/ 1 Gpoints	31 Mpoints/ 1 Gpoints	31 Mpoints/ 1 Gpoints

- 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 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 and Advanced Search
- 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.

SHIPS WITH PRODUCT

Accessory pouch, front cover, mouse, keyboard, user manual, (4) TekConnect® to 2.92 mm adapters and (1) TekConnect-to-BNC 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

INSTRUMENT OPTIONS

- Frame and bit error rate detector
- Triggering and decoding for 8b/10b
- Extended record length to 62.5, 125, 250, or 500 Mpoints/ch

ADVANCED ANALYSIS OPTIONS

- Decode/trigger/search for key serial buses
- Compliance testing for key serial standards
- Memory bus analysis
- Vector signal analysis
- Cable, channel, and probe compensation
- Serial data link analysis
- Power analysis
- Jitter analysis
- Limit and mask testing
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES

- TekConnect® probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, optical, and current probes
- Available hard case and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

DPO70000SX Series

DPO70000SX 70 GHz Oscilloscope provides lowest-noise, real-time acquisition using Tektronix' patented Asynchronous Time Interleaving technology. Its compact, scalable package allows flexible system configurations. Get the most accurate real-time performance for ultra-bandwidth applications like coherent optical modulation, 100G/400G Datacom, wideband RF, and leading-edge research.

MODEL	DPO77002SX	DPS77004SX (2-UNIT SYSTEM)	DPO75002SX	DPS75004SX (2-UNIT SYSTEM)
Analog Channels	1, 2	2, 4	1, 2	2, 4
Analog Bandwidth	70 GHz, 33 GHz	70 GHz, 33 GHz	50 GHz, 33 GHz	50 GHz, 33 GHz
Sample Rate	200GS/s, 100GS/s	200GS/s, 100GS/s	200GS/s, 100GS/s	200GS/s, 100GS/s
Record Length (Std/Opt)	62.5 Mpoints/ 1 Gpoints	62.5 Mpoints/ 1 Gpoints	62.5 Mpoints/ 1 Gpoints	62.5 Mpoints/ 1 Gpoints

MODEL	DPO73304SX	DPS73308SX (2-UNIT SYSTEM)	DPO72304SX
Analog Channels	2, 4	4, 4	2, 4
Analog Bandwidth	33 GHz, 23 GHz	33 GHz, 23 GHz	23 GHz, 23 GHz
Sample Rate	100GS/s, 50GS/s	100GS/s, 50GS/s	100GS/s, 50GS/s
Record Length (Std/Opt)	62.5 Mpoints/ 1 Gpoints	62.5 Mpoints/ 1 Gpoints	62.5 Mpoints/ 1 Gpoints

- 70 GHz bandwidth with the industry's lowest noise, highest ENOB
- Compact, scalable package allows you to position units very close to the device under test
- UltraSync architecture ensures precise data synchronization and convenient Master/Extension operation in multi-unit systems
- 200 GS/s sample rate for 5 ps timing resolution
- Up to 1 Gpoints Record Length with MultiView Zoom for Quick Navigation and Advanced Search
- Enable comprehensive analysis and presentation of optical modulation systems with Coherent Optical Modulation Analysis software.
- Precisely characterize your system's performance with DPOJET Advanced Jitter and Eye Diagram measurement application.

SHIPS WITH PRODUCT

Accessory pouch, front cover, mouse, keyboard, user manual, TekConnect® to 2.92 mm adapters, static protection wrist strap, DPO70000SX software/GPIB reference on instrument SSD, performance verification procedure PDF file, calibration certificate documenting NIST traceability, Z 540-1 compliance and ISO9001, power cord, one-year warranty

INSTRUMENT OPTIONS

- Extended record length to 125, 250, or 500 Mpoints/ch

ADVANCED ANALYSIS OPTIONS

- Decode/trigger/search for key serial buses
- Compliance testing for key serial standards
- Memory bus analysis
- Vector signal analysis
- Cable, channel, and probe compensation
- Serial data link analysis
- High speed serial lin training analysis
- PAM4 transmitter analysis
- Power analysis
- Jitter analysis
- Limit and mask testing
- See datasheet for a complete list

RECOMMENDED PROBES AND ACCESSORIES

- TekConnect® probe interface; compatible with a wide range of passive, active, differential, high voltage, isolated, optical, and current probes
- Available hard case and rackmount kit
- See datasheet for a complete list of compatible probes and accessories
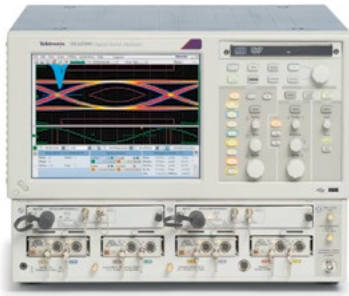
- High Optical Sensitivity, Low Noise, and Wide Dynamic Range of the Optical Sampling Modules

- 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

- The PAM-4 analysis has full signal path emulation tools that support Continuous Time Linear Equalizer (CTLE), channel emulators described by S-parameters or TDR waveforms, and receiver equalizers Feed Forward (FFE) and Decision Feedback (DFE).

- Design characterization is supported beyond 100GBASE-SR4 compliance requirements for all measurements.
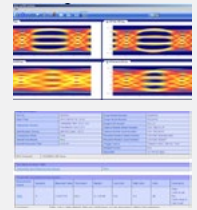
DSA8300 Series

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 155 Mb/sec to 100 Gb/sec.

OPTICAL MODULES	80C07B	80C08D	80C10C	80C11B	80C12B	80C14	80C15	80C17	80C18	80C20	80C21
Channels	1	1	1	1	1	1	1	1	2	1	2
Bandwidth	2.5 GHz	12.5 GHz	80+ GHz	30 GHz	12 GHz	14 GHz	32 GHz	>30 GHz	>30 GHz	53 GHz	53 GHz
Clock Recovery (Min/Max)	155 Mb/s - 2.666 Gb/s	9.8 Gb/s - 12.6 Gb/s	Provided by Opt. CRTP and CR286A	9.8 Gb/s - 12.6 Gb/s	Provided by CR125A	Provided by CR175A or CR286A	Provided by CR286A	NA	NA	NA	NA
Filter Rates Supported (Min/Max)	155 Mb/s - 2.5 Gb/s	9.953 Gb/s - 12.5 Gb/s	25.8 Gb/s - 43.018 Gb/s	9.953 - 12.5 Gb/s	155 Mb/s - 11.3 Gb/s	8.500 Gb/s - 14.025 Gb/s	25.781 Gb/s - 28.05 Gb/s	25.781 Gb/s - 28.05 Gb/s	25.781 Gb/s - 28.05 Gb/s	26.388 Gb/s - 54.215 Gb/s	26.388 Gb/s - 54.215 Gb/s

ACCESSORIES MODULES	82A04B	80A02	80A03	80X01	80X02	80A08	CR125A, CR175A, CR286A	80A09
Description	Phase Reference Module	EOS/ESD Protection Module	Probe Adapter Module	1 Meter Extender Cable	2 Meter Extender Cable	Accessory Kit	Clock Recovery Instrument	EOS/ESD Static Protection Device
Functionality	<100 fs RMS timebase jitter	EOS/ESD protection	Sampling Scope Probe Connectivity	Clock Recovery Phase Alignment	Position Module Close To DUT	Connection to DUT and CRU @ 25G	Continues Clock Recovery, 150 Mb/s to 28.6 Gb/s	26 GHz EOS/ESD Static Protection

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

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

TBS1000B Series

More features, more scope; the TBS1000B is in a class all on 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.

MODEL	TBS1032B*	TBS1052B	TBS1072B
Analog Channels	2	2	2
Analog Bandwidth	30 MHz	50 MHz	70 MHz
Analog Sample Rate (per channel)	500 MS/s	1 GS/s	1 GS/s

MODEL	TBS1102B	TBS1152B	TBS1202B
Analog Channels	2	2	2
Analog Bandwidth	100 MHz	150 MHz	200 MHz
Analog Sample Rate (per channel)	2 GS/s	2 GS/s	2 GS/s

*Available only for North America and Europe.

- Two channel instruments
- Extensive monitoring capability using TrendPlot™ testing
- Pass/Fail analysis with built in waveform limit testing
- Automated data logging featur
- 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
- TekSmartLab™ supported
- TrendPlot™ function can evaluate signal behavior over extended time periods.
- Thoroughly analyze your waveforms with convenient math tools and 34 automated measurements.

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

RECOMMENDED PROBES AND ACCESSORIES

- BNC probe interface; compatible with a wide range of passive, active, differential, high voltage, and current probes
- Available hard case, soft case, and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

LEARN MORE ↘ Download "Reliability by Design" Technical Brief.

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 comes with an innovative course-ware feature that allows students to review lab material, follow 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.

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

- 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
- TekSmartLab™ supported
- 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.

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

RECOMMENDED PROBES AND ACCESSORIES

- BNC probe interface; compatible with a wide range of passive, active, differential, high voltage, and current probes
- Available hard case, soft case, and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

HELP STUDENTS ↘ Master the use of an oscilloscope with the included courseware software and labs. Click here to learn more.
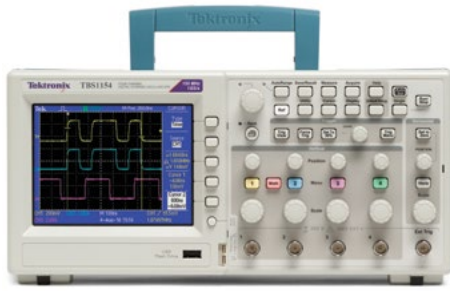
TBS1000 Series

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.

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

- 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
- TekSmartLab™ supported
- 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.

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

RECOMMENDED PROBES AND ACCESSORIES
- BNC probe interface; compatible with a wide range of passive, active, differential, high voltage, and current probes
- Available hard case, soft case, and rackmount kit
- See datasheet for a complete list of compatible probes and accessories

LEARN MORE ⬎ Download the Technical Brief "Be Sure to Capture the Complete Picture".

TBS2000 Series

When you see more signal, you find anomalies faster. With an impressive 9-in. WVGA display and 15 horizontal divisions—the most in its class—the TBS2000 not only helps you see the big picture, it gives you a clearer picture. Plus a 20-million point record length lets you easily capture long time windows. The TBS2000 also includes courseware support for education labs.

MODEL	TBS2072	TBS2102	TBS2074	TBS2104
Analog Channels	2	2	4	4
Analog Bandwidth	70 MHz	100 MHz	70 MHz	100 MHz
Analog Sample Rate (per channel)	1 GS/s	1 GS/s	1 GS/s	1 GS/s

- 9-inch WVGA display with 15 horizontal divisions
- Long 20M record length
- 32 automated measurements with gating
- TekVPI® Probe Interface allows you to use latest-generation active voltage and current probes
- A large, 9-inch display, with 15 horizontal divisions lets you see more of your signal.
- Select any of the 32 available measurements from a single screen, with helpful tips on each.

SHIPS WITH PRODUCT
TPP0100 100 MHz, 10x passive probe (one per analog channel)
Documentation CD
Installation and safety manual
Programmer manual, available on documentation CD and on Tek Web
Power Cord
Calibration certificate documenting traceability to National Metrology Institute(s) and ISO9001 quality system registration

RECOMMENDED PROBES AND ACCESSORIES
- TekVPI probe interface; compatible with a wide range of passive, active, differential, high voltage, and current probes
- Available soft case
- See datasheet for a complete list of compatible probes and accessories

LEARN MORE ⬎ Download the "Anatomy of Digital Oscilloscopes" Poster which shows how parts in an oscilloscope work together.

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.

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

- 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.

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

RECOMMENDED PROBES AND ACCESSORIES
- Isotated BNC probe interface; compatible with a range of passive and current probes
- Additional battery, external charger
- Available hard case, soft case
- See datasheet for a complete list of compatible probes and accessories

LEARN MORE ⬎ Download "Fundamentals of Floating Measurements and Isolated Input Oscilloscopes" Application Note.

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.

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

- 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!

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 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

ADVANCED ANALYSIS OPTIONS
- Power analysis

RECOMMENDED PROBES AND ACCESSORIES
- Isotated BNC probe interface; compatible with a range of passive, differential, high voltage, and current probes
- Available hard case, soft case
- Additional battery, external charger
- See datasheet for a complete list of compatible probes and accessories

LEARN MORE ⬎ Download "Fundamentals of Floating Measurements and Isolated Input Oscilloscopes" Application Note.

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.

MODEL	TDS2001C	TDS2002C	TDS2004C
Analog Channels	2	2	4
Analog Bandwidth	50 MHz	70 MHz	70 MHz
Analog Sample Rate	500 MS/s	1 GS/s	1 GS/s

MODEL	TDS2012C	TDS2014C	TDS2022C	TDS2024C
Analog Channels	2	4	2	4
Analog Bandwidth	100 MHz	100 MHz	200 MHz	200 MHz
Analog Sample Rate	2 GS/s	2 GS/s	2 GS/s	2 GS/s

- 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]
- TekSmartLab™ supported
- 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.

SHIPS WITH PRODUCT
One TPP0x01 100 MHz or 200 MHz, 10X Passive Probe Per Analog Channel
OpenChoice® Desktop Software
Calibration Certificate, Quick Reference Manual and Documentation on CD
Power Cord
Lifetime Warranty[1]

RECOMMENDED PROBES AND ACCESSORIES
- BNC probe interface; compatible with a wide range of passive, active, differential, high voltage, and current probes
- Available hard case, soft case
- See datasheet for a complete list of compatible probes and accessories

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.

MODEL	TDS3012C	TDS3014C	TDS3032C
Analog Channels	2	4	2
Analog Bandwidth	100 MHz	100 MHz	300 MHz
Analog Sample Rate	1.25 GS/s	1.25 GS/s	2.5 GS/s

MODEL	TDS3034C	TDS3052C	TDS3054C
Analog Channels	4	2	4
Analog Bandwidth	300 MHz	500 MHz	500 MHz
Analog Sample Rate	2.5 GS/s	5 GS/s	5 GS/s

- 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.

SHIPS WITH PRODUCT
One P6139B 500 MHz, 10X Passive Probe Per Analog Channel
OpenChoice® Desktop Software
Calibration Certificate, Quick Reference Manual, & Documentation on CD
Front Panel Cover, Power Cord
3-year Warranty

ADVANCED ANALYSIS OPTIONS
- Limit Testing
- Mask Testing
- HDTV and Custom Video Triggering

RECOMMENDED PROBES AND ACCESSORIES
- TekProbe® probe interface; compatible with a wide range of passive, active, differential, high voltage, and current probes
- Battery pack and charger
- Available soft case
- See datasheet for a complete list of compatible probes and accessories

OSCILLOSCOPE 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, Eye Diagram, Timing and Noise Analysis
- Comprehensive DPOJET tool set for measuring timing, amplitude, jitter and noise with integrated clock recovery
- Reporting and plotting capabilities for signal and root cause analysis

Serial Data Link Analysis
- SDLA Visualizer provides channel de-embed, emulation, reference equalizers and IBI-ABI model support to enable characterization, performance and what-if analysis of next generation high speed designs.

SignalVu RF and Vector Signal Analysis
- Characterize wideband spectral events
- Demodulate the signal and verify designs
- Supports wideband radar, high data rate satellite links, WiFi, WiGig, Zigbee and Bluetooth

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

SignalCorrect
- SignalCorrect allows quick characterization and de-embed of the cables, fixtures and other types of interconnects using the DPO/MSO70000 series of oscilloscopes enabling signal margin recovery leading to more accurate measurements.

DDR Memory Bus Analysis
- Comprehensive memory validation and debug suite supporting legacy and next generation memory standards

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 with the latest High Speed Serial Standards. Additionally, standard specific DPOJet software allows the user to seamlessly debug designs in the event of compliance failure.

Sample of Supported Technologies

Computer Peripherals
- PCI Express
- USB
- Thunderbolt

Storage
- SATA
- SAS

Mobile
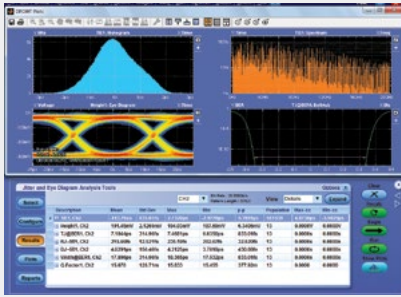- MIPI M-PHY
- MIPI D-PHY
- MIPI C-PHY

Display
- HDMI
- MHL
- DisplayPort

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

Jitter Analysis

Oscilloscope-based jitter analysis tools automate key jitter measurements and provide important insight into the nature of jitter.

- Flexible clock recovery
- Automated time interval error measurement
- Plot eye diagrams, histograms, trends, and bathtub plots
- Decompose jitter into random and deterministic components
- Jitter analysis tools are available in several real time oscilloscope series, sampling oscilloscopes, and bit error rate testers.

tek.com/jitter-measurement-and-timing-analysis

High-Speed Serial Data Link Analysis

Serial data link analysis (SDLA) tools remove the impact of the measurement system on your high-speed measurements.

- The SDLA Visualizer allows you to remove the effects of reflections, insertion loss, and cross-coupling caused by the measurement system
- Signal Correct software works with a fast step generator to quickly characterize cables, fixtures, and connectors automatically
- Available on high-performance real-time and sampling oscilloscopes

tek.com/application/serial-data-link-analysis-sdla-1

Serial ATA/SAS

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

- SATA/ SAS characterization and compliance testing
- Full characterization tool set including voltage, equalization and jitter analysis across multiple date rates and operating conditions
- One button SATA solution for device state control and test automation

tek.com/sata-sas

PCI Express®

PCI Express design dhallenges need fast, accurate answers

- Dual-port acquisition and million unit interval analysis
- Full sample rate and deep record length on all channels for compliance testing and debug
- Channel emulation, equalization and up to 70GHz bandwidth supporting PCIe Gen 1, 2, 3 & 4
- Upgradeable to PCIe Gen 5

tek.com/pci_express

USB and Type-C

Flexible Tools for Compliance and Debug of USB Hosts and Peripherals

- Comprehensive automated and manual tool set for USB 2.0, 3.x and USB Type-C verification, characterization, debug, and compliance testing
- USB-IF compliant
- USB-PD electrical parametric and protocol measurements also available

tek.com/usb
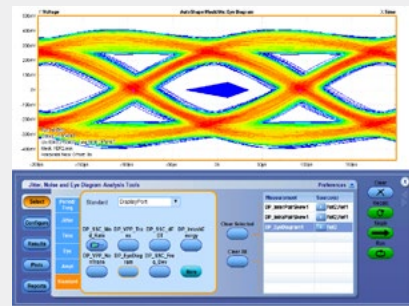
HDMI, MHL and DisplayPort

Characterize and stress devices to the maximum potential

- Comprehensive and automated testing for DisplayPort (1.x), HDMI (1.x, 2.x) & MHL (1.x, 2.x, 3.x) transmitter, receiver and protocol test solution

HDMI: tek.com/hdmi
MHL: tek.com/mhl
DisplayPort: tek.com/displayport-0

MIPI®

Complete MIPI D-PHY, C-PHY and M-PHY Transmitter, Receiver and Protocol Test Solutions
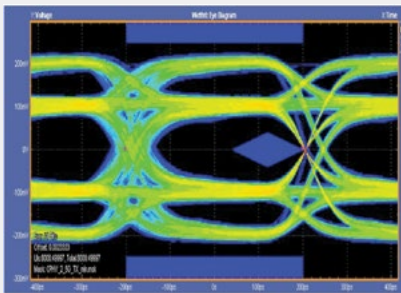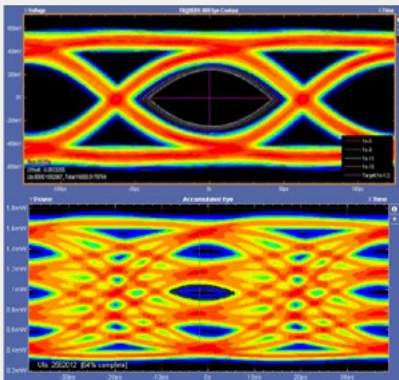
- Automated compliance and conformance transmitter testing for MIPI D-PHY (1.2), C-PHY (1.1) & M-PHY (3.1) transmitter, receiver and protocol test solutions
- Arbitrary Waveform Generator based D-PHY and C-PHY receiver compliance and margin testing solution with 100% RX test coverage per CTS

tek.com/mipi

100G/400G Rx/Tx Technology and Application Solutions

Streamline PAM4 analysis and debug with all the capabilities needed at your finger tips

- Comprehensive set of electrical and optical measurements that cover IEEE and OIF-CEI standards as well as jitter and eye measurements for PAM4
- Single integrated application with auto configuration of several signal parameters

tek.com/wired-communications/400g-pam4-testing
tek.com/100g-optical-and-electrical-tx-rx
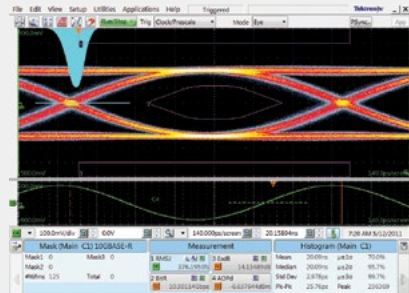
Optical Testing

Tools and analysis software for testing optical standards and technologies

- Complete coherent signal analysis system for polarization-multiplexed QPSK, QAM, differential BPSK/QPSK, and other advanced modulation formats

tek.com/wired-communications/coherent-optical

Power Analysis

Automated power analysis packages help you make fast, accurate, repeatable measurements on power supplies and converters. Power analysis packages are available for many oscilloscope series, and may include:

- AC line power and harmonics analysis
- Switching transistor loss and safe operating area
- In-circuit inductor and transformer loss
- Control loop frequency response analysis and rejection ratio
- Turn on/off timing, efficiency, and noise measurements

tek.com/power-efficiency/power-supply-measurement-analysis

Memory

Comprehensive Tools for Memory Interface Verification and Debug

- Capture, measure and characterize DDR memory interface signal behavior, jitter, eye size, crossover, strobes/clock alignment, bit errors
- Capture and measure the digital logic state of the DDR memory interface and perform bus cycle based timing and protocol analysis

tek.com/ddr-test-validation-and-debug

Data Communications

IEEE802.3 and non-IEEE device development, debug and physical layer validation

- Comprehensive, integrated tool sets for supporting 10BASET to 400Gbps Ethernet based systems
- Compliance and debug solutions for SFF 8431, SFP+, OIF-CEI, InfiniBand and FC-16G

tek.com/ethernet-test

Automotive Ethernet

Automate testing to validate your design and confirm compliance with 100BASE-T1 and 1000BASE-T1 per IEEE 802.3bw and IEEE 802.3bp standards.
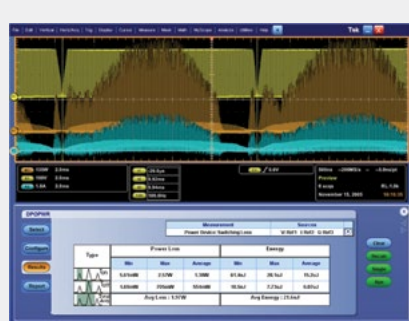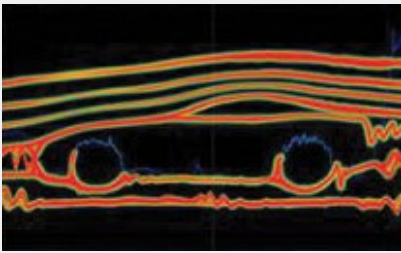
- Detailed instructions and automated setups help deliver consistent results
- Comprehensive reporting shows pass/fail information with margins
- Available on multiple oscilloscope platforms, all designed to quickly troubleshoot failures

tek.com/automotive/automotive-ethernet

Bluetooth®

Get your design to market faster

- Perform Bluetooth SIG standard-based transmitter RF measurements in time, frequency and modulation domains
- Customizable limits and Bluetooth pre-sets for push-button testing

tek.com/application/bluetooth-testing-and-analysis-1#content
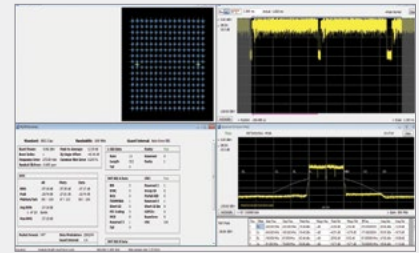
WLAN (IEEE 802.11)

Speed up WiFi testing of your latest design

- Physical layer RF transmitter measurements supporting IEEE 802.11a/b/g/j/p/n/ac standards for up to 160 MHz
- Robust measurement summary reporting

tek.com/product-software-series/signalvu-spectrum-analyzer-software
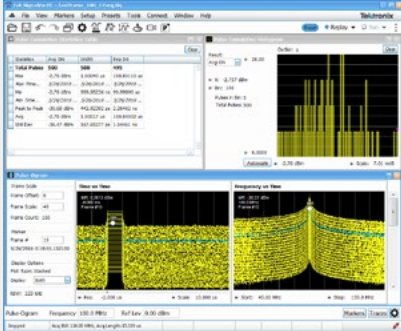
Radar/EW

Performance, precision and insight for your radar/electronic warfare design

- Extensive toolset with 31 individual measurements to automatically characterize long pulse trains
- Cumulative statics of key performance indicators and histograms for thorough analysis

tek.com/radar
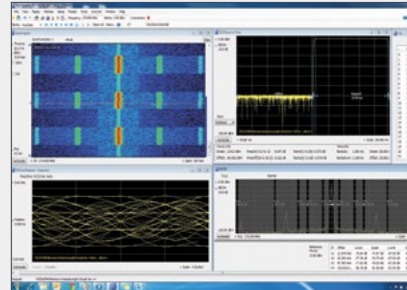
APCO Project 25 (P25)

Accurate and fast performance and compliance testing

- Complete APCO Project 25 transmitter testing and analysis for Phase 1 (C4FM) and Phase 2

tek.com/apco-project-25-p25-transmitter-testing-and-analysis

WiGig (IEEE 802.11ad)

Design leading-edge performance with confidence

- Single integrated software tool for standard and performance troubleshooting and debugging
- Analyze up to 70 GHz bandwidth per acquisition

Search **802.11ad** on tek.com
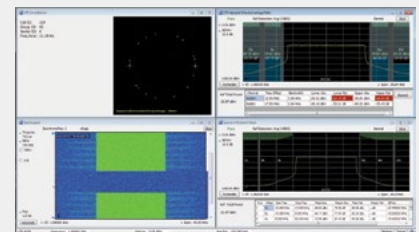
LTE™ Downlink

Fast validation of LTE base station transmitter with push button preset, and pass/fail information

- Comprehensive RF measurements including ACLR, SEM, Channel Power and OBW, plus Cell ID detection
- Support for TDD and FDD frame formats

OSCILLOSCOPE 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. 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.

LEARN MORE ON THE GO!

Isolated Probes

- High-resolution measurements in the presence of common mode signals or noise
- Up to 1 GHz bandwidth
- Complete galvanic isolation
- 1 Million to 1 (120 dB) of common mode rejection at 100 MHz

tek.com/isolated-measurement-systems

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

tek.com/differential-probe-low-voltage

High Voltage Differential Probes

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

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

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

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

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

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
- DC to 33 GHz (DPO7OE1)

Optical Probe DPO7OE2 DC to 59 GHz

tek.com/optical-probe

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: tektronix.com/probes.

LEARN MORE ON THE GO!

IsoVu® Isolated Probes — See what's been hidden until now.
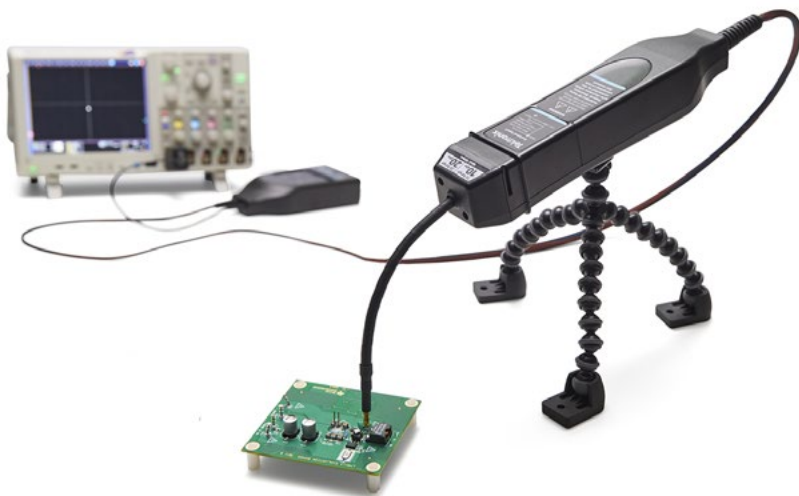
Common mode interference often causes engineers to design, debug, evaluate, and optimize "blind." Revolutionary IsoVu™ technology uses optical communications and power-over-fiber for complete galvanic isolation. When combined with an oscilloscope equipped with the TekVPI interface, it is the first, and only, measurement system capable of accurately resolving high bandwidth differential signals in the presence of large common mode voltage.

LEARN MORE

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.

	TSG4100A	AFG31000	AFG3000C	AFG2000	AFG1000
Bandwidth	Internal 6 MHz, External 200 MHz	250 MHz, 150 MHz, 100 MHz, 50 MHz, 25 MHz	240 MHz, 150 MHz, 100 MHz, 50 MHz, 25 MHz, 10 MHz	20 MHz	25 MHz, 60 MHz
Channels	1 LF and 1 RF	1 or 2 (independent or synchronized)	1 or 2 (independent or synchronized)	1	2
Memory Depth	16M bits	16Mpts (standard) 128Mpts (optional)	4 x 128 k points	4 x 128 k points	8 k -1 M points
Standard Waveforms	CW	Sine, Square, Pulse, Ramp, Noise, DC, Sin(x)/x, Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine	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	Sine, Square, Pulse, Ramp, Noise, and 45 Frequently Used Arbitrary Waveforms
Modulation	AM/FM/PM/Pulse, ASK/FSK/ PSK/QAM/CPM/VSB, GSM, GSM-EDGE, W-CDMA, APCO-25, DECT, NADC, PDC,TETRA, and Audio clip (Analog AM and FM)	AM, FM, PM, FSK, PWM	AM, FM, PM, FSK, PWM, External	AM, FM, PM, FSK, PWM, External	AM, FM, PM, FSK, ASK, PSK, PWM, External
Additional Modes	External IQ Waveform Input, Custom IQ Waveform Generation, ARB Waveform Generation (Remote Mode), Additive White Gaussian noise	Basic (continuous, modulation, sweeping, burst); Advanced (continuous, sequence, triggered, gated)	Sweep, Burst, Add Noise Impairment	Sweep, Burst, Add Noise Impairment	Sweep, Burst

CHOOSING YOUR SIGNAL GENERATOR

Below arew 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 reproduced waveform. Although 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.

SIGNAL GENERATORS:
ARBITRARY WAVEFORM GENERATORS

Tektronix arbitrary waveform generators enable complex signal generation with simple, easy to use tools. The AWG family provides leading-edge performance with sample rates up to 50 GS/s, up to 4 channels, and software packages that simplify the creation of these complex signals. The unparalleled flexibility, speed, and fidelity of the Tektronix AWGs make them an ideal solution for high speed serial, optical communications, radar test, and electronic warfare.

	AWG5000	AWG5200	AWG70000
Channel	2-4	2-8	1-2
Sampling Rate	Up to 1.2 GS/s	Up to 10 GS/s	1.5 KS/s – 50 GS/s
Bandwidth	300MHz	2GHz	14GHz
Analog Channel Vertical Resolution	14 bits	16 bits	10 bits
Memory	16M point per channel (32M optional)	Up to 2Gpts per channel	2GS - 8GS
Output Frequency Range	480 MHz	2 GHz (4 GHz)	20 GHz
Portability	Rack Mounted	Rack Mounted	Rack Mounted
Code Compatibility (with current AWG5k)	Yes	Yes	—
AFG Mode	No	No	No
Digital Outputs	28-bit optional on 2-ch models, 1-2 markers/channel	4 markers/channel, 32 max	None
Multi-unit Synchronization	—	Yes	Yes
Output Amplitude	370ns (basic)/2µs (adv.)	Up to 5Vp-p	250mV – 500mV (single ended), 500mV – 1.0V (differential)
Sequencing	YES	Yes	YES
Applications	Radar, research, and electrical test	Radar, electronic warfare, threat emitters, advanced research: quantum research, baseband 5G, electrical test and advanced labs	RF/MW communications and defense electronics, high-speed serial communications, mixed signal design and test, clock source, optical and advanced research
Additional Modes	—	SourceXpress	SourceXpress

AFG1000 Series

The AFG1000 Series Arbitrary/Function Generator offers the best price performance ratio in its class. It's tailored for educational users with 25 MHz, 60 MHz bandwidth, 2 output channels, and 1 mVp-p to 10 Vp-p output amplitude across full bandwidth. It generates all kinds of waveforms needed in a lab.

MODEL	AFG1022	AFG1062
Analog Channels	2	2
Output Bandwidth	25 MHz	60 MHz
Analog Sample Rate	125 MS/s	300 MS/s
Memory Depth	8 k	1 M
Amplitude (into 50 ohm)	1mV$_{p-p}$ to 10V$_{p-p}$	1mV$_{p-p}$ to 10V$_{p-p}$
Built-in Frequency Counter	200 MHz, 6 digits	200 MHz, 6 digits

- Full functional AFG with multiple run modes and a built-in 200 MHz frequency counter
- 1 mVpp to 10 Vpp output amplitude across full frequency range
- Intuitive UI with 3.95" color display provides quick access to functions and parameters, and gives full confidence on settings
- Fully supports TekSmartLab™
- 5-year warranty
- A fully functional AFG with modulation, sweep and burst modes.
- AFG1000 fully supported by TekSmartLab™.

SHIPS WITH PRODUCT
Power Cord
USB Cable
CD-ROM with Programmer Manual, Service Manual
BNC to BNC cables
Fuses
Calibration Certificate

RECOMMENDED ACCESSORIES
174-4401-00: USB type A to type B cable – three feet
174-6053-00: Cable, USB 2.0 Compliant, type A Male to type B male, 6 feet long
012-1732-00: BNC to BNC CABLE - three feet
159-0107-00: Fuse, cartridge; 5 x 20 mm, 2 A, 250 V, time-delay
159-0397-00: Fuse, cartridge; 5 x 20 mm, 4 A, 250 V, time-delay

AFG2000

Usually, generating a range of signals requires investing in a high-end signal generator. But with the Tektronix AFG2000 Arbitrary Function Generator, that's no longer the case. With 20 MHz bandwidth, 14-bit resolution, and 250 MS/s sample rate, it can create simple and complex signals. But perhaps its most impressive feature is its entry-level price.

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

- NIST-traceable calibration with high reliability
- Form factor is ideal for both benchtop and rack mount applications
- Powerful pulse generation combined with adjustable edge time, flexible duty cycle, and PWM mode
- 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.

SHIPS WITH PRODUCT
User Manual
Power Cord
USB Cable
BNC to BNC cable
CD-ROM with Programmer Manual, Service Manual, LabVIEW and IVI Drivers
CD-ROM with ArbExpress® Software
NIST-traceable Calibration Certificate

RECOMMENDED ACCESSORIES
Cables
012-1732-00: BNC cable shielded, 3 ft.
012-0991-00: GPIB cable, double shielded
011-0049-02: 50Ω BNC Terminator
Accessories
RMU2U: Rackmount kit
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

LEARN MORE � Download the Application Note "Replicating Real World Signals with an Arbitrary/Function Generator."

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.

MODEL	AFG3011C	AFG3021C	AFG3022C	AFG3051C	AFG3052C
Analog Channels	1	1	2	1	2
Output Bandwidth	10 MHz	25 MHz	25 MHz	50 MHz	50 MHz
Analog Sample Rate	250 MS/s	250 MS/s	250 MS/s	1 GS/s (≤16k), 250 MS/s (>16k)	
Memory Depth	4 x 128 k	4 x 128 k	4 x 128 k	4 x 128 k	4 x 128 k
Amplitude (into 50 Ω)	20 mV$_{p-p}$ to 20 V$_{p-p}$	10 mV$_{p-p}$ to 10 V$_{p-p}$	10 mV$_{p-p}$ to 10 V$_{p-p}$	10 mV$_{p-p}$ to 10 V$_{p-p}$	10 mV$_{p-p}$ to 10 V$_{p-p}$

MODEL	AFG3101C	AFG3102C	AFG3151C	AFG3152C	AFG3251C	AFG3252C
Analog Channels	1	2	1	2	1	2
Output Bandwidth	100 MHz	100 MHz	150 MHz	150 MHz	240 MHz	240 MHz
Analog Sample Rate	1 GS/s (≤16k), 250 MS/s (>16k)				2 GS/s (≤16k), 250 MS/s (>16k)	
Memory Depth	4 x 128 k	4 x 128 k	4 x 128 k	4 x 128 k	4 x 128 k	4 x 128 k
Amplitude (into 50 Ω)	20 mV$_{p-p}$ to 10 V$_{p-p}$	20 mV$_{p-p}$ to 10 V$_{p-p}$	20 mV$_{p-p}$ to 10 V$_{p-p}$	20 mV$_{p-p}$ to 10 V$_{p-p}$	50 mV$_{p-p}$ to 5 V$_{p-p}$	50 mV$_{p-p}$ to 5 V$_{p-p}$

- High sample rate and stable time base ensure signal precision and stability
- 25 shortcut buttons and 5.6" color display provide quick access to functions and parameters, and give full confidence on settings
- 9 models with up to 240 MHz bandwidth and up to 20 Vp-p output amplitude cover customer needs in most applications
- Free ArbExpress software enables an easy way to create, edit and load arbitrary waveforms
- Large color display shows your settings and waveforms at a single glance.
- Create and modify waveforms with ease with the included ArbExpress® software.
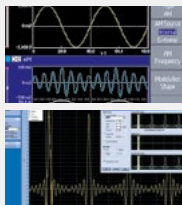
SHIPS WITH PRODUCT

Quick Start User Manual; Power Cord; USB cable; BNC to BNC 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.

RECOMMENDED ACCESSORIES

Cables
012-1732-00: BNC cable shielded, 3 ft.
011-0049-02: 50 Ω BNC terminator
012-0991-00: GPIB cable, double shielded

Accessories
RM3100: Rackmount kit

RECOMMENDED SERVICE

SILV400: 5-year Extended Warranty

LEARN MORE ⭧ Download the "Replicating Real World Signals with an Arbitrary/Function Generator" Application Note.

AFG31000 Series

The Tektronix AFG31000 Series is a high-performance AFG with built-in arbitrary waveform generation, real-time waveform monitoring, and the largest touchscreen on the market. Providing advanced waveform generation and programming capabilities, waveform verification, and a modern touch-screen interface, the new AFG31000 is sure to delight and simplify the job of every researcher and engineer.

MODEL	AFG31021	AFG31022	AFG31051	AFG31052	AFG1101
Number of Channels	1	2	1	2	1
Sine Frequency Range	25 MHz	25 MHz	50 MHz	50 MHz	100 MHz
Sample Rate	250 MS/s	250 MS/s	500 MS/s	500 MS/s	1 GS/s
Waveform Memory size	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)
Maximum Amplitude (into 50 Ω)	1 mV$_{p-p}$ to 10 V$_{p-p}$	1 mV$_{p-p}$ to 10 V$_{p-p}$	1 mV$_{p-p}$ to 10 V$_{p-p}$	1 mV$_{p-p}$ to 10 V$_{p-p}$	1 mV$_{p-p}$ to 10 V$_{p-p}$

MODEL	AFG31102	AFG31151	AFG31152	AFG1251	AFG1252
Number of Channels	2	1	2	1	2
Sine Frequency Range	100 MHz	150 MHz	150 MHz	250 MHz	250 MHz
Sample Rate	1 GS/s	2 GS/s	2 GS/s	2 GS/s	2 GS/s
Waveform Memory size	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)	16 MSa/ch (128Mpt optional)
Maximum Amplitude (into 50 Ω)	1 mV$_{p-p}$ to 10 V$_{p-p}$	1 mV$_{p-p}$ to 5 V$_{p-p}$	1 mV$_{p-p}$ to 5 V$_{p-p}$	1 mV$_{p-p}$ to 5 V$_{p-p}$	1 mV$_{p-p}$ to 5 V$_{p-p}$

- Advanced features and capabilities enable you to generate test signals quickly and easily
- 10 models with up to 250 MHz frequency range and up to 128Mpts of arbitrary waveform memory
- 9-inch capacitive touchscreen user interface works like a smart device so you can pinch, zoom and scroll to easily locate settings and parameters on the simplified menu and find shortcuts to frequently used settings.
- Built-in ArbBuilder lets you create and edit arbitrary waveforms on the instrument, eliminating the need to connect to a PC
- Sequencing option adds the ability to program long, complex waveforms with up to 256 steps
- Simplified multi-unit synchronization with an onscreen wizard that leads you through the process of configuring and synchronizing multiple generators
- Compatible with TekBench™ software to help students set up, control, and analyze test results in the lab
- Upgrade bandwidth, memory, and waveform sequencing after purchase without returning unit to the factory

SHIPS WITH PRODUCT

AFG31000 Series Arbitrary Function Generator Compliance, Installation, and Safety Instructions, power cord, NIST-traceable calibration certificate, BNC-BNC cable (2x for dual channel models, 1x for single channel models), USB cable, three-year standard warranty on parts and labor.

RECOMMENDED ACCESSORIES

012-1732-00: BNC cable shielded, 3 ft.
011-0049-02: 50 Ω BNC terminator
012-0991-00: GPIB cable, double shielded

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); R5: Repair Service 5 Years (including warranty); T3: Three Year Total Protection Plan; T5: Five Year Total Protection Plan.
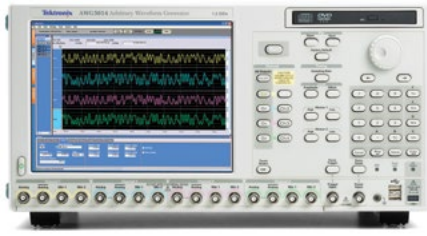
AWG5000 Series

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.

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

- 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.
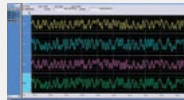
SHIPS WITH PRODUCT
USB Mouse, Compact USB Keyboard, Front Cover, Power Cable, Lead set for DC output, Software CD and Instructions, Documentation CD with Browser, Quick Start User Manual and Registration Card and Certificate of Calibration.

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

SOFTWARE
See page 39-40 for more information
RFXpress® Software for AWG5000, AWG70000 (RFX100)
SerialXpress® Software for AWG5000, AWG70000 (SDX100)

AWG70000 Series

The industry-leading AWG70000 Series arbitrary waveform generator represents the cutting edge in sample rate, signal fidelity, and waveform memory. Featuring up to up to 50 GS/s, 10-bit vertical resolution and unparalleled signal fidelity, the AWG70000 Series enables the easy generation of complex signals in wideband RF, coherent optical, high speed serial receiver test and advanced physics research applications.

MODEL	AWG70001A	AWG70002A
Sample Rate	1.5 KS/s to 50 GS/s	1.5 KS/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 Vp-p (Differential)	1.0 Vp-p (Differential)
Output Amplitude (single-ended)	-70 dBm to 25 dBm (Option-AC)	-70 dBm to 25 dBm (Option-AC)
Waveform Memory	Standard: 2G Samples, Optional: 16G Samples	Standard: 2G Samples, Optional: 8G Samples
Channels	1 (Differential)	2 (Differential)

- Generate wide bandwidth signals at baseband, IF and RF frequencies with excellent dynamic range
- Accelerate designs and research by generating waveforms that could not 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, and other software packages.
- Waveforms captured on scopes or spectrum analyzers can be played back on the AWG.

SHIPS WITH PRODUCT: Keyboard, Mouse, Power Cord

SOFTWARE AND PLUGINS
See page 39-40 for more information
Multitone, Notches & Chirp Plug-in for AWG70000 Series, AWG5200 Series, and SourceXpress®; Environment Plug-in for the AWG5200, AWG70000, and SourceXpress; Generic Pre-compensation Plug-in for AWG70000 Series, AWG 5200 Series, and SourceXpress; Spread Spectrum Clocking (SSC) Plug-in for AWG70000 series, AWG 5200 Series and SourceXpress; S-Parameters Plug-in for AWG70000A, AWG 5200 Series and SourceXpress; RF Generic Plug-in for AWG70000 Series, AWG 5200 Series and SourceXpress; High Speed Serial Plug-in for AWG70000, AWG 5200 Series and SourceXpress; Optical Plug-In for AWG70000, AWG 5200 Series and SourceXpress; Radar Plug-In for AWG70000, AWG 5200 Series and SourceXpress; OFDM Plug-In for AWG70000, AWG 5200 Series and SourceXpress.

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: Option-AC

OPTION AC FOR AWG70001
Option AC adds a single-ended AC coupled connector to the front panel of the single channel AWG70001A Arbitrary Waveform Generator. This option adds an additional amplified and attenuated path to the AWG70001, expanding its output to -77 dBm to 18 dBm at 11 GHz and -90 dBm to 20 dBm at 14 GHz.

For more information visit:
tek.com/datasheet/awg70001a-arbitrary-waveform-generator-option-ac-datasheet

AWG5200 Series

The Tektronix 5200A Arbitrary Waveform Generator has the cleanest signal on the market at an unbeatable price per channel. With code compatibility, you can fast forward integration and scaling while simplifying waveform design. Test and validate sensitive devices requiring lots of inputs at a low cost, without sacrificing performance.

MODEL	AWG5202	AWG5204	AWG5208
Channel	2	4	8
Sample Rate/ Frequency	1.5 KS/s - 10 GS/s (4 GHz)	1.5 KS/s - 10 GS/s (4 GHz)	1.5 KS/s - 10 GS/s (4 GHz)
Resolution	16 bit	16 bit	16 bit
SFDR (DC-1.25GHz)	<-70 dBc	<-70 dBc	<-70 dBc
Analog BW (at -3 db x)	2 GHz	2 GHz	2 GHz
Output	DC Out: 1.5Vp-p Diff (standard); DC High Voltage Out: 10mV to 5.0Vp-p single ended, BW DC-370MHz (option); AC Out: -17 to -5 dBm single-ended, BW 10MHz to 2.0 GHz (standard); Amp AC Out: -85 to +10 dBm single-ended, BW 10MHz to 2 GHz (option)		

- 16 bits of DAC resolution, low noise floor, good RF performance ensures accurate, detailed signals
- Up to 8 channels/unit at a low cost per channel
- 2 GS of memory per channel and a sequencer conserves memory
- Multi-unit synchronization ensures efficient scaling for research or radar applications
- Quick, flexible test setup
- Easily integrate AWG5200 with complex test set ups.
- Scale based on your needs with multi-unit synchronization.

SHIPS WITH PRODUCT
USB Mouse, Compact USB Keyboard, Power Cord, One 50 Ω SMA Terminator per Channel, Installation and Safety Manual, Certificate of Calibration

RECOMMENDED ACCESSORIES
Cables
012-1690-xxSMA: Cable, 40 in. (102 cm); 012-1503-xx SMB: Cable, 20 in. (51 cm)
Accessories
GF-RACK3U: Rackmount kit; 016-1979-xx: Front Removable HDD Bay

SOFTWARE AND PLUGINS
See page 39-40 for more information
Multitone, Notches & Chirp Plug-in for AWG70000 Series, AWG5200 Series, and SourceXpress®; Environment Plug-in for the AWG5200, AWG70000, and SourceXpress; Generic Pre-compensation Plug-in for AWG70000 Series, AWG 5200 Series, and SourceXpress; Spread Spectrum Clocking (SSC) Plug-in for AWG70000 series, AWG 5200 Series and SourceXpress; S-Parameters Plug-in for AWG70000A, AWG 5200 Series and SourceXpress; RF Generic Plug-in for AWG70000 Series, AWG 5200 Series and SourceXpress; High Speed Serial Plug-in for AWG70000, AWG 5200 Series and SourceXpress; Optical Plug-In for AWG70000, AWG 5200 Series and SourceXpress; Radar Plug-In for AWG70000, AWG 5200 Series and SourceXpress; OFDM Plug-In for AWG70000, AWG 5200 Series and SourceXpress

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

LEARN MORE ⤵ Download the "Fundamentals of Radar Measurements" Primer.

LEARN MORE ⤵ Download "Overcoming RF Signal Generation Challenges in Quantum Computing."

AWGSYNC01 AWG Synchronization Hub

The AWGSYNC01 enables synchronization of up to four AWG70001A or AWG70002A units, allowing up to eight channels to be aligned to the same clock, pattern jump and trigger inputs.

MODEL	AWGSYNC01
Description	AWG Synchronization Hub
Key Spec	Random Jitter (typical): 315 fs RMS Skew Repeatability/Accuracy: ≤5 ps
Key Spec	Total Jitter (typical): 13 ps$_{p-p}$
Key Spec	Instrument to Instrument Skew: ± 10 ps

- Synchronize signal output from two to four AWG70000 instruments
- Synchronize each channel to within ±10 ps
- Enable validation and compliance testing of high speed silicon and communications devices
- Controlled directly in the AWG and requires no additional AWG software.
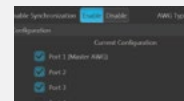
SHIPS WITH PRODUCT
AWG Communication Cables; Phase-matched Clock Cables; Calibration Deskew Cables; Power Cord.

SIGNAL GENERATOR PLUG-INS

SourceXpress™

SourceXpress signal design and generation software allows you to build complex, difficult to code waveforms on your PC. SourceXpress is free software that controls, runs waveform generation plug-ins and emulates the AWG5200 and AWG70000 environment on your PC. Create custom signals in its sophisticated, easy to use interface, before loading and playing them on Tektronix AWGs. SourceXpress plug-ins provide specialty generation solutions for RF, radar, high speed serial, and optical applications.

- Build, add impairments and customize your signals before emulating them on an AWG instrument running on your PC
- Create waveforms, sequences, and sub-sequences and control multiple, synchronized AWGs from one instance
- Import common waveform files, including MATLAB, SerialXpress, RFXpress, and more
- Pre-compensate, apply S-parameters, or add jitter, impairments, multipath, and Doppler to waveforms
- Install plug-ins that expand your signal design capabilities and use one interface
- Applications specific plug-ins, like Optical, seamlessly integrate as tabs into the SourceXpress UI.
- The SourceXpress pulse train allows users to add an array of impairments, modulation schemes, and more.
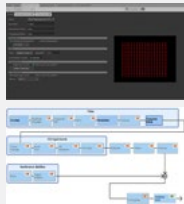
SOURCEXPRESS PLUG-INS
PRECOM: General Precompensation
HSS: High Speed Serial
MTONE: Multi-Tone and Chirp
RFGEN: RF Generic
SPARA: S-Parameter
SSC: Spread Spectrum Clock (SSC)
OPTICAL: Optical
ENVM: Environment Plug-in

SOFTWARE AND PLUGINS
See page 39-40 for more information

Multitone, Notches & Chirp Plug-in for AWG70000 Series, AWG5200 Series, and SourceXpress®
Environment Plug-in for the AWG5200, AWG70000, and SourceXpress
Generic Pre-compensation Plug-in for AWG70000 Series, AWG 5200 Series, and SourceXpress
Spread Spectrum Clocking (SSC) Plug-in for AWG70000 series, AWG 5200 Series and SourceXpress
S-Parameters Plug-in for AWG70000A, AWG 5200 Series and SourceXpress
RF Generic Plug-in for AWG70000 Series, AWG 5200 Series and SourceXpress
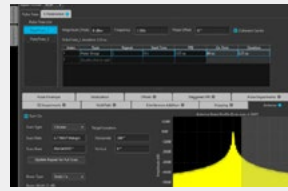High Speed Serial Plug-in for AWG70000, AWG 5200 Series and SourceXpress
Optical Plug-In for AWG70000, AWG 5200 Series and SourceXpress
Radar Plug-In for AWG70000, AWG 5200 Series and SourceXpress
OFDM Plug-In for AWG70000, AWG 5200 Series and SourceXpress

LEARN MORE ⤵ View the SourceXpress Software Demo.

Radar

Create multiple customized pulses and pulse groups to simulate multiple target returns and antenna scanning

- Create custom modulation types such as LFM, Barker, Polyphase Codes, Step FM and nonlinear RF
- Simulate antenna scanning with different beam profiles
- Generate pulse trains with staggered PRI, frequency-hopping and pulse-to-pulse amplitude variation to simulate Swerling target models

tek.com/datasheet/radar-plug-datasheet
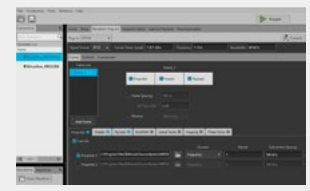
OFDM Plug-In

Configure and create complete multiple, definable OFDM frames with preamble, header and payload

- Use presets for standard compliant frames for wireless standards like Wi-Fi, WiMAX or define your own using subcarrier modulation formats including BPSK, QPSK, QAM (16, 32, 64, 256, 512, 1024), and 8-PSK
- Add impairments and define frequency hopping and gated noise to simulate practical environments for receiver testing

tek.com/datasheet/ofdm-plug-datasheet

Environment

Create specific RF environments waveforms for advanced application testing

- Extensive waveform creation capabilities for applications such as, real world wireless scenarios/environments simulation/emulation for EW monitoring, radar receiver testing with interfering signals, and MIMO and Phased Array Antennae
- Specify up to 50 scenarios to define your environment, including WiMAX, WiFi, GSM, CDMA, W-CDMA, DVB-T, Noise, Bluetooth, LTE, OFDM, Radar and more

tek.com/environment-plug-awg5200-series-and-awg70000-series

High Speed Serial

Simplify signal creation and jitter simulations to reduce development and test time.

- Create the exact waveforms required for thorough and repeatable design validation, margin, characterization, and conformance testing
- Create worst-case scenarios to stress receivers by accurately controlling the Crest Factor of the random jitter

tek.com/product-software/high-speed-serial-plug-in

SIGNAL GENERATOR SOFTWARE, OPTIONS, & PLUG-INS

Optical Plug-In

Advanced waveforms for testing optical communication components and devices

- Define and generate complex dual polarization modulation schemes with separately configured baseband data
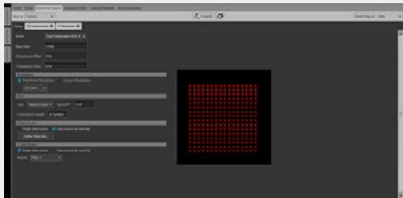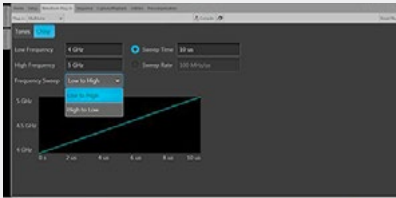- Create optical waveforms using a variety of predefined modulation schemes such as, BPSK, QPSK, OQPSK, OOK, NRZ, up to 8 PAM, and up to QAM1024 – including QAM8
- Generate data streams from variety of predefined patterns, a PRBS 31 generator, or define your own custom arbitrary data stream.

tek.com/optical-plug-awg70000-series-and-sourcexpress

Multi-Tone, Notches and Chirp

Create clean, precise signals

- Notch out frequencies by setting the start and end frequency of choice
- When generating chirps, set high-to-low or low-to-high frequency sweeps and define chirp characteristics by sweep time or sweep rate
- Create tones desired start and end frequency, and user defined resolution, spacing or number of tones.

tek.com/signal-generator-software/multitone-chirp-awg-plug
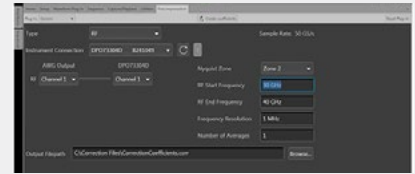
Generic Pre-compensation

Advanced capabilities to synthesize digitally modulated baseband, IF, and RF/microwave signals

- Create correction coefficients that can be applied on waveforms to get flat frequency and linear phase response
- Support for a variety of modulations waveform types and applications including RF, IF, or IQ and NRZ signals IQ

tek.com/signal-generator-software/generic-precompensation-plug

RF Generic

- Advanced capabilities to synthesize digitally modulated baseband, IF, and RF/microwave signals supporting a wide range of modulation schemes.

tek.com/product-software/rf-generic-plug-in
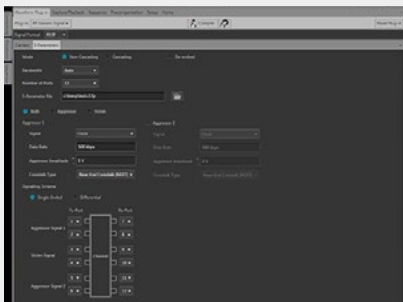
S-Parameter

Precise channel or device emulation

- Generate S-parameter files using a vector network analyzer and combine with the base pattern to recreate channel characteristics
- Inverse filtering to de-embed the effects of the channel from the system.
- The S-parameter plug-in also enables the ISI capability within the High-Speed Serial plug-in

tek.com/datasheet/awg70000a-s-parameters-applications
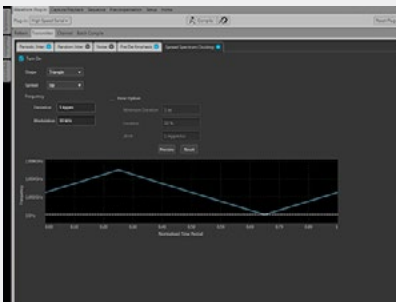
Spread Spectrum Clock (SSC)

Full support for common modulation profiles

- Supports SSC modulation addition with precisely controlled profile, spread, deviation, and df/dt
- Enables the addition Triangular, Sinusodial, Up-/Down-/Center-frequency, and user-defined frequency spreading schemes to the base pattern
- Designed to also run on an external PC via the SourceXpress PC application

tek.com/datasheet/spread-spectrum-clocking-applications-datasheet-awg70000a-series-and-sourcexpress%C2%AE

D-PHYXpress and C-PHYXpress Software

Powerful and easy to use waveform synthesis for D-PHY and C-PHY RX testing

- Create High Speed (HS), Low Power (LP) and High Speed Low Power (HS-LP) patterns with MIPI CTS required Jitter and Noise
- Supports conformance and margin testing per CTS specifications
- Remotely generate D-PHY and C-PHY waveforms on the Arbitrary Waveform Generator
- Available on the AWG70000

tek.com/mipi-0

EDUCATION SOLUTIONS

TekBench™ Control Software

TekBench is PC software that controls Tektronix oscilloscopes. It offers intuitive instrument control, automated measurement data logging, and easy waveform exporting with required format to eliminate extra time and effort. Perfect for project laboratories and senior design laboratories.

LEARN MORE

TekSmartLab™

TekSmartLab is the industry's first network-based instrument management solution for teaching labs that brings a more efficient lab experience.

LEARN MORE

TTR500

The TTR500 Series rivals the leading bench-top competition, at 40% lower price! It delivers better RF performance on key parameters like dynamic range, and now includes a built-in Bias Tee. Whether you're designing for RF devices or teaching in the lab, the TTR500 Series VNA gives you all the capability and performance you need in a 6 GHz 2-port VNA at a price you can afford.

LEARN MORE

TBS2000 Series

Students can take a hands-on approach, thanks to features that make learning engineering fundamentals easier.

The TBS2000 is great at performing an oscilloscope's most important jobs - looking at and measuring signals. See more with a bigger 9" display and longer 20M record length.

- HelpEverywhere tips provide context for complex settings.
- Courseware ecosystem lets instructors load information into the TBS2000, to help students during labs.
- Full compatibility with TekSmartLab™ network software.

LEARN MORE

RSA306B

The RSA306B offers full-featured spectrum analysis at an unmatched price. Using the latest in commercial interfaces and available computing power, the RSA306B separates signal acquisition from measurement, dramatically lowering the cost of instrument hardware. Data analysis, storage and replay is performed on your personal computer, tablet or laptop, making processing upgrades easy.

LEARN MORE

AFG1000 SERIES

The AFG1000 Series Arbitrary/Function Generator offers the best price performance ratio in its class.

Tailored for educational users with 25 MHz, 60 MHz bandwidth, 2 output channels, and 1 mVp-p to 10 Vp-p output amplitude across full bandwidth. It generates all kinds of waveforms needed in a lab.

LEARN MORE

DMM2110

This cost-effective, high precision instrument offers 5.5 digit resolution and is ideal for a wide range of manual, semi-automatic, and production test applications. It can be used as stand-alone benchtop instrument and as a component in test systems.

LEARN MORE

2231A-30-3

The Model 2231A-30-3 Triple-Channel DC Power Supply can output a total of 195W of power, providing the power levels needed to energize a wide range of circuits and devices for benchtop work. Two channels can supply up to 30V at 3A each; the third channel can provide up to 5V at 3A.

LEARN MORE

TekSmartLab™ - Education Solution

With TekSmartLab, you can wirelessly configure, control and monitor up to 600 instruments (100 test benches) from a single platform. Students can retrieve test results wirelessly, edit and submit the test reports online through the web browser of their mobile or laptop. Instrument asset info including utilization time is recorded automatically.

TEKSMARTLAB CONFIGURATION SAMPLES (20 benches with 80 instruments)

ITEM	QTY	SUPPLIER	COMMENTS
TSL3000B- FL	1	Tektronix	Server software floating license, one per lab
TBX3000A	20	Tektronix	One per bench
Instruments	80	Tektronix	Supported instruments. One oscilloscope, one arbitrary function generator, one digital multimeter, and one power supply per bench. Option 2231A-001 required for the power supply 2231A-30-3.
USB WIFI Dongle	20	Provided by customer	Compatible USB-WIFI dongle
Router	1	Provided by customer	WIFI Router that can meet WI-FI networking requirements.
Lab server	1	Provided by customer	

INSTRUMENTS SUPPORTED

Oscilloscopes	Tektronix TDS1000B, TDS1000C-SC, TDS1000C-EDU,TBS1000, TBS1000B(-EDU), TDS2000C, DPO/MSO2000 (B), TBS2000, MDO3000
Arbitrary Function Generators	Tektronix AFG1000, AFG2021, AFG3000(C)
Digital Multimeters	Keithley DMM2110, DMM2100
Power Supplies	Keithley 2230G(J)-30-1, 2220G(J)-30-1, 2220(J)-30-1, 2230(J)-30-1, 2231A-30-3 (requires Option 2231A-001)

- Easy setup via Wi-Fi with instruments automatically recognized
- Instant remote configuration of large fleets of instruments
- Centralized monitoring and remote assistance
- Test report online editing and submission
- Increased utilization with instrument asset information auto-recording

TekBench™ Control Software

Perfect for project and senior design labs, TekBench is free PC software that controls Tektronix oscilloscopes. It offers students an intuitive instrument control interface and automated measurement data logging capabilities. Students can easily and quickly export waveform data and export screen snapshots in a variety of formats. It also enables Oscilloscope measurement data logging with a testing time of up to 30 minutes. TekBench is a free software available at tek.com/tekbench.

ITEM	DESCRIPTION & OPTIONS
TEKBENCHFL-BAS	TekBench™ Control Software for Oscilloscopes, floating license, supports oscilloscope measurement data logging testing time up to 1 day for the DPO2000B and MSO2000B series, and up to 5 days for the MDO3000 and TBS2000 series.

INSTRUMENTS SUPPORTED

Oscilloscopes	TBS2000 Series
DPO/MSO2000B Series (oscilloscope function only)
MDO3000 Series (oscilloscope function only)

- Intuitive interface to control and monitor instruments
- Automated measurement data logging
- Simple connection to instruments and automatic software detection
- Simple connection to instruments.
- Easily capture and export results.

SYSTEM REQUIREMENTS

Operating System: Windows 7, Windows 10 32-bit and Windows 7, Windows 10 64-bit
CPU: Dual core 2 GHz or above
RAM: 4 GB DDR3 or above
Hard Disk: 1 GB free disk space (recommended)
Screen Resolution: 1366 × 768 or above
Instrument Communication Interface: USB

OSCILLOSCOPE MEASUREMENT DATA LOGGING

Supported Measurements
Frequency, Period, Rise time, Fall Time, Positive Pulse Width, Negative Pulse Width, Peak to Peak, Amplitude, Maximum
Minimum, High, Low, Positive Overshot, Negative Overshot, Mean, RMS
Maximum Simultaneous Measurements
6 (MDO3000 and TBS2000 series)
3 (DPO2000B and MSO2000B series)
Minimal Time Interval
2 seconds (MDO3000 and TBS2000 series)
5 seconds (DPO2000B and MSO2000B series)
Result Display Mode
Trend plot, List, Histogram

OUTPUT FORMATS

Waveform data exporting format: *.csv (MDO3000 series only), *.csv (no header), *.mat (matlab)
Snapshot exporting format: *.png, *.bmp, *.jpg, *.tif

VECTOR NETWORK ANALYZERS

Legendary support and quality meet ease-of-use and affordability. The Tektronix TTR500 Series 2-port, 2-path vector network analyzer is our latest breakthrough – an unmatched combination of measurement performance and convenience at 40% lower price than leading benchtop alternatives!

	TTR500 SERIES
Frequency Range	100 kHz to 3.0 or 6.0 GHz
Dynamic Range	> 122 dB
Trace Noise	< 0.008 dBrms
Output Power	-50 to +7 dBm
Bias Tee (internal)	Yes
Weight	3.5 lbs.
Applications	S-parameter Measurements (S11, S21, S12, S22), Antenna Matching, RF Component Design and Testing, Return Loss, Insertion Loss/Gain, Impedance
Typical DUTs	Filters, Amplifiers, Cables, Connectors, Antennas, RF Components, Discrete Components

CHOOSING YOUR VECTOR NETWORK ANALYZER

To help you choose the right VNA, the most common selection criteria are listed below, along with helpful tips.

1 DUT Performance Requirements

The Vector Network Analyzer (VNA) you select should match your measurement requirements for your device under test (DUT). Important parameters to consider are the number of ports, frequency range, dynamic range, and whether or not the instrument is capable of measuring passive or active components. With its two ports, more than 122 dB dynamic range, less than 0.008 dB rms trace noise, and hardware designed specifically for measuring both passive and active components, the TTR500 Series VNA is capable of making everyday S-parameter measurements with the accuracy and confidence you expect from Tektronix, all while saving you money.

2 Size, Weight and Power (SWaP)

Whether you plan to use the VNA in the lab, in the field, at your desk, or on the manufacturing floor, you need to consider the SWaP of the instrument. Traditionally, VNAs are large and bulky, requiring a cart so it can migrate among groups more easily. VNAs also require proper ventilation and heat management. Thanks to an innovative design centered around a tightly integrated ASIC, the TTR500 Series VNA consumes less than 16 watts of power, is fanless, weighs less than 3.5 lbs, and can be easily stacked, moved, or stored.

3 Calibration

Before you can make any measurements with the VNA, you must calibrate it to reduce errors that can affect the measurement. This is what makes the VNA one of the most accurate RF test instruments available. User calibration enables the VNA to factor out the effects of cables, adaptors, and most things used in the connection of the DUT. There are many different calibration methods and standards available, each with varying levels of accuracy. You will want to make sure that the VNA supports your required calibration method. The TTR500 Series VNA supports 8 and 12-term error correction and is compatible with the industry's most popular mechanical cal standards.

TTR500 Series

The TTR500 has a form factor small enough to fit in a briefcase with a price tag to match. You can put a VNA on every engineering bench to improve efficiency and uptime. In a classroom, students can get hands-on experience with industry standard test instrumentation. Whether you're designing for RF devices or teaching in the lab, the TTR500 Series VNA gives you all the capability and performance you need in a 6 GHz 2-port VNA at a price you can afford.

MODEL	TTR503A	TTR506A
Frequency Range	100 kHz to 3 GHZ	100 kHz to 6 GHZ
Number of Ports	2, type-N female connectors	2, type-N female connectors
Dynamic Range	>122 dB	>122 dB
Output Power	-50 to +7 dBm	-50 to +7 dBm
Trace Noise	<0.008 dB RMS	<0.008 dB RMS

- Full 2-port 2-path S-parameter measurement in a variety of formats
- Complete vector network analysis capability with Tektronix VectorVu-PC™ software
- Built-in bias tee accessible on both ports to bias active devices
- Application programming interface (API) for Microsoft Windows environment and LabView
- Robust SCPI command interface to optimize code migration
- RF Component Troubleshooting and Design Validation
- Antenna Matching and Tuning
- Education

SHIPS WITH PRODUCT
USB 2.0 cable (6 Ft), Power supply, Country-specific power cord, USB stick (internal) with VectorVu-PC and all documentation, Three-year Warranty

RECOMMENDED CALIBRATION KITS
CALSOLT35F: 3.5mm Female SOLT 4-in-1 Cal Kit, 0 to 13 GHz (SPINNER BN 53 38 28)
CALSOLT35M: 3.5mm Male SOLT 4-in-1 Cal Kit, 0 to 13 GHz (SPINNER BN 53 38 29)
CALSOLTNF: Type-N Female SOLT 4-in-1 Cal Kit, 0 to 9 GHz (SPINNER BN 53 38 43)
CALSOLTNM: Type-N Male SOLT 4-in-1 Cal Kit, 0 to 9 GHz (SPINNER BN 53 38 44)
CALSOLT716F: 7/16 Female SOLT 4-in-1 Cal Kit, 0 to 6 GHz (SPINNER BN 53 38 45)
CALSOLT716M: 7/16 Male SOLT 4-in-1 Cal Kit, 0 to 6 GHz (SPINNER BN 53 38 45)
CALSOLTNF-75: Type-N Female SOLT 4-in-1 Cal Kit, 0 to 3 GHz (SPINNER BN 53 38 57 R000)
CALSOLTNM-75: Type-N Male SOLT 4-in-1 Cal Kit, 0 to 3 GHz (SPINNER BN 53 38 58 R000)

STORAGE SOLUTIONS
TTR500TRANSIT: TTR500 Carrying Case
TTR500RACK: TTR500 Rack Mount Kit; Holds 2 VNAs side-by-side

CABLES
012-1768-00 (60 cm), 012-1767-00 (1 m), 012-1746-00 (1.5 m):
Type-N(m) to Type-N(m) Cable, Rugged, Phase-stable
012-1765-00 (60 cm), 012-1766-00 (1 m), 012-1745-00 (1.5m):
Type-N(m) to Type-N(f) Cable, Rugged, Phase-stable
012-1752-00 (60 cm), 012-1750-00 (1 m), 012-1751-00 (1.5 m):
Type-N(m) to 7/16(m) Cable, Rugged, Phase-stable
012-1747-00 (60 cm), 012-1748-00 (1 m), 012-1749-00 (1.5m):
Type-N(m) to 7/16(f) Cable, Rugged, Phase-stable
012-1772-00 (60 cm), 012-1773-00 (1 m), 012-1774-00 (1.5 m):
Type-N(m) to SMA(m) Cable, Rugged, Phase-stable
012-1769-00 (60 cm), 012-1770-00 (1 m), 012-1771-00 (1.5 m):
Type-N(m) to SMA(f) Cable, Rugged, Phase-stable

RECOMMENDED SERVICE
R5: 5-year Extended Warranty

LEARN MORE ⬎ Download the White Pape "Performance, size, reliability affordability. Choose four."

SPECTRUM ANALYZERS

Choosing your Wireless/RF Test Solution
See an RF world that others can't with affordable real-time performance. This guide gives an overview of the signal analysis capabilities required to overcome the most challenging wireless and RF design challenges. Spend your time fixing the problem, not looking for it. If you need a refresher on Real-Time Spectrum Analysis, download the Fundamentals of Real-Time Spectrum Analysis Primer.

	RSA306B USB SPECTRUM ANALYZER	RSA500A USB SPECTRUM ANALYZER	RSA600A USB SPECTRUM ANALYZER	RSA5100B REAL TIME SPECTRUM ANALYZER	RSA7100A REAL TIME SPECTRUM ANALYZER
Applications	Portable for field and lab use	Field and lab signal analysis, spectrum management and monitoring	Lab use, including EMI and wireless design validation	High performance, advanced signal analysis	Very high performance, advanced signal analysis, record and playback
Power Source	USB 3.0	Battery or Line	Line	Line	Line
Max Frequency Range	9 kHz - 6.2 GHz	9 kHz - 18 GHz	9 kHz - 7.5 GHz	1 Hz - 26.5 GHz	16 kHz - 26.5 GHz
Max Acquisition Bandwidth (Real Time)	40 MHz	40 MHz	40 MHz	165 MHz	800 MHz
Noise Floor (DANL at 1GHz, Preamp On, dBm/Hz)	-163	-164	-164	-167	-164
Tracking Generator		Option	Option	–	–
Full-feature Spectrum Analysis with Real Time	Yes	Yes	Yes	Yes	Yes
Modulation, Pulse, Wireless Standards Analysis	Option	Option	Option	Option	Option
Recording Time	PC SSD size dependent	PC SSD size dependent	PC SSD size dependent	NA - IQ streaming outputs available	>2 hours
Reference Frequency Accuracy, ppm	± 3	± 1, 0.003 with GPS lock	± 1, 0.003 with GPS lock	± 1 ± 0.1 Opt PFR	±0.05

CHOOSING YOUR REAL-TIME SPECTRUM ANALYZER
Key items for consideration when choosing your Spectrum Analyzer.

❶ Frequency Range

Of course, the analyzer chosen must cover all of the frequencies you need to measure. Consider harmonics and spurious signals 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.

❷ 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. Also, wide band radar and electronic warfare signals often require as much bandwidth as possible to completely capture the full bandwidth of a signal, so it is very useful to use an analyzer with the maximum available real-time analysis bandwidth available, at 800 MHz.

❸ 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 RSA5100B has the best Spurious Free Dynamic Range of any wide band analyzer on the market, while the RSA306B has a much smaller form factor and is great for making quick measurements. So the RSA5100B may be more suitable for characterizing things like power amplifiers or radar systems.

❹ Features and Capabilities

All of our real-time spectrum analyzers can run the same feature set and capabilities with SignalVu-PC, from our USB Spectrum Analyzers to the RSA7100A as well as the MDO4000C. Optional features include preamplifiers, acquisition bandwidth options, and analysis options that include WLAN, Bluetooth, P25 and general purpose digital modulation measurements.

USB SPECTRUM ANALYZERS

Big Performance Has Never Been So Small

The RSA Series **offers full-featured spectrum analysis** and deep signal analysis. Using the **latest in commercial interfaces** and available computing power, the RSA Series separates signal acquisition from measurement, dramatically lowering the cost of instrument hardware. Data analysis, storage and replay is performed on your **personal computer, tablet or laptop**. Managing the PC separately from the acquisition hardware makes processing upgrades easy, and helps to make the RSA Series an **extremely portable** spectrum analyzer family **for many different applications**.

1 ## 40MHz Capture Bandwidth

Make complex modulation measurements on wideband standards – 802.11 a/b/d/g/n, Bluetooth, and more.

2 ## Built-in Tracking Generator

Measure VSWR/Return Loss and distance to fault for component and antenna characterization. (RSA500 and RSA600 Series only)

3 ## Real-time Analysis

Included DPX Spectrum/Spectrogram measurements minimize time spent on transient discovery and interference hunting. Get immediate insight into your toughest problems.

4 ## SignalVu-PC Software

Full-featured spectrum analysis software is included free with 17 built-in measurements including spectrum, spur search, spectral emissions, and DPX.

5 ## Optional Advanced Analysis

Software modules that support modulation analysis, popular wireless standards, pulse, playback of recorded files, mapping, signal classification, EMI/EMC pre-compliance testing, and more are available for SignalVu-PC software.

6 ## Portable and Lightweight

With units ranging from 1.7 to 5.5 lbs., the RSA Series is easy to move, when and where you need to go.

RSA306B USB Spectrum Analyzer

From basic RF measurements to advanced analysis, the RSA306B offers the full features of a benchtop spectrum analyzer at a fraction of the price. With 17 automated measurements included, you can make common measurements quick and easy. Additional software options enable you to tackle advanced analysis tasks, including modulation analysis, pulse measurements, mapping and pre-compliance EMI/EMC testing. At just 1.7 pounds, the RSA306B takes little space on your bench, and fits easily in your hand, bag, pocket or tool belt.

MODEL	RSA306B
Description	Portable real time USB spectrum analyzer
Frequency Range	9 kHz–6.2 GHz
Capture Bandwidth	40 MHz
Spurious Free Dynamic Range	–60 dBc to 3 GHz
Minimum Signal Duration for 100% Probability of Intercept	100 µs

- Frequency Range: 9 kHz to 6.2 GHz / Acquisition Bandwidth: 40 MHz
- Full featured spectrum analysis capability with Tek SignalVu PC™ Software
- 17 spectrum and signal analysis measurements standard
- Over 15 options for mapping, modulation analysis, standards support, pulse, playback of recorded files, and more
- Small, power consumption less than 4.5 Watts; Weight: 1.7 pounds (0.75 kg)
- **Applications:** R&D, Education, Interference Hunting, Field Installation and Maintenance

SHIPS WITH PRODUCT
USB 3.0 cable (1 M), USB stick with SignalVu-PC and all documentation, Three-year Warranty

SIGNALVU-PC / DATAVU-PC LICENSES
Recommended SignalVu-PC or DataVu-PC application licenses (Floating and node-locked licenses available). Other applications available, see SignalVu-PC or DataVu-PC data sheet for details.
SV23xx-SVPC: WLAN 802.11a/b/g/j/p Measurement Software
SV24xx-SVPC: WLAN 802.11n Measurement Software
SV25xx-SVPC: WLAN 802.11ac Measurement Software
SV27xx-SVPC: Bluetooth Basic LE TX SIG measurements
EMCVUxx-SVPC: EMI Pre-compliance and Troubleshooting Software
EMCVUNL-SVPC: EMI Pre-compliance and Troubleshooting, Node Locked
EMCVUFL-SVPC: EMI Pre-compliance & Troubleshooting, Floating
DVPC-MREC: Operate & record two RSA/300/500/600 spectrum analyzers simultaneously
DVPC-SPAN50NL: DataVu-PC Software for 50 MHz BW playback files
SV28xx-SVPC: LTE downlink (eNB) RF measurements
SV54xx-SVPC: Signal Classification/Survey
SV56xx-SVPC: Playback of recorded signal files
SVAxx-SVPC: AM/FM/PM Direct Audio Measurements
SVMxx-SVPC: General Purpose Modulation Analysis, including demodulation for Zigbee and Bluetooth Enhanced Data Rate
SVPxx-SVPC: Pulse Measurement Software
SVTxx-SVPC: Settling Time (Frequency and Phase)
MAPxx-SVPC: Mapping Software

RECOMMENDED ACCESSORIES
DFA0047: Smart Directional Antenna, 20-8500 MHz, with electronic compass & preamp
DF-A0047-01: Frequency range extension DF-A0047 directional antenna, 9 kHz-20 MHz, requires DF-A0047
EMI-RE-HWPARTS: Bundle of EMI accessories for radiated pre-compliance test (includes EMI-BICON-ANT, EMI-CLP-ANT, EMI-PREAMP, EMI-TRIPOD, CABLE-5M, CABLE-1M
EMI-DEBUG-HWPARTS: Bundle of EMI accessories for Debug (includes EMI-NF-PROBE and EMI-NF-AMP)
OPT CTRL-G1-x: Portable controller, availability varies by region
RSA306-BRACK: Rack mount, holds 2 RSA306B, room for 2 Mini-PC's

RECOMMENDED SERVICE & AVAILABLE DOWNLOADS
R5: 5-year Extended Warranty; SignalVu-PC base software; LabVIEW drivers; Applications programming interface; Fully documented programmers manual (Example source code for getting started)
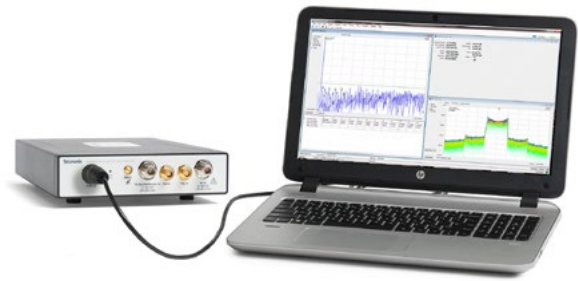
RSA500A Series

The RSA500A series offers rugged, portable real time spectrum analysis for interference hunting, spectrum management, network maintenance tasks and pre-compliance EMI/EMC testing. Capture, stream, analyze and record raw signal data without missing signals of interest to solve your toughest interference challenge. When equipped with the optional Tracking Generator with internal VSWR bridge, and Cable and Antenna testing software, the RSA500A becomes an indispensable field tool. Mapping, signal strength, signal recording and playback and many other options are available to tailor the RSA500A to your requirements.

MODEL	RSA503A	RSA507A	RSA513A	RSA518A
Description	Portable real time USB spectrum analyzer			
Frequency Range	9 kHz - 3.0 GHz	9 kHz - 7.5 GHz	9 kHz - 13.6 GHz	9 kHz - 18.0 GHz
Capture Bandwidth	40 MHz	40 MHz	40 MHz	40 MHz
Spurious Free Dynamic Range	–70 dBc	–70 dBc	–70 dBc	–70 dBc
Minimum Signal Duration for 100% Probability of Intercept	15 µs	15 µs	15 µs	15 µs

- Frequency range: 9 kHz-3.0/7.5/13.6/18.0 GHz / Acquisition bandwidth: 40 MHz
- Spurious-free dynamic range: 70 dB
- Full featured spectrum analysis capability with Tektronix SignalVu-PC software
- 17 spectrum & signal analysis measurements standard
- Over 15 options for modulation analysis, standards support, pulse, playback of recorded files, mapping, signal classification and more
- Tracking generator with gain/loss, cable loss, distance to fault, VSWR options
- Ruggedized Mil-Std PRF-28800F Class 2
- Weight: 8.5 pounds
- Standard integrated GPS receiver for mapping measurements; Standard Preamplifier

SHIPS WITH PRODUCT
Battery pack and charger, Carrying case, Ruggedized USB 3.0 cable, USB stick with SignalVu-PC software and all documentation

SIGNALVU-PC / DATAVU-PC LICENSES
Recommended SignalVu-PC or DataVu-PC application licenses (Floating and node-locked licenses available). Other applications available, see SignalVu-PC or DataVu-PC data sheet for details.
DVPC-MREC: Operate and record two RSA/300/500/600 spectrum analyzers simultaneously; DVPC-SPAN50NL: DataVu-PC Software for 50 MHz BW playback files; EMCVUxx-SVPC: EMI Pre-compliance and Troubleshooting Software; EMCVUNL-SVPC: EMI Pre-compliance and Troubleshooting, Node Locked (includes CISPR detectors); EMCVUFL-SVPC: EMI Pre-compliance and Troubleshooting, Floating (includes CISPR detectors); MAPxx-SVPC: Mapping Software; SV26xx-SVPC: APCO P25 phase 1 and 2 measurements; SV28xx-SVPC: LTE downlink (eNB) RF measurements; SV54xx-SVPC: Signal Classification/Survey; SV56xx-SVPC: Signal Playback: Enables playback and re-analysis of recorded R3F files; SV60xx-SVPC: VSWR, Return Loss, Distance to Fault, Cable Attenuation Measurements. Requires tracking generator on spectrum analyzer; SVAxx-SVPC: AM/FM/PM Direct Audio Measurements; SVMxx-SVPC: General Purpose Modulation Analysis, including demodulation for Zigbee and Bluetooth Enhanced Data Rate; SVPxx-SVPC: Pulse Measurement Software; SVTxx-SVPC: Settling Time (Frequency/Phase)

RECOMMENDED ACCESSORIES
DF-A0047: Smart Directional Antenna, 20-8500 MHz, with electronic compass and preamp; DF-A0047-01: Frequency range extension for DF-A0047 directional antenna, 9 kHz-20 MHz, requires DF-A0047; EMI-RE-HWPARTS: Bundle of EMI accessories for radiated pre-compliance test (includes EMI-BICON-ANT, EMI-CLP-ANT, EMI-PREAMP, EMI-TRIPOD, CABLE-5M, CABLE-1M; EMI-DEBUG-HWPARTS: Bundle of EMI accessories for Debug (includes EMI-NF-PROBE & EMI-NF-AMP); FZ-G1-x: Panasonic Touchpad Instrument Controller; RSA5600 RACK: Rackmount (holds 1 RSA500), Various Calibration Kits, Cables, Adapters; Various Calibration Kits for Cable and Antenna Measurements

INSTRUMENT OPTIONS
OPT 04: Tracking Generator: 10 MHz – to maximum range of instrument; OPT CTRL-G1-x: Portable controller, availability varies by region. Also available as separate item.

RECOMMENDED SERVICE
C3: Calibration Service 3 Years; C5: Calibration Service 5 Years; R5: Standard Warranty Extended to 5 years; D1: Calibration Data Report; D3: Calibration Data Report, 3 years (with option C3); D5: Calibration Data Report, 5 years (with option C5); G3: Three Year Gold Care; G5: Five Year Gold Care

RSA600A Series

The RSA600A series offers mid-range laboratory spectrum analysis at a remarkable price. Forty megahertz of standard analysis bandwidth enables analysis of the latest communications standards up to 802.11n, and real-time spectrum analysis reduces troubleshooting time by finding transient problems that other spectrum analyzers may miss. An available tracking generator with options for VSWR/Return loss and distance to fault enables component and antenna characterization. The RSA600A runs with SignalVu-PC or an application programming interface for automated measurements.

MODEL	RSA603A	RSA607A
Description	Laboratory real time USB spectrum analyzer	
Frequency Range	9 kHz - 3.0 GHz	9 kHz - 7.5 GHz
Capture Bandwidth	40 MHz	40 MHz
Spurious Free Dynamic Range	-70 dBc	-70 dBc
Minimum Signal Duration for 100% Probability of Intercept	100 µs	100 µs

- Frequency range: 9 kHz-3.0/7.5 GHz / Acquisition bandwidth: 40 MHz
- Spurious-free dynamic range: 70 dB
- Full featured spectrum analysis capability with Tektronix SignalVu-PC software
- 17 spectrum and signal analysis measurements standard
- Over 15 options for mapping, modulation analysis, standards support, pulse, playback of recorded files, and more
- Tracking generator with gain/loss, cable loss, distance to fault, VSWR options
- Small Laboratory form factor, power consumption less than 45 W
- Smaller than conventional spectrum analyzers; Weight: ~6.6 pounds (3 kg)
- Wideband modulation analysis.

SHIPS WITH PRODUCT
AC power cord, USB 3.0 cable, SignalVu-PC software and all documentation on USB stick

SIGNALVU-PC / DATAVU-PC LICENSES
Recommended SignalVu-PC or DataVu-PC application licenses (Floating and node-locked licenses available). Other applications available, see SignalVu-PC or DataVu-PC data sheet for details.
SV23xx-SVPC: WLAN 802.11a/b/g/j/p Measurement Software; SV24xx-SVPC: WLAN 802.11n Measurement Software; SV25xx-SVPC: WLAN 802.11ac Measurement Software; SV26xx-SVPC: APCO P25 phase 1 and 2 measurements; SV27xx-SVPC: Bluetooth Basic LE TX SIG measurements; SV28xx-SVPC: LTE downlink (eNB) RF measurements; SV54xx-SVPC: Signal Classification/Survey; SV56xx-SVPC: Playback of recorded signal files; SV60xx-SVPC: VSWR, Return Loss, Distance to Fault, Cable Attenuation Measurements. Requires tracking generator on your spectrum analyzer; SVAxx-SVPC: AM/FM/PM Direct Audio Measurements; SVMxx-SVPC: General Purpose Modulation Analysis, including demodulation for Zigbee and Bluetooth Enhanced Data Rate; SVPxx-SVPC: Pulse Measurement Software; SVTxx-SVPC: Settling Time (Frequency and Phase); DVPC-MREC: Operate and record two RSA/300/500/600 spectrum analyzers simultaneously; DVPC-SPAN50NL: DataVu-PC Software for 50 MHz BW playback files; EMCVUNL-SVPC: EMI Pre-compliance and Troubleshooting, Node Locked (includes CISPR detectors); EMCVUFL-SVPC: EMI Pre-compliance and Troubleshooting, Floating (includes CISPR detectors)

RECOMMENDED ACCESSORIES
EMI-RE-HWPARTS: Bundle of EMI accessories for radiated pre-compliance test (includes EMI-BICON-ANT, EMI-CLP-ANT, EMI-PREAMP, EMI-TRIPOD, CABLE-5M, CABLE-1M; EMI-DEBUG-HWPARTS: Bundle of EMI accessories for Debug (includes EMI-NF-PROBE & EMI-NF-AMP); RSA5600 RACK: Rackmount (holds 2 RSA600), Various Calibration Kits, Cables, Adapters; Multiple Calibration Kits for Cable/Antenna measurements

INSTRUMENT OPTIONS
OPT 04: Tracking Generator: 10 MHz – to maximum range of instrument

RECOMMENDED SERVICE
C3: Calibration Service 3 years; C5: Calibration Service 5 years; R5: Standard Warranty extended to 5 years; D1: Calibration Data Report; D3: Calibration Data Report, 3 years (with option C3); D5: Calibration Data Report, 5 years (with option C5); G3: Three Year Gold Care; G5: Five Year Gold Care

AVAILABLE DOWNLOADS
SignalVu-PC base software; LabVIEW drivers; Applications programming interface; Fully documented programmers manual (Example source code for getting started)

RSA5000B
Real-Time Spectrum Analyzer

The RSA5000 Series mid-range Real-Time Spectrum Analyzer combines best-in-class RF performance with up to 165 MHz bandwidth and 6th 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.

MODEL	RSA5103B	RSA5106B	RSA5115B	RSA5126B
Capture Bandwidth	25 MHz, 40 MHz, 85 MHz, 125 MHz, 165 MHz			
Frequency Range	1 Hz - 3 GHz	1 Hz - 6.2 GHz	1 Hz - 15 GHz	1 Hz - 26.5 GHz
SFDR at 165 MHz BW (typical)	80 dBc	80 dBc	80 dBc	80 dBc
Minimum Event Duration for 100% POI	0.43 µs	0.43 µs	0.43 µs	0.43 µs

- Discover difficult to find signal behavior with DPX® Live RF spectrum display
- Save time by isolating signal anomalies on which other instruments can't even trigger
- Seamless data capture of entire duration of signal events, like frequency hopping sequences, PLL settling times, turn on transients, and multiple pulses
- Accelerate troubleshooting and analysis by pinpointing the root cause of problems in any/all domains at any time with correlated markers
- Most advanced Real-time capability
- Automatic pulse measurement and detection

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

INSTRUMENT OPTIONS
Opt. 09: Enhanced Real-Time; Opt. 10: AM/FM/PM Modulation and Audio Measurements; Opt. 11: Phase Noise / Jitter Measurement; Opt. 12: Settling Time (Frequency and Phase); Opt. 14: Noise Figure and Gain; Opt. 20: Pulse Signal Analysis; Opt. 21: General Purpose Modulation Analysis; Opt. 22: Flexible OFDM Analysis; Opt. 23: WLAN 802.1a/b/g Measurements; Opt. 24: WLAN 802.11n Measurements; Opt. 25: WLAN 802.11ac Measurements; Opt. 26: APCO P25 Measurement Application; Opt. 27: Bluetooth Basic LE TX SIG Measurements; Opt. 28: LTE FDD and TDD BTS Power and BTS ID; Opt. 32: EMI Pre-compliance and Troubleshooting; Opt. MAP: Mapping and Signal Strength; Opt. 53: Memory Extension, 4 GB Acquisition Memory Total; Opt. 54: Signal Classification/Survey; Opt. 65: Digital I and Q Output; Opt. B85: 85 MHz Acquisition Bandwidth; Opt. 300: High Performance Real-Time; Opt. B16x: 165 MHz Acquisition Bandwidth; Opt. B16xHD: High Dynamic Range, 85 MHz acquisition bandwidth; Opt. B25: 25 MHz Acquisition Bandwidth (no charge option); Opt. B40: 40 MHz Acquisition Bandwidth; Opt. B85HD: High Dynamic Range, 85 MHz acquisition bandwidth; Opt. B125: 125 MHz Acquisition Bandwidth; Opt. B125HD: High Dynamic Range, 125 MHz acquisition bandwidth

RECOMMENDED ACCESSORIES
119-4146-00: Near Field Probe Kit; EMI-RE-HWPARTS: Bundle of EMI accessories for radiated pre-compliance test (includes EMI-BICON-ANT, EMI-CLP-ANT, EMI-PREAMP, EMI-TRIPOD, CABLE-5M, CABLE-1M); EMI-DEBUG-HWPARTS: Bundle of EMI accessories for Debug (includes EMI-NF-PROBE & EMI-NF-AMP); 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

LEARN MORE ⬎ about Advanced Radar Analysis with the "Tool for Measuring Modern Radar" Application Note.

RSA7100A

The RSA7100A is a high performance spectrum analyzer focused on wideband analysis and signal recording. The RSA7100A wideband signal analyzer offers real-time spectrum analysis up to 800 MHz bandwidth and simultaneous streaming of seamless data at full bandwidth. It enables researchers in communications, Radar and Electronic Warfare to create next-generations designs. SignalVu-PC software is included for real time, spectrum and vector signal analysis, and DataVu-PC software is available for analysis of recorded signals.

MODEL	RSA7100A 14*	RSA7100A 26*
Description	Real-time signal analyzer, up to 800 MHz acquisition bandwidth	
Frequency Range	16 kHz – 14 GHz	16 kHz – 26.5 GHz
Capture Bandwidth	50 / 320 / 800 MHz	50 / 320 / 800 MHz
Spurious Free Dynamic Range	134 dBc at 1 GHz	134 dBc at 1 GHz
Minimum Signal Duration for 100% Probability of Intercept	700ns	700ns

* Only sold in UK and United States

- 16 kHz to 14/26.5 GHz frequency range covers a broad range of analysis needs
- High performance spectrum analysis for advanced design verification with -134 dBc/Hz phase noise at 1 GHz, 10kHz offset and amplitude accuracy of .05dB at 10 GHz to 26.5 GHz
- IQFlow™ streaming to RAID, LVDS, 40 GbE and an API provides the speed and flexibility needed to perform real-time DSP algorithms, and record/analyze long event sequences.
- A broad range of analysis tools are standard: channel power, ACLR, CCDF, OBW/EBW, spur search, EMI detectors amplitude, frequency, phase vs. time, DPX spectrum, and spectrograms. Correlated multi-domain displays
- Up to 800 MHz acquisition bandwidth, 320 MHz acquisition bandwidth standard
- The RSA7100A combined with SignalVu-PC application licenses offers advanced analysis plus 800 MHz bandwidth and streaming to internal RAID.
- With DataVu-PC you can search, mark and measure on up to 2,000,000 amplitude events or pulses in recorded files.

SHIPS WITH PRODUCT
Installation and safety manual, 3.5mm Crown Connector-Female, PCIe cable, mouse, keyboard, adapter, Mini-Display Port to HDMI, Mini-Display Port to DVI, Power cables, rack mount kits for acquisition unit and controller. Controller rack-mount is a 'telecom-style'. A server-style rackmount can also be used with the controller, available from third parties.

Note: A PC monitor is not included with the RSA7100A. Tektronix recommends the Dell UltraSharp U2414H 23.8 in. Widescreen IPS LCD Monitor, or any monitor that supports Display port, DVI or HDMI input and has a minimum 1920 x 1080 display resolution.

INSTRUMENT OPTIONS
RSA7100A GPS: GPS receiver; RSA7100A CAL: Calibration report with data (ISO 17025); RSA7100A GPS: CAL GPS receiver and calibration report with data (ISO17025); RSA7100A C7100-A: Controller, no RAID memory; RSA7100A C7100-B: Controller, RAID memory, >20 minutes recording time (requires STREAMNL-SVPC); RSA7100A C7100-C: Controller, RAID memory, > 120 minutes recording time (requires STREAMNL-SVPC); RSA7100A SV09: High performance real time (export class 3A002), node-locked license

SIGNALVU-PC / DATAVU-PC LICENSES
B800NL-SVPC: License, 800 MHz acquisition bandwidth - RSA7100A, Node Locked; STREAMNL-SVPC: License, Streaming data, Node Locked; SVMHNL-SVPC: License, General Purpose Modulation Analysis to work with analyzer of any acquisition bandwidth and MDO, Node Locked; SVPHNL-SVPC: License, Pulse Analysis to work with analyzer of any acquisition bandwidth and MDO, Node Locked; TRIGHNL-SVPC: License, Advanced triggers, RSA7100A only, Node Locked; MAPNL-SVPC: License, Mapping and signal strength, Node Locked; SV54NL-SVPC: License, Signal survey and classification, Node Locked; SVTNL-SVPC: License, Settling Time (frequency and phase) measurements, Node Locked; SV23NL-SVPC: License, WLAN 802.11a/b/g/j/p measurement, Node Locked; SV24NL-SVPC: License, WLAN 802.11n measurement (requires SV23), Node Locked; SV25HNL-SVPC: License, WLAN 802.11ac = measurement to work with analyzer of any acquisition bandwidth and MDO (requires SV23 and SV24), Node Locked; SV26NL-SVPC: License, APCO P25 measurement, Node Locked; SV27NL-SVPC: License, Bluetooth measurement, Node Locked; DVPC-SPAN1000-NL: DataVu Analysis of up to 1000mHz bandwidths, Floating
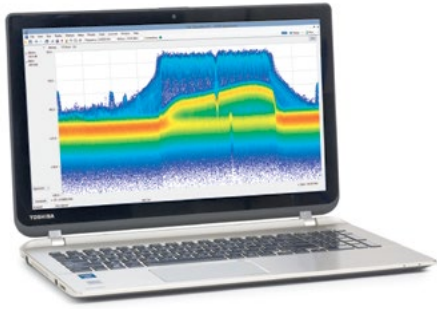
SignalVu-PC

SignalVu-PC vector signal analysis software helps you easily validate wideband designs. Using the signal analysis engine of the RSA5000 and RSA7100A Series on your computer or Windows tablet, you can now move your analysis of acquisitions off the instrument, and anywhere. SignalVu-PC directly controls the RSA306B and RSA500A/600A USB Spectrum Analyzers or the MDO4000C Mixed Domain Oscilloscope RF acquisition, enabling powerful measurements for spectrum analysis, vector signal analysis, pulse measurements, commercial wireless standards, and more. 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.

- Record/Playback of signals is available for the USB Spectrum Analyzers.
- Power measurements and signal statistics help you characterize components and systems: ACLR, Multicarrier ACLR, Power vs. Time, CCDF, and OBW/EBW.
- PC-based multi-domain vector signal analysis for waveforms acquired by Tektronix real-time signal analyzers and oscilloscopes.
- The basic features for SignalVu-PC are free of charge and available for download from Tek.com.
- Each option for SignalVu-PC is available as a Node Locked (NL) license or a Floating license (FL). You can try them for free with a 30-day trial license.
- DPX Spectrum
- Mapping and Signal Geolocation
- Bluetooth Signal Analysis

SIGNALVU-PC / DATAVU-PC LICENSES

SV23NL-SVPC, SV23FL-SVPC: WLAN 802.11a/b/g/j/p measurement

SV24NL-SVPC, SV24FL-SVPC: WLAN 802.11n measurement (requires SV23)

SV25NL-SVPC, SV25FL-SVPC: WLAN 802.11ac measurement to work with analyzer of acquisition bandwidth ≤ 40MHz (requires SV23 and SV24) or MDO

SV26NL-SVPC, SV26FL-SVPC: APCO P25 measurement

SV27NL-SVPC, SV27FL-SVPC: Bluetooth measurement to work with analyzer of acquisition bandwidth ≤ 40MHz or MDO

SV28NL-SVPC, SV28FL-SVPC: LTE Downlink RF measurement to work with analyzer of acquisition bandwidth ≤ 40MHz or MDO

SV54NL-SVPC, SV54FL-SVPC: Signal survey and classification

SV56NL-SVPC, SV56FL-SVPC: Playback of recorded files

SV60NL-SVPC, SV60FL-SVPC: VSWR, Return Loss, Distance to Fault cable and antenna measurements. Required tracking

SV2CNL-SVPC, SV2CFL-SVPC: WLAN 802.11a/b/g/j/p/n/ac and live link to MDO4000C to work with analyzer of acquisition bandwidth ≤ 40MHz or MDO

SVANL-SVPC, SVAFL-SVPC: AM/FM/PM/Direct Audio Analysis

SVMNL-SVPC, SVMFL-SVPC: General Purpose Modulation Analysis to work with analyzer of acquisition bandwidth ≤ 40MHz or MDO

SVONL-SVPC, SVOFL-SVPC: Flexible OFDM Analysis

SVPNL-SVPC, SVPFL-SVPC: Pulse Analysis to work with analyzer of acquisition bandwidth ≤ 40MHz or MDO

SVTNL-SVPC, SVTFL-SVPC: Settling Time (frequency and phase) measurements

CONNL-SVPC, CONFL-SVPC: SignalVu-PC live link to the MDO4000C series mixed-domain oscilloscopes

EDUFL-SVPC: Education-only version of all modules for SignalVu-PC

MAPNL-SVPC, MAPFL-SVPC: Mapping

EMCVUNL-SVPC: License, EMI Pre-compliance and Troubleshooting (not for RSA7100), Node locked (includes CISPR detectors)

EMCVUFL-SVPC: License, EMI Pre-compliance and Troubleshooting (not for RSA7100), Floating (includes CISPR detectors)

RSA5000B Opt. 32: EMI Pre-compliance and Troubleshooting for RSA5000B

LEARN MORE � about the signals around you by downloading the SignalVu-PC "eGuide to RF Signals."
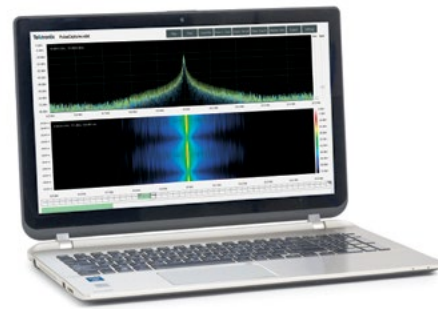
DataVu-PC

DataVu-PC can be used to record 1 or 2 USB Spectrum Analyzers. For the USB Spectrum Analyzers, this can include a controlling one instrument to search while the second instrument can stare and record the signal. Alternatively, both instruments could record simultaneously. Once the recording is made, DataVu can play back and process the larger recorded files an all USB Tektronix spectrum analyzers, as well as from the RSA7100A. DataVu-PC can turn hours of attended monitoring into fast post-acquisition search, mark, and measurement tasks. Analyzer your results and search for specific signal artifacts with a mask search.

- Record and frequency scan on 2 instruments simultaneously.
- Search based on signal amplitude characteristics, marking each event occurrence for later examination.
- Make an unlimited number of Scalar pulse measurements with the eMarker application and export the results in Pulse Descriptor Word format for integration into other.
- Export results to in-depth analysis packages like SignalVu-PC from within DataVu-PC – without any additional conversion software.
- Time overview views the whole file at once, controls start-stop time of analysis.
- DataVu PC basic application license based on acquisition bandwidth, three bandwidths available.
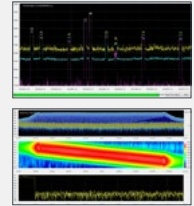
DATAVU-PC LICENSES

DVPC-SPAN50NL: DataVu-PC operation on acquisitions to 50 MHz bandwidth, Node Locked License

DVPC-SPAN50FL: DataVu-PC operation on acquisitions to 50 MHz bandwidth, Floating License

DVPC-SPAN200NL: DataVu-PC-PC operation on acquisitions to 200 MHz bandwidth, Node Locked License

DVPC-SPAN200FL: DataVu-PC operation on acquisitions to 1000 MHz bandwidth, Floating License

DVPC-SPAN1000NL: DataVu-PC operation on acquisitions to 1000 MHz bandwidth, Node Locked License

DVPC-SPAN1000FL: DataVu-PC operation on acquisitions to 1000 MHz bandwidth, Floating License

DVPC-PULSENL: DataVu-PC pulse analysis including frequency mask, Node Locked License

DVPC-PULSEFL: DataVu-PC pulse analysis including frequency mask, Floating License

DVPC-MREC-NL: Multi-unit recording for USB analyzers, Node Locked

DVPC-MREC-FL: Multi unit recording for USB analyzers, Floating

RF Application Solutions

Bluetooth®

Get your design to market faster

- Perform Bluetooth SIG standard-based transmitter RF measurements in time, frequency and modulation domains
- Customizable limits and Bluetooth pre-sets for push-button testing
- Option for Bluetooth Low Power v5

tek.com/application/bluetooth-testing-and-analysis-1#content
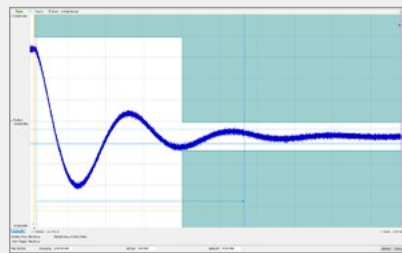
Settling Time (Frequency and Phase) Analysis

Easy setup; automated time measurements

- User defined measurement bandwidth, tolerance bands and reference frequency
- Establish up to 3 tolerance bands vs. time for pass/fail testing
- Reference time settings to external or internal triggers, and from the last settled frequency or phase

tek.com/product-software-series/signalvu-pc
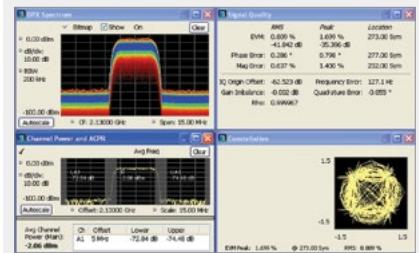
General Modulation Analysis

User-friendly, advanced RF analysis

- Error Vector Magnitude, Modulation Error Rate, Magnitude Error, and more
- Support for 27 different modulation schemes, including 256 QAM, CPM, nFSK, and others
- Sync word search to lock on constellations, Burst Mode to detect and analyze modulation quality on bursted signals
- Useful for measuring modulation quality of Zigbee, Bluetooth EDR, TETRA, and DVB-S devices
- Allows OFDM analysis for signals that are close in format to 802.11a or 802.16.d (fixed WiMAX) signals

tek.com/product-software-series/signalvu-pc
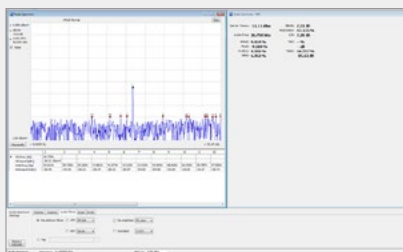
AM/FM/PM Direct Audio Measurements

Tools for comprehensive audio measurements

- Carrier power, frequency error, modulation frequency, modulation parameters SINAD, modulation distortion, S/N,THD, hum and noise
- Preset or user-defined high pass, low pass and deemphasize filters

tek.com/product-software-series/signalvu-pc
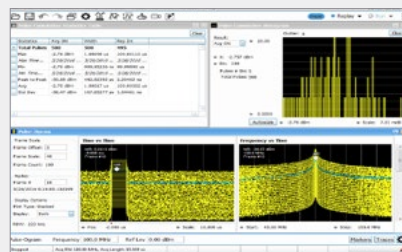
Pulse Analysis

Performance, precision and insight for radar and electronic warfare designs

- 31 individual measurements to automatically characterize long pulse trains
- Cumulative statics of key performance indicators and histograms for thorough analysis

tek.com/product-software-series/signalvu-pc
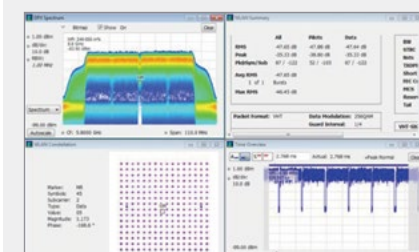
WLAN Analysis

Perform transmitter measurements in the time, frequency, and modulation domains

- Physical layer RF transmitter measurements supporting IEEE 802.11a/b/g/j/p/n/ac standards for up to 160 MHz
- Robust measurement summary reporting

tek.com/product-software-series/signalvu-pc

RF Application Solutions
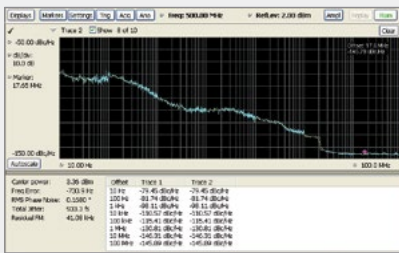
Phase Noise and Jitter Measurements for the RSA5000 Series

Measurement margin for the task

- 10 Hz to 1 GHz frequency offset range, log frequency scale traces -2
- ± Peak trace, average trace, trace smoothing and averaging

tek.com/datasheet/spectrum-analyzer
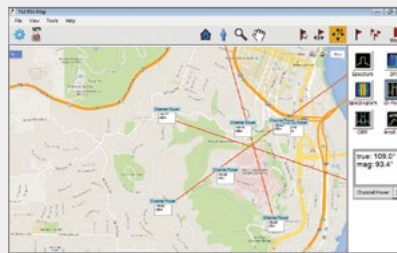
Mapping

Accurately locate signals of interest fast

- Azimuth function to draw lines or arrows on a map
- Integrates with GPS and other Global Satellite Navigation receivers
- Plot measurements based on time or distance traveled

tek.com/product-software-series/signalvu-pc
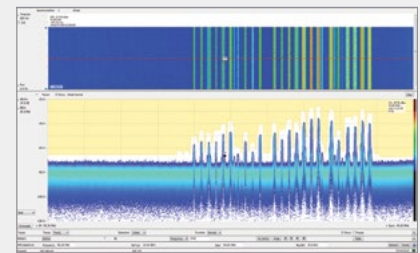
Playback of Recorded Files

Reduce hours of watching and waiting for spectral violations to minutes

- Capture hours of recorded data for real-time or post analysis
- Advanced frequency masks, with actions on mask violations including beep, stop, save trace, picture and data
- Support for numerous file formats including MIDAS

tek.com/product-software-series/signalvu-pc

EMCVu

Reduce EMI compliance design and test costs

- Automated easy-to-use Set-Up Wizard, robust measurements and reporting capabilities
- Push button support for FCC, MIL-STD, DEF-STAN and CISPR regulations
- Harmonic markers and faster scans using peak detector, quasi-peak and average detector failures

tek.com/landing-page/emcvu-software-and-accessories
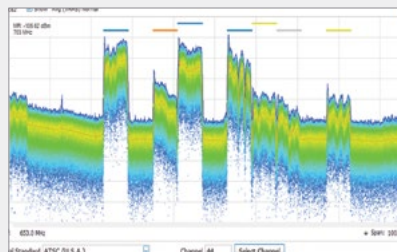
Signal Survey/Classification

Efficiently locate, classify and sort signals

- Graphical tools to quickly create a spectral region of interest
- Quickly classify WLAN, GSM, W-CDMA, CDMA, Bluetooth, LTE FDD and TDD, and ATSC signals

tek.com/product-software-series/signalvu-pc

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.

	SERIES 2400 GRAPHICAL BENCH SOURCEMETER SMU INSTRUMENTS	SERIES 2400 BENCH SOURCEMETER® SMU INSTRUMENTS	SERIES 2600B SYSTEM SOURCEMETER® SMU INSTRUMENTS	2650A HIGH POWER SYSTEM SOURCEMETER® SMU INSTRUMENTS	2450/2460-EC GRAPHICAL POTENTIONSTATS
Channels	1 (optional expansion to 32 via TSP-Link®)	1	1,2,4 (optional expansions to 64 via TSP-Link®)	1 (optional expansion to 32 via TSP-Link®)	1
Accuracy	6½-digit measurements	6½-digit measurements	6½-digit measurements	6½-digit measurements	6 ½-digit measurements
Max. Readings / Second	Up to 1,000,000	2,000	20,000	38,500 1µSec/pt., 18-bit digitizer	3000
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	GPIB, USB 2.0, LXI/Ethernet. Digital I/O
Application Features	Capabilities of analyzers, curve tracers, and I-V systems at a fraction of their cost; touchscreen and icon menu; 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	Perform Cyclic, Squarewave, or Galvanic Voltammetry, Chronoamperometry, and Chronopotentiometry
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	TSP® (Test Script Processing) technology embeds complete test programs inside the instrument for unmatched system-level speed
Software	Test Script Builder and KickStart Instrument Control Software, LabVIEW and IVI drivers	LabVIEW and IVI drivers	Built-in, web browser-based characterization software, KickStart Instrument Control Software, LabVIEW and IVI drivers	Built-in, web browser-based characterization software, LabVIEW and IVI drivers	Test Script Builder,Pre-loaded application scripts, LabVIEW and IVI drivers

CHOOSING YOUR SOURCE MEASURE (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, the higher the bit count on the ADC and the higher the accuracy.

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.

2450/2460/2461 Graphical Touchscreen

Touch, Test, Invent® with the intuitively smart, interactive SMU Instruments. The 2450, 2460, and 2461 SMU Instruments are innovative, compact I-V solutions that offer 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, these graphical user interface instruments **enable users to learn faster, work smarter, and invent easier.**

A Smart Toolkit Beyond the Touchscreen

Speed, ease of use, and learnability does not stop with the advanced touchscreen. Each instrument's 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.

TYPICAL APPLICATIONS

The Series 2400 are ideal for I-V functional test and characterization of a wide range of today's modern devices, including: Low and High Power Semiconductors; LEDs, High Brightness LEDs; Solar Cells, Solar Panels; Nanomaterials and Devices; Graphene; Printed/Flexible Electronics; Batteries/Electrochemistry; Sensors; Biotechnology

- 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 (100 nA, 10 nA, 20 mV) reduce need for additional expensive low level instruments (2450)
- High current and high power ranges (7 A, 100 W DC, 2460; 10 A, 1000 W Pulse, 2461) for characterizing and testing high power materials and devices
- Kickstart Instrument Control Software for the PC enables instrument control without programming. Download at www.tek.com/keithley-kickstart.
- Four programming modes provide unmatched programming flexibility and system integration.
- 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.
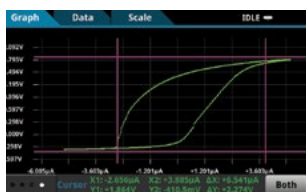
Built-in functions like real-time graphing, histogram charting, and scope-like cursors simplify converting test results into useful information.

2450/2460/2461
SourceMeter® SMU Instruments

The 2450, 2460 and 2461 are based on the trusted analog performance of Keithley's Series 2400 SourceMeter SMU Instruments and offer a highly flexible, four-quadrant voltage and current source/load coupled with precision voltage and current meters. These fourth-generation members of Keithley's award-winning SMU family provide the superior precision, resolution, accuracy, and dependability that users have come to expect from Keithley SMU instruments.

MODEL	2450, 2450-NFP[*1], 2450-RACK[*2], 2450-NFP-RACK[*3]	2460, 2460-NFP[*1], 2460-RACK[*2], 2460-NFP-RACK[*3]	2461, 2461-NFP[*1], 2461-RACK[*2], 2461-NFP-RACK[*3]
Current Max / Min	1.000000 A / 10.00000 nA	7.000000 A / 1.000000 µA	10.00000 A / 1.000000 µA
Voltage Max / Min	200.0000 V / 20.00000 mV	100.0000 V / 200.0000 mV	100.0000 V / 200.0000 mV
Power	20 W	100 W	1000 W

[*1] No Front Panel, [*2] No Handle, [*3] No Front Panel or Handle

- 4-quadrant design simultaneously sources and measures voltage, current, and resistance
- Advanced, five-inch touchscreen user interface with multi-point, pan-pinch-zoom-swipe operation
- Graphical interface enables I-V curve tracing functionality
- Lower current and voltage measurements (2450 range: 100 nA, 10 nA, 20 mV)
- High current/high power (ranges: 2460: 7 A, 100 W DC; 2461: 10 A, 1000 W Pulse)
- Front panel banana jack inputs and rear panel connections (triaxial connectors on 2450, mass terminated screw terminal on 2460/2416)
- GPIB, LAN (LXI), USB interfaces
- Kickstart Instrument Control Software for the PC enables instrument control without programming. Download at www.tek.com/keithley-kickstart

SHIPS WITH PRODUCT
8608: High Performance Test Leads
2460-KIT: Rear Panel Mating Mass Terminated Screw Connector (2460/2461 only)
USB-B-1: USB Cable, Type A to Type B, 1m (3.3 ft)
CS-1616-3: Safety Interlock Mating Connector
174694600: TSP-Link®/Ethernet Cable (1.5 m)
User Documentation
QuickStart Guide
Test Script Builder Software (available at www.tek.com)
LabVIEW® and IVI Drivers (available at www.tek.com)

RECOMMENDED ACCESSORIES
5805: Kelvin (4-Wire) Spring-Loaded Probes
5808: Low Cost Single-pin Kelvin Probe Set
8607: 2-Wire, 1000 V Banana Cables, 1 m (3.3 ft.)
CS-1616-3: Safety Interlock Mating Connector

RECOMMENDED SERVICE
24XX-3Y-EW: 1-year factory warranty extended to 3 years from date of shipment
24XX-5Y-EW: 1-year factory warranty extended to 5 years from date of shipment
C/24XX-3Y-17025: KeithleyCare® 3-year ISO 17025 Calibration Plan
C/24XX-3Y-DATA: KeithleyCare® 3-year Calibration w/Data Plan
C/24XX-3Y-STD: KeithleyCare® 3-year Std. Calibration Plan
C/24XX-5Y-17025: KeithleyCare® 5-year ISO 17025 Calibration Plan
C/24XX-5Y-DATA: KeithleyCare® 5-year Calibration w/Data Plan
C/24XX-5Y-STD: KeithleyCare® 5-year Std. Calibration Plan

LEARN MORE ↘ Download "There's an Unsung Hero on Your Workbench"

Series 2400
SourceMeter® SMU Instruments

Series 2400 SourceMeter® SMU instruments are single-channel models with I-V capability from 1100 V to 100 nV and 5.25 A to 10 pA. They offer a smart alternative to separate power supplies and digital multimeters (DMMs) and provide a convenient DMM-like user interface.

MODEL	2400 / 2401	2410	2440	2420
Current Max / Min	1.05 A /10 pA	1.05 A /10 pA	5.25 A /100 pA	3.15 A /100 pA
Voltage Max / Min	200 V/1 μV (20 V 2401)	1100 V/1 μV	40 V/1 μV	Up to 60 V/1 μV
Power	20 W	20 W	50 W	60 W

- Wide I-V range from 1100 V to 100 nV and 5.25 A to 10 pA
- 4-quadrant design simultaneously measures voltage, current, and resistance
- Remote sense on V-source and measure plus guarded ohms mode
- Built-In test sequencer
- IVI and LabVIEW drivers available (tek.com)
- Standard GPIB and RS-232 interfaces; Banana (front/rear) Connectors
- Kickstart Instrument Control Software for the PC enables instrument control without programming. Download at www.tek.com/keithley-kickstart.

SHIPS WITH PRODUCT
8605 Test Leads
LabVIEW Software Driver (downloadable at www.tek.com)
Calibration Certificate (Basic)
User Documentation
Power Cord
Warranty

RECOMMENDED ACCESSORIES
5804: Kelvin (4-Wire) Universal 10-Piece Test Lead Kit
5805: Kelvin (4-Wire) Spring-Loaded Probes
5809: Low Cost Kelvin Clip Lead Set
8607: 2-Wire, 1000 V Banana Cables, 1 m (3.3 ft)
CA-18-1: Shielded Dual Banana Cable, 1.2 m (4 ft)
7007-1: Shielded GPIB Cable, 1 m (3.3 ft)
7007-2: Shielded GPIB Cable, 2 m (6.6 ft)
KPCI-488LPA: IEEE-488 Interface/Controller for the PCI Bus
KUSB-488B: IEEE-488 USB-to-GPIB Interface Adapter
8501-1: Trigger Link Cable, DIN-to-DIN, 1 m (3.3 ft)
8501-2: Trigger Link Cable, DIN-to-DIN, 2 m (6.6 ft)

RECOMMENDED SERVICE
C/2400-3Y-17025: (ISO-17025 accredited) calibrations within 3 yrs. of purchase for 2400*
C/2401-3Y-17025: (ISO-17025 accredited) calibrations within 3 yrs. of purchase for 2401*
C/2410-3Y-17025: (ISO-17025 accredited) calibrations within 3 yrs. of purchase for 2410*
C/2420-3Y-17025: (ISO-17025 accredited) calibrations within 3 yrs. of purchase for 2420*
*Not available in all countries.

LEARN MORE ⬎ Download the White Paper "Choosing the Optimal Source Measurement Unit Instrument for Your Test and Measurement Application."

2450-EC, 2460-EC, and 2461-EC
Graphical Potentionstats

The 2450-EC, 2460-EC, and 2461-EC Potentiostats are versatile instruments, particularly well-suited for research and development in fundamental electrochemical lab research, characterizing the next generation of materials and electrolytes, new energy storage devices, and faster, smaller sensors. Each potentiostat comes preloaded with application tests to perform Cyclic Voltammetry, Chronoamperometry, and Chronopotentiometry.

MODEL	2450-EC	2460-EC	2461-EC
Current Max / Min	1 A/10 nA	7 A/1 μA	10 A/1 μA
Voltage Max / Min	200 V/20 mV	100 V/200 mV	100 V/200 mV
CV Scan Rate	0.1 mV/s to 3500 mV/s	0.1 mV/s to 3500 mV/s	0.1 mV/s to 3500 mV/s
Applications	Cyclic Voltammetry, Open Circuit Potential, Potential Pulse and Square Wave, Current Pulse and Square Wave, Chronoamperometry, Chronopotentiometry		

- Perform Cyclic, Squarewave, or Galvanic Voltammetry, Chronoamperometry, and Chronopotentiometry
- Simplified user interface for faster test setup and analysis of results
- Real-time plotting of voltammograms on the front panel
- Analytical graph cursors for immediate analysis of results without the need for a PC
- Create libraries of reusable, customizable experimental software with built-in open source scripting
- Screen capture function allows copying test results from the display to reports
- The 2450-EC can be easily connected to a 3-electrode cell.
- Built-in real-time graphing, charting, and scope-like cursors simplifies converting test results into useful information.

SHIPS WITH PRODUCT
Electrochemistry Translation Cable Accessory Kit
8608: High Performance Test Leads
USB-B-1: USB Cable, Type A to Type B, 1 m (3.3 ft)
CS-1616-3: Safety Interlock Mating Connector
174694600: TSP-Link/Ethernet Cable (1.5 m)
User Documentation
Application Test Scripts and Documentation
Test Script Builder Software (available at www.tek.com)
LabVIEW and IVI Drivers (available at www.tek.com)

RECOMMENDED ACCESSORIES
5805: Kelvin (4-Wire) Spring-Loaded Probes
5808: Low Cost Single-pin Kelvin Probe Set
8607: 2-Wire, 1000V Banana Cables, 1 m (3.3 ft.)

RECOMMENDED SERVICE
24XX-EC-3Y-EW: 1 Year Factory Warranty extended to 3 years from date of shipment
24XX-EC-5Y-EW: 1 Year Factory Warranty extended to 5 years from date of shipment
C/24XX-3Y-17025: KeithleyCare® 3 Year ISO 17025 Calibration Plan
C/24XX-3Y-DATA: KeithleyCare 3 Year Calibration w/Data Plan
C/24XX-3Y-STD: KeithleyCare 3 Year Std. Calibration Plan
C/24XX-5Y-17025: KeithleyCare 5 Year ISO 17025 Calibration Plan
C/24XX-5Y-DATA: KeithleyCare 5 Year Calibration w/Data Plan
C/24XX-5Y-STD: KeithleyCare 5 Year Std. Calibration Plan
C/New Data: Calibration Data for New Units
C/New Data ISO: ISO-17025 Calibration Data for New Units

LEARN MORE ⬎ Download "Performing Cyclic Voltammetry Measurements Using 2450-EC or 2460-EC Electrochemistry Lab Systems" Application Note.

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, 2400 software emulation, and Java-based plug & play test software. Series 2600B models offer the industry's widest dynamic range: 10 A pulse to 0.1 fA and 200 V to 100 nV.

MODEL	2601B	2602B	2604B	2611B	2612B
Current Max / Min	3 A DC, 10 A pulse/100 fA	3 A DC, 10 A pulse/100 fA	3 A DC, 10 A pulse/100 fA	1.5 A DC, 10 A pulse/100 fA	1.5 A DC, 10 A pulse/100 fA
Voltage Max / Min	40 V/100 nV	40 V/100 nV	40 V/100 nV	200 V/100 nV	200 V/100 nV
Max Readings / Sec	20,000	20,000	20,000	20,000	20,000
No. of Channels	1	2	2	1	2

MODEL	2614B	2634B	2635B	2636B
Current Max / Min	1.5 A DC, 10 A pulse/100 fA	1.5 A DC, 10 A pulse/1 fA	1.5 A DC, 10 A pulse/0.1 fA	1.5 A DC, 10 A pulse/0.1 fA
Voltage Max / Min	200 V/100 nV	200 V/100 nV	200 V/100 nV	200 V/100 nV
Max Readings / Sec	20,000	20,000	20,000	20,000
No. of Channels	2	2	1	2

- 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
- Download IVy mobile app for quick and easy device characterization. Available for iPhone, iPad and for Android devices.
- GPIB, LAN (LXI), USB and RS-232
- Kickstart Instrument Control Software for the PC enables instrument control without programming. Download at www.tek.com/keithley-kickstart.

SHIPS WITH PRODUCT
Operators and Programming Manuals
2600-ALG-2: Low Noise Triax Cable with Alligator Clips, 2 m (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)
174694600: TSP-Link®/Ethernet Cable (1.5 m) (two per unit)
Test Script Builder Software (download at www.tek.com)
LabVIEW Driver (downloadable at www.tek.com)
ACS Basic Edition Software (optional)
Download IVy mobile app for quick and easy device characterization. For iPhone, iPad and for Android devices from the App Store and from Google Play Store.

RECOMMENDED ACCESSORIES
2600-BAN: Banana Test Leads Adapter
8606: Probe Kit for 2600-BAN

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)

LEARN MORE ⬎ Download "Simplifying DC-DC Converter Characterization" Application Note.

2606B High Density SourceMeter® SMU Instrument

The 2606B High Density System SourceMeter (SMU) Instrument offers four 20-watt SMU channels in a 1U high form factor chassis. The 2606B improves density by 3 times and minimizes the need to add additional racks of test equipment. This SMU is the perfect solution for production testing of Laser Diodes, LEDs, 2- and 3-terminal semiconductors and much more.

MODEL	2606B
Current Max / Min	3 A DC, 3 A pulse/100 fA
Voltage Max / Min	20 V/100 nV
Max Readings / Sec	20,000
No. of Channels	4

- Four-channel stackable SMU instrument in a single 1U full rack chassis
- Incorporates the capabilities of two of the industry leading 2602B SMUs.
- Tightly-integrated voltage/current source and measure instruments offer best in class performance with 6½-digit resolution
- TSP technology embeds complete test programs inside the instrument for best-in-class system-level throughput
- TSP-Link expansion technology for multi-channel parallel test without a mainframe
- TSP technology executes complete test programs from the 2600B's non-volatile memory.

SHIPS WITH PRODUCT
CA-180-16: LAN Crossover cable, 0.41 m (16 in.) (2 included); 174710700: Shielded CAT5 Crossover Cable for TSP-Link and direct Ethernet connection, 1.5 m (5 ft.); CA-568: Green and yellow ground cable, 3 m (120 in.); 2600-KIT: Eight-pin custom cable connector, cable housing, and strain relief (4 included); 7709-308A: 25-pin D-shell connector kit (for Digital I/O port) (2 included); 4299-13: 1U Fixed Rack Mount Kit (minimum 0.686 m (27 inches) rail depth required); Power Line Cord: Country Dependent; Test Script Builder Software: Download from www.tek.com; LabVIEW Driver: Download from www.tek.com; User's Manual: Download from www.tek.com

AVAILABLE ACCESSORIES
Cables and Connectors
2600-BAN: Banana Test Leads/Adapter Cable.
2600-KIT: Extra screw terminal connector, strain relief, and cover
2600-FIX-TRIAX: Phoenix-to-Triax Adapter for 2 wire sensing
2600-TRIAX: Phoenix-to-Triax Adapter for 4 wire sensing
7078-TRX-*: 3-Slot, Low Noise Triax Cable, 0.3 m–6.1 m. Use with 2600-TRIAX Adapter
* = 1, 3, 5, 10, 12, 20 (for 0.3 m, 0.9 m, 1.5 m, 3.0 m, 3.5 m, 6.0 m respectively)
7078-TRX-GND: 3-Slot Male Triax to BNC adapter (guard removed)
7709-308A: Digital I/O Connector (model specific)
8606: High Performance Modular Probe Kit. For use with 2600B-BAN
Digital I/O, Trigger Link, and TSP-Link
2600-TLINK: Digital I/O to TLINK Adapter Cable, 1 m
CA-126-1A: Digital I/O and Trigger Cable, 1.5 m
174710700: Shielded CAT5 Crossover Cable for TSP-Link and direct Ethernet connection, 1.5 m (5 ft.)

RECOMMENDED SERVICE
2606B-EW: 1 Year Factory Warranty extended to 2 years; 2606B-3Y-EW: 1 Year Factory Warranty extended to 3 years; 2606B-5Y-EW: 1 Year Factory Warranty extended to 5 years; C/2606B-3Y-STD: 3 Calibrations within 3 years C/2606B-5Y-STD: 5 Calibrations within 5 years; C/2606B-3Y-DATA: 3 Calibrations within 3 years and includes calibration data before and after adjustment; C/2606B-5Y-DATA: 5 Calibrations within 5 years and includes calibration data before and after adjustment; C/2606B-3Y-17025: 3 ISO-17025 accredited calibrations within 3 years; C/2606B-5Y-17025: 5 ISO-17025 accredited calibrations within 5 years.

Series 2650A High Power System SourceMeter® SMU Instruments

The high current 2651A and high voltage 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.

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

- Source and measure up to 3 kV or 50 A pulse, with best-in-class low current resolution
- Up to 2000 W pulse or 200 W 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 1 µs/point, enabling full simultaneous characterization of both current and voltage waveforms.

SHIPS WITH PRODUCT
7709-308A: Digital I/O and Interlock Connector
174694600: TSP-Link®/Ethernet Cable (1.5 m)
User Documentation
Test Script Builder Software (available at www.tek.com)
2651A-KIT-1A: Low Impedance Cable Assembly (1 m) (2651)
CS-1592-2: High Current Phoenix Connector (male) (2651)
CS-1626-2: High Current Phoenix Connector (female) (2651)
CA-557-1: Sense Line Cable Assembly (1 m) (2651)

RECOMMENDED ACCESSORIES
2600-KIT: Low Impedance Cable Assemble, 1 m (3.3 ft)
ACS-BASIC: Component Characterization Software
4299-6: Rack Mount Kit
8011: Test Socket Kit
8010: High Power Device Test Fixture (2657A)
8020: High Power Interface Panel
2657A-LIM-3: Low Interconnect Module (2657A)
2657A-PM-200: 200V Protection Module (2657A)
SHV-CA-553-2: High Voltage Triax to SHV Cable (1, 2, 3m) (2657A)
HV-CA-554-2: High Voltage Triax to Triax Cable (0.5, 1, 2, 3m) (2657A)
HV-CA-571-3: High Voltage Triax to Unterminated Cable (2657A)
HV-CS-1613: High Voltage Triax Feedthrough Connector (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

LEARN MORE ⬎ Download "Creating Multi-SMU Systems with High Power System SourceMeter Instruments" Application Note.

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.

	2110	DMM4020	2000, 2100	DMM6500	DMM7510	DMM4040/4050	2001, 2010	2002	DMM7512
Measurement Channels	1	1	1	1	1	1	1	1	2
Resolution	5½ digit	5½ digit	6½ digit	6 ½ digit	7½ digit	6½ digit	7½ digit	8½ digit	7 ½ digit
Basic Accuracy	0.012%	0.015%	0.0038% (2100) 0.0030% (2000)	0.0025%	0.0014%	0.0035% (DMM4040) 0.0024% (DMM4050)	0.0024%	0.0010%	0.0014%
Optional Switch Functions	Not Applicable	Not Applicable	10 Channel (2000)	10 channel	Future	Not Applicable	10 Channel	10 Channel	Not Applicable
Interface	USB-TMC GPIB Option	RS-232, RS-232 to USB device adapter included	GPIB, RS-232 (2000) USB-TMC (2100)	Ethernet-LXI, USB Device-TMC, USB-Host, Optional GPIB, RS-232, or TSP-LINK	GPIB, USB Device-TMC, Ethernet-LXI, USB-Host, TSP-Link	USB host, RS-232, GPIB, Ethernet, RS-232 to USB device adapter included	GPIB, RS-232 (2010) GPIB (2001)	GPIB	USB Device-TMC, Ethernet-LXI, USB-Host, TSP-Link
Software w(Software and drivers available at tek.com/keithley)	KI-Tool and KI-Link Startup Software, LabVIEW and IVI drivers.	—	KI-Tool and KI-Link Startup Software (2100 only), LabVIEW and IVI drivers.	KickStart Instrument Control Software, LabView, IVI-COM/IVI-C drivers, Keithley LXI Discovery Browser, Test Script Builder	KickStart Instrument Control Software, LabVIEW, IVI-COM/IVI-C, drivers, Keithley LXI Discovery Browser, Test Script Builder	—	LabVIEW Driver	LabVIEW Driver	IVI-COM/IVI-C drivers, Keithley LXI Discovery Browser, Test Script Builder

CHOOSING YOUR DIGITAL MULTIMETER

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

Many of Keithley's DMMs include the capability to add a scanner accessory, enabling measurements on multiple test points or devices.
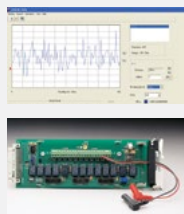
2000, 2100, 2110

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 bench-top instruments and as components in test systems.

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

- Exceptional 6½-digit measurement integrity with high speed throughput (2000)
- Built-in slot for scanner card (2000)
- 15 built-in measurement functions including thermocouples (2110)
- Full featured DMMs at a value price
- USB Test and Measurement Class (USBTMC) interface (2110 and 2100)
- The KI-Tool application for the 2100 provides charting and graphing capabilities without programming.
- For multi-point measurement, plug a scanner card into the 2000.

SHIPS WITH PRODUCT

Safety Test Leads
User Documentation
USB Cable (2100/2110)
KI Tool and KI Link Software (2100/2110)
Calibration Certificate
Power Cord
1-year Warranty
3-year Warranty (2110)

RECOMMENDED ACCESSORIES

2000-SCAN: 10-channel Scanner Card (2000)
2001-SCAN: 10-channel Scanner Card with Two High-speed Channels (2000)
2001-TSCAN: 9-channel Thermocouple Scanner Card (2000)
5808: Low cost, Single Pin, Kelvin Probes
5805: Kelvin Probes, 0.9 m (3 ft)
5805-12: Kelvin Probes, 3.6 m (12 ft)
5809: Low Cost, Kelvin Clip Lead Set
7007-1: Shielded GPIB Cable, 1 m (3.3 ft)
7007-2: Shielded GPIB Cable, 2 m (6.6 ft)
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 (2000, 2100)
4299-3: Single Rack Mount Kit (2100 and 2110)
4299-4: Dual Rack Mount Kit (2100 and 2110)

LEARN MORE ⬎ Download "Using the Dual Measurement Functionality and Dual Measurement Display" Application Note.

2001, 2002, 2010

2001/2002   **2010**

Each 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.

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

- Measurement functions include temperature, 4-wire resistance, peak detection, low ohms, and Keysight 3458A emulation (2002)
- Built-in slot for scanner card
- Multiple measurement display (2001 and 2002)
- Dry circuit measure function limits test voltage when testing contact or connector resistances (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 (2001/2002) to simultaneously display different aspects of one signal.

SHIPS WITH PRODUCT

8605: High Performance Modular Test Leads (2001, 2002)
1751: Safety Test Leads (2010)
Calibration Data (2001, 2002)
Calibration Certificate (2010)
Quick Reference Guide
User Manual, Service Manual
Power Cord
1-year Warranty

RECOMMENDED ACCESSORIES

2000-SCAN: 10-channel Scanner Card (2000)
2001-SCAN: 10-channel Scanner Card with Two High-speed Channels (2000)
2001-TSCAN: 9-channel Thermocouple Scanner Card (2000)
5805: Kelvin Probes, 0.9 m (3 ft)
5805-12: Kelvin Probes, 3.6 m (12 ft)
5808: Low cost, Single Pin, Kelvin Probes
5809: Low Cost, Kelvin Clip Lead Set
7007-1: Shielded GPIB Cable, 1 m (3.3 ft)
7007-2: Shielded GPIB Cable, 2 m (6.6 ft)
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

LEARN MORE ⬎ about Peak Detection with the Model 2001 DMM.

DMM7510 7½-Digit Graphical Sampling Multimeter

The DMM7510 combines all the advantages of a precision digital multimeter, a graphical touchscreen display, and a high speed, high resolution digitizer to create an industry first: a graphical sampling multimeter. The digitizer gives the DMM7510 unprecedented signal analysis flexibility; the five-inch capacitive touchscreen display makes it easy to observe, interact with, and explore measurements with "pinch and zoom" simplicity. This combination of high performance and high ease of use offers unparalleled insight into your test results.

MODEL	DMM7510
Resolution	7½
Basic VDC Accuracy, 1 Year (% Reading + % Range)	0.0014 + 0.00012
Measurements	Vac, Vdc, Idc, Iac, 2WΩ, 4WΩ, Temp, Freq, Period, Cont., Diode, Ratio, Cap, Digitize V, Digitize I
Interface	GPIB, USB-TMC, LAN-LXI

- Precision multimeter with 3½- to 7½-digit resolution
- 100 mV, 1 Ω, and 10 µA ranges offer the sensitivity needed for measuring low level signals such as sleep mode current
- Capture and display waveforms such as current drain waveforms, or transients with 1 MS/sec digitizer
- Large internal memory buffer; store over 11 million readings in standard mode or 27.5 million in compact mode
- Display more with five-inch, high resolution touchscreen interface
- Extensive software available including: Test Script Builder, KickStart Instrument Control Software, and LabVIEW and IVI Drivers (available at tek.com/keithley)
- The high speed digitizing function allows capturing and displaying voltage and current waveforms.
- Advanced triggering options make it possible to capture a signal at precisely the right point.

SHIPS WITH PRODUCT

1756: Test Leads; USB-B-1 USB Cable, Type A to Type B, 1 m (3.3 ft); 174694600 TSP-Link/Ethernet Cable (1.5 m); User Documentation; DMM7510 QuickStart Guide; Calibration Certificate; Power Cord; 1-Year Warranty; Test Script Builder Software (available at www.tek.com); LabVIEW® and IVI Drivers (available at www.tek.com)

RECOMMENDED ACCESSORIES

Test Leads and Probes
1754: 2-Wire Universal 10-Piece Test Lead Kit
1756: General Purpose Test Lead Kit
5804: Kelvin (4-Wire) Universal 10-Piece Test Lead Kit
5805: Kelvin (4-Wire) Spring-Loaded Probes
5806: Kelvin Clip Lead Set
5808: Low Cost Single-pin Kelvin Probe Set
5809: Low Cost Kelvin Clip Lead Set
8606: High Performance Modular Probe Kit
8610: Low Thermal Shorting Plug
174694600: LAN Crossover Cable (3 m)

Replacement Fuse
DMM7510-FUSE-10A: 11 A Current Fuse
DMM7510-FUSE-3A: 3.5 A Current Fuse

Communication Interfaces & Cables
KPCI-488LPA: IEEE-488 Interface for PCI Bus
KUSB-488B: IEEE-488 USB-to-GPIB Interface Adapter
7007-x: Shielded GPIB Cable
174694600: CAT5 Crossover Cable for TSP-Link / Ethernet
USB-B-1: USB Cable, Type A to Type B, 1 m (3.3 ft)

Triggering and Control
2450-TLINK: DB-9 to Trigger Link Connector Adapter
8501-x: Trigger Link Cable, DIN-to-DIN, 1 m or 2 m
8503: DIN-to-BNC Trigger Cable

LEARN MORE ↘ Download " Measuring Ultra-Low Power Using the Model DMM7510 7½-Digit Graphical Sampling Multimeter" Application Note.

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.

MODEL	DMM4020
Display	Dual; Numeric
Resolution	5.5
Measurements	V_{AC}, V_{DC}, I_{DC}, I_{AC}, Ω, Cont, Diode, Freq
Basic VDC Accuracy, 1 Year (% Reading + % Range)	0.015 + 0.004

- 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.
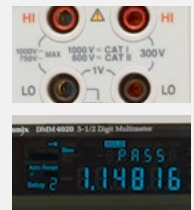
SHIPS WITH PRODUCT

One Set TL710 Test Leads
RS-232 to USB Adapter Cable
Statement of Calibration Practices
User Documentation
Power Cord
3-year Warranty

RECOMMENDED TEST LEADS

196-3520-xx: Premium Test Leads (TL710 replacement/spare)
TL705: 2×4 Wire Ohm 1000 V Test Lead
TL725: 2×4 Wire Ohm SMD Test Tweezers

RECOMMENDED 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.

LEARN MORE ↘ Download "Using the DMM Series to Make Simple and Accurate Resistance Measurements" Application Note.

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.

MODEL	DMM4040	DMM4050
Display	Dual; Numeric & Graphical	Dual; Numeric & Graphical
Resolution	6.5	6.5
Measurements	V_{AC}, V_{DC}, I_{DC}, IAC, Ω, Continuitçy, Diode, Freq, Period	V_{AC}, V_{DC}, I_{DC}, IAC, Ω, Continuity, Diode, Freq, Period, Temp., Capacitance
Basic VDC Accuracy (% Reading + % Range)	0.0035 + 0.0005	0.0024 + 0.0005

- 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.

SHIPS WITH PRODUCT

One Set TL710 Test Leads
RS-232 to USB Adapter Cable
Calibration Certificate
User Documentation
Power Cord
3-year Warranty

RECOMMENDED ACCESSORIES

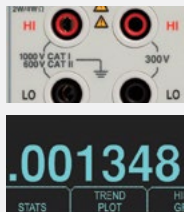TP750: 100 Ohm RTD Temperature Probe (DMM4050 only)
196-3520-xx: Premium Test Leads (TL710 replacement/spare)
TL705: 2×4 Wire Ohmç 1000 V Test Lead
TL725: 2×4 Wire Ohm SMD Test Tweezers
ACD4000: Soft Carrying Case
HCTEK-4321: Hard Carrying Case
RMU2U: Rackmount Kit
013-0369-xx: Calibration Fixture 4-terminal 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.

LEARN MORE ⬎ Download the "Measurement Statistics and Histograms with the Tektronix DMM4050 and DMM4040 Multimeters" Application Note.

DMM6500 6½-Digit Bench/ System Digital Multimeter

The DMM6500 is an advanced bench/system DMM that delivers more measurement functionality, superior measurement insight, and more communication and control than any other 6½-digit DMM. Use the 1 M sample/s digitizer to capture waveforms and display on the interactive 5-in (12.7cm) display. The touchscreen interface allows pinch and zoom control to quickly analyze signals and to compute statistics on data. Expand to 10 channels of measurement with the optional switch cards. Select from LAN, LXI, and USB interfaces or optional GPIB, RS-232, or TSP-Link® interfaces. Upgrade your most important measurement instrument to get more functions and wider measurement ranges for current and resistance.

MODEL	DMM6500
Resolution (Digits)	6½
Basic VDC Accuracy, 1 Year (% Reading + % Range)	0.0025 + 0.0005
Measurements	Vac, Vdc, Iac, Idc, 2WΩ, 4WΩ, Temp, Freq, Period, Cont., Diode, Ratio, Cap, Digitize V, Digitize I
Interface	Ethernet-LXI, USB Device-TMC, USB-Host, Optional GPIB, RS-232, or TSP-LINK

- Precision multimeter with 3½- to 6½-digit resolution
- Excellent measurement accuracy: 0.0025% of reading + 0.0005% of range 1-year DC Volt accuracy (10 V range)
- High sensitivity, 100 nV, 1 µΩ, and 10 pA to characterize low power circuits and devices
- 1 Msample/s, 16-bit digitizer to capture complex waveforms and transient waveforms
- 5 in (12.7 cm) touchscreen display with pinch and zoom as well as statistics for fast signal analysis
- Standard LAN/LXI and USB interfaces with optional GPIB, RS-232, or TSP-LINK interfaces for a wide range of PC communication choices
- Expand up to 10 measurement channels with the optional voltage or thermocouple scanner cards
- Numerous software options allow everything from customizing of instrument features with Test Script Builder to point-and-click programming with KickStart Instrument Control Software to coding with LabView and IVI drivers. Downloads available at www.tek.com/keithley.

SHIPS WITH PRODUCT

1757: Standard Test Lead Kit; USB-B-1: USB Cable Type A to Type B, 1 m (3.3 ft); Calibration Certificate; User documentation (available at www.tek.com): DMM6500-903-01: Quick Start Guide; DMM6500 900-01: User Manual; DMM6500-901-01: Reference Manual; Test Script Builder Software (available at www.tek.com); LabView® and IVI Drivers (available at www.tek.com); Power Cord; 3-Year Warranty

RECOMMENDED ACCESSORIES

Test Leads and Probes: 1754: 2-Wire Universal 10-Piece Test Lead Kit; 1756: General Purpose Test Lead Kit; 5804: Kelvin (4-Wire) Universal 10-Piece Test Lead Kit; 5805: Kelvin (4-Wire) Spring-Loaded Probes; 5806: Kelvin Clip Lead Set; 5808: Low Cost Single-pin Kelvin Probe Set; 5809: Low Cost Kelvin Clip Lead Set; 8606: High Performance Modular Probe Kit; 8610: Low Thermal Shorting Plug
Communication Interfaces & Cables: KPCI-488LPA: IEEE-488 Interface for PCI Bus; KUSB-488B: IEEE-488 USB-to-GPIB Interface Adapter; 7007-x: Shielded GPIB Cable; 174694600: CAT5 Crossover Cable for TSP-Link or Ethernet 1.5 m (5 ft); USB-B-1: USB Cable, Type A to Type B, 1 m (3.3 ft)

SWITCH CARDS

2000-SCAN: 10 channel, 2-pole or 5-channel, 4-pole multiplexer; 2001-TCSCAN: 9 channel, 2-pole or 4-channel, 4-pole multiplexer with CJC sensor

OPTIONAL INTERFACE MODULES

KTTI-GPIB: GPIB interface with 6 digital I/O ports; KTTI-RS232: RS-232 interface with 6 digital I/O ports; KTTI-TSP: TSP-Link® Expansion interface with 6 digital I/O ports

LEARN MORE ⬎ Download the Application Note on digitizing with DMM6500.

DMM7512 Dual Channel 7½-Digit Sampling Multimeter

The DMM7512 Dual Channel 7½-digit Sampling Multimeter combines two full-function, high accuracy and high sampling speed DMMs into a compact 1U high, full rack wide form factor chassis. The compact chassis saves rack space in high-instrument density, test systems. The small size does not compromise measurement performance. Each DMM has identical functionality, and both are entirely independent of each other.

MODEL	DMM7512
Number of Measurement Channels	2
Resolution and best DCV Accuracy ±(% of reading + % of accuracy)	7 ½ digits 0.0014 + 0.00012
Digitizer	Up to 1Msample/s, 18-bit
Measurements	Vdc, Idc, 2WΩ, 4WΩ, Digitize V, Digitize I, Temp, Ratio, Diode Test
Interface	USB-TMC, LAN-LXI, TSP-Link

- Two high-precision, 3 ½ - 7 ½-digit DMMs in a 1U high, full rack width chassis
- Capture waveforms or identify transients with two 1 Msample/s 18-bit digitizers
- Trigger a waveform measurement on a signal level, a rising or falling edge, a window, or a digital trigger
- Store up to 27.5M timestamped readings on a waveform
- Basic one-year DC Voltage accuracy as low as 14 ppm
- 10 nV, 0.1 µΩ, and 1 pA sensitivities for making high resolution low level measurements such as measurements of portable device sleep currents
- High accuracy, low resistance measurements with offset compensated ohms, four-wire measurement, and dry circuit functions
- Reduce test time by executing test scripts with the Embedded Test Script Processor, which saves PC command communication overhead
- Tight synchronization between the two DMMs using TSP-Link® communication

SHIPS WITH PRODUCT

012178100: Test Lead Kit, Quantity 4; CA-18-16A: LAN Crossover Cable, 40 cm (16 in), quantity 2; 174710700: Shielded Crossover Cable with RJ-45 Connector, 1.5 m (5 ft), quantity 1; CA-568-120A: Green and Yellow Ground Cable, 3.0 m (120 in), quantity 1; 4299-13: 1U High Fixed Rack Mount Kit, quantity 1; 0713411: Safety Precautions Document; 071357600: DMM7512 7½-Digit Multimeter Instrument Information;

Instruction Manuals/Documentation (available at www.tek.com/DMM7512): DMM7510 7.5 Digit Graphical Sampling Multimeter Reference Manual, DMM7510 7.5 Digit Graphical Sampling Multimeter User's Manual; Software and Drivers (available at tek.com): IVI/VISA Drivers for Microsoft® Visual Basic®, Visual C/C++®, Keithley Test Script Builder available at tek.com/keithley-test-script-builder

RECOMMENDED ACCESSORIES

Test Leads and Probes: 1751: Safety Test Leads; 1754: 2-Wire Universal 10-Piece Test Lead Kit; 1756: General Purpose Test Lead Kit; 5804: Kelvin (4-Wire) Universal 10-Piece Test Lead Kit; 5805: Kelvin (4-Wire) Spring-Loaded Probes; 5806: Kelvin Clip Lead Set; 5808: Low Cost Single-pin Kelvin Probe Set; 5809: Low Cost Kelvin Clip Lead Set; 8606: High Performance Modular Probe Kit; 8610: Low Thermal Shorting Plug

Replacement Fuses: FU-106-3.15: Line Power Fuse, 250 V, 3.15 A, Slow Blow 5 × 20 mm; DMM7510-FUSE-3A: 3.5 A Current Fuse

Cables: CA-18-1: Shielded Dual Banana Cable, 1.2 m (4 ft.); CA-180-3A: CAT5 Crossover Cable for TSP-Link / Ethernet; USB-B-1: USB Cable, Type A to Type B, 1 m (3.3 ft)

LEARN MORE ⬎ Download the "Laser Diode Array Test for 3D Sensing" Application Note.

ULTRA-SENSITIVE MEASUREMENT 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	1aA/100mA
Voltage Min/Max	1nV / 100V	—	—	1µV / 200V
Resistance Min/Max	10nΩ /1GΩ (with Model 6220 or 6221)	10nΩ/1GΩ (with Model 2182A)	10Ω/1PΩ (with Model 6487)	1µΩ - 1000PΩ
Resolution	7½ Digits	4½ Digits	5½ Digits (6485, 6487) 6½ Digits (6482)	5½ Digits (6514) 6½ Digits (6517B, 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.

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.

| MODEL	2182A	6220/2182A	6221/2182A
Voltage	1 nV – 100 V	1 nV – 100 V	1 nV – 100 V
Temperature	-200˚C – 1820˚C	-200˚C – 1820˚C	-200˚C – 1820˚C
Resistance		10 nΩ – 1 GΩ	10 nΩ – 1 GΩ
Channels	2	—	—
Current Source	—	±100 fA – 100 mA	±100 fA – 100 mA, with 1 mHz – 100 kHz, 10 Msamples/s, 64k arbitrary waveform generator

*Delta Mode Resistance Measurement System

- Low noise voltage measurements at high speeds
- Delta mode coordinates measurements with a reversing current source at up to 24 Hz with 30 nV 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 2182A's DC noise performance with a nanovolt/micro-ohmmeter's.

- Results from a 2182A and 6220 using the delta mode to measure a 10 mΩ resistor with a 20 µA test current.
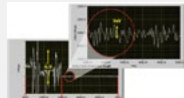
SHIPS WITH PRODUCT
2107-4: Low Thermal Input Cable with Spade Lugs, 1.2 m (4 ft)
User Documentation
Contact Cleaner
Power Cord
Alligator Clips

RECOMMENDED ACCESSORIES
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, 9.1 m (30 ft)
2182-KIT: Low Thermal Test Lead Kit
2187-4: Input Cable with safety banana plugs
2188: Low Thermal Calibration Shorting Plug
7007-1: Shielded GPIB Cable, 1 m (3.2 ft)
7007-2: Shielded GPIB Cable, 2 m (6.5 ft)
7009-5: Shielded RS-232 Cable, 1.5 m (5 ft)
8501-1: Trigger Link Cable, 1 m (3.2 ft)
8501-2: Trigger Link Cable, 2 m (6.5 ft)
8503: Trigger Link Cable to 2 male BNC connectors

LEARN MORE ⬎ Download the Application Note "Low-Level Pulsed Electrical Characterization using Model 6221/2182A Combination."

6220 / 6221 Current Sources

Keithley precision current sources include both broad-purpose 6220 and high-performance 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.

MODEL	6220	6221	6220/2182A	6221/2182A
Current Source	±100 fA – 100 mA	±100 fA – 100 mA	±100 fA – 100 mA	±100 fA – 100 mA
Arbitrary Waveform Generator	—	1 mHz – 100 kHz, 10 Msamples/s sample rate, 64k point waveform length		1 mHz – 100 kHz, 10Msamples/s sample rate, 64k point waveform length
Pulse Generator	—	Programmable, 5 µs min. width		Programmable, 50µs min. width, for pulsed I-V measurements
Resistance	—	—	10 nΩ – 1 GΩ	10nΩ – 1GΩ
PC Interface	GPIB, RS-232	GPIB, RS-232, Ethernet	GPIB, RS-232	GPIB, RS-232, Ethernet

- Measure low current & high voltage, resistance, and charge
- Resistance measurements to 1000P‡ (6517B)
- Current sensitivity as low as 1aA (6430)
- Voltage burden as low as 200µV
- Superior accuracy and sensitivity
- Perform insulation resistivity measurements in accordance with **ASTM D257 standard**
- Measurements are line synchronized to minimize 50/60Hz interference.
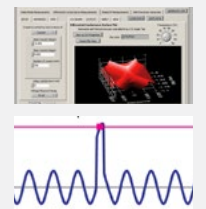
SHIPS WITH PRODUCT
237-ALG-2: Low Noise, Input Cable with Triax-to-Alligator Clips 6.6 ft (2 m)
8501-2: Trigger Link Cable to connect 622x to 2182A, 6.6 ft (2 m)
174694600: Ethernet Crossover Cable (1.5 m) (6221 only)
CA-351: Communication Cable between 2182A and 622x
CS-1195-2: Safety Interlock Connector
User Documentation
Getting Started manual (hardcopy)
Software (downloadable)

RECOMMENDED ACCESSORIES
237-ALG-2: Low Noise Triax Cable, 3-slot triax to alligator clips
7007-1: Shielded GPIB Cable, 1 m (3.2 ft)
7007-2: Shielded GPIB Cable, 2 m (6.5 ft)
7007-4: Shielded IEEE-488 Cable, 4 m (13.1 ft)
7009-5: Shielded RS-232 Cable, 1.5 m (5 ft)
7078-TRX-3: Low Noise Triax Cable, 3-Slot Triax Connectors, 0.9 m (3 ft)
7078-TRX-5: Low Noise Triax Cable, 3-Slot Triax Connectors, 1.5 m (5 ft)
7078-TRX-10: Low Noise Triax Cable, 3-Slot Triax Connectors, 3 m (10 ft)
7078-TRX-20: Low Noise Triax Cable, 3-Slot Triax Connectors, 6 m (20 ft)
174694600: LAN Crossover Cable (3 m)
8501-1: Trigger Link Cable with male Micro-DIN connectors at each end, 1 m (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

LEARN MORE ⬎ Download "Determining Resisitivity and Conductivity Type using a Four-Point Collinear Probe and the Model 6221 Current Source".

6514

6485 Picoammeter, 6487/6482 Picoammeter & Voltage Sources

6485 6487 6482

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

MODEL	6482	6487	6485
Channels	2	1	2
Current	1 fA – 20 mA (2 ch)	10 fA – 20 mA	10 fA – 20 mA
Resistance	N/A	Up to 10^{15} Ω	N/A
Reading Rate	900 rdgs/s	1000 rdgs/s	1000 rdgs/s
Voltage Source	2, ±30 V	±500 V	—

- Measure currents down to 1 fA
- Voltage and resistance measurement options
- Voltage burden <200 µV (most models)
- 5½- to 6½-digit resolution (most models)
- Feedback ammeter design for higher accuracy
- Dark current characterization of a photodiode using picoammeter and voltage source (such as the 6482)
- MOSFET sub-threshold voltage test using picoammeters and voltage sources (such as the 6482)
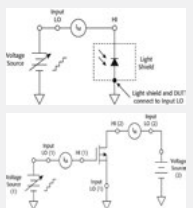
SHIPS WITH PRODUCT
7078-TRX-BNC: Triax-to-BNC Connector (2×) (6482)
CA-186-1B: Ground Connection Cable, Banana to Screw-Lug (6487)
CAP-31: Protective Shield/Cap (3-lug) (6487)
CS-459: Safety Interlock Plug (6487)
7078-TRX-3: Low Noise Triax Input Cable, 1 m (3 ft) (6487)
8607: High Voltage Banana Cable Set for Voltage Source Output (6487)
CAP-18: Protective Shield/Cap (2-lug) (6485)
4801: Low Noise BNC Input (6485)
User Documentation

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

LEARN MORE ⌄ Download the "Low Current Measurements" Application Note.

6514/6517B/6430 Electrometers

6517 6430

Our Electrometers provide a voltage source and the most current sensitivity to make extremely high resistivity measurements. They combine flexible interfacing capabilities with high impedance voltage measurement, charge measurement capabilities, resolution, and speed. The 6430 offers unmatched low current sensitivity.

MODEL	6517B	6514	6430
Current	10 aA – 20 mA	100 aA – 20 mA	1 aA – 100 mA
Voltage	1 µV – 200 V	10 µV – 200 V	100 nV – 200 V
Resistance	1 Ω – 1000 PΩ	10 mΩ – 200 GΩ	1 µΩ – >20 TΩ
Charge	1 fC – 2 µC	10 fC – 20 µC	—
Sources	±5 mV – 1000 V	—	±5 µV – 200 V, ±50 aA – 100 mA

- Measure low current & high voltage, resistance, and charge
- Resistance measurements to 1000 PΩ (6517B)
- Current sensitivity as low as 1 aA (6430)
- Voltage burden as low as 200 µV
- Superior accuracy and sensitivity
- Perform insulation resistivity measurements in accordance with ASTM D257 standard
- The 6514's measurement can be adjusted to reflect the true dark current of a photodiode.
- A 6517B is well suited for applications where the volume resistivity needs to be measured.
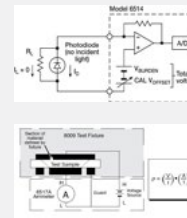
SHIPS WITH PRODUCT
237-ALG-2: Low Noise Triax Cable, 3-slot triax to alligator clips (2 m) (6514, 6517B)
6430-322-1B: Low noise Triax Cable, 3-slot triax to alligator clips (20 cm) (6430)
8607: Safety High Voltage Dual Test Leads (6430, 6517B)
6517-TP: Thermocouple Bead Probe (6517B)
CS-1305: Interlock Connector (6517B)
PreAmp Cable, 2 m (6.6 ft) (6430)
User Documentation

RECOMMENDED ACCESSORIES
237-ALG-2: Low Noise Triax Cable, 3-slot triax to alligator clips
6517B-ILC-3: Interlock Cable (6517B only)
7078-TRX-3: Low Noise Triax Cable, 3-Slot Triax Connectors, 0.9 m (3 ft)
7007-1: Shielded IEEE-488 Cable, 1 m (3.2 ft)
8501-1: Trigger Link Cable, 1 m (3.3 ft)
8503: Trigger Link DIN-to-BNC Trigger Cable
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 (6517B Only)
KICKSTARTFL-HRMA: High Resistance Measurement Application for KickStart Instrument Control Software (6517B)
237-BNC-TRX: Male BNC to 3-Lug Female Triax Adapter (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 (6517B)
4288-1: Single Fixed Rack Mounting Kit
4288-2: Dual Fixed Rack Mounting Kit
6521: Low Current Scanner Card (6517B)
6522: Voltage/Low Current Scanner Card (6517B)
KPCI-488LPA: IEEE-488 Interface/Controller for the PCI Bus
KUSB-488B: IEEE-488 USB-to-GPIB Interface Adapter

LEARN MORE ⌄ Download the Application Note "Volume and Surface Resistivity Measurements of Insulating Materials".

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.

	DAQ6510	SERIES 2700	SERIES 3700A
DMM Resolution	6½ Digits	6½ Digits	7½ Digits
Switching Density	Up to 80, 2-pole channels	Up to 80, 2-pole channels (2700/2701) Up to 200, 2-pole channels (2750)	Up to 576, 2-pole channels
Special Features	5-in (12.7cm) touchscreen display, 1Msample/s digitizer, 10pA and 1µΩ sensitivity, front panel DMM jacks, 7M reading storage, solid state temperature scanning	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 plug-in switch module options	Up to 40, 2-pole Channels and 12 card options	Up to 96, 2-pole Channels and 10 card options
Interface	Ethernet-LXI, USB Device-TMC, USB-Host, Optional GPIB, RS-232, or TSP-LINK	GPIB, RS-232 (Models 2700 and 2750) LAN, RS-232 (Model 2701)	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus
Software	KickStart Instrument Control Software, LabView, IVI-COM/IVI-C drivers, Keithley LXI Discovery Browser, Test Script Builder	KickStart Instrument Control Software, LabVIEW and IVI drivers. Available at www.tek.com	Test Script Builder, LXI Discovery Browser, LabVIEW and IVI drivers. Available at www.tek.com

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 quick look at basic key decision points in the design of a switching system.

❶ 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.

❷ Relay Types

Three key relay types are used. Electromechanical relays 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 relays cost still more, but offer the best life and speed with no contact wear or bounce.

❸ Systemization

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

2700 Series

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.

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

- 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
- Kickstart Instrument Control Software for the PC provides an easy way to configure channels and log data from long scans. Download at www.tek.com/keithley-kickstart.
- 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.

SHIPS WITH PRODUCT

User Documentation; 174694600: Ethernet Crossover Cable (1.5 m) (2701 Only); Calibration Certificate; Quick Reference Manual; Power Cord; 1-year Warranty

RECOMMENDED ACCESSORIES

7007-1: Shielded IEEE-488 Cable, 1 m (2700, 2750)
7007-2: Shielded IEEE-488 Cable, 2 m (2700, 2750)
7788: 50-Pin D-Shell Connector Kit (for 7703 & 7705)
7789: 50-Pin/25-Pin D-Shell Kit
7790: 50-Pin Male/Female, 25-Pin Male IDC D-Shell Con. Kit
174694600: LAN Crossover Cable (3 m)

PLUG-IN CARDS

7700: Dual 1×10 / Multiplexer Electromechanical Relay
7701: Dual 1×16 / Multiplexer Electromechanical Relay
7702: Dual 1×20 / Multiplexer Electromechanical Relay
7703: Dual 1×16 / Reed Relay Mux
7705: 40 Independent Relay / Electromechanical Relay
7706: 16 Digital I/O, 2 Analog Outputs, 1×20 Multiplexer
7707: 32 Digital I/O, 1×10 Multiplexer
7708: Dual 1×20 / Multiplexer Electromechanical Relay
7709: 6×8 / Electromechanical Relay Matrix
7710: Dual 1×10 / Multiplexer Solid State Relay
7711: Dual 1×4, 2 GHz / Multiplexer RF Relay
7712: Dual 1×4, 3.5 GHz / Multiplexer RF Relay

LEARN MORE ⌘ Download the "Switching Handbook: A Guide to Signal Switching in Automated Test Systems"

3700A Series

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.

- Mainframe variations (DMM and keypad/display optional)
- High performance (1 Ω resistance, 10 µA DCI ranges) 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
- 3706A-NFP eliminates keypad and display for automated test rack applications.

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

SHIPS WITH PRODUCT

User Documentation
Test Script Builder Software (available at www.tek.com)
174694600: TSP-Link/Ethernet Cable (1.5 m)
Calibration Certificate
Quick Reference Manual
Power Cord
1-year Warranty

RECOMMENDED ACCESSORIES

3706-BAN: DMM Adapter Cable
3706-TLK: Test Lead Kit
KUSB-488B: IEEE-488 USB to GPIB Interface Adapter
4288-1: Single Fixed Rack Mount Kit
4288-10: Fixed Rear Rack Mount Kit
174694600: LAN Crossover Cable (3 m)

PLUG-IN CARDS

3720: Dual 1×30 Multiplexer: 300 V, 2 A, Auto-CJC with 3720-ST accessory
3721: Dual 1×20 Multiplexer: 300 V, 3 A, Auto-CJC with 3721-ST accessory
3722: Dual 1×48 Multiplexer: 300 V, 2 A
3723: Dual 1×30 Multiplexer: 200 V, 1.25 A, Reed Relay
3724: Dual 1×30 Multiplexer: 200 V, 0.12 A, Solid State Relay, Auto-CJC with 3724-ST accessory
3730: 6×16 Matrix: 300 V, 2 A
3731: 6×16 Matrix: 200V, 2 A, Reed Relay
3732: Quad 4×28 Matrix: 200V, 1.2 A, Reed Relay
3740: Independent Relay: 28 Form C: 300 V, 3 A; 4 Form A: 250 VAC, 7 A
3750: Control: 40 Digital I/O 2 Analog Outputs, 4 Counter
3760: 1×10 Multiplexer: 300 V, 5 A
3761: 1×10 Multiplexer: <1 pA offset current, 30 V
3762: 1×10 Multiplexer: 1000 V, 500 mA
3765: Hall Effect Measurement System

LEARN MORE ⌘ Download "Optimizing Switched Measurements" Application Note.

DAQ6510 Data Acquisition and Logging Multimeter System

The DAQ6510 is a precision data acquisition and logging system that creates a new level of simplicity. A large 5-in (12.7 cm) multi-touch display will guide users through set-up, data visualization, and analysis removing the necessity of a PC and custom software for many applications. Using Keithley's 6½-digit multimeter technology, the DAQ6510 provides greater accuracy, more functionality, and higher speed. With 12 plug-in switch modules and with two slots for modules, test systems as large as 80 channels can be built. If you prefer or require a PC, a complement of IVI and LabView drivers and KickStart start-up software are available.

MODEL	DAQ5610
Mainframe Size	2U, ½ Rack
Interfaces	Ethernet-LXI, USB Device-TMC, USB-Host, Optional GPIB, RS-232, or TSP-LINK
Resolution (Digits), Accuracy	6½ Digits, 0.0025%
Advance Measure Functions	Temperature, 4-Wire Resistance, 1Msample/s digitizing, Capacitance

- Large 5-in (12.7 cm) multi-touch capacitive touchscreen with graphical display
- 2-year specified, full-featured, traceable 6½-digit multimeter with 0.0025% DCV (10 V range) basic accuracy
- 12 different switch, RF, and control plug-in modules to connect to as many as 80 DUTs in one test setup
- Up to 80 2-pole channels of thermocouple, RTD, or thermistor temperature measurements
- Front panel jacks for stand-alone DMM operation
- LAN/LXI and USB communication interfaces are standard
- Optional interfaces include GPIB, RS-232, and TSP-Link
- Kickstart Instrument Control Software for the PC enables instrument control without programming. Download at www.tek.com/keithley-kickstart.
- Use the touchscreen user interface to quickly set up a test, run and monitor results, and analyze data.
- Build an 80 channel system with two 7700-series plug-in switch modules.

SHIPS WITH PRODUCT

1757: Standard Test Lead Kit; USB-B-1: USB Cable Type A to Type B, 1 m (3.3 ft); Calibration Certificate; User documentation (available at www.tek.com): DAQ6510-903-01 Quick Start Guide, DAQ6510 900-01 User Manual, DAQ6510 901-01 Reference Manual; Test Script Builder Software (available at www.tek.com); LabView® and IVI Drivers (available at www.tek.com); Power Cord; 3-Year Warranty

RECOMMENDED ACCESSORIES

7007-1: Shielded IEEE-488 Cable, 1 m (2700, 2750); 7007-2: Shielded IEEE-488 Cable, 2 m (2700, 2750); 7788: 50-Pin D-Shell Connector Kit (for 7703 & 7705); 7789: 50-Pin/25-Pin D-Shell Kit; 7790: 50-Pin Male/Female, 25-Pin Male IDC D-Shell Con. Kit; 174694600: CAT5 Crossover Cable for TSP-Link or Ethernet, 1.5 m (5 ft)

PLUG-IN CARDS

7700: Dual 1×10 / Mutiplexer Electromechanical Relay; 7701: Dual 1×16 / Mutiplexer Electromechanical Relay; 7702: Dual 1×20 / Mutiplexer Electromechanical Relay; 7703: Dual 1×16 / Reed Relay Mux; 7705: 40 Independent Relay / Electromechanical Relay; 7706: 16 Digital I/O, 2 Analog Outputs, 1×20 Multiplexer; 7707: 32 Digital I/O, 1×10 Multiplexer; 7708: Dual 1×20 / Mutiplexer Electromechanical Relay; 7709: 6×8 / Electromechanical Relay Matrix; 7710: Dual 1×10 / Mutiplexer Solid State Relay; 7711: Dual 1×4, 2GHz / Mutiplexer RF Relay; 7712: Dual 1×4, 3.5GHz / Mutiplexer RF Relay

OPTIONAL INTERFACE MODULES

KTTI-GPIB: GPIB interface with 6 digital I/O ports; KTTI-RS232: RS-232 interface with 6 digital I/O ports; KTTI-TSP: TSP-Link® Expansion interface with 6 digital I/O ports

LEARN MORE ⌄ Download the "Data Acquisition Primer: An Introduction to Multi-Channel Measurement Systems".

POWER SUPPLIES

Tektronix and Keithley power supplies offer a wide range of performance. Get single-channel models with superior accuracy and 10nA 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.

CATEGORY	DESCRIPTION	CHANNELS	MAX VOLTAGE/MAX CURRENT	RESOLUTION	VOLTAGE ACCURACY	CURRENT ACCURACY	INTERFACE
PWS2000	Manual	1	18V-72V/1.5A-6A	10mV, 10mA	± (0.05% + 15 mV)	± (0.1% + 15 mA)	Not applicable
PWS4000	USB Programmable Single-Channel	1	20V-72V /1.2A-5A	1mV, 0.1mA	± (0.02% + 2.5 mV)	± (0.05% + 1 mA)	USB
2200	USB and GPIB Programmable Single-Channel	1	20V-72V /1.2A-5A	1mV, 0.1mA	± (0.02% + 2.5 mV)	± (0.05% + 1 mA)	USB, GPIB
2231A-30-3	Optional USB Triple-Channel	3	CH1/2: 30V/3A CH3: 5V/3A	10mV, 1mA	± (0.06% + 20mV)	± (0.2% + 10 mA)	Optional USB
2220/2230	USB Multi-Channel; USB and GPIB Multi-Channel	2 (2220 Series) 3 (2230 Series)	CH1/2-30V / 1.5A (2220 Series) CH1/2-30V / 1.5A, CH3-6V / 5A (2230 Series)	1mV, 1mA	± (0.03% + 10 mV)	± (0.1% + 5 mA)	USB USB & GPIB (-G versions)
2230G-30-3, 2230G-30-6, 2230G-60-3	High Power, 3-Channel Programmable Power Supply	3	30V/3A (2230G-30-3) 30V/6A (2230G-30-6) 60V/3A (2230G-60-3)	1mV, 1mA	±(0.03% + 10mV)	±(0.1% + 5mA), 2230G-30-6, 30V Channels: ±(0.1% + 8mA)	USB, GPIB, RS-232
2260B	360W, 720W and 1080W Wide output range USB, LAN, and Optional GPIB	1	30V-800V / 1.44A-108A	1mV, 1mA	± (0.1% + 10 mV)	± (0.1% + 10 mA)	USB, LAN, analog, and optional GPIB
2280S-32-6 2280S-60-3	Precision measurement 6½-digit measurement resolution	1	32V-60V/3.2A-6A	0.1mV, 10nA	± (0.02% + 2 mV)	± (0.05% + 10 µA)	USB, GPIB, and LAN
2281S-20-6	Single-Channel, Precision DC Power Supply & Battery Simulator	1	20V/6A	0.1mV, 10nA	± (0.02% + 2 mV)	± (0.05% + 10 uA)	USB, GPIB, and LAN
2290-5 2290-10	High Voltage	1	5kV / 5mA (2290-5) 10kV / 1mA (2290-10)	1V, 1µA	±0.01% (2290-5), ±6V (2290-10)	±0.01% (2290-5), ±5µA (2290-10)	GPIB (2290-5), GPIB, RS-232 (2290-10)
2302, 2302-PJ, 2306, 2306-PJ, 2308	Battery Simulator	1 (2302) 2 (2306, 2308)	15V / 5A	1mV, 100nA	0.05% + 3mV	0.2% + 1µA	GPIB
2303, 2303-PJ	Fast Transient Response	1	15V / 5A	1mV, 100nA	0.05% + 3mV	0.2% + 1µA	GPIB

PWS2000 Series
Single-Channel Power Supply

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.

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

- 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.

ANOTHER PRODUCT FOR CONSIDERATION
The PWS4000 Series offers greater accuracy, additional features and programmability.

SHIPS WITH PRODUCT
Calibration Certificate
User Documentation
Power Cord
3-year Warranty

RECOMMENDED ACCESSORIES
RMU2U: Rackmount Shelf Kit for 1 or 2 Units
386759800: Rackmount Cosmetic Filler Panel

RECOMMENDED SERVICE
R5: 5-year Extended Warranty

LEARN MORE ⬎ Download the Application Note "Choosing the Right Power Supply for Accurate Power Delivery."

PWS4000 Series USB Programmable,
Single-Channel Power Supply

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.

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

- 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.

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

SHIPS WITH PRODUCT
Calibration Certificate
User Documentation
Power Cord
3-year Warranty

RECOMMENDED ACCESSORIES
RMU2U: Rackmount Shelf Kit for 1 or 2 Units
386759800: Rackmount Cosmetic Filler Panel

RECOMMENDED SERVICE
SILV100: 5-year Extended Warranty

LEARN MORE ⬎ Download "Choosing the Right Power Supply for Accurate Power Delivery" Application Note.

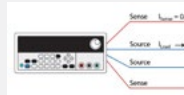## 2200 Programmable Single-Channel DC Power Supplies with Remote Sensing

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

MODEL	2200-20-5	2200-30-5	2200-32-3	2200-60-2	2200-72-1
MAX Output Voltage	20 V	30 V	32 V	60 V	72 V
MAX Output Current	5 A	5 A	3 A	2.5 A	1.2 A
Power	100 W	150 W	96 W	150 W	86 W
Ripple and Noise	$<1\ mV_{RMS}$, $<3\ mV_{P-P}$	$<1\ mV_{RMS}$, $<4\ mV_{P-P}$	$<1\ mV_{RMS}$, $<4\ mV_{P-P}$	$<1\ mV_{RMS}$, $<5\ mV_{P-P}$	$<1\ mV_{RMS}$, $<3\ mV_{P-P}$

- Low noise, linear regulation
- 0.03% basic voltage output
- 0.05% basic current accuracy
- 1 mV and 0.1 mA output and measurement resolution
- Seven programmable output lists with up to 80 steps/list
- GPIB and USB interfaces
- Remote sensing compensates for voltage drops in the test leads by extending the power supply feedback loop to the input of the load.

Series 2200 rear panel.

SHIPS WITH PRODUCT
User Documentation
Rear Panel Mating Connector
Calibration Certificate
Power Cord
3-year Warranty

RECOMMENDED ACCESSORIES
CS-1638-12: Rear Panel Mating Connector, Single Channel
USB-B-1: USB Cable
4299-7: Fixed Rack Mount Kit
RMU2U: Rackmount Shelf Kit for 1 or 2 Units
386759800: Rackmount Cosmetic Filler Panel
KPCI-488LPA: IEEE-488 Interface Board for PCI Bus
7007-05: Double Shielded IEEE-488 Cable, 0.5 m (1.6 ft)
7007-1: Double Shielded IEEE-488 Cable, 1 m (3.2 ft)
7007-2: Double Shielded IEEE-488 Cable, 2 m (6.5 ft)
7007-3: Double Shielded IEEE-488 Cable, 3 m (10 ft)
7007-4: Double Shielded IEEE-488 Cable, 4 m (13 ft)

RECOMMENDED SERVICE
Model Number*-EW: 1 additional year of factory warranty
C/Model Number*-3Y-STD: 3 calibrations within 3 years of purchase
C/Model Number*-3Y-DATA: 3 (ANSI-Z540-1 compliant) calibrations within 3 years of purchase
C/Model Number*-5Y-STD: 5 calibrations within 5 years of purchase
C/Model Number*-5Y-DATA: 5 (ANSI-Z540-1 compliant) calibrations within 5 years of purchase
*Insert Model Number. Example: C/2200-20-5-3Y-DATA.

LEARN MORE ⤵ Download the "Understanding Linear Power Supply Specifications" Application Note.

2231A-30-3 Triple-Channel DC Power Supply

The 2231A-30-3 Triple-Channel DC Power Supply can output a total of 195 W of power, providing the power levels needed to energize a wide range of circuits and devices for benchtop work. Two channels can supply up to 30 V at 3 A each; the third channel can provide up to 5 V at 3 A. The 2231A-30-3 does not compromise on performance or convenience features, offering the versatility and ease of use you need, so it can be the only DC power supply on your bench.

MODEL	2231A-30-3
MAX Output Voltage	CH1: 30 V, CH2: 30 V, CH3: 5 V
MAX Output Current	CH1: 3 A, CH2: 3 A, CH3: 3 V
Power	195 W
Ripple and Noise	$<1\ mV_{RMS}$, $<5\ mV_{P-P}$

- 195 W with two 30 V @ 3 A outputs and one 5 V @ 3 A output
- All channels are isolated and programmable
- 0.06% basic voltage accuracy and 0.2% basic current accuracy
- Double output levels by connecting two channels in series or parallel
- Optional USB interface
- Fully supported by TekSmartLab™
- Connect the two 30 V channels in series or parallel to double the output voltage to 60 V or the supplied current to 6 A.

SHIPS WITH PRODUCT
Calibration Certificate
User Documentation
Power Cord
3-year Warranty

RECOMMENDED ACCESSORIES
2231A-001: USB Adaptor with USB Cable

RECOMMENDED SERVICE
Model Number*-EW: 1-Year KeithleyCare® Gold Plan
Model Number*-5Y-EW: 5-Year KeithleyCare Gold Plan
C/Model Number*-3Y-STD: KeithleyCare 3-Year Std Calibration Plan
C/Model Number*-5Y-STD: KeithleyCare 5-Year Std Calibration Plan
*Insert Model Number. Examples: 2231A-5Y-EW, C/2200-20-5-3Y-DATA

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.

- Dual- and triple-channel models
- Two 30 V / 1.5 A channels
- One 6 V / 5 A channel (on triple-channel model)
- All channels are isolated and programmable
- USB interface, USB and GPIB on G versions
- Fully supported by TekSmartLab™
- Power two isolated circuits with isolated output channels

2230G-30-1 rear panel

MODEL	2220-30-1, 2220G-30-1*, 2220J-30-1*, 2220GJ-30-1*	2230-30-1, 2230G-30-1*, 2230J-30-1* 2230GJ-30-1*
MAX Output Voltage	Ch 1: 30 V, Ch 2: 30 V	Ch1: 30 V, Ch 2: 30 V, Ch 3: 6 V
MAX Output Current	Ch1: 1.5 A, Ch 2: 1.5 A	Ch1: 1.5 A, Ch 2: 1.5 A, Ch 3: 5 A
Power	45 W/channel; 90 W total	Ch 1 and Ch2: 45 W each Ch 3: 30 W, 120 W total
Ripple and Noise	<1 mV$_{RMS}$, <3 mV$_{P-P}$	<1 mV$_{RMS}$, <3 mV$_{P-P}$

*G versions include a GPIB interface; J versions for Japan.

SHIPS WITH PRODUCT
User Documentation
Rear Panel Mating Connector
Calibration Certificate
Power Cord
3-year Warranty

RECOMMENDED ACCESSORIES
CS-1655-15: Rear Panel Mating Connector, Multi-Channel
USB-B-1: USB Cable
4299-7: Fixed Rack Mount Kit
RMU2U: Rack-mount Shelf Kit for 1 or 2 Units
386759800: Rack-mount Cosmetic Filler Panel
Additional Recommended Accessories for "G" Versions
KPCI-488LPA: IEEE-488 Interface Board for PCI Bus
7007-05: Double Shielded IEEE-488 Cable, 0.5 m (1.6ft)
7007-1: Double Shielded IEEE-488 Cable, 1 m (3.2 ft)
7007-2: Double Shielded IEEE-488 Cable, 2 m (6.5 ft)
7007-3: Double Shielded IEEE-488 Cable, 3 m (10 ft)
7007-4: Double Shielded IEEE-488 Cable, 4 m (13 ft)

RECOMMENDED SERVICE
Model Number*-EW: 1 additional year of factory warranty
C/Model Number*- 3Y-STD: 3 calibrations within 3 years of purchase
C/Model Number*- 3Y-DATA: 3 (ANSI-Z540-1 compliant) calibrations within 3 years of purchase
C/Model Number*- 5Y-STD: 5 calibrations within 5 years of purchase
C/Model Number*- 5Y-DATA: 5 (ANSI-Z540-1 compliant) calibrations within 5 years of purchase
*Insert Model Number. Examples: 2220-30-1-5Y-EW, C/2220-30-1-3Y-DATA.

2230G Series High Power, 3-Channel Programmable DC Power Supplies

The Series 2230G 3-channel programmable power supplies provide up to 375 W of power in a space-saving 2U high, half-rack width enclosure to power automotive circuits, LED drivers, power supplies, power ICs and other high-power circuits. The 2230G-30-3 offers 195 W with two 30 V, 3 A channels and a 5 V, 3 A channel. The 2230G-30-6 and the 2230-60-3 supplies output as much as 375 W. The 2230G-30-6 provides two 30 V, 6 A channels, while the 2230G-60-3 has two 60 V, 3 A channels. Both 375 W supplies have a 5 V, 3 A channel as the third channel. These three supplies are linear power supplies; and thus, they are low noise supplies to have minimal impact on a device-under-test (DUT).

- 195 W model has two 30 V, 3 A channels and one 5 V, 3 A channel
- 375 W models have two 30 V, 6 A channels or two 60 V, 3 A channels and one 5 V, 3 A channel
- All channels are independently controlled and are isolated to power a wide range of test setups
- All channels have remote sensing so that the programmed voltage is accurately applied to the load
- Low noise, linear regulation with <1 mVrms ripple & noise
- USB, GPIB, and RS-232 interfaces and rear panel connections for automated test convenience
- Power two isolated circuits with isolated output channels.
- Combine 30 V channels in series to extend voltage output to 60 V. Combine channels in parallel to extend current output capacity. For example, combine all three channels of a 2230G-30-6 to output up to 15 A.

MODEL	2230G-30-3	2230G-30-6	2230G-60-3
MAX Output Voltage	Ch1/Ch2: 30 V Ch3: 5 V	Ch1/Ch2: 30 V Ch3: 5 V	Ch1/Ch2: 60 V Ch3: 5 V
MAX Output Current	Ch1/Ch2: 3 A Ch3: 3 A	Ch1/Ch2: 6 A Ch3: 3 A	Ch1/Ch2: 3 A Ch3: 3 A
Power	Ch1/Ch2: 90 W Ch3: 15 W Total: 195 W	Ch1/Ch2: 180 W Ch3: 15 W Total: 375 W	Ch1/Ch2: 180 W Ch3: 15 W Total: 375 W
Ripple and Noise	<1 mV$_{RMS}$, <3 mV$_{P-P}$	Ch1/Ch2: <1 mV$_{RMS}$, <4 mV$_{P-P}$ Ch3: <1 mV$_{RMS}$, <3 mV$_{P-P}$	<1 mV$_{RMS}$, <4 mV$_{P-P}$

SHIPS WITH PRODUCT
Quick Start Guide, Rear Panel Mating Connector, Harmonic Reduction Module (with 2230G-30-6 and 2230G-60-3), Harmonic Reduction Module Line Cord (with 2230G-30-6 and 2230G-60-3), USB Cable, Power Cord, Calibration Certificate

RECOMMENDED ACCESSORIES
116128300: Screw Terminal Block, 15 Terminals; 4299-7: Universal Rack Mount Shelf Kit; 7007-1: Shielded GPIB Cable, 1 m (3.2 ft); 7007-2: Shielded GPIB Cable, 2 m (6.5 ft); KPCI-488LPA: IEEE-488 Interface for PCI Bus; KUSB-488B: IEEE-488 USB-GPIB Interface Adapter; USB-B-1: USB Cable 1 m (3.2 ft)

RECOMMENDED SERVICE
KeithleyCare Extended Warranty
Model No.*-EW: 1 Year, extends 3-year warranty one additional year
Model No.*-5Y-EW: 5 Year, extends 3-year warranty to 5 years

KeithleyCare Standard Calibration Plan
C/Model No.*-3Y-STD: 3 Year, 3 calibrations within 3 years of purchase
C/Model No.*-3Y-DATA: 3 Year, 3 calibrations within 3 years with Z540 data report
C/Model No.*-5Y-STD: 5 Year, 5 calibrations within 5 years of purchase
C/Model No.*-5Y-DATA: 5 Year, 5 calibrations within 5 years with Z540 data report
*Replace Model Number with a 2230G series model number. For example, if the 2230G-30-3 is selected, then the part number for the 1 YearKeithleyCare Extended Warranty is 2230G-30-3-EW.

2260B Series Programmable DC Power Supply (360 W, 720 W, 1080 W)

Source a wide range of voltages and currents using the Series 2260B Programmable DC Power Supplies. All twelve instruments have constant power outputs to provide a wide range of voltage and output currents. The wide range of output voltages and currents and multiple interfaces in the 2260B power supplies enables their use in a broad array of applications including research and design, quality control, and production test.

MODEL	2260B-30-36	2260B-80-13	2260B-250-4	2260B-800-1	2260B-30-72	2260B-80-27
MAX Output Voltage	30 V	80 V	250 V	800 V	30 V	80 V
MAX Output Current	36 A	13.5 A	4.5 A	1.44 A	72 A	27 A
Power	360 W	360 W	360 W	360 W	720 W	720 W
Ripple and Noise	<7 mV$_{RMS}$, <60 mV$_{P-P}$	<7 mV$_{RMS}$, <60 mV$_{P-P}$	<15 mV$_{RMS}$, <80 mV$_{P-P}$	<30 mV$_{RMS}$, <150 mV$_{P-P}$	<11 mV$_{RMS}$, <80 mV$_{P-P}$	<11 mV$_{RMS}$, <80 mV$_{P-P}$

MODEL	2260B-250-9	2260B-800-2	2260B-30-108	2260B-80-40	2260B-250-13	2260B-800-4
MAX Output Voltage	250 V	800 V	30 V	80 V	250 V	800 V
MAX Output Current	9 A	2.88 A	108 A	40.5 A	13 A	4.32 A
Power	720 W	720 W	1080 W	1080 W	1080 W	1080 W
Ripple and Noise	<15 mV$_{RMS}$, <100 mV$_{P-P}$	<30 mV$_{RMS}$, <200 mV$_{P-P}$	<14 mV$_{RMS}$, <100 mV$_{P-P}$	<14 mV$_{RMS}$, <100 mV$_{P-P}$	<15 mV$_{RMS}$, <120 mV$_{P-P}$	<30 mV$_{RMS}$, <200 mV$_{P-P}$

- Wide output range with constant power
- Programmable voltage/current rise and fall times
- Constant current priority setting
- Programmable output resistance
- USB, LAN, Analog Control, optional GPIB
- Precisely control voltage rise time with the variable slew rate control.

SHIPS WITH PRODUCT
2260B Basic Accessories Kit, Test Leads, USB Cable, Quick Start Guide, User Documentation, Power Cord, 3-year Warranty

RECOMMENDED ACCESSORIES
2260-001: Accessory Kit; 2260-002: Simple IDC Tool; 2260-003: Contact Removal Tool; 2260-004: Basic Accessories Kit; 2260-005: Cable for 2 units in Series connection; 2260-006: Cable for 2 units in Parallel connection; 2260-007: Cable for 3 units in Parallel connection; 2260-008: Test Lead Set with Lugs; 2260-009: Test Leads (250 V, 800 V); 2260-010: Basic Accessories Kit (250 V, 800 V models); 2260-EXTERM-HV: Extended Terminal (250 V, 800 V models); 2260B-GPIB-USB: GPIB To USB Adapter; 2260B-EXTERM: Extended Terminal; 2260B-RMK-JIS: Rack Mount Kit (JIS); 2260B-RMK-EIA: Rack Mount Kit (EIA)

RECOMMENDED SERVICE
Model Number*-EW: 3-year factory warranty extended to 1 additional year from date of shipment
Model Number*-5Y-EW: 3-year factory warranty extended to 5 years from date of shipment
C/Model Number*- 3Y-STD: KeithleyCare 3-Year Standard Calibration Plan
C/Model Number*- 3Y-DAT: KeithleyCare 3-Year Calibration with Data Plan
C/Model Number*- 5Y-STD: KeithleyCare 5-Year Standard Calibration Plan
C/Model Number*- 5Y-DAT: KeithleyCare 5-Year Calibration with Data Plan
*Insert Model Number. Examples: 2260B-30-36-5Y-EW, C/2260B-30-36-3Y-DATA.

LEARN MORE ⟩ Download "Avoiding Inrush Current when Testing High Power LEDs with Series 2260B Power Supplies" Application Note.

2280S Series Precision Measurement DC Power Supply

Series 2280S Precision Measurement, Low Noise, Programmable DC Power Supplies are much more than just sources of clean power; they are also precision measurement instruments. They can source stable, low noise voltages as well as monitor load currents over a wide dynamic range from amps to nanoamps. The 2280S-32-6 can output up to 32 V at up to 6 A; the 2280S-60-3 can output up to 60 V at up to 3.2 A.

MODEL	2280S-32-6	2280S-60-3
MAX Output Voltage/Current	32 V / 6 A	60 V / 3.2 A
Output Power	192 W	192 W
Max Current Measurement Accuracy	±(0.05% + 10 µA)	±(0.05% + 10 µA)
Transient Response Time	<50 µs	<50 µs

- 10 nA resolution to 6 A with high accuracy, measure voltage and current with 6½-digit resolution
- Capture dynamic load currents as short as 140 µs
- Output up to 192 W of low noise, linear regulated power
- Programmable rise and fall times eliminate voltage overshoot and undershoot transients
- Built-in graphing simplifies analyzing trends or displaying voltage or current waveforms
- GPIB, USB, and LAN interfaces, built-in LXI web interface simplifies automated control/monitoring/data logging
- Kickstart Instrument Control Software for the PC enables instrument control without programming. Download at www.tek.com/keithley-kickstart.

SHIPS WITH PRODUCT
2280-001: Output mating connector
174694600: LAN crossover cable (1.5 m)
User Documentation
QuickStart guide
Calibrate Certificate
Power Cord
3-year Warranty

RECOMMENDED ACCESSORIES
2280-001: Rear Panel Mating connector and Cover
2280-Test-Lead: Power Supply Test Lead Kit, 1000 V, 20 A Rating
174694600: LAN Crossover Cable (3 m)
USB-B-1: USB Cable Type A to B, 1 m (3.3 ft)
2450-TLINK: Trigger Link cable to connect 2280S digital I/O to Trigger Link I/O on other Keithley instruments
4299-8: Single Fixed Rack-Mount Kit
4299-9: Dual Fixed Rack-Mount Kit
4299-10: Dual Fixed Rack-Mount Kit for one 2U Graphical Display Instrument and one Series 26xx Instrument
4299-11: Dual Fixed Rack-Mount Kit for one 2U Graphical Display Instrument and one Series 24xx, Series 2000, or 2U Agilent Instrument
7007-05: Double Shielded Premium IEEE-488 Interface Cables, 0.5 m (1.6 ft)
7007-1: Double Shielded Premium IEEE-488 Interface Cables, 1 m (3.2 ft)
7007-2: Double Shielded Premium IEEE-488 Interface Cables, 2 m (6.5 ft)
7007-3: Double Shielded Premium IEEE-488 Interface Cables, 3 m (10 ft)
7007-4: Double Shielded Premium IEEE-488 Interface Cables, 4 m (13 ft)
KPCI-488LPA: IEEE-488.2 Interface Board for the PCI Bus

LEARN MORE ⟩ Download "Making Low Current Measurements with the Series 2280S Precision Measurement DC Power Supply" Application Note.

2281S Series Precision DC Power Supply with Battery Test and Battery Simulation Functions

The Series 2281S single-channel, precision DC supply and battery simulator innovatively integrates the functions of high-precision power supply, battery test, and battery simulation. It is able to analyze the DC consumption of a device under test, test a battery and generate a battery model based on the battery charging process, and simulate a battery based on the battery model. The 2281S-20-6 can output power up to 20 V and 6 A and sink current up to 1 A.

The 2281S uses linear regulation to ensure low output noise and superior load current measurement sensitivity. A high resolution color thin film transistor (TFT) screen displays a wide range of information on measurements. Soft-key buttons and a navigation wheel combine with the TFT display to provide an easy-to-navigate user interface that speeds instrument setup and operation. In addition, built-in plotting functions allow monitoring trends such as drift. These features provide the flexibility required for both benchtop and automated test system applications. In addition, the 2281S provides a list mode, triggers, and other speed optimization functions to minimize test time in automated testing applications.

MODEL	2281S-20-6
Description	Single-Channel, Precision DC Power Supply & Battery Simulator
Maximum Output Voltage/Current	20 V / 6 A
Output Power	120 W
Maximum Current Measurement Accuracy	±(0.05% + 10 µA)

- One box integrates the functions of high-precision power supply, battery test, and battery simulation
- Sink current up to 1 A and source current up to 6 A
- Build a battery model based on charging a battery measurement. Use the model for battery simulation.
- Simulate real output during discharge with a battery model. Set the SOC/Voc, capacity, and resistance of a simulated battery according to test requirements
- Manually create, edit, import and export battery models
- Kickstart Instrument Control Software for the PC enables instrument control without programming. Download at www.tek.com/keithley-kickstart.
- Log battery charge/discharge process and data (V, I, R and Amp-Hour).
- Offers both dynamic and static simulation modes to simulate battery output.

SHIPS WITH PRODUCT
Quick Start Guide, User Documentation, 174694600 LAN Crossover Cable (1.5 m), Power Cord, Rear Panel Mating, Connector with Cover

RECOMMENDED ACCESSORIES
2450-TLINK: Trigger Link Cable to connect 2281S Digital I/O to Trigger Link I/O on other Keithley instruments; 4299-8: Single Fixed Rack-Mount Kit; 4299-9: Dual Fixed Rack-Mount Kit; 4299-10: Dual Fixed Rack-Mount Kit for one 2U Graphical Display Instrument and one Series 26xx Instrument; 4299-11: Dual Fixed Rack-Mount Kit for one 2U Graphical Display Instrument and one Series 24xx, Series 2000, or 2U Agilent Instrument; 174694600: LAN crossover cable (3 m); 7007-05: Double Shielded Premium IEEE-488 Interface Cables, 0.5 m (1.6 ft); 7007-1: Double Shielded Premium IEEE-488 Interface Cables, 1 m (3.2 ft); 7007-2: Double Shielded Premium IEEE-488 Interface Cables, 2 m (6.5 ft); 7007-3: Double Shielded Premium IEEE-488 Interface Cables, 3 m (10 ft); 7007-4: Double Shielded Premium IEEE-488 Interface Cables, 4 m (13 ft); KPCI-488LPA: IEEE-488.2 Interface Board for the PCI Bus; KUSB-488B: IEEE-488.2 USB-GPIB Interface Adapter for USB Port with 2m (6.6 ft) cable; USB-B-1: USB Cable Type A to B, 1 m (3.3 ft)

LEARN MORE ⬏ Download "How to Accelerate a Power Management Unit Test Using the Keithley 2281S Battery Simulator" Application Note.

2290 High Voltage Power Supply

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

MODEL	2290-5	2290-10
MAX Output Voltage	5 kV	10 kV
MAX Output Current	5 mA	1 mA
Power	25 W	10 W
Ripple	3 mV$_{RMS}$ maximum with filter	1 V$_{RMS}$

- Source voltages up to 5 kV and 10 kV
- 1 µA current measurement resolution
- Low noise for precision sourcing and sensitive measurements; selectable filters reduce noise to less than 3mVRMS on the 5 kV supply
- Safety interlock controls high voltage output
- GPIB programmable
- Protection module prevents damage to low voltage instrumentation
- The 2290-PM-200 Protection Module protects low voltage measurement equipment from voltages greater than 200 V.
- Reverse breakdown testing of a high voltage diode using a Keithley SourceMeter® SMU instrument to measure leakage currents down to picoamp levels. The 2290-PM-200 SMU Protection Module protects the SourceMeter SMU instrument from high voltage when the diode breaks down.

SHIPS WITH PRODUCT: User Documentation, Power Cord

RECOMMENDED ACCESSORIES
For 2290-5
2290-5-SHV: 5 kV SHV Female–SHV Female Cable, 3 m (10 ft)
2290-5-MHV: 5 kV SHV Female–MHV Male Cable, 3 m (10 ft)
2290-5-SHVBH: 5 kV SHV Male Bulkhead Connector
2290-5-RMK-1: Single Fixed Rack Mount Kit for 5 kV Power Supply
2290-5-RMK-2: Dual Fixed Rack Mount Kit for 5 kV Power Supply

For 2290-10
2290-10-SHVUC: 10 kV SHV Male to Unterminated Cable, 3 m (10 ft)
2290-10-SHV: 10 kV SHV Male–SHV Male Cable, 3 m (10 ft)
2290-10-SHVBH: 10 kV SHV Female Bulkhead Connector
2290-10-RMK-1: Single Fixed Rack Mount Kit for 10 kV Power Supply
2290-10-RMK-2: Dual Fixed Rack Mount Kit for 10 kV Power Supply
For both
2290-PM-200: 10 kV 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 2 m (6.6 ft) cable
Double Shielded Premium IEEE-488 Interface Cables
7007-05: 0.5 m (1.6 ft); 7007-1: 1 m (3.2 ft); 7007-2: 2m (6.5 ft); 7007-3: 3 m (10 ft); 7007-4: 4 m (13 ft)

RECOMMENDED SERVICE
Model*-3Y-EW: 1-Year Factory Warranty extended to 3 years from date of shipment
Model*-5Y-EW: 1-Year Factory Warranty extended to 5 years from date of shipment
C/Model*-3Y-STD: KeithleyCare 3-Year Standard Calibration Plan
*Insert Model Number. Examples: 2290-5-3Y-EW, C/2290E-10-3Y-STD

LEARN MORE ⬏ Download the Application Note.

2300 Series Portable
Device Battery/Charger Simulator

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.

MODEL	2302, 2302-PJ	2306, 2306-PJ	2308
Channels	1	2	2
Max Output Voltage/Current	15 V / 5 A	15 V / 5 A	15 V / 5 A
Power	45 W	45 W	45 W
Transient Response to a 10× Load Current Change	<40 µs recovery time and <75 mV voltage drop	<40 µs recovery time and <75 mV voltage drop	<35 µs recovery time and <90 mV voltage drop
Current Sink Capacity	3 A	3 A	3 A

- Optimized for battery-powered device testing
- 100 nA current measurement sensitivity
- Load pulse current measurement: 33 µs–833 µs
- Variable output resistance: 0–1 Ω with 10 mΩ resolution
- Measure sleep, currents, standby currents, and full load currents to determine power consumption
- Sink current to simulate a discharged battery

2306 rear panel.

SHIPS WITH PRODUCT
User Documentation
Rear Panel Mating Connector
Calibration Certificate
Power Cord
1-year Warranty

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
7007-05: Double Shielded IEEE-488 Cable, 0.5 m (1.6 ft)
7007-1: Double Shielded IEEE-488 Cable, 1 m (3.2 ft)
7007-2: Double Shielded IEEE-488 Cable, 2 m (6.5 ft)
7007-3: Double Shielded IEEE-488 Cable, 3 m (10 ft)
7007-4: Double Shielded IEEE-488 Cable, 4 m (13 ft)

RECOMMENDED SERVICE
Model*-3Y-EW: 1-year factory warranty extended to 3 years from date of shipment
Model*-PJ-3Y-EW: 1-year factory warranty extended to 3 years from date of shipment
*Insert Model Number. Example: 2302-3Y-EW.

LEARN MORE ↘ Download "Simulating Battery Impedance with the Models 2302 and 2306 Battery Simulators/Chargers" Application Note.

2303 High Speed Power Supply

The 2303 Power Supply provides both voltage control and power consumption monitoring for automated testing of portable, battery-operated devices. It is optimized for testing battery-operated, wireless communication devices such as cellular phones that undergo substantial load changes for very short time intervals.

MODEL	2303, 2303-PJ
Channels	Single Output
Max Output Voltage/Current	15 V / 3 A or 9 V / 5 A
Power	45 W
Transient Response to a 10× Load Current Change	<40 µs recovery time and <100 mV voltage drop
Current Sink Capacity	2 A

- Ultra-fast response times to load changes
- Optimized for battery-powered device testing
- 100 nA current measurement sensitivity
- Load pulse current measurement: 33 µs–833 µs
- Measure sleep, standby currents, and full load currents to determine power consumption
- Sink current to simulate a discharged battery
- Keithley's high speed power supply maintain a stable voltage during large load changes.

2303 rear panel.

SHIPS WITH PRODUCT
User Documentation
Rear Panel Mating Connector
Calibration Certificate
Power Cord
1-year Warranty

RECOMMENDED ACCESSORIES
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
7007-05: Double Shielded IEEE-488 Cable, 0.5 m (1.6 ft)
7007-1: Double Shielded IEEE-488 Cable, 1 m (3.2 ft)
7007-2: Double Shielded IEEE-488 Cable, 2 m (6.5 ft)
7007-3: Double Shielded IEEE-488 Cable, 3 m (10 ft)
7007-4: Double Shielded IEEE-488 Cable, 4 m (13 ft)

RECOMMENDED SERVICE
Model*-3Y-EW: 1-year factory warranty extended to 3 years from date of shipment
C/Model*-3Y-ISO: 3 (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2303, 2303-PJ
*Insert Model Number. Examples: 2303-3Y-EW, C/2303-3Y-ISO.

LEARN MORE ↘ Download "Stabilizing Fast Transient Response Power Supply Load Circuits" Application Note.

DC ELECTRONIC LOADS

Keithley DC electronic loads are stand-alone, high accuracy instruments for testing and for performance characterization of power conversion devices such as power supplies, battery chargers, solar cells, DC/DC converters, and other power components. Keithley electronic loads offer high resolution as low as 0.1mV and 0.01mA to enable detection of subtle changes in power devices. The loads also have high bandwidth dynamic cycling and slew rates as fast as 2.5A/µs to thoroughly test the transient performance of power conversion devices.

	2380 SERIES
Channels	1
Maximum power	200W, 250W, 750W
Maximum Voltage/Current	500V/15A, 120V/60A, 500V/30A
Operation Modes	Constant Current (CC), Constant Voltage (CV), Constant Resistance (CR), and Constant Power (CP), Battery Test, LED Simulation
Connectivity	GPIB, USB, RS232

CHOOSING YOUR DC ELECTRONIC LOAD

DC electronic loads have a wide range of performance to enable testing both static and dynamic performance of power devices. Key capabilities to consider when selecting DC electronic loads are presented below.

❶ Output Power, Output Voltage, and Output Current

Ensure that the electronic load can dissipate the output power that your devices can generate. Also make sure that the load is rated for the maximum voltage and maximum current that your devices or components can supply. It is essential that all three parameters are factored in to your selection decision on the dissipation requirements for your DC electronic load.

❷ Electronic Load Operating Modes

All electronic loads offer a constant current (CC) operating mode. Most also offer constant voltage (CV) and constant power (CP) operating modes. Some also provide constant resistance (CR) loading. More advanced electronic loads offer battery discharge loading to test battery life characteristics and LED simulation loading to test LED driver modules. Make sure the electronic load you select has the operating modes that you will need.

❸ Dynamic Load Testing

If you need to test how your device performs with load changes, ensure that the load you select has a dynamic mode with a transition speed that is fast enough to test the specified transient response of your device. Dynamic modes are typically specified as the range of times that the load will be at each of two current levels. The inverse of twice the shortest time interval determines maximum cycling rate. Shorter time intervals, with fast transitions between loading, stress the power source and provide insight into its stability.

In addition to testing response to fast load changes, it can also be important to determine whether your device can respond at the rate that the load is changing. Ensure electronic load slew rates, often specified in A/µs, are high enough to test your device to its slew rate specifications. Ensure these rates are programmable so the electronic load's range of slew rates meets your application needs.

❹ Safety Testing

Verifying that your power source does not fail under fault conditions is of critical importance. This is particularly true for a short circuit load condition. Electronic loads can be set for short circuits conditions with the load operating near 0V with milliohm load impedance. Make sure the electronic load you select has short circuit test features.

2380 Series

Series 2380 programmable DC Electronic Loads are single output, standalone loads with 200 W, 250 W and 750 W models. Multiple operating modes with up to 25 kHz of dynamic cycling, superior voltage/current resolution and readback accuracy together with multiple interface choices make the Series 2380 ideal for testing a power source in your bench.

MODEL	2380-500-15	2380-120-60	2380-500-30
Number of Output	1	1	1
Maximum Power	200 W	250 W	750 W
Maximum Voltage	500 V	120 V	500 V
Maximum Current	15 A	60 A	30 A
Operating Modes	CV, CC, CR, CP, Battery Test, LED Simulation		
Connectivity	GPIB, USB, RS232	GPIB, USB, RS232	GPIB, USB, RS232

- Multiple operating modes: CV, CC, CR, CP, Battery Test, and LED Simulation
- 0.1 mV / 0.01 mA V/I readback resolution and 0.025%/0.05% V/I readback accuracy
- Up to 25 kHz dynamic cycling mode with adjustable slew rates up to 2.5 A/µs
- Helpful features include voltage rise and fall time measurement, a current monitor output, and list mode load profiles
- Built-in GPIB, USB, RS232 interfaces
- 0.1 mV / 0.01 mA voltage/current readback resolution give you more confidence in the reading when testing your device.
- Dynamic Mode up to 25 kHz for faster transient validation of DC power sources.
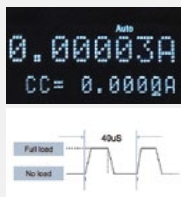
SHIPS WITH PRODUCT

Quick Start Guide
User Documentation
Power Cords
9-Pin Rear Mating Connector

RECOMMENDED ACCESSORIES

2380-001: 9-pin Rear Panel Mating Connector
2380-002: DUT Connection Protective Cover
7007-2: Double-Shielded Premium IEEE-488 Interface Cable, 2 m (6.5 ft)
KPCI-488LPA: IEEE-488.2 Interface Board for the PCI Bus
USB-B-1: USB Cable, Type A Connector to Type B Connector, 1 m (3.3 ft)
4299-7: Universal Fixed Rack Mount Kit for 2380-500-15 and 2380-120-60
RMU2U: Fixed Rack Mount Kit for 2380-500-15 and 2380-120-60
386759800: RMU2U Rack Mount Cosmetic Filler Panel for 2380-500-15 and 2380-120-60
2380-RM: Full-Rack-Width Instrument Fixed Rack Mount Kit for 2380-500-30

RECOMMENDED SERVICE

Model*-1-EW: 3-year factory warranty from date of shipment extended 1 additional year
Model*-5Y-EW: 3-year factory warranty from date of shipment extended to 5 years
C/Model*-3Y-STD: KeithleyCare 3 YR STD Calibration Plan
C/Model*-3Y-DAT: KeithleyCare 3 YR Calibration w/Data Plan
C/Model*-5Y-STD: KeithleyCare 5 YR STD Calibration Plan
C/Model*-5Y-DAT: KeithleyCare 5 YR Calibration w/Data Plan

*Replace the specific power supply model number in place of Model Number to generate the appropriate model number for a service item. Example for a 2380-500-15, a 1-year extended warranty model number would be 2380-500-15-EW.

LEARN MORE ⬊ with the "AC-DC Power Supply Efficiency Testing for Regulatory Standards" 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 picoseconds, 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.

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.

MODEL	FCA3000	FCA3003	FCA3020	FCA3100	FCA3103	FCA3120
Max. Frequency	400 MHz	3 GHz	20 GHz	400 MHz	3 GHz	20 GHz
Channels	2	2 – 400 MHz 1 – 3 GHz	2 – 400 MHz 1 – 20 GHz	2	2 – 400 MHz 1 – 3 GHz	2 – 400 MHz 1 – 20 GHz
Time Resolution	100 ps	100 ps	100 ps	50 ps	50 ps	50 ps
Frequency Resolution	12 digit/s	12 digit/s	12 digit/s	12 digit/s	12 digit/s	12 digit/s

- 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.
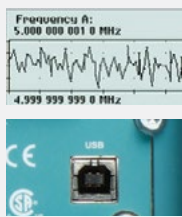
SHIPS WITH PRODUCT
Trial Version of TimeView™ and NI LabVIEW SignalExpress™ TE (LE version)
Calibration Certificate
User Manual on CD
Programmers Guide & Technical Specifications
Power Cord
3-year Warranty

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

INSTRUMENT OPTIONS
MS: Medium Stability OCXO Timebase, 2×10^{-7}
HS: High Stability OCXO Timebase, 5×10^{-8}
RP: Rear-panel Connectors

RECOMMENDED SERVICE
SILV200: 5-year Extended Warranty (FCA3000, FCA3003, FCA3100, FCA3103)
SILV400: 5-year Extended Warranty (FCA3020, FCA3120)

LEARN MORE ↘ Download the "Time and Frequency Measurements for Oscillator Manufacturers" Application Note.

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.

MODEL	MCA3027	MCA3040
Max. Frequency	27 GHz	40 GHz
Channels	2 – 300 MHz 1 – 27 GHz	2 – 300 MHz 1 – 40 GHz
Time Resolution	100 ps	100 ps
Frequency Resolution	12 digit/s	12 digit/s

- 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.

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

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

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

LEARN MORE ↘ Download the "Measurement Statistics, Histograms and TrendPlot™ Analysis Modes" 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.

	PA1000 SINGLE-PHASE	PA3000 MULTI-PHASE
Channels	1	4
Basic Accuracy (V & I)	± 0.04%	± 0.04%
Measurement Bandwidth	DC, 0.1Hz - 1MHz	DC, 0.1Hz - 1MHz
Max Voltage and Current (internal shunt)	600Vrms / 20A RMS	600Vrms / 30A 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 >30 Amps), 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.

PA1000 Power Analyzer

The Tektronix PA1000 is a single-phase, single-channel power analysis solution that is optimized for fast, efficient, and accurate power consumption testing to international standards. Its compact size, DMM-like user-interface, graphical display, and powerful software enable users to quickly visualize, analyze, and document the power consumption efficiency of next-generation devices, including standby power measurements and harmonic analysis.

MODEL	PA1000
Description	PA1000 Single-Phase Power Analyzer
Basic Accuracy (V & I)	0.04% (45-850 Hz)
Bandwidth	1 MHz
Voltage Input Range	Up to 600 V_{RMS}
Current Range (internal shunts)	20 µA to 20 A_{RMS}

- Harmonic analysis to IEC/EN 61000-3-2 / 4-7 (pre-compliance testing to the 50th order)
- Standby power analysis to IEC 62301 / EN 50564 (full compliance testing as low as 5 mW)
- 1 MHz bandwidth
- ±0.04% basic accuracy
- USB, LAN, and GPIB interfaces (standard)
- Easily and accurately measure harmonic performance, standby power, and more with the optional breakout box, and free PWRVIEW software.

SHIPS WITH PRODUCT
Lead Set
User Manual
AC Power Cord
Certificate of Traceable Calibration
3-year Product Warranty

RECOMMENDED ACCESSORIES
PWRVIEW: Complete Power Analysis PC Suite for compliance testing, visualizing signals, analyzing data and documenting results.
Application notes, whitepapers and videos at tek.com/application/power-measurement

RECOMMENDED ACCESSORIES
CL200: Current Clamp, 0.5A - 200A, for Tektronix Power Analyzers
CL1200: Current Clamp, 0.1A - 1000A, for Tektronix Power Analyzers
BB1000-XX: Breakout Box simplifies connections to AC power cords. NA, EU, UK versions
PA-LEADSET: Replacement Lead Set for Tektronix Power Analyzers (One Channel Lead Set)
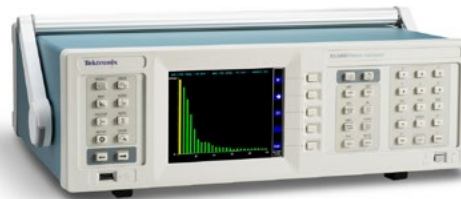
RECOMMENDED SERVICE
C3: Calibration Service 3 Years
C5: Calibration Service 5 Years
D1: Calibration Data Report
D3: Calibration Data Report 3 Years (with Opt. C3)
D5: Calibration Data Report 5 Years (with Opt. C5)

BB1000-UN Universal Breakout Box

LEARN MORE ⌐ Click here to learn about Power Supply measurements using the PA1000.

PA3000 Power Analyzer

The Tektronix PA3000 is a 1 to 4 channel power analyzer optimized for testing today's single and multi-phase, high efficiency power conversion products and designs. Use it to quickly visualize, analyze, and document power efficiency, energy consumption, and electrical performance to the latest regional and international standards including Level VI, EnergyStar, CEC, IEC 62301, and CQC-3146.

MODEL	PA3000 1CH	PA3000 2CH	PA3000 3CH	PA3000 4CH
Input Modules	1	2	3	4
Basic Accuracy (V & I)	±0.04%	±0.04%	±0.04%	±0.04%
Bandwidth	1 MHz	1 MHz	1 MHz	1 MHz
Voltage Input	Up to 600 V_{RMS} (2000 Vpk)	Up to 600 V_{RMS} (2000 Vpk)	Up to 600 V_{RMS} (2000 Vpk)	Up to 600 V_{RMS} (2000 Vpk)
Current Input	80µA to 30A	80µA to 30A	80µA to 30A	80µA to 30A

- 1 to 4 channels supports single-and three phase applications; Up to 600 V_{rms} (2000Vpk) and 30 A_{rms} direct input
- 10 mW standby power measurement
- 1 MHz bandwidth and harmonic analysis to 100th order
- ±0.04% basic voltage and current accuracy
- USB and LAN interfaces standard (GPIB option)
- Free PWRVIEW software
- The PA3000's full color display provides intuitive readout of measured values. View measurements in full color graphical, tabular, or vector format.
- Application specific test modes simplify test setup and analysis for Standby Power, Energy Integration, Ballasts, and Motor Drives.

SHIPS WITH PRODUCT
PWRVIEW: Complete Power Analysis PC Suite for compliance testing, visualizing signals, analyzing data and documenting results; Stackable Test Lead Set (1 set per input channel); Built-in ±15 V power supply for external current transducers; Calibration Certificate; User Manual and AC Power Cord; 3-year Product Warranty

RECOMMENDED ACCESSORIES
CT-60-S: Fixed-Core Current Transducer, High Accuracy, up to 60 A
CT-200-S: Fixed-Core Current Transducer, High Accuracy, up to 200 A
CT-1000-S: Fixed-Core Current Transducer, High Acc., up to 1000 A (requires external power supply)
CT-100-M: Fixed-Core Current Transducer, Hall Effect, up to 100 A
CT-200-M: Fixed-Core Current Transducer, Hall Effect, up to 200 A
CT-1000-M: Fixed-Core Current Transducer, Hall Effect, up to 1000 A
CL200: Current Clamp, 0.5 A–200 A, for Tektronix Power Analyzers
CL1200: Current Clamp, 0.1 A–1000 A, for Tektronix Power Analyzers
BB1000-XX: Breakout Box simplifies connections to AC pwr cords. NA, EU, UK versions.
PA-LEADSET: Replacement stackable banana test leads, safety shrouded with insulated alligator clips, 1000 V CAT II, 30 A. (Set of four for one channel)
PA-EXT-LEADSET: Replacement stackable 2 mm Test Leads for External Current Sensor Input

RECOMMENDED SERVICE
PA3000 C3: Calibration Service 3 Years
PA3000 C5: Calibration Service 5 Years
PA3000 D1: Calibration Data Report
PA3000 D3: Calibration Data Report 3 Years (with Option C3)
PA3000 D5: Calibration Data Report 5 Years (with Option C5)
PA3000 G3: 3 Year Gold Care Plan
PA3000 G5: 5 Year Gold Care Plan
PA3000 R5: Standard Warranty Extended to 5 Years

LEARN MORE ⌐ Download the "Fundamentals of AC Power Measurements" Application Note.

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 make 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	Up to 6.4 GHz
MagniVu™ Timing	25 GHz	50 GHz
State Clock Rate	333 MHz (standard) 667 MHz (optional)	750 MHz to 1.4 GHz
Maximum State Data Rate	1.33 Gb/s	3.0 Gb/s
Record Length	2Mb, 4Mb, 8Mb, 16Mb, 32Mb, 64Mb	2Mb to 64Mb
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.

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.

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

- 15-inch display, with optional touch screen lets you see more of your data and navigate through it efficiently
- 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.
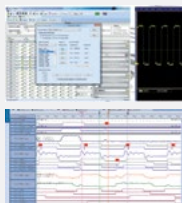
SHIPS WITH PRODUCT
Power Cord, Quick Start Guide, Keyboard and Mouse, Front Cover, Documentation CD, Calibration Certificate

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

RECOMMENDED ACCESSORIES
PG3L-B: Stand-Alone Digital Pattern Generator
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

LEARN MORE ↘ Download the "XYZs of Logic Analyzers" Primer.

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.

MAINFRAME MODEL	TLA7012	TLA7016
Description	Portable Mainframe	Benchtop Mainframe
Number of Modules	2	6
Built-In Computer	Yes	Requires an external computer
Display	15"	None

ACQUISITION MODULE MODEL	TLA7BBX
Channels	68, 102, 136
State Clock Rate	750 MHz (standard); 1.4 GHz (optional)
MagniVu Timing	50 GHz
Timing	1.6 GHz on all channels; 3.2 GHz on ½ channels; 6.4 GHz on ¼ channels

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

- 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.

SHIPS WITH PRODUCT
Power Cord, Quick Start Guide, Keyboard and Mouse, Front Cover (TLA7012), Documentation CD, Calibration Certificate

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

LEARN HOW ↘ The TLA7012 can help in the debug of signal integrity problems. Download the "Fundamentals of Signal Integrity" Primer.

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	BSX SERIES
Product Series	BA1500, BA1600	BSA125C, BSA175C, BSA286CL	BSX125. BSX240, BSX320
Channels	1	1	1
Maximum Bitrate	1.5-1.6 Gbps	12.5-28.6 Gbps	12.5-32 Gbps
Maximum Native Error Detector Rate	1.6 Gbps	26 Gbps	26 Gbps, sub-sampled 26 to 32 Gbps
Maximum Pattern Length	8Mbits	128Mbits	512Mbits with Protocol Sequencing
Stress Impairments	External Stressed Clock	External Stressed Clock Internal: (STR) Rj, Sj, Si, Pj, BUJ	External Stressed Clock Internal (STR) Rj, Sj, Di Pj, BUJ
Output Signal Amplitude	4V Differential	4V Differential	Variable, 100 mV to 3V Differential
Detector Functions	BER, BER Contour, BER Mask, Error Location, Eye Diagram, Jitter Peak	BER, BER Contour, BER Mask, Error Location Analysis, Eye Diagram, Jitter Peak, Jitter Map, Jitter Tolerance	BER, BER Contour, BER Mask, Error Location Analysis, Eye Diagram, Jitter Peak, Jitter Map, Jitter Tolerance, Programmable Pattern Matching
Input Sensitivity	40mV Typical	50mV Typical	50mV Typical
Applications	Digital Radio and Satellite Test	PCIe, USB, Thunderbolt, SATA, SAS, FC, IEEE802.x, OIF, CEI	PCIe Gen 3/4, USB 3.1 Gen1/2, Thunderbolt, SAS, FC, IEEE802.x, OIF, CEI
Software	–	BSAUSB3: USB (Gen3) and BSAUSB3.1L USB (Gen 3.1) 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.	BSXUSB31: USB 3.1 Gen1 and Gen2 Automated Loopback Control, Auto Impairment Calibration and Receiver Compliance Test System; BSXPCI: PCI Express Gen3/4 Automated Loopback Control, Auto Impairment Calibration and Receiver Compliance Test System.

BA

BSA

BA/BSA Bit Error Rate Tester

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.

MODEL	BA1500	BA1600	BSA125C	BSA175C	BSA286CL
Output Channels	1	1	1	1	1
Bit Rate	1.5 Gbps	1.6 Gbps	12.5 Gbps	17.5 Gbps	28.6 Gbps
Maximum User Defined Pattern Length	8 Mbits	8 Mbits	128 Mbits	128 Mbits	128 Mbits

- BA1500/BA1600:
  - 1.6 Gbps performance and low entry cost with full featured analysis capabilities key for telecommunications and satellite systems testing
- BSA125C-BSA286CL:
  - 12.5 to 28.6 Gbps 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 28.6 Gbps performance makes these instruments key for all forms of receiver characterization and debug.
- 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 infrequent errors, which other instruments overlook.

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 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

Linear Equalizer Options
LE160: 16Gbps Linear Equalizer; LE320: 32Gbps Linear Equalizer

Common Options
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

Adapters
BARACK BA-Rack Mount Kits; BSA12500ISI Differential ISI Board; BSARACK BSA-Rack Mount Kits; BSASWITCH Hardware switch for receiver testing in applications such as USB3 compliance testing allowing attainment of loopback; PMCABLE1M Precision Phase Matched Cable Pair

INSTRUMENT OPTIONS

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

BSA125C-BSA286CL: F2: F/2 Jitter Generation (requires STR); STR Stressed Signal Generation; 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

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

BSX Series Bit Error Rate Tester

The new protocol enabled BSX Series BERTScope simplifies and accelerates receiver testing of Gen3 and Gen4 devices (up 32 Gb/s) – with the most comprehensive tools to shorten the time required to debug link training and bit error rate issues. Pattern sequencing and pattern matching allows users to observe their devices response to loop-back and link training test cases. The BERTScope family also provides unique visibility into the underlying root cause of physical layer issues by capturing the exact location and timing of bit errors.

MODEL	BSX125	BSX240	BSX320
Output Channels	1	1	1
Maximum Bit Rate	12.5 Gbps	24 Gbps	32 Gbps
TXEQ to Maximum Rate	Yes	Yes	Yes

- Up to 32 Gbps maximum data rate
- Built-in 4-tap TX equalization
- Full complement of stress impairments including RJ, SJ DI PJ, BUJ
- Protocol-aware pattern sequencing with detector pattern matching
- Error location analysis with forward error correction emulation
- Protocol aware pattern editing and sequencing simplifies creation of user-defined handshaking test cases.
- Error locations provide debugging information such as the exact number of errors at each bit position in the test pattern.

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: LVD Low Voltage Directive, US Listed UL61010-1, Canada Certified CAN/CSA 61010-1

RECOMMENDED ACCESSORIES

Clock Recovery Instruments
CR125A: 1-12.5 Gbps
CR175A: 1-17.5 Gbps
CR286A: 1-28.6 Gbps

Linear Equalizer
LE160: 16Gbps Linear Equalizer
LE320: 32Gbps Linear Equalizer

Software Packages
BSXUSB31: Calibration and compliance test automation for USB31 Gen1 and Gen2
BSXPCI4Base: Calibration and compliance test automation for PCIe Gen3 and Gen4 BASE

BSX Instrument Options
STR: Stress impairment option
TXEQ: 4-tap equalization option
JMAP: Advanced jitter decomposition option
FEC: Forward Error Correction emulation
UPM: User defined pattern matching

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

COHERENT OPTICAL SOLUTIONS

Characterization of Signals at 100 Gb/s, 400 Gb/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.

	OM4225 OPTICAL MODULATION ANALYZER	OM4245 OPTICAL MODULATION ANALYZER	OM2210 COHERENT RECEIVER CALIBRATION SOURCE	OM2012 TUNABLE LASER SOURCE
Bandwidth	25 GHz	45 GHz	N/A	N/A
Band Options	C	C or C+L	C, L, or C+L	C, L, or C+L
Description	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, narrow-linewidth, 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 optical modulation 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 Optical Modulation Analyzer series are tightly coupled with the DPO70000SX 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 25GHz can accurately measure signals up to 40GBaud. Using the 45GHz OMA, signals as high as 80GBaud 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, an 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.

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	—	15.5	dBm
Operating Frequency Range (50 GHz channel spacing on ITU grid)	ν (C-band)	196.25	—	191.25	THz
	ν (L-band)	191.25	—	186.25	THz
Operating Wavelength Range (50 GHz channel spacing on ITU grid)	λ (C-band)	1527.6	—	1567.54	nm
	λ (L-band)	1567.54	—	1609.62	nm
Wavelength Accuracy EOL	$\Delta\lambda$.acc	—	—	±2.5	GHz
Linewidth [FWHM (–3 dB), instantaneous]	$\Delta\lambda$	—	—	100	kHz
Side Mode Suppression Ratio	SMSR	40	55	—	dB
Polarization Extinction Ratio (Unconnectorized)	Er, p	20	—	—	dB

- 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.

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.

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

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. Within our product portfolio you will also find data acquisition systems and digital multimeters with switching options.

	SERIES 3700A*	SYSTEM 46 /46T	707B / 708B
Max Channels / Crosspoints	576 / 2688	32	576 / 96
Card Slots	6	Not applicable	6 / 1
Unique optional card capabilities	High density switching, automatic CJC, long-life switching, FET switching	Not applicable	7072-HV provides 1kV and low current
Interface	GPIB, LAN (LXI), USB-TMC, TSP-Link® Channel Expansion Bus	GPIB	GPIB, LAN (LXI), ACS software, 4200-SCS KTEI software

* Series 3700A Switch Systems are found in this catalog under the Data Acquisition product category

CHOOSING YOUR SWITCH SYSTEMS

The most common selection criteria to help you choose the appropriate switch mainframe for your application.

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.
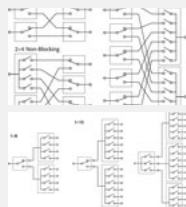
System 46 RF Microwave Switch System

Both terminated and unterminated versions of the 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.

MODEL	S46 (UNTERMINATED)	S46T (TERMINATED)
Max. Channels or Crosspoints per Chassis	Up to 32 RF/microwave chs	Up to 32 RF/microwave chs
Frequency Ranges	Up to 40 GHz	Up to 26.5 GHz
Relays	Up to 8 unterminated SPDT coaxial microwave relays and 4 unterminated multi-pole coaxial microwave relays	Up to 8 terminated or unterminated SPDT coaxial microwave relays and 4 terminated or unterminated multi-pole coaxial microwave relays

- 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).

SHIPS WITH PRODUCT
Power Cord
Instruction Manual
Rack Mount Kit

LEARN MORE ⬎ Download "Configuring an Optimal RF/ Microwave Switch System" Application Note.

Semiconductor Switch Matrix Mainframes

The 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 708B supports a single 8x12 switch card. For larger systems, the 707B can accommodate up to six 8×12 cards.

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

- Remote and manual programming support
- Integrates seamlessly with the Model 4200A-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.
- The 707B and 708B support a family of matrices designed specifically for low-level semiconductor device testing.

SHIPS WITH PRODUCT
User Documentation
Test Script Builder Software (available at www.tek.com)
CA-180-4A: CAT 5 Ethernet Crossover Cable, 1 m (3.3 ft)
CA-179-2A: CAT 5 Ethernet Cable, 3 m (10 ft)
CO-7: Line Cord
Rear Fixed Rack Mount Hardware (707B only)

RECOMMENDED ACCESSORIES
CA-126-5A: 25-pin Female Digital I/O to 25-pin Male Cable, 3 m (10 ft)
2600-TLINK: Digital I/O to Trigger Link Cable, 1 m (3.3 ft)
4299-6: Universal Full Rack Mount Kit (for 708B)
7007-1: Double-shielded GPIB Cable, 1 m (3.3 ft)
7007-2: Double-shielded GPIB Cable, 2 m (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 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:

LEARN MORE ⬎ Download "Designing a High Throughput Switch System for Semiconductor Measurements" 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.

	4200A-SCS	PCT CONFIGURATIONS	S500, 530 & S535 PARAMETRIC TEST SYSTEMS	S540 POWER SEMICONDUCTOR TEST SYSTEM
Definition	Parameter Analyzer for semiconductor devices and materials	Parametric Curve Tracer configurations for power device characterization	Automated Parametric Test Systems used in production and lab environments. Up to 60 pins.	Automated Parametric Test System that enables testing up to 3kV
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 and TEG structures, analog, WBG, mixed signal, communications, sensors and displays.	SiC, GaN, and other high voltage semiconductor devices and structures
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	Automated Characterization, Process Integration, Process Control Monitoring, Production Die Sort
Measurement Capabilities	I-V, C-V, Ultra-fast I-V, Pulse I-V	Low-power I-V, high-power I-V, and C-V	I-V, C-V, frequency, and pulse up to 1100V. Multi-site parallel test.	I-V, C-V, frequency, and pulse. Up to 3kV. 2- and 3-terminal capacitance measurements.

CHOOSING YOUR SEMICONDUCTOR TEST SYSTEM

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

❶ 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, wafer acceptance testing, and device characterization and are used in production and lab environments that include a broad range of devices and technologies.
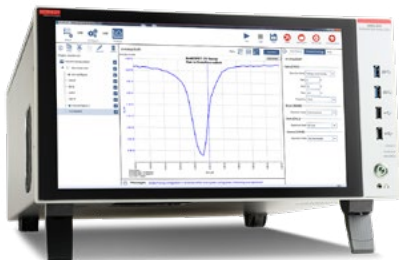
❷ Characterization Software

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 setups and high-speed production test systems.

❸ Parameter Analyzers

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

❹ Curve Tracer Solutions

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

4200A-SCS Parameter Analyzer

The modular, fully integrated 4200A-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. Now running Windows 10 OS.

MODEL	4200A-SCS	4200A-SCS-PK1	4200A-SCS-PK2	4200A-SCS-PK3
Total # of SMUs	Up to 9 high or medium power	2 medium power	2 medium power	2 medium power 2 high power
Current Range & Resolution (SMU)	1 A / 10 aA	100 mA / 10 aA	100 mA / 10 aA	1 A / 10 aA
Voltage Range & Resolution (SMU)	± 210 V / 0.2 µV	210 V / 0.2 µV	210 V / 0.2 µV	± 210 V / 0.2 µV
Capacitance-Voltage C-V Module	Optional	No	Yes	Yes
Ultra-Fast Pulsed I-V module	Optional	No	No	No

- Modular architecture - configurable and scalable to test needs
- 10 aA and 0.2 µV SMU/PA measure resolution
- Multi-frequency, Quasistatic and VLF C-V measurement capabilities
- Two-channel, Ultra-Fast Pulse I-V module for transient and self-heating analysis
- Includes software drivers for leading analytical probers

4200A-CVIV I-V/C-V Multi-Switch Module

SHIPS WITH PRODUCT
Reference and User Manual
236-ILC-3: Interlock Cable
All Cables and Adapters

INSTRUMENT MODULES
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-CVU: Multi-frequency Capacitance Unit
4200A-CVIV: I-V/C-V Multi-Switch Module
4225-PMU: Ultra-Fast I-V Pulse Measure Unit
4225-RPM: Remote Amplifier/Switch
4220-PGU: High Voltage Pulse Generator
4210-MMPC/X: Multi-measurement Performance Cables

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

LEARN MORE ↘ Discover what upgrade options are available for your 4200-SCS. Contact your local Keithley or Tektronix representative today.

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.

MODEL	2600-PCT-1	2600-PCT-2	2600-PCT-3	2600-PCT-4	PCT-CVU
Type	Low Power	High Current	High Voltage	High Current/ High Voltage	Multi Frequency C-V Meter
Collector/Drain Supply High Voltage Mode	200 V/10 A	200 V/10 A	3 kV/120 mA	3 kV/120 mA	Measures Capacitance vs. Voltage on 2, 3 and 4 Terminal Devices up to 3 kV
Collector/Drain Supply High Current Mode	200 V/10 A	40 V/50 A	200 V/10 A	40 V/50 A	
Step Generator Base/Gate Supply	200 V/10 A	200 V/10 A	200 V/10 A	200 V/10 A	

- 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.

SHIPS WITH PRODUCT
ACS-Basic Component Test Software
KUSB-488B USB to GPIB Adapter (2600 configurations only)
All Cables and Adapters
Sample Parts

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
8010-DTB-CT: Curve Tracer Socket Adaptor
CVU-3K-KIT: Bias Tee Kit for Up to 3 kV
CVU-200-KIT: Bias Tee Kit for Up to 200 V
70161-MSA: Keyboard/Monitor Arm for K420 and K475 Carts
8020: High Power Interface Panel
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

LEARN MORE ↘ "Testing to 100A by Combining Keithley Model 2651A High Power SourceMeter Instruments" Application Note.

S530 Parametric Test System, S535 Multi-Site Test System and S500 Integrated Test System

S530 **S500** **S535**

Keithley's S530 and S535 Semiconductor Parametric Test Systems are engineered to handle the DC and C-V measurements required in process control monitoring, on-wafer functional test, 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, including multi-pin parallel test.

MODEL	S530 LOW CURRENT PARAMETRIC TEST SYSTEM	S530 HIGH VOLTAGE PARAMETRIC TEST SYSTEM	S535 MULTI-SITE TEST SYSTEM	S500 INTEGRATED TEST SYSTEM
Wiring & Pin Count	Up to 60 pins (4-wire or "Kelvin")	Up to 60 pins (4-wire or "Kelvin")	Up to 64 pins (2 or 4 sites tested in parallel)	Up to 60 pins with switch (2-wire), or 32 pins (direct wiring from SMU)
SMU Channels	2 to 8	2 to 8	2 to 8	1 to 8 with switch, or 1 to 32 without switch
Max Voltage	200 V (2636B SMU)	1100 V (2410 SMU)	200 V @ 100 mA 100 V @ 1 A	3 kV (2657A SMU)
Max Current	1 A	1 A	1 A	50 A pulse (2651A SMU)

- Industry lowest cost of ownership
- Sub- pA current measurement capability (S530 Low I)
- Test up to 3 kV (S540)
- Multi-site parallel test reduces test time
- C-V measurements up to 1 MHz
- Up to 60 pins full Kelvin (S530 High V or S530 Low I)
- S530/S535 systems quickly settle to sub-200 fA noise floor.
- KTE software for fast execution and compatibility with legacy Keithley systems.

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

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)

LEARN MORE ⤵ Download The Application Note "Multi-Site Parallel Testing"

S540 Power Semiconductor Test System

The Keithley S540 is a fully automated, wafer-level parametric test system that can perform all high voltage, low voltage, low current, and capacitance tests up to 3 kV in a single probe touch-down to maximize productivity and minimize cost of ownership. It is fully configurable from 12 to 48 pins.

MODEL	S540HV	S540HV/LC
Wiring & Pin Count	12 pins	Up to 48 pins (12 pins HV, 36 pins LC)
SMU Channels	Up to 4	Up to 8
Max Voltage	3 kV	3 kV
Current Resolution	10 fA	1 fA

- Up to 48 pins
- Automatic three-terminal capacitance measurements such as Ciss, Coss, Crss up to 3 kV
- Sub-pA current measurement capability
- Perform all tests in a single probe touch-down
- KTE v5.8 software for fast test development and execution
- 9140 PCA combines high voltage and low current performance
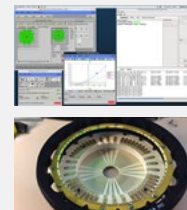
SHIPS WITH PRODUCT
System Source Measure Units (SMUs)
Switching Matrices
System Cabinet, Controller, and Integration
System Software
High-voltage Safety Interlock

RECOMMENDED ACCESSORIES
Probe Card Adapter (Keithley 9140 or Celeadon VC20)
Capacitance Meter
High Resolution DMM
Pulse Generator
Frequency Meter

LEARN MORE ⤵ Download the "Wafer Level Testing up to 3kV" Application Note.

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 setups and high-speed production test systems.

MODEL	ACS	ACS BASIC EDITION	ACS-2600-RTM
Description	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	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 (PCT) configurations; Interactive and real-time data plotting; Use unlicensed copies on stand-alone PCs for test development	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

- ACS is a flexible, interactive software test environment that supports many Keithley instruments and parametric test systems
- 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's 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.

SHIPS WITH PRODUCT
User Documentation
License Key

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

LEARN MORE ⭳ Download the "ACS Basic Edition Semiconductor Parametric Test Software for Component and Discrete Devices" Data Sheet.

Contact us for brand new, refurbished and used Tektronix Equipment

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