Tektronix®

# 6 Series Low Profile Digitizer

LPD64 Datasheet

*Highest Performance. Unmatched Density.*
*Oscilloscope Class Control.*

## Performance in numbers

### Input channels

- 4 SMA inputs
- Each SMA input supports Analog, Spectral (using DDC), or both simultaneously

### Performance for every channel

- Sample Rate: 25 GS/s
- Bandwidth: DC to 8 GHz (optional)
- Vertical Resolution: 12-bit ADC
- Real-Time 2 GHz DDC (optional)
- Record Length: 125 Mpts (std), 250 Mpts, 500 Mpts or 1 Gpts (optional)
- Lowest-in-class Noise
- Highest-in-class ENOB
- Best-in-class channel-to-channel isolation

### Real-Time Digital Down Converter (DDC)

- Patented individual time domain and frequency domain controls
- Up to 2 GHz capture bandwidth (optional)
- IQ data transfers to PC for analysis (optional)
- Frequency vs time, Phase vs time and Magnitude vs time plotting (optional)
- RF vs Time Triggering (optional)

### Superior low noise, vertical resolution and accuracy

- Low input noise enabled by new TEK061 front-end ASICs
- Noise at 1 mV/div: 54.8 uV @ 1 GHz
- Input Range: 10 mV to 10 V full scale
- DC Gain Accuracy: +/-1.0% at all gain settings >1 mV/div
- Effective Number of Bits (ENOB):
  - 8.2 bits at 1 GHz
  - 7.6 bits at 2.5 GHz
  - 7.25 bits at 4 GHz
  - 6.8 bits at 6 GHz
  - 6.5 bits at 8 GHz

### Remote communication and connectivity

- Ethernet 10/100/1000 port
- USB 3.0 device port (USBTMC) up to 800 Megabits/second
- LXI 1.5 Certified (VXI-11)
- Easy remote access with e*Scope; just enter the instrument IP address into a browser
- Award-winning user interface
- Connect a Mouse, Keyboard, Monitor or KVM switch
- Drivers: IVI-C, IVI-COM, LabVIEW, VOSS Scientific DAAAC
- Support for VISA, MATLAB, Python, C/C++/C#, Sockets

### Measurement analysis

- 36 standard measurements
- Jitter Measurements (optional)
- User-Defined Filtering (optional)
- DDR Measurements (optional)
- Power Measurements (optional)
- Advanced Spectrum View (optional)

### Operating systems

- Closed Embedded OS (standard)
- Microsoft Windows 10 (option 6-WINM2)

### Security & declassification (option 6-SEC)

- Password protect all user-accessible ports
- Locks down the digitizer, prevents on-instrument user data storage
- Meets the needs for top secret and high security environments

### Dimensions

- 2U (3.5 in./89 mm) tall & rack ready out of the box (standard configuration)
- 17 in. (432 mm) wide
- Fits into standard 24 - 32 in. (610 - 813 mm) racks
- Air flow is left to right for rack setup

With the lowest input noise and up to 8 GHz analog bandwidth, the 6 Series Low Profile Digitizer LPD64 provides the best signal fidelity for analyzing and debugging signals in a compact 2U rack space. With four SMA inputs each supporting Analog, Spectral (using DDC), or both simultaneously, lowest-in-class noise, and highest-in-class ENOB, the 6 Series Low Profile Digitizer LPD64 is ready for next generation test rack designs.

## The 6 Series family

The 6 Series Low Profile Digitizer (LPD64) represents the highest performance digitizer on all channels in its class. This high-speed digitizer has the functionality of a digitizer and the power of an oscilloscope, sharing a similar hardware platform as the 6 Series MSO.

The transition from a 6 Series MSO benchtop oscilloscope to a Low Profile Digitizer has never been easier for R&D engineers needing to move their code, test work and platform performance into manufacturing and automation. Both products support the same user interface, remote capability, performance characteristics and programming back-end to make this transition as simple and easy as possible. No need to rewrite test routines and development test cycle code!

For more information on the capabilities of the benchtop 6 Series B MSO, including the award-winning user experience and the various analysis software options, please see the 6 Series B MSO datasheet at *www.tek.com/6SeriesMSO*.

## The Low Profile family

The 6 Series Low Profile Digitizer expands the performance of the 5 Series MSO Low Profile by adding twice the number of Tektronix TEK049 ASICS in the same 2U footprint. Now with 25 GS/s and up to 8 GHz on all channels. Low Profile users now have the choice of extreme high channel count or extreme performance in the same rack form factor.

For more information on the capabilities of the 5 Series MSO Low Profile (8 channels, 1 GHz), please see the datasheet at *www.tek.com/MSO58LP/*

*Two 6 Series Low Profile Digitizers (left) and two 5 Series MSO Low Profile oscilloscopes (right)*

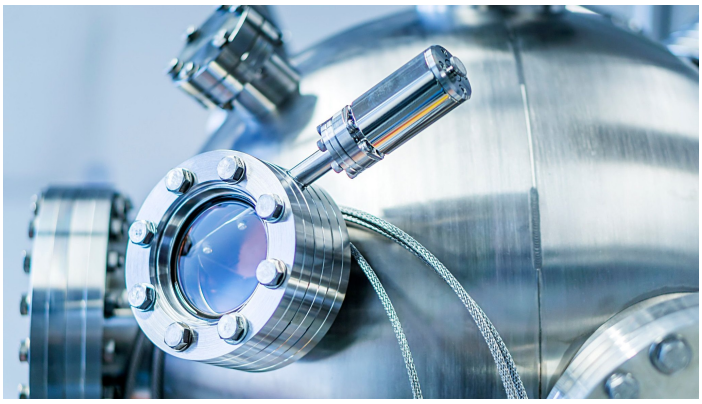
| Quick Comparison | 6 Series Low Profile Digitizer | 5 Series MSO Low Profile Digitizer |
|---|---|---|
| Sample Rate | 25 GS/s | 6.25 GS/s |

Table continued…

| Quick Comparison | 6 Series Low Profile Digitizer | 5 Series MSO Low Profile Digitizer |
|---|---|---|
| Analog Bandwidth | Up to 8 GHz | 1 GHz |
| RF (DDC) Span Bandwidth | 2 GHz | 500 MHz |
| ENOB @ 1 GHz | 8.2 bits | 7.6 bits |
| LXI compliance version | 1.5 | - |
| Rack Dimensions | 2U | 2U |

## Machine diagnostics for physics

Physics is constantly leading the world to exciting new scientific discoveries in both matter and energy. These experiments require digitizers and oscilloscopes with improvements in precision, accuracy, performance and density when monitoring target test points. The 6 Series Low Profile Digitizer meets these requirements by bringing an industry leading performance, small form factor, Tektronix's class of reliability, easy remote accessibility, and award-winning user interface.



Common physics fields

- High Energy (Particle) Physics
- Nuclear Physics
- Atomic, Molecular and Optical Physics
- Condensed Matter

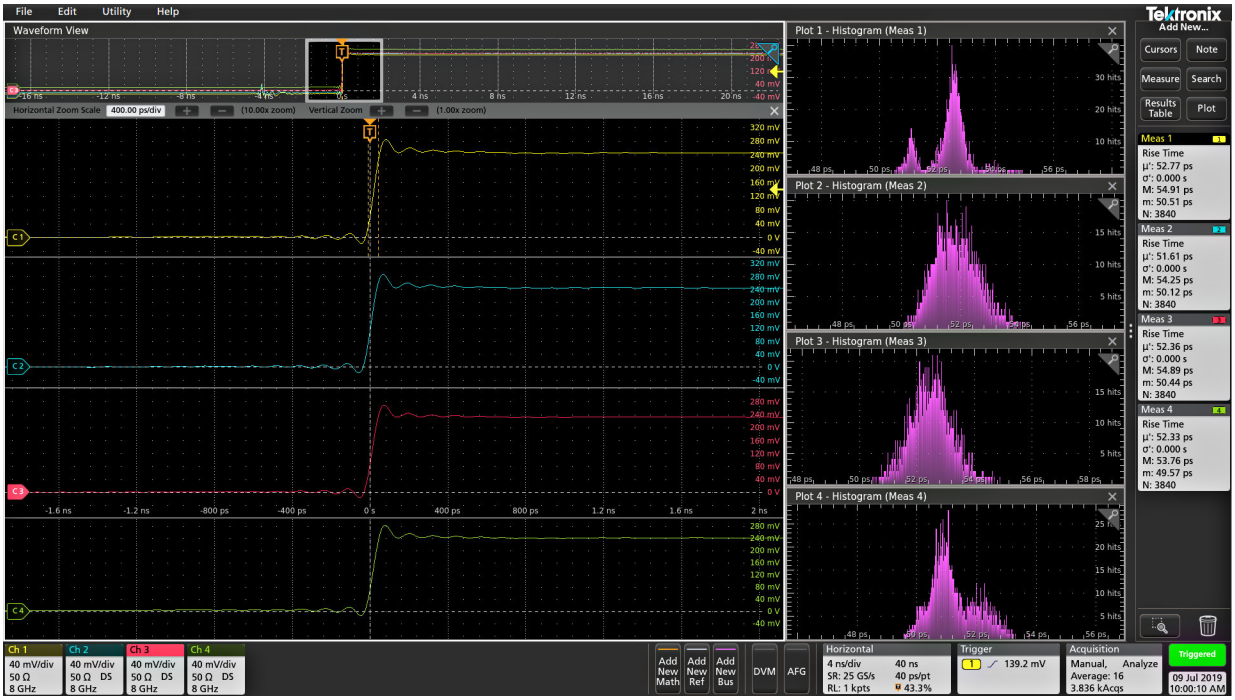
Research fields requiring single shot events or fast repetitive monitoring in their research labs; experiments like Photo Doppler Velocimetry (PDV), VISAR, gas guns, spectroscopy, accelerators and more. Many of these are diagnosing experiments and validating doppler shifts, phase alignments, beat frequencies, beam steering alignment or amplitudes. Doing this with reliable, high performance equipment is key for long term success.

## Performance on every channel

Tired of turning on multiple digitizer channels and wondering what the sample rate, record length or bandwidth settings are? The 6 Series Low Profile Digitizer has industry leading performance on EVERY channel, always. No compromises!

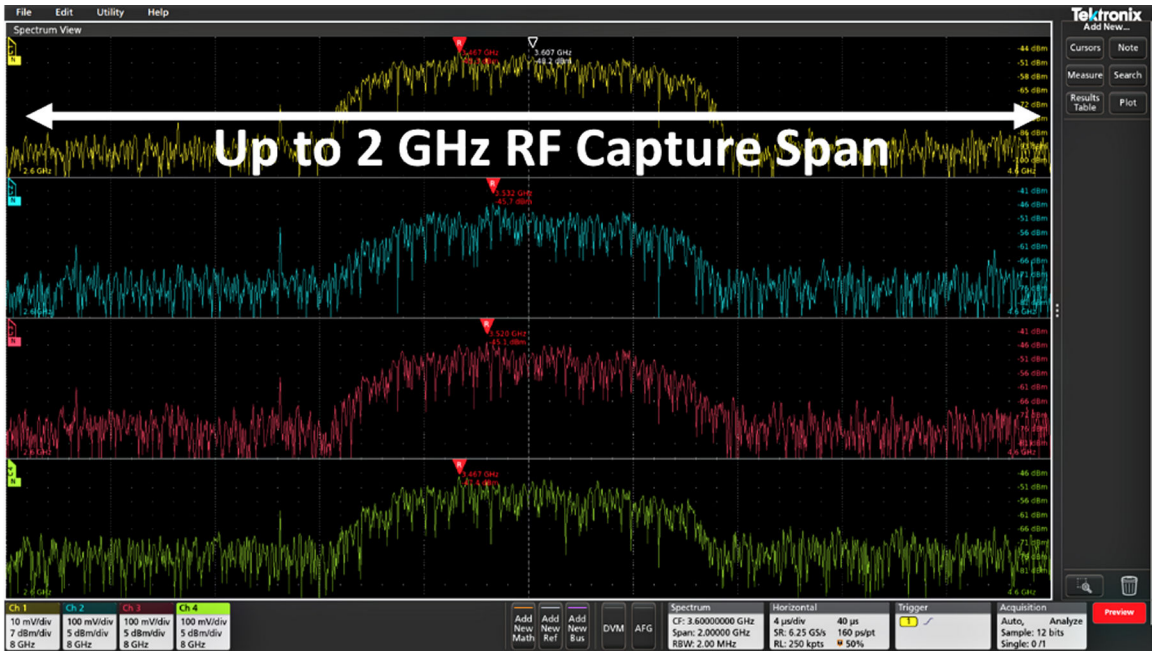
Key performance features:

- 25 GS/s on ALL channels
- DC to 8 GHz on ALL channels
- Up to 1 Billion samples on ALL channels
- Up to 2 GHz RF DDC capture bandwidth on ALL channels
- 12-bit analog-to-digital converters
- Best-in-class low noise
- Best-in-class Effective Number Of Bits
- Best-in-class channel isolation (crosstalk)




*High Sample rate on each input enables a new class of density performance. In this example, 4 channels at 25 GS/s are measuring rising edges ~52 ps.*

## Spectrum View

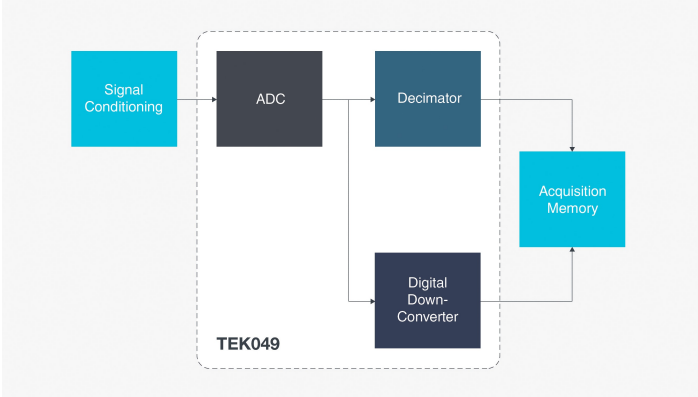



*Intuitive spectrum analyzer controls like center frequency, span and resolution bandwidth (RBW), independent from time domain controls, provide easy setup for frequency domain analysis. A spectrum view is available for each analog input, enabling multichannel mixed domain analysis.*

It is often easier to debug an issue by viewing one or more signals in the frequency domain. Oscilloscopes and digitizers have included math-based FFTs for decades in an attempt to address this need. However, FFTs are notoriously difficult to use as they are driven by the same acquisition system that's delivering the analog time-domain view. When you optimize acquisition settings for the analog view, your frequency-domain view isn't what you want. When you get the frequency-domain view you want, your analog view is not what you want. With math-based FFTs, it is virtually impossible to get optimized views in both domains.

Spectrum View changes all of this. Tektronix' patented technology provides both a decimator for the time-domain and a digital down-converter for the frequency-domain behind each input. The two different acquisition paths let you simultaneously observe both time- and frequency-domain views of the input signal with independent acquisition settings for each domain. Other manufacturers offer various 'spectral analysis' packages that claim ease-of-use, but they all exhibit the limitations described above. Only Spectrum View provides both exceptional ease-of-use and the ability to achieve optimal views in both domains simultaneously.

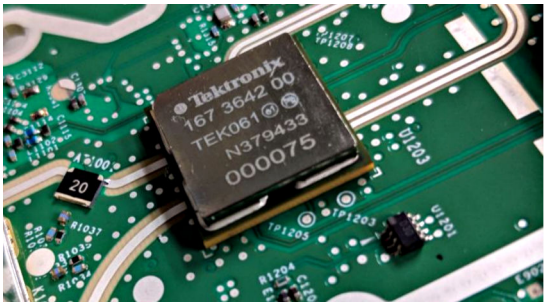
Waveform and IQ data can easily be transferred from the 6 Series Low Profile to a PC using a variety of programming commands and API interfaces that come standard on all Tektronix 5 Series & 6 Series products.




*Tektronix's TEK049 ASIC has a patented signal path enabling signals to travel from the ADC to both a traditional decimator (scope) and Digital Down Converter (DDC - RF) for independent control of both the time and frequency domains.*

## Behind the performance

The Tektronix-designed TEK049 ASIC contains 12-bit analog-to-digital converters (ADCs) that provide 16 times more resolution than traditional 8-bit ADCs. The TEK049 is paired with the new Tektronix TEK061 front-end amplifier with industry leading low noise that enables the best signal fidelity possible to capture small signals with high resolution.




*Lowest in class noise enabled by new front-end amplifier*

A key attribute to being able to view fine signal details on small, high-speed signals is noise. The higher a measurement systems' intrinsic noise, the less actual signal detail will be visible. This becomes more critical on a digitizer when the vertical settings are set to high sensitivity (like ≤ 10 mV/div) to view small signals that are prevalent in high-speed bus topologies. The 6 Series Low Profile has a new front-end ASIC, the TEK061, that enables breakthrough noise performance at the highest sensitivity settings.

In addition, a new High Res mode applies a hardware-based unique Finite Impulse Response (FIR) filter based on the selected sample rate. The FIR filter maintains the maximum bandwidth possible for that sample rate while preventing aliasing and removing noise from the digitizer amplifiers and ADC above the usable bandwidth for the selected sample rate. High Res mode always provides at least 12 bits of vertical resolution and extends all the way to 16 bits of vertical resolution at ≤ 625 MS/s sample rates and 200 MHz of bandwidth.

## Building a next-generation test rack

Looking for a modern way to refresh your test rack, view, download or analyze your data? Looking to replace obsolete hardware without rewriting your code?

We understand that test rack designs take time and include numerous tradeoffs. Tektronix has heard your voice loud and clear and is blazing a new path to provide a richer set of tools to enable flexible ways to access data and replace obsolete hardware. If that means you're automating a test rack with LabVIEW, Python or another interface, we have an expanding number of drivers and numerous support resources available.

Maybe you require an easy way to view waveforms on a remote computer. Not a problem, Tektronix has a software team designing new ways to control the instrument from a browser (E*Scope), store your data in the cloud (TekCloud), or stream data to our PC (TekScope). Providing modern age tools at your fingertips.

Lastly, users familiar with keyboards, mice, monitors, and KVM switches can continue to operate as they always have!

TekCloud

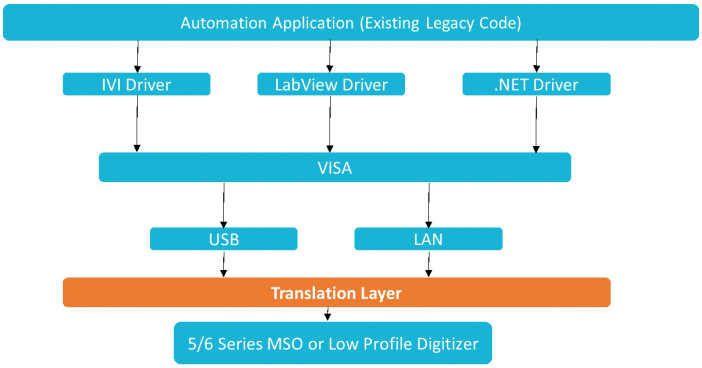
All your data in one place.

## Upgrade Automated Test Equipment (ATE) systems quickly and smoothly

Was your automation code written in the 1970s, 1980s, or 1990s?

Anyone working closely with automated test systems knows that moving to a new model or platform can be painful. Modifying an existing codebase for a new product can be prohibitively expensive and complicated. Now there's a solution.

All 5 and 6 Series Low Profile instruments include a Programmatic Interface (PI) Translator. When enabled, the PI Translator acts as an intermediate layer between your test application and the digitizer. The PI translator recognizes a subset of legacy commands from the popular DPO/MSO5000B, DPO7000C, and DPO70000C oscilloscope platforms and translates them on the fly into supported commands. The interface is designed to be human-readable and easily extensible, which means that you can customize its behavior to minimize the amount of effort required when transitioning from obsolete instruments to the newest Tektronix platform.

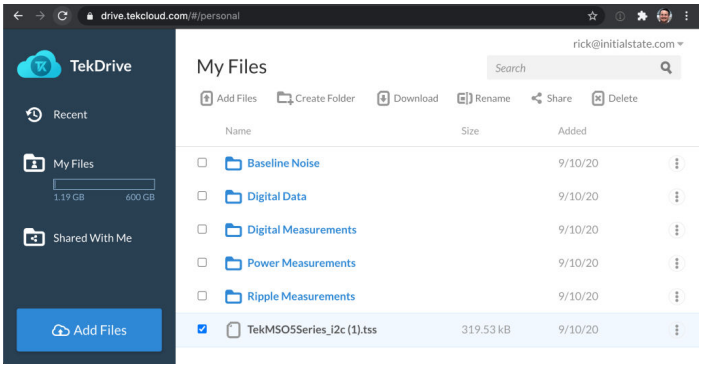



*How the PI Translator works from Automation software to Tek instrument*

## Access data in all the new ways you can dream about

Using TekDrive, you can upload, store, organize, search, download, and share any file type from any connected device. TekDrive is natively integrated into the 6 Series Low Profile instrument for seamless sharing and recalling of files - no USB stick is required. Analyze and explore standard files like .wfm, .isf, .tss, and .csv, directly in a browser with smooth interactive waveform viewers. TekDrive is purpose-built for integration, automation, and security. *www.tekcloud.com/tekdrive*

*Programming with a Low Profile in a test rack has never been easier*

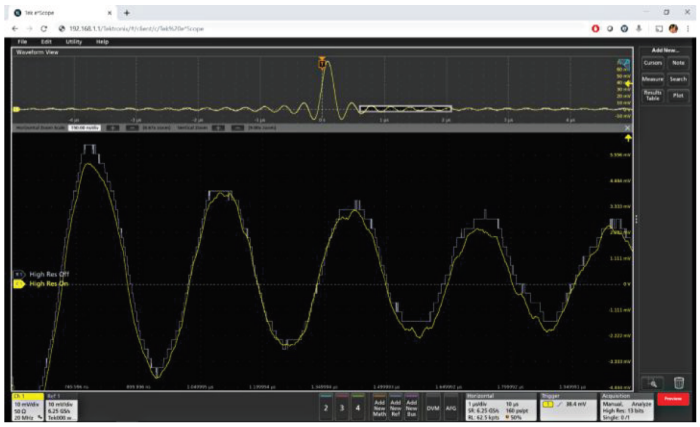



*TekDrive collaborative workspace - save files directly from your 6 Series Low Profile and share across your team*

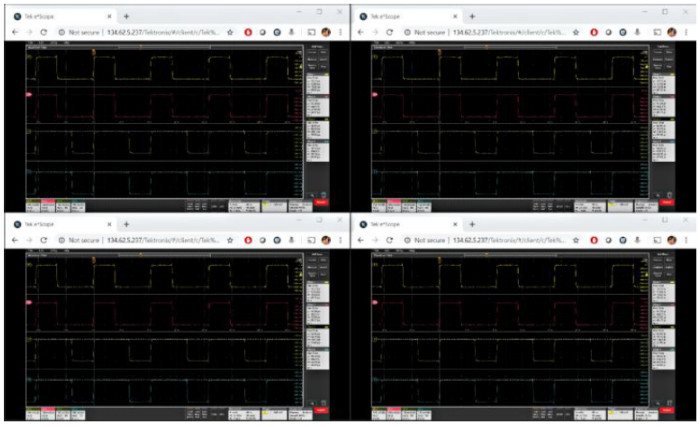
The TekScope gives users the analysis capability of an award-winning oscilloscope on your PC. Analyze waveforms anywhere and anytime. The basic package is free and lets you scale and measure waveforms locally. Purchased options add advanced capabilities such as multi-scope analysis, bus decoding, power analysis, and jitter analysis, no matter which scope the data was acquired on. TekScope Multi-Scope enables you to connect and download data from up to 4 instruments (16-32 max channels) for easy viewing and cross-instrument analysis.

*Two LPD64 instruments being analyzed on PC running TekScope's 'Multi-Scope'*

E*Scope is an easy method of viewing and controlling a 6 Series Low Profile instrument over a network connection in the same way that you do in-person with a monitor or keyboard. Simply type the instrument's IP address into a browser to display the LXI landing page, then select the Instrument Control to access E*Scope. There are no drivers needed. It's all self-contained within the browser and you can control the instrument. It's fast, responsive, and perfect for controlling or visualizing single or multiple instrument situations.



*Live browser control is available using e*Scope via a browser like Chrome, Firefox, or Edge.*



*Tile multiple e*Scope browser tabs on a monitor for viewing live data*

## Synchronizing


*Synchronize multiple instrument channels within 200 ps using manual deskew and the Aux Trigger input*

When synchronizing multiple instruments its important to have the smallest amount of skew between instrument channels to allow for data timing accuracy. Generally speaking this can be broken down into two types of skew; the part that comes from uncertainty between the aux trigger to analog channel, and the part that comes from trigger jitter. By calibrating out the effects of channel delay to the aux input we can reduce the amount of timing inaccuracy between instrument channels to just the jitter. This process is called deskewing an instrument.

Deskewing can be done to a reference channel that is simultaneously feeding a trigger edge (preferably over 1 Vpp) into the Aux Trigger input of multiple instruments and to the reference channel. When everything is adjusted, instrument to instrument channels can be within a very tight tolerance of only a couple sample points and within our specification of 200 ps. Whether you have 16 channels or 200 channels, all the data can be easily synchronized and analyzed.

## Enhanced security option

The optional 6-SEC enhanced security option enables password-protected enabling/disabling of all instrument I/O ports and firmware upgrades. In addition, option 6-SEC provides the highest level of security by ensuring that internal memory never stores user settings or waveform data, in compliance with National Industrial Security Program Operating Manual (NISPOM) DoD 5220.22-M, Chapter 8 requirements and Defense Security Service Manual for the Certification

and Accreditation of Classified Systems under the NISPOM. This ensures that you can confidently move the instrument out of a secure area.

## Arbitrary/Function Generator (AFG)

The instrument contains an optional integrated arbitrary/function generator, perfect for simulating sensor signals within a design or adding noise to signals to perform margin testing. The integrated function generator provides output of predefined waveforms up to 50 MHz for sine, square, pulse, ramp/triangle, DC, noise, sin(x)/x (Sinc), Gaussian, Lorentz, exponential rise/fall, Haversine and cardiac. The AFG can load waveform records up to 128 k points in size from an internal file location or a USB mass storage device.

The AFG feature is compatible with Tektronix' ArbExpress PC-based waveform creation and editing software, making creation of complex waveforms fast and easy.

## Digital Voltmeter (DVM) and Trigger Frequency Counter

The instrument contains an integrated 4-digit digital voltmeter (DVM) and 8-digit trigger frequency counter. Any of the analog inputs can be a source for the voltmeter, using the same probes that are already attached for general oscilloscope usage. The trigger frequency counter provides a very precise readout of the frequency of the trigger event on which you’re triggering.

Both the DVM and trigger frequency counter are available for free and are activated when you register your product.

## User-defined filtering (optional)

In the broad sense, any system that processes a signal can be thought of as a filter. For example, an oscilloscope channel operates as a low pass filter where its 3 dB down point is referred to as its bandwidth. Given a waveform of any shape, a filter can be designed that can transform it into a defined shape within the context of some basic rules, assumptions, and limitations.

Digital filters have some significant advantages over analog filters. For example, the tolerance values of analog filter circuit components are high enough that high order filters are difficult or even impossible to implement. High order filters are easily implemented as digital filters. Digital filters can be implemented as Infinite Impulse Response (IIR) or Finite Impulse Response (FIR). The choice of IIR or FIR filters are based upon design requirements and application.

The 6 Series Low Profile has the ability to apply designated filters to math waveforms through a MATH arbitrary function. Option 6-UDFLT takes this functionality a level deeper, providing more than MATH arbitrary basic functions and adds flexibility to support standard filters and can be used for application centric filter designs.


*Filters can be created through the Math dialog. Once a filter is edited, it can be easily applied, saved, and recalled for use or modification later.*

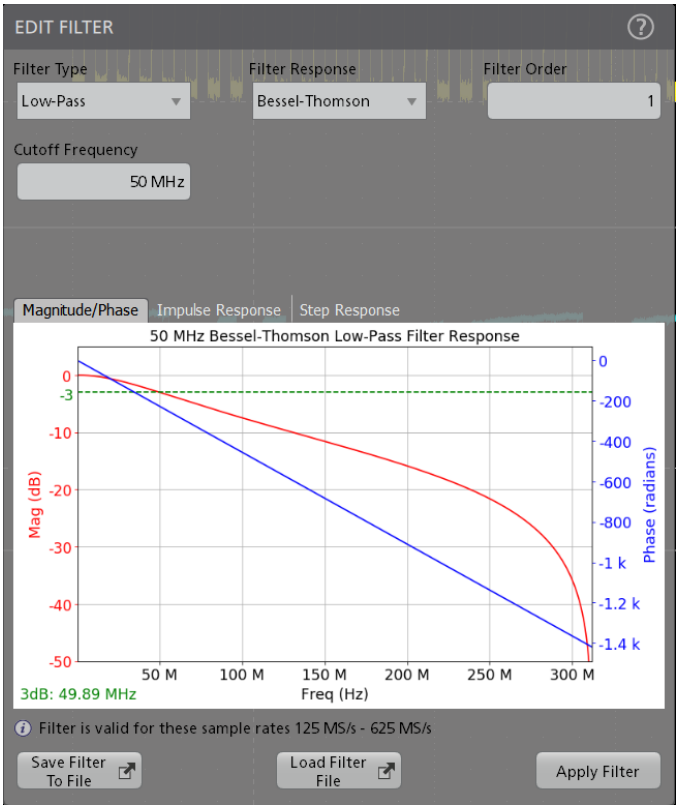
Filter types supported on the 6 Series Low Profile include:

- Low pass
- High pass
- Band pass
- Band stop
- All pass
- Hilbert
- Differentiator

Filter response types supported on the 6 Series Low Profile include:

- Butterworth
- Chebyshev I
- Chebyshev II
- Elliptical
- Gaussian
- Bessel-Thomson

The Filter Response control is available for all Filter Types except All-pass, Hilbert, or Differentiator.




*Filter creation dialog showing selection for Filter Type, Filter Response, Cutoff Frequency, Filter Order, and a graphical representation of Magnitude/Phase, Impulse Response, and Step Response*

Filter designs can be saved, recalled, and applied once any editing has been completed.

# Specifications

All specifications are guaranteed unless noted otherwise. All specifications apply to all models unless noted otherwise.

## Model overview

### Table 1: LPD64 Low Profile Digitizer

| Characteristic | LPD64 |
|---|---|
| Analog inputs | 4 |
| Bandwidth (calculated rise time) | 1 GHz (400 ps), 2.5 GHz (160 ps), 4 GHz (100 ps), 6 GHz (66.67 ps), 8 GHz (50 ps) |
| DC Gain Accuracy | 50 Ω: ±2.0% [1], (±2.0% at 2 mV/div, ±4.0% at 1 mV/div, typical)<br>50 Ω: ±1.0% [2] of full scale, (±1.0% of full scale at 2 mV/div, ±2.0% at 1 mV/div, typical) |
| ADC Resolution | 12 bits |
| Vertical Resolution (all channels) | 8 bits @ 25 GS/s; 8 GHz<br>12 bits @ 12.5 GS/s; 4 GHz<br>13 bits @ 6.25 GS/s (High Res); 2 GHz<br>14 bits @ 3.125 GS/s (High Res); 1 GHz<br>15 bits @ 1.25 GS/s (High Res); 500 MHz<br>16 bits @ ≤625 MS/s (High Res); 200 MHz |
| Sample Rate | 25 GS/s on all channels |
| Record Length | 125 Mpoints on all channels (standard)<br>250 Mpoints, 500 Mpoints or 1 Gpoints on all channels (optional) |
| Waveform Capture Rate | >500,000 wfms/s (Peak Detect, Envelope acquisition mode),<br>>30,000 wfms/s (all other acquisition modes) |
| Arbitrary/Function Generator (option) | 13 predefined waveform types with up to 50 MHz output |
| DVM | 4-digit DVM (free with product registration) |
| Trigger Frequency Counter | 8-digit frequency counter (free with product registration) |

## Vertical system

| | |
|---|---|
| **Input coupling** | DC |
| **Input impedance 50 Ω, DC coupled** | 50 Ω ±3% |

[1] Warranted specification, immediately after SPC, add 2% for every 5 °C change in ambient temperature.

[2] Warranted specification, immediately after SPC, add 1% for every 5 °C change in ambient temperature. At full scale is sometimes used to compare to other manufactures.

**Input sensitivity range**

**50 Ω**

1 mV/div to 1 V/div in a 1-2-5 sequence

Note: 1 mV/div is a 2X digital zoom of 2 mV/div.

**Maximum input voltage**

2.3$V_{RMS}$, at < 100 mV/div, with peaks ≤±20 V (Pulse Width ≤ 1 us).

5.5$V_{RMS}$, at ≥ 100 mV/div, with peaks ≤±20 V (Pulse Width ≤ 200 us)

**Effective bits (ENOB), typical**

**2 mV/div, High Res mode, 50 Ω, 10 MHz input with 90% full screen**

| Bandwidth | ENOB |
|---|---|
| 4 GHz | 5.9 |
| 3 GHz | 6.1 |
| 2.5 GHz | 6.2 |
| 2 GHz | 6.35 |
| 1 GHz | 6.8 |
| 500 MHz | 7.2 |
| 350 MHz | 7.4 |
| 250 MHz | 7.5 |
| 200 MHz | 7.75 |
| 20 MHz | 8.8 |

**50 mV/div, High Res mode, 50 Ω, 10 MHz input with 90% full screen**

| Bandwidth | ENOB |
|---|---|
| 4 GHz | 7.25 |
| 3 GHz | 7.5 |
| 2.5 GHz | 7.6 |
| 2 GHz | 7.8 |
| 1 GHz | 8.2 |
| 500 MHz | 8.5 |
| 350 MHz | 8.8 |
| 250 MHz | 8.9 |
| 200 MHz | 9 |

Table continued…

| Bandwidth | ENOB |
|---|---|
| 20 MHz | 9.8 |

**2 mV/div, Sample mode, 50 Ω, 10 MHz input with 90% full screen**

| Bandwidth | ENOB |
|---|---|
| 8 GHz | 5.1 |
| 7 GHz | 5.3 |
| 6 GHz | 5.5 |
| 5 GHz | 5.65 |
| 4 GHz | 5.9 |
| 3 GHz | 6.05 |
| 2.5 GHz | 6.2 |
| 2 GHz | 6.35 |
| 1 GHz | 6.8 |
| 500 MHz | 7.2 |
| 350 MHz | 7.3 |
| 250 MHz | 7.5 |
| 200 MHz | 7.3 |
| 20 MHz | 7.6 |

**50 mV/div, Sample mode, 50 Ω, 10 MHz input with 90% full screen**

| Bandwidth | ENOB |
|---|---|
| 8 GHz | 6.5 |
| 7 GHz | 6.6 |
| 6 GHz | 6.8 |
| 5 GHz | 7 |
| 4 GHz | 7.2 |
| 3 GHz | 7.4 |
| 2.5 GHz | 7.6 |
| 2 GHz | 7.7 |

Table continued…

| Bandwidth | ENOB |
|---|---|
| 1 GHz | 8.2 |
| 500 MHz | 8.4 |
| 350 MHz | 8.7 |
| 250 MHz | 8.8 |
| 200 MHz | 7.8 |
| 20 MHz | 7.9 |

**DC balance**

0.1 div with DC-50 Ω digitizer input impedance (50 Ω terminated)

0.2 div at 1 mV/div with DC-50 Ω digitizer input impedance (50 Ω terminated)

**Position range**

±5 divisions

**Offset ranges, maximum**

Input signal cannot exceed maximum input voltage for the 50 Ω input path.

| Volts/div Setting | Maximum offset range, 50 Ω Input |
|---|---|
| 1 mV/div - 99 mV/div | ±1 V |
| 100 mV/div - 1 V/div | ±10 V |

**Offset accuracy**

±(0.005 X | offset - position | + DC balance); Offset, position, and DC Balance in units of Volts

**Bandwidth selections**

**8 GHz model, 50 Ohm** 20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, 2.5 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz, 7 GHz, and 8 GHz

**6 GHz model, 50 Ohm** 20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, 2.5 GHz, 3 GHz, 4 GHz, 5 GHz, and 6 GHz

**4 GHz model, 50 Ohm** 20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, 2.5 GHz, 3 GHz, and 4 GHz

**2.5 GHz model, 50 Ohm** 20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, 1 GHz, 2 GHz, and 2.5 GHz

**1 GHz model, 50 Ohm** 20 MHz, 200 MHz, 250 MHz, 350 MHz, 500 MHz, and 1 GHz

**Bandwidth filtering optimized for**

Flatness or Step response

**Random noise, RMS, typical**

**50 Ω, typical**

### Table 2: 25 GS/s, Sample Mode, RMS

| V/div | 1 mV/div | 2 mV/div | 5 mV/div | 10 mV/div | 20 mV/div | 50 mV/div | 100 mV/div | 1 V/div |
|---|---|---|---|---|---|---|---|---|
| **8 GHz** | 158 µV | 158 µV | 208 µV | 342 µV | 630 µV | 1.49 mV | 3.46 mV | 29.7 mV |
| **7 GHz** | 141 µV | 143 µV | 192 µV | 311 µV | 562 µV | 1.31 mV | 3.11 mV | 26.2 mV |

Table continued…

| V/div | 1 mV/div | 2 mV/div | 5 mV/div | 10 mV/div | 20 mV/div | 50 mV/div | 100 mV/div | 1 V/div |
|---|---|---|---|---|---|---|---|---|
| 6 GHz | 127 µV | 127 µV | 165 µV | 274 µV | 489 µV | 1.18 mV | 2.71 mV | 23.6 mV |
| 5 GHz | 112 µV | 113 µV | 149 µV | 239 µV | 446 µV | 1.05 mV | 2.42 mV | 21.1 mV |

**Table 3: 12.5 GS/s, HiRes Mode, RMS**

| V/div | 1 mV/div | 2 mV/div | 5 mV/div | 10 mV/div | 20 mV/div | 50 mV/div | 100 mV/div | 1 V/div |
|---|---|---|---|---|---|---|---|---|
| 4 GHz | 97.4 µV | 98.7 µV | 124 µV | 192 µV | 344 µV | 817 µV | 1.92 mV | 16.3 mV |
| 3 GHz | 82.9 µV | 84 µV | 105 µV | 160 µV | 282 µV | 680 µV | 1.62 mV | 13.6 mV |
| 2.5 GHz | 76.5 µV | 77.5 µV | 93.8 µV | 144 µV | 257 µV | 606 µV | 1.44 mV | 12.1 mV |
| 2 GHz | 68.1 µV | 69.1 µV | 83.6 µV | 131 µV | 226 µV | 528 µV | 1.28 mV | 10.6 mV |
| 1 GHz | 54.8 µV | 51.2 µV | 63.4 µV | 90.9 µV | 160 µV | 378 µV | 941 µV | 7.65 mV |
| 500 MHz | 39.7 µV | 39.8 µV | 48.1 µV | 65.1 µV | 115 µV | 280 µV | 666 µV | 5.6 mV |
| 350 MHz | 33.8 µV | 33.5 µV | 40 µV | 54.8 µV | 94.3 µV | 217 µV | 560 µV | 4.35 mV |
| 250 MHz | 30.8 µV | 31.2 µV | 36.1 µV | 49.9 µV | 80.3 µV | 187 µV | 482 µV | 3.75 mV |
| 200 MHz | 25.3 µV | 25.4 µV | 29.7 µV | 44 µV | 70.7 µV | 165 µV | 445 µV | 3.3 mV |
| 20 MHz | 8.68 µV | 8.9 µV | 10.4 µV | 15.1 µV | 27.5 µV | 70.4 µV | 158 µV | 1.41 mV |

**Crosstalk (channel isolation), typical**

≥ -80 dB up to 2 GHz

≥ -65 dB up to 4 GHz

≥ -55 dB up to 8 GHz

for any two channels set to 200 mV/div.

## Horizontal system

**Time base range**

40 ps/div to 1,000 s/div

**Sample rate range**

6.25 S/s to 25 GS/s (real time)

50 GS/s to 2.5 TS/s (interpolated)

**Record length range**

All acquisition modes are 250 M maximum record length, down to 1 k minimum record length, adjustable in 1 sample increments.

Standard: 125 Mpoints

Option 6-RL-2: 250 Mpoints

**Seconds/Division range**

| Record length | 1 K | 10 K | 100 K | 1 M | 10 M | 62.5 M | 125 M | 250 M | 500M | 1 G |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard: 125 M | 40 ps - 16 s | 400 ps - 160 s | 4 ns - 1000 s | | | 2.5 µs - 1000 s | 5 µs - 1000 s | N/A | N/A | N/A |

Table continued…

| Record length | 1 K | 10 K | 100 K | 1 M | 10 M | 62.5 M | 125 M | 250 M | 500M | 1 G |
|---|---|---|---|---|---|---|---|---|---|---|
| Option 6-RL-2: 250 M | 40 ps - 16 s | 400 ps - 160 s | 4 ps - 1000 s | | | 2.5 µs - 1000 s | 5 µs - 1000 s | 10 µs - 1000 s | N/A | N/A |
| Option 6-RL-3: 500 Mpts | 40 ps - 16 s | 400 ps - 160 s | 4 ps - 1000 s | | | 2.5 µs - 1000 s | 5 µs - 1000 s | 10 µs - 1000 s | 20 us - 1000 s | N/A |
| Option 6-RL-4: 1 Gpts | 40 ps - 16 s | 400 ps - 160 s | 4 ps - 1000 s | | | 2.5 µs - 1000 s | 5 µs - 1000 s | 10 µs - 1000 s | 20 us - 1000 s | 40 us - 1000 s |

**Aperture uncertainty**

| Time duration | Typical jitter |
|---|---|
| <1 µs | 80 fs |
| <1 ms | 130 fs |

**Timebase accuracy**

±1.0 x$10^{-7}$ over any ≥1 ms time interval

| Description | Specification |
|---|---|
| Factory Tolerance | ±12 ppb. At calibration, 25 °C ambient, over any ≥1 ms interval |
| Temperature stability | ±20 ppb across the full operating range of 0 °C to 50 °C, after a sufficient soak time at the temperature. Tested at operating temperatures |
| Crystal aging | ±300 ppb. Frequency tolerance change at 25 °C over a period of 1 year |

**Delta-time measurement accuracy**

$$DTA_{pp}(typical) = 10 \times \sqrt{\left(\frac{N}{SR_1}\right)^2 + \left(\frac{N}{SR_2}\right)^2 + \left(0.450\ ps + \left(1 \times 10^{-11} \times t_p\right)\right)^2} + TBA \times t_p$$

$$DTA_{RMS} = \sqrt{\left(\frac{N}{SR_1}\right)^2 + \left(\frac{N}{SR_2}\right)^2 + \left(0.450\ ps + \left(1 \times 10^{-11} \times t_p\right)\right)^2} + TBA \times t_p$$

*(assume edge shape that results from Gaussian filter response)*

The formula to calculate delta-time measurement accuracy (DTA) for a given instrument setting and input signal assumes insignificant signal content above Nyquist frequency, where:

$SR_1$ = Slew Rate (1st Edge) around 1st point in measurement

$SR_2$ = Slew Rate (2nd Edge) around 2nd point in measurement

N = input-referred guaranteed noise limit ($V_{RMS}$)

TBA = timebase accuracy or Reference Frequency Error

$t_p$ = delta-time measurement duration (sec)

**Maximum duration at highest sample rate**

5 ms (standard) or 10 ms (option 6-RL-2, 250 Mpoints)

**Time base delay time range**

-10 divisions to 5,000 s

**Deskew range**

-125 ns to +125 ns with a resolution of 40 ps (for Peak Detect and Envelope acquisition modes).

-125 ns to +125 ns with a resolution of 1 ps (for all other acquisition modes).

**Delay between analog channels, full bandwidth, typical** ≤ 10 ps for any two channels with input impedance set to 50 Ω, DC coupling with equal Volts/div or above 10 mV/div

## Trigger system

**Trigger modes** Auto, Normal, and Single

**Trigger coupling** DC, HF Reject (attenuates > 50 kHz), LF Reject (attenuates < 50 kHz), noise reject (reduces sensitivity)

**Trigger bandwidth (edge, pulse and logic), typical**

| Model | Trigger type | Trigger bandwidth |
|---|---|---|
| 8 GHz | Edge | 8 GHz |
| 8 GHz | Pulse, Logic | 4 GHz |
| 6 GHz | Edge | 6 GHz |
| 6 GHz | Pulse, Logic | 4 GHz |
| 4 GHz, 2.5 GHz, 1 GHz: | Edge, Pulse, Logic | Product Bandwidth |

**Edge-type trigger sensitivity, DC coupled, typical**

| Path | Range | Specification |
|---|---|---|
| 50 Ω path | 1 mV/div to 9.98 mV/div | 3.0 div from DC to instrument bandwidth |
| | ≥ 10 mV/div | < 1.0 division from DC to instrument bandwidth |
| Line | 90 V to 264 V line voltage at 50 - 60 Hz line frequency | 103.5 V to 126.5 V |
| AUX Trigger in | | 250 $mV_{PP}$, DC to 400 MHz |

**Edge-type trigger sensitivity, not DC coupled, typical**

| Trigger Coupling | Typical Sensitivity |
|---|---|
| NOISE REJ | 2.5 times the DC Coupled limits |
| HF REJ | 1.0 times the DC Coupled limits from DC to 50 kHz. Attenuates signals above 50 kHz. |
| LF REJ | 1.5 times the DC Coupled limits for frequencies above 50 kHz. Attenuates signals below 50 kHz. |

**Trigger jitter, analog channels, typical** ≤ 1.5 $ps_{RMS}$ for sample mode and edge-type trigger

≤ 2 $ps_{RMS}$ for edge-type trigger and FastAcq mode

≤ 40 $ps_{RMS}$ for non edge-type trigger modes

**Trigger jitter, AUX input, typical** ≤ 40 $ps_{RMS}$ for sample mode and edge-type trigger

**AUX In trigger skew between instruments, typical** ±100 ps jitter on each instrument with <450 ps skew; <550 ps total between instruments. Can be manually deskewed so channel-to-channel total skew is <200ps between instruments using AUX In.

Skew improves for pulse input voltages ≥1 $V_{pp}$

**Trigger level ranges**

| Source | Range |
|---|---|
| Any Channel | ±5 divs from center of screen |
| Aux In Trigger | ±5 V |
| Line | Fixed at about 50% of line voltage |

This specification applies to logic and pulse thresholds.

**Trigger frequency counter** 8-digits (free with product registration)

**Trigger types**

**Edge:** Positive, negative, or either slope on any channel. Coupling includes DC, AC, noise reject, HF reject, and LF reject

**Pulse Width:** Trigger on width of positive or negative pulses. Event can be time- or logic-qualified

**Timeout:** Trigger on an event which remains high, low, or either, for a specified time period. Event can be logic-qualified

**Runt:** Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Event can be time- or logic-qualified

**Window:** Trigger on an event that enters, exits, stays inside or stays outside of a window defined by two user-adjustable thresholds. Event can be time- or logic-qualified

**Logic:** Trigger when logic pattern goes true, goes false, or occurs coincident with a clock edge. Pattern (AND, OR, NAND, NOR) specified for all input channels defined as high, low, or don't care. Logic pattern going true can be time-qualified

**Setup & Hold:** Trigger on violations of both setup time and hold time between clock and data present on any input channels

**Rise / Fall Time:** Trigger on pulse edge rates that are faster or slower than specified. Slope may be positive, negative, or either. Event can be logic-qualified

**Video:** Trigger on all lines, odd, even, or all fields of NTSC, PAL, and SECAM video signals

**Sequence:** Trigger on B event X time or N events after A trigger with a reset on C event. In general, A and B trigger events can be set to any trigger type with a few exceptions: logic qualification is not supported, if A event or B event is set to Setup & Hold, then the other must be set to Edge, and Ethernet and High Speed USB (480 Mbps) are not supported

**Visual trigger** Qualifies standard triggers by scanning all waveform acquisitions and comparing them to on-screen areas (geometric shapes). An unlimited number of areas can be defined with In, Out, or Don't Care as the qualifier for each area. A boolean expression can be defined using any combination of visual trigger areas to further qualify the events that get stored into acquisition memory. Shapes include rectangle, triangle, trapezoid, hexagon and user-defined

**Parallel Bus:** Trigger on a parallel bus data value. Parallel bus can be from 1 to 4 bits (from the analog channels) in size. Supports Binary and Hex radices

**$I^2C$ Bus (option 6-SREMBD):** Trigger on Start, Repeated Start, Stop, Missing ACK, Address (7 or 10 bit), Data, or Address and Data on $I^2C$ buses up to 10 Mb/s

**SPI Bus (option 6-SREMBD):** Trigger on Slave Select, Idle Time, or Data (1-16 words) on SPI buses up to 20 Mb/s

**RS-232/422/485/UART Bus (option 6-SRCOMP):** Trigger on Start Bit, End of Packet, Data, and Parity Error up to 15 Mb/s

**CAN Bus (option 6-SRAUTO):** Trigger on Start of Frame, Type of Frame (Data, Remote, Error, or Overload), Identifier, Data, Identifier and Data, End Of Frame, Missing Ack, and Bit Stuff Error on CAN buses up to 1 Mb/s

**CAN FD Bus (option 6-SRAUTO):** Trigger on Start of Frame, Type of Frame (Data, Remote, Error, or Overload), Identifier (Standard or Extended), Data (1-8 bytes), Identifier and Data, End Of Frame, Error (Missing Ack, Bit Stuffing Error, FD Form Error, Any Error) on CAN FD buses up to 16 Mb/s

**LIN Bus (option 6-SRAUTO):** Trigger on Sync, Identifier, Data, Identifier and Data, Wakeup Frame, Sleep Frame, and Error on LIN buses up to 1 Mb/s

**FlexRay Bus (option 6-SRAUTO):** Trigger on Start of Frame, Indicator Bits (Normal, Payload, Null, Sync, Startup), Frame ID, Cycle Count, Header Fields (Indicator Bits, Identifier, Payload Length, Header CRC, and Cycle Count), Identifier, Data, Identifier and Data, End Of Frame, and Errors on FlexRay buses up to 10 Mb/s

**SENT Bus (option 6-SRAUTOSEN)** Trigger on Start of Packet, Fast Channel Status and Data, Slow Channel Message ID and Data, and CRC Errors

| | |
|---|---|
| **SPMI Bus (option 6-SRPM):** | Trigger on Sequence Start Condition, Reset, Sleep, Shutdown, Wakeup, Authenticate, Master Read, Master Write, Register Read, Register Write, Extended Register Read, Extended Register Write, Extended Register Read Long, Extended Register Write Long, Device Descriptor Block Master Read, Device Descriptor Block Slave Read, Register 0 Write, Transfer Bus Ownership, and Parity Error |
| **USB 2.0 LS/FS/HS Bus (option 6-SRUSB2):** | Trigger on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error on USB buses up to 480 Mb/s |
| **Ethernet Bus (option 6-SRENET):** | Trigger on Start of Frame, MAC Addresses, MAC Q-tag, MAC Length/Type, MAC Data, IP Header, TCP Header, TCP/IPV4 Data, End of Packet, and FCS (CRC) Error on 10BASE-T and 100BASE-TX buses |
| **Audio ($I^2S$, LJ, RJ, TDM) Bus (option 6-SRAUDIO):** | Trigger on Word Select, Frame Sync, or Data. Maximum data rate for $I^2S$/LJ/RJ is 12.5 Mb/s. Maximum data rate for TDM is 25 Mb/s |
| **MIL-STD-1553 Bus (option 6-SRAERO):** | Trigger on Sync, Command (Transmit/Receive Bit, Parity, Subaddress / Mode, Word Count / Mode Count, RT Address), Status (Parity, Message Error, Instrumentation, Service Request, Broadcast Command Received, Busy, Subsystem Flag, Dynamic Bus Control Acceptance, Terminal Flag), Data, Time (RT/IMG), and Error (Parity Error, Sync Error, Manchester Error, Non-contiguous Data) on MIL-STD-1553 buses |
| **ARINC 429 Bus (option 6-SRAERO):** | Trigger on Word Start, Label, Data, Label and Data, Word End, and Error (Any Error, Parity Error, Word Error, Gap Error) on ARINC 429 buses up to 1 Mb/s |

| | |
|---|---|
| **RF Magnitude vs. Time and RF Frequency vs. Time (option 6-SV-RFVT)** | Trigger on edge, pulse width, and timeout events |
| **Trigger holdoff range** | 0 ns to 10 seconds |

## Acquisition system

| | |
|---|---|
| **Sample** | Acquires sampled values |
| **Peak Detect** | Captures glitches as narrow as at all sweep speeds |
| **Averaging** | From 2 to 10,240 waveforms |
| **Envelope** | Min-max envelope reflecting Peak Detect data over multiple acquisitions |
| **High Res** | Applies a unique Finite Impulse Response (FIR) filter for each sample rate that maintains the maximum bandwidth possible for that sample rate while preventing aliasing and removing noise from the oscilloscope amplifiers and ADC above the usable bandwidth for the selected sample rate.<br>High Res mode always provides at least 12 bits of vertical resolution and extends all the way to 16 bits of vertical resolution at ≤ 625 MS/s sample rates. |
| **FastAcq®** | FastAcq optimizes the instrument for analysis of dynamic signals and capture of infrequent events.<br>Maximum waveform capture rate:<br>>500,000 wfms/s (Peak Detect or Envelope Acquisition mode)<br>>30,000 wfms/s (All other acquisition modes) |
| **Roll mode** | Scrolls sequential waveform points across the display in a right-to-left rolling motion, at timebase speeds of 40 ms/div and slower, when in Auto trigger mode. |
| **FastFrame™** | Acquisition memory divided into segments.<br>Maximum trigger rate >5,000,000 waveforms per second |

Minimum frame size = 50 points

Maximum Number of Frames: For frame size ≥ 1,000 points, maximum number of frames = record length / frame size.

For 50 point frames, maximum number of frames = 1,000,000

## Waveform measurements

**Cursor types**

Waveform, V Bars, H Bars, V&H Bars, and Polar (XY/XYZ plots only)

**DC voltage measurement accuracy, Average acquisition mode**

| Measurement Type | DC Accuracy (In Volts) |
|---|---|
| Average of ≥ 16 waveforms | ±((DC Gain Accuracy) * \|reading - (offset - position)\| + Offset Accuracy + 0.05 * V/div setting) |
| Delta volts between any two averages of ≥ 16 waveforms acquired with the same oscilloscope setup and ambient conditions | ±(DC Gain Accuracy * \|reading\| + 0.1 div) |

**Automatic measurements**

36, of which an unlimited number can be displayed as either individual measurement badges or collectively in a measurement results table

**Amplitude measurements**

Amplitude, Maximum, Minimum, Peak-to-Peak, Positive Overshoot, Negative Overshoot, Mean, RMS, AC RMS, Top, Base, and Area

**Timing measurements**

Period, Frequency, Unit Interval, Data Rate, Positive Pulse Width, Negative Pulse Width, Skew, Delay, Rise Time, Fall Time, Phase, Rising Slew Rate, Falling Slew Rate, Burst Width, Positive Duty Cycle, Negative Duty Cycle, Time Outside Level, Setup Time, Hold Time, Duration N-Periods, High Time, Low Time, Time to Minimum, and Time to Maximum

**Jitter measurements (standard)**

TIE and Phase Noise

**Measurement statistics**

Mean, Standard Deviation, Maximum, Minimum, and Population. Statistics are available on both the current acquisition and all acquisitions

**Reference levels**

User-definable reference levels for automatic measurements can be specified in either percent or units. Reference levels can be set to global for all measurements, per source channel or signal, or unique for each measurement

**Gating**

Screen, Cursors, Logic, Search, or Time. Specifies the region of an acquisition in which to take measurements. Gating can be set to Global (affects all measurements set to Global) or Local (all measurements can have a unique Time gate setting; only one Local gate is available for Screen, Cursors, Logic, and Search actions).

**Measurement plots**

Histogram, Time Trend, Spectrum, Eye Diagram (TIE measurement only), Phase Noise (Phase Noise measurement only)

Fast eye rendering: Shows the Unit Intervals (UIs) that define the boundaries of the eye along with a user specified number of surrounding UIs for added visual context

Complete eye rendering: Shows all valid Unit Intervals (UIs)

**Measurement limits**

Pass/fail testing for user-definable limits on measurement values. Act on event for measurement value failures include Save Screen Capture, Save Waveform, System Request (SRQ), and Stop Acquisitions

**Jitter analysis (option 6-DJA) adds the following:**

**Measurements**

Jitter Summary, TJ@BER, RJ- δδ, DJ- δδ, PJ, RJ, DJ, DDJ, DCD, SRJ, J2, J9, NPJ, F/2, F/4, F/8, Eye Height, Eye Height@BER, Eye Width, Eye Width@BER, Eye High, Eye Low, Q-Factor, Bit High, Bit Low, Bit Amplitude, DC Common Mode, AC Common Mode (Pk-Pk), Differential Crossover, T/nT Ratio, SSC Freq Dev, SSC Modulation Rate

**Measurement plots**

Eye Diagram and Jitter Bathtub

| | |
|---|---|
| | Fast eye rendering: Shows the Unit Intervals (UIs) that define the boundaries of the eye along with a user specified number of surrounding UIs for added visual context |
| | Complete eye rendering: Shows all valid Unit Intervals (UIs) |
| **Measurement limits** | Pass/fail testing for user-definable limits on measurement values. Act on event for measurement value failures include Save Screen Capture, Save Waveform, System Request (SRQ), and Stop Acquisitions |
| **Eye diagram mask testing** | Automated mask pass/fail testing |

**Power analysis adds the following:**

| | |
|---|---|
| **Measurements** | Input Analysis (Frequency, $V_{RMS}$, $I_{RMS}$, voltage and current Crest Factors, True Power, Apparent Power, Reactive Power, Power Factor, Phase Angle, Harmonics, Inrush Current, Input Capacitance ) |
| | Amplitude Analysis (Cycle Amplitude, Cycle Top, Cycle Base, Cycle Maximum, Cycle Minimum, Cycle Peak-to-Peak) |
| | Timing Analysis (Period, Frequency, Negative Duty Cycle, Positive Duty Cycle, Negative Pulse Width, Positive Pulse Width) |
| | Switching Analysis (Switching Loss, dv/dt, di/dt, Safe Operating Area, $R_{DSon}$) |
| | Magnetic Analysis (Inductance, I vs. Intg(V), Magnetic Loss, Magnetic Property) |
| | Output Analysis (Line Ripple, Switching Ripple, Efficiency, Turn-on Time, Turn-off Time) |
| | Frequency Response Analysis (Control Loop Response Bode Plot, Power Supply Rejection Ratio, Impedance) |
| **Measurement Plots** | Harmonics Bar Graph, Switching Loss Trajectory Plot, and Safe Operating Area |

**Digital Power Management adds the following:**

| | |
|---|---|
| **Measurements** | Ripple Analysis (Ripple) |
| | Transient Analysis (Overshoot, Undershoot, Turn On Overshoot, DC Rail Voltage) |
| | Power Sequence Analysis (Turn-on, Turn-off) |
| | Jitter Analysis (TIE, PJ, RJ, DJ, Eye Height, Eye Width, Eye High, Eye Low) |

**DDR3/LPDDR3 memory debug and analysis option (6-DBDDR3) adds the following:**

| | |
|---|---|
| **Measurements** | Amplitude Measurements (AOS, AUS, Vix(ac), AOS Per tCK, AUS Per tCK, AOS Per UI, AUS Per UI) |
| | Time Measurements (tRPRE, tWPRE, tPST, Hold Diff, Setup Diff, tCH(avg), tCK(avg), tCL(avg), tCH(abs), tCL(abs), tJIT(duty), tJIT(per), tJIT(cc), tERR(n), tERR(m-n), tDQSCK, tCMD-CMD, tCKSRE, tCKSRX) |

**LVDS debug and analysis option (option 6-DBLVDS) adds the following:**

| | |
|---|---|
| **Data Lane Measurements** | Generic Test (Unit Interval, Rise Time, Fall Time, Data Width, Data Intra Skew (PN), Data Inter Skew (Lane-to-Lane), Data Peak-to-Peak) |
| | Jitter Test (AC Timing, Clock Data Setup Time, Clock Data Hold Time, Eye Diagram (TIE), TJ@BER, DJ Delta, RJ Delta, DDJ, De-Emphasis Level) |
| **Clock Lane Measurements** | Generic Test (Frequency, Period, Duty Cycle, Rise Time, Fall Time, Clock Intra Skew (PN), Clock Peak-to-Peak) |
| | Jitter Test (TIE, DJ, RJ) |
| | SSC On (Mod Rate, Frequency Deviation Mean) |

## Waveform math

**Number of math waveforms** Unlimited

**Arithmetic** Add, subtract, multiply, and divide waveforms and scalars

**Algebraic expressions** Define extensive algebraic expressions including waveforms, scalars, user-adjustable variables, and results of parametric measurements. Perform math on math using complex equations. For example (Integral (CH1 - Mean(CH1)) X 1.414 X VAR1)

**Math functions** Invert, Integrate, Differentiate, Square Root, Exponential, Log 10, Log e, Abs, Ceiling, Floor, Min, Max, Degrees, Radians, Sin, Cos, Tan, ASin, ACos, and ATan

**Relational** Boolean result of comparison >, <, ≥, ≤, =, and ≠

**Logic** AND, OR, NAND, NOR, XOR, and EQV

**Filtering function (standard)** User-definable filters. Users specify a file containing the coefficients of the filter

**Filtering function (option 6-UDFLT)**

- **Filter types** Low pass, High pass, Band pass, Band stop, All pass, Hilbert, Differentiator
- **Filter response types** Butterworth, Chebyshev I, Chebyshev II, Elliptical, Gaussian, Bessel-Thomson

**FFT functions** Spectral Magnitude and Phase, and Real and Imaginary Spectra

**FFT vertical units** Magnitude: Linear and Log (dBm)

Phase: Degrees, Radians, and Group Delay

**FFT window functions** Hanning, Rectangular, Hamming, Blackman-Harris, Flattop2, Gaussian, Kaiser-Bessel, and TekExp

## Spectrum View

**Center Frequency** Limited by instrument analog bandwidth

**Span** 74.5 Hz – 1.25 GHz (standard) 74.5 Hz – 2 GHz (option 6-SV-BW-1)

Coarse adjustment in a 1-2-5 sequence

**RF vs. Time Traces** Magnitude vs. time, Frequency vs. time, Phase vs. Time

**RF vs. Time Trigger** Edge, pulse width and timeout trigger on RF Magnitude vs. Time and RF Frequency vs. Time (with option 6-SV-RFVT)

**Resolution Bandwidth (RBW)** 93 µHz to 62.5 MHz 93 µHz to 100 MHz (option 6-SV-BW-1)

**Window types and factors**

| Window type | Factor |
|---|---|
| Blackman-Harris | 1.90 |
| Flat-Top 2 | 3.77 |

Table continued…

| Window type | Factor |
|---|---|
| Hamming | 1.30 |
| Hanning | 1.44 |
| Kaiser-Bessel | 2.23 |
| Rectangular | 0.89 |

**Spectrum Time** FFT Window Factor / RBW

**Reference level** Reference level is automatically set by the analog channel Volts/div setting Setting range: -42 dBm to +44 dBm

**Vertical Position** -100 divs to +100 divs

**Vertical units** dBm, dBµW, dBmV, dBµV, dBmA, dBµA

**Horizontal scaling** Linear, Log

## Search

**Number of searches** Unlimited

**Search types** Search through long records to find all occurrences of user specified criteria including edges, pulse widths, timeouts, runt pulses, window violations, logic patterns, setup & hold violations, rise/fall times, and bus protocol events. Search results can be viewed in the Waveform View or in the Results table.

## Save

**Waveform type** Tektronix Waveform Data (.wfm), Comma Separated Values (.csv), MATLAB (.mat)

**Waveform Gating** Cursors, Screen, Resample (save every nth sample)

**Screen Capture Type** Portable Network Graphic (*.png), 24-bit Bitmap (*.bmp), JPEG (*.jpg)

**Setup Type** Tektronix Setup (.set)

**Report Type** Adobe Portable Documents (.pdf), Single File web Pages (.mht)

**Session Type** Tektronix Session Setup (.tss)

## Display

**Display type** External monitor

1,920 horizontal × 1,080 vertical pixels (High Definition)

**Display modes** Overlay: traditional oscilloscope display where traces overlay each other

Stacked: display mode where each waveform is placed in its own slice and can take advantage of the full ADC range while still being visually separated from other waveforms. Groups of channels can also be overlaid within a slice to simplify visual comparison of signals.

**Zoom** Horizontal and vertical zooming is supported in all waveform and plot views.

**Interpolation** Sin(x)/x and Linear

**Waveform styles** Vectors, dots, variable persistence, and infinite persistence

**Graticules** Movable and fixed graticules, selectable between Grid, Time, Full, and None

**Color palettes** Normal and inverted for screen captures Individual waveform colors are user-selectable

**Format** YT, XY, and XYZ

**Local Language User Interface** English, Japanese, Simplified Chinese, Traditional Chinese, French, German, Italian, Spanish, Portuguese, Russian, Korean

**Local Language Help** English, Japanese, Simplified Chinese

## Arbitrary-Function Generator optional

**Function types** Arbitrary, sine, square, pulse, ramp, triangle, DC level, Gaussian, Lorentz, exponential rise/fall, sin(x)/x, random noise, Haversine, Cardiac

**Amplitude range** Values are peak-to-peak voltages

| Waveform | 50 Ω | 1 MΩ |
|---|---|---|
| Arbitrary | 10 mV to 2.5 V | 20 mV to 5 V |
| Sine | 10 mV to 2.5 V | 20 mV to 5 V |
| Square | 10 mV to 2.5 V | 20 mV to 5 V |
| Pulse | 10 mV to 2.5 V | 20 mV to 5 V |
| Ramp | 10 mV to 2.5 V | 20 mV to 5 V |
| Triangle | 10 mV to 2.5 V | 20 mV to 5 V |
| Gaussian | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Lorentz | 10 mV to 1.2 V | 20 mV to 2.4 V |
| Exponential Rise | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Exponential Fall | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Sine(x)/x | 10 mV to 1.5 V | 20 mV to 3.0 V |
| Random Noise | 10 mV to 2.5 V | 20 mV to 5 V |
| Haversine | 10 mV to 1.25 V | 20 mV to 2.5 V |
| Cardiac | 10 mV to 2.5 V | 20 mV to 5 V |

**Sine waveform**

**Frequency range** 0.1 Hz to 50 MHz

**Frequency setting resolution** 0.1 Hz

**Frequency accuracy** 130 ppm (frequency ≤ 10 kHz), 50 ppm (frequency > 10 kHz) This is for Sine, Ramp, Square and Pulse waveforms only.

| | |
|---|---|
| **Amplitude range** | 20 $mV_{pp}$ to 5 $V_{pp}$ into Hi-Z; 10 $mV_{pp}$ to 2.5 $V_{pp}$ into 50 Ω |
| **Amplitude flatness, typical** | ±0.5 dB at 1 kHz |
| | ±1.5 dB at 1 kHz for < 20 $mV_{pp}$ amplitudes |
| **Total harmonic distortion, typical** | 1% for amplitude ≥ 200 $mV_{pp}$ into 50 Ω load |
| | 2.5% for amplitude > 50 mV AND < 200 $mV_{pp}$ into 50 Ω load |
| | This is for Sine wave only. |
| **Spurious free dynamic range, typical** | 40 dB ($V_{pp}$ ≥ 0.1 V); 30 dB ($V_{pp}$ ≥ 0.02 V), 50 Ω load |

**Square and pulse waveform**

| | |
|---|---|
| **Frequency range** | 0.1 Hz to 25 MHz |
| **Frequency setting resolution** | 0.1 Hz |
| **Frequency accuracy** | 130 ppm (frequency ≤ 10 kHz), 50 ppm (frequency > 10 kHz) |
| **Amplitude range** | 20 $mV_{pp}$ to 5 $V_{pp}$ into Hi-Z; 10 $mV_{pp}$ to 2.5 $V_{pp}$ into 50 Ω |
| **Duty cycle range** | 10% - 90% or 10 ns minimum pulse, whichever is larger Minimum pulse time applies to both on and off time, so maximum duty cycle will reduce at higher frequencies to maintain 10 ns off time |
| **Duty cycle resolution** | 0.1% |
| **Minimum pulse width, typical** | 10 ns. This is the minimum time for either on or off duration. |
| **Rise/Fall time, typical** | 5 ns, 10% - 90% |
| **Pulse width resolution** | 100 ps |
| **Overshoot, typical** | < % for signal steps greater than 100 $mV_{pp}$ |
| | This applies to overshoot of the positive-going transition (+overshoot) and of the negative-going (-overshoot) transition |
| **Asymmetry, typical** | ±1% ±5 ns, at 50% duty cycle |
| **Jitter, typical** | < 60 ps $TIE_{RMS}$, ≥ 100 $mV_{pp}$ amplitude, 40%-60% duty cycle |

**Ramp and triangle waveform**

| | |
|---|---|
| **Frequency range** | 0.1 Hz to 500 kHz |
| **Frequency setting resolution** | 0.1 Hz |
| **Frequency accuracy** | 130 ppm (frequency ≤ 10 kHz), 50 ppm (frequency > 10 kHz) |
| **Amplitude range** | 20 $mV_{pp}$ to 5 $V_{pp}$ into Hi-Z; 10 $mV_{pp}$ to 2.5 $V_{pp}$ into 50 Ω |
| **Variable symmetry** | 0% - 100% |
| **Symmetry resolution** | 0.1% |

| | |
|---|---|
| **DC level range** | ±2.5 V into Hi-Z |
| | ±1.25 V into 50 Ω |
| **Random noise amplitude range** | 20 $mV_{pp}$ to 5 $V_{pp}$ into Hi-Z |
| | 10 $mV_{pp}$ to 2.5 $V_{pp}$ into 50 Ω |

**Sin(x)/x**

| | |
|---|---|
| **Maximum frequency** | 2 MHz |

**Gaussian pulse, Haversine, and Lorentz pulse**

| | |
|---|---|
| **Maximum frequency** | 5 MHz |

**Lorentz pulse**

| | |
|---|---|
| **Frequency range** | 0.1 Hz to 5 MHz |
| **Amplitude range** | 20 $mV_{pp}$ to 2.4 $V_{pp}$ into Hi-Z |
| | 10 $mV_{pp}$ to 1.2 $V_{pp}$ into 50 Ω |

**Cardiac**

| | |
|---|---|
| **Frequency range** | 0.1 Hz to 500 kHz |
| **Amplitude range** | 20 $mV_{pp}$ to 5 $V_{pp}$ into Hi-Z |
| | 10 $mV_{pp}$ to 2.5 $V_{pp}$ into 50 Ω |

**Arbitrary**

| | |
|---|---|
| **Memory depth** | 1 to 128 k |
| **Amplitude range** | 20 $mV_{pp}$ to 5 $V_{pp}$ into Hi-Z |
| | 10 $mV_{pp}$ to 2.5 $V_{pp}$ into 50 Ω |
| **Repetition rate** | 0.1 Hz to 25 MHz |
| **Sample rate** | 250 MS/s |

| | |
|---|---|
| **Signal amplitude accuracy** | ±[ (1.5% of peak-to-peak amplitude setting) + (1.5% of absolute DC offset setting) + 1 mV ] (frequency = 1 kHz) |
| **Signal amplitude resolution** | 1 mV (Hi-Z) |
| | 500 µV (50 Ω) |
| **Sine and ramp frequency accuracy** | 130 ppm (frequency ≤10 kHz) |
| | 50 ppm (frequency >10 kHz) |
| **DC offset range** | ±2.5 V into Hi-Z |
| | ±1.25 V into 50 Ω |
| **DC offset resolution** | 1 mV (Hi-Z) |
| | 500 µV (50 Ω) |
| **DC offset accuracy** | ±[ (1.5% of absolute offset voltage setting) + 1 mV ] |
| | Add 3 mV of uncertainty per 10 °C change from 25 °C ambient |

## Digital volt meter (DVM)

| | |
|---|---|
| **Measurement types** | DC, $AC_{RMS}$+DC, $AC_{RMS}$, Trigger frequency count |
| **Voltage resolution** | 4 digits |
| **Voltage accuracy** | |
| **DC:** | ±((1.5% * \|reading - offset - position\|) + (0.5% * \|(offset - position)\|) + (0.1 * Volts/div)) |
| | De-rated at 0.100%/°C of \|reading - offset - position\| above 30 °C |
| | Signal ± 5 divisions from screen center |
| **AC:** | ± 3% (40 Hz to 1 kHz) with no harmonic content outside 40 Hz to 1 kHz |
| | AC, typical: ± 2% (20 Hz to 10 kHz) |
| | For AC measurements, the input channel vertical settings must allow the $V_{PP}$ input signal to cover between 4 and 10 divisions and must be fully visible on the screen |

## Trigger frequency counter

| | |
|---|---|
| **Resolution** | 8-digits |
| **Accuracy** | ±(1 count + time base accuracy * input frequency) |
| | The signal must be at least 8 $mV_{pp}$ or 2 div, whichever is greater. |
| **Maximum input frequency** | 10 Hz to maximum bandwidth of the analog channel |
| | The signal must be at least 8 $mV_{pp}$ or 2 div, whichever is greater. |

## Processor system

| | |
|---|---|
| **Host processor** | Intel i5-4400E, 2.7 GHz, 64-bit, dual core processor, 8 GB System RAM |
| **Internal storage** | ≥ 80 GB. Form factor is an 80 mm m.2 card with a SATA-3 interface |
| | 512 GB m.2 drive with a SATA-3 interface (with option 6-WINM2) |
| **Operating system** | Closed Embedded OS (std configuration). No access to OS file system. |
| | Instrument with option 6-WINM2 installed: Microsoft Windows 10. |

## Input-Output ports

| | |
|---|---|
| **DisplayPort connector** | A 20-pin DisplayPort connector; connect to show the oscilloscope display on an external monitor or projector |
| **DVI connector** | A 29-pin DVI-I connector; connect to show the oscilloscope display on an external monitor or projector |
| **VGA** | DB-15 female connector; connect to show the oscilloscope display on an external monitor or projector |
| **Probe compensator signal, typical** | |
| **Connection:** | Connectors are located on the lower front right of the instrument |
| **Amplitude:** | 0 to 2.5 V |

**Frequency:** 1 kHz

**Source impedance:** 1 kΩ

**External reference input**

The time-base system can phase lock to an external 10 MHz reference signal . There are two ranges for the reference clock.

The instrument can accept a high-accuracy reference clock of 10 MHz ±2 ppm or a lower-accuracy reference clock of 10 MHz ±1 kppm.

**USB interface (Host, Device ports)**

Front panel USB Host ports: Two USB 2.0 Hi-Speed ports, one USB 3.0 SuperSpeed port

Rear panel USB Host ports: Two USB 2.0 Hi-Speed ports, two USB 3.0 SuperSpeed ports

Rear panel USB Device port: One USB 3.0 SuperSpeed Device port providing USBTMC support and up to 800 Mbps transfer speeds

**Ethernet interface**

10/100/1000 Mb/s

**Auxiliary output**

Rear-panel BNC connector. Output can be configured to provide a positive or negative pulse out when the oscilloscope triggers, the internal oscilloscope reference clock out, or an AFG sync pulse

| Characteristic | Limits |
|---|---|
| Vout (HI) | ≥ 2.5 V open circuit; ≥ 1.0 V into a 50 Ω load to ground |
| Vout (LO) | ≤ 0.7 V into a load of ≤ 4 mA; ≤0.25 V into a 50 Ω load to ground |

**Kensington-style lock**

Rear-panel security slot connects to standard Kensington-style lock

**LXI**

Class: LXI 2016

Version: 1.5

## Power source

**Power**

**Power consumption** 360 Watts maximum

**Source voltage** 100 - 240 V ±10% at 50 Hz to 60 Hz 115 V ±10% at 400 Hz

## Physical characteristics

**Dimensions**

Height: 3.44 in (87.3 mm)

Width: 17.01 in (432 mm)

Depth: 23.85 in (605.7 mm)

Fits rack depths from 24 inches to 32 inches

**Weight**

29.4 lbs (13.34 kg)

**Cooling**

The clearance requirement for adequate cooling is 2.0 in (50.8 mm) on the left and right sides of the instrument. Air flows from left to right through the instrument.

**Rackmount configuration**

2U rack mount kit is included as standard configuration

## Environmental specifications

**Temperature**

| | |
|---|---|
| **Operating** | +0 °C to +50 °C (32 °F to 122 °F) |
| **Non-operating** | -20 °C to +60 °C (-4 °F to 140 °F) |

**Humidity**

| | |
|---|---|
| **Operating** | 5% to 90% relative humidity (% RH) at up to +40 °C |
| | 5% to RH above +40 °C up to +50 °C, noncondensing |
| **Non-operating** | 5% to 90% relative humidity (% RH) at up to +60 °C, noncondensing |

**Altitude**

| | |
|---|---|
| **Operating** | Up to 3,000 meters (9,843 feet) |
| **Non-operating** | Up to 12,000 meters (39,370 feet) |

## EMC Environmental and Safety

| | |
|---|---|
| **Regulatory** | CE marked for the European Union and CSA approved for the USA and Canada |
| | RoHS compliant |

## Software

**Software**

| | |
|---|---|
| **IVI driver** | Provides a standard instrument programming interface for common applications such as LabVIEW, LabWindows/CVI, Microsoft .NET, and MATLAB. Compatible with Python, C/C++/C# and many other languages through VISA. |
| **e*Scope®** | Enables control of the oscilloscope over a network connection through a standard web browser. Simply enter the IP address or network name of the oscilloscope and a web page will be served to the browser. Transfer and save settings, waveforms, measurements, and screen images or make live control changes to settings on the oscilloscope directly from the web browser. |
| **LXI Web interface** | Connect to the oscilloscope through a standard Web browser by simply entering the oscilloscope's IP address or network name in the address bar of the browser. The web interface enables viewing of instrument status and configuration, status and modification of network settings, and instrument control through the e*Scope web-based remote control. All web interaction conforms to LXI specification, version 1.5. |
| **Programming Examples** | Programming with the 4/5/6 Series platforms has never been easier. With a programmers manual and a GitHub site you have many commands and examples to help you get started remotely automating your instrument. See *HTTPS://GITHUB.COM/TEKTRONIX/PROGRAMMATIC-CONTROL-EXAMPLES*. |

# Ordering Information

Use the following steps to select the appropriate instrument and options for your measurement needs.

## Step 1

**Start by selecting the model.**

| Model | Number of channels |
|---|---|
| LPD64 | 4 |

| Each model includes |
|---|
| Rackmount attachments installed |
| Installation and safety manual (translated in English, French, German) |
| Embedded Help |
| Power cord |
| Calibration certificate documenting traceability to National Metrology Institute(s) and ISO9001/ISO17025 quality system registration |
| One-year warranty covering all parts and labor on the instrument. |

## Step 2

**Configure your Low Profile Digitizer by selecting the analog channel bandwidth you need**

Choose the bandwidth you need today by choosing one of these bandwidth options. You can upgrade it later by purchasing an upgrade option.

| Bandwidth Option | Bandwidth |
|---|---|
| 6-BW-1000 | 1 GHz |
| 6-BW-2500 | 2.5 GHz |
| 6-BW-4000 | 4 GHz |
| 6-BW-6000 | 6 GHz |
| 6-BW-8000 | 8 GHz |

## Step 3

**Add instrument functionality**

Instrument functionality can be ordered with the instrument or later as an upgrade kit.

| Instrument Option | Built-in Functionality |
|---|---|
| 6-RL-2 | Extend record length from 125 Mpts/channel to 250 Mpts/channel |
| 6-RL-3 | Extend record length from 125 Mpts/channel to 500 Mpts/channel |
| 6-RL-4 | Extend record length from 125 Mpts/channel to 1 Gpts/channel |
| 6-AFG | Add Arbitrary / Function Generator |
| 6-SEC [3] [4] | Security package adds enhanced security that restricts user data from being saved to the instrument, password-protected enabling for USB ports and firmware updates. Recommended for highly classified data environments. |
| 6-WINM2[4] | Instrument replaces std. embedded OS with Windows 10 Operating system on a m.2 512 GB drive. |

## Step 4

**Add optional serial bus triggering, decode, and search capabilities**

Choose the serial support you need today by choosing from these serial analysis options. You can upgrade later by purchasing an upgrade kit.

| Instrument Option | Serial Buses Supported |
|---|---|
| 6-SRAERO | Aerospace (MIL-STD-1553, ARINC 429) |
| 6-SRAUDIO | Audio ($I^2S$, LJ, RJ, TDM) |
| 6-SRAUTO | Automotive (CAN, CAN FD, LIN, FlexRay, and CAN symbolic decoding) |
| 6-SRAUTOSEN | Automotive sensor (SENT) |
| 6-SRCOMP | Computer (RS-232/422/485/UART) |
| 6-SREMBD | Embedded ($I^2C$, SPI) |
| 6-SRENET | Ethernet (10BASE-T, 100BASE-TX) |
| 6-SRI3C | MIPI I3C (I3C decode and search only) |
| 6-SRPM | Power Management (SPMI) |
| 6-SRUSB2 | USB (USB2.0 LS, FS, HS) |

## Step 5

**Add optional serial bus compliance testing**

Choose the serial compliance testing packages you need today by choosing from these options. You can upgrade later by purchasing an upgrade kit. All options in the table below require option 6-WIN (SSD with Microsoft Windows 10 operating system).

| Instrument Option | Serial Buses Supported |
|---|---|
| 6-CMNBASET | 2.5 and 5 GBASE-T Ethernet automated compliance test solution.<br>2.5 GHz is recommended |

[3] This option is not compatible with option 6-WINM2.

[4] This option must be purchased at the same time as the instrument. Not available as an upgrade.

## Step 6

**Add optional memory analysis**

| Instrument Option | Advanced Analysis |
|---|---|
| 6-DBDDR3 | DDR3 and LPDDR3 Debug and Analysis |

## Step 7

**Add optional analysis capabilities**

| Instrument Option | Advanced Analysis |
|---|---|
| 6-DBLVDS | TekExpress automated LVDS test solution (requires option 6-DJA) |
| 6-DJA | Advanced Jitter and Eye Analysis |
| 6-DPM | Digital Power Management |
| 6-MTM | Mask and Limit testing |
| 6-PAM3 | PAM3 Analysis (requires options 6-DJA and 6-WIN) |
| 6-PWR | Power Measurement and Analysis |
| 6-SV-BW-1 | Increase Spectrum View Capture Bandwidth to 2 GHz |
| 6-SV-RFVT | Spectrum View RF versus Time analysis, trigger and remote IQ data transferring |
| 6-UDFLT | User Defined Filter Creation Tool |
| 6-VID | NTSC, PAL, and SECAM video triggering |

## Step 8

**Add accessories**

| Optional Accessory | Description |
|---|---|
| 020-3180-xx | Benchtop conversion kit including four (4) instrument feet and a strap handle |
| 016-2139-xx | Hard transit case with handles and wheels for easy transportation |
| 003-1929-xx | SMA 8-lb Torque Wrench for connecting SMA cables |
| 174-6211-xx | 2x Matched SMA cables (within 1 pS) |
| 174-6212-xx | 4x Matched SMA cables (within 1 pS) |
| 174-6215-00 | Power Divider, 2-way, 50 Ohm, DC-18 GHz |
| 174-6214-00 | Power Divider, 4-way, 50 Ohm, DC-18 GHz |
| GPIB to Ethernet adapter | Order model 4865B (GPIB to Ethernet to Instrument Interface) directly from ICS Electronics<br>*www.icselect.com/gpib_instrument_intfc.html* |

## Step 9

**Select power cord option**

| Power Cord Option | Description |
|---|---|
| A0 | North America power plug (115 V, 60 Hz)<br>Includes mechanism that retains power cord to instrument |
| A1 | Universal Euro power plug (220 V, 50 Hz) |
| A2 | United Kingdom power plug (240 V, 50 Hz) |
| A3 | Australia power plug (240 V, 50 Hz) |
| A5 | Switzerland power plug (220 V, 50 Hz) |
| A6 | Japan power plug (100 V, 50/60 Hz) |
| A10 | China power plug (50 Hz) |
| A11 | India power plug (50 Hz) |
| A12 | Brazil power plug (60 Hz) |
| A99 | No power cord |

## Step 10

**Add extended service and calibration options**

| Service Option | Description |
|---|---|
| G3 | Three Year Gold Care Plan. Includes expedited repair of all product failures including ESD and EOS, access to a loaner product during repair or advanced exchange to reduce downtime, priority access to Customer Support among others. |
| G5 | Five Year Gold Care Plan. Includes expedited repair of all product failures including ESD and EOS, access to a loaner product during repair or advanced exchange to reduce downtime, priority access to Customer Support among others. |
| R3 | Standard Warranty Extended to 3 Years. Covers parts, labor and 2-day shipping within country. Guarantees faster repair time than without coverage. All repairs include calibration and updates. Hassle free - a single call starts the process. |
| R5 | Standard Warranty Extended to 5 Years. Covers parts, labor and 2-day shipping within country. Guarantees faster repair time than without coverage. All repairs include calibration and updates. Hassle free - a single call starts the process. |
| C3 | Calibration service 3 Years. Includes traceable calibration or functional verification where applicable, for recommended calibrations. Coverage includes the initial calibration plus 2 years calibration coverage. |
| C5 | Calibration service 5 Years. Includes traceable calibration or functional verification where applicable, for recommended calibrations. Coverage includes the initial calibration plus 4 years calibration coverage. |
| D1 | Calibration Data Report |
| D3 | Calibration Data Report 3 Years (with Option C3) |
| D5 | Calibration Data Report 5 Years (with Option C5) |

## Feature upgrades after purchase

**Add feature upgrades in the future**

The 6 Series products offer many ways to easily add functionality after the initial purchase. Node-locked licenses permanently enable optional features on a single product. Floating licenses allow license-enabled options to be easily moved between compatible instruments.

| Upgrade feature | Node-locked license upgrade | Floating license upgrade | Description |
|---|---|---|---|
| Add instrument functions | SUP6-AFG | SUP6-AFG-FL | Add arbitrary function generator |
| | SUP6-RL-1T2 | SUP6-RL-1T2-FL | Extend record length from 125 Mpts to 250 Mpts / channel |
| | SUP6-RL-1T3 | SUP6-RL-1T3-FL | Extend record length from 125 Mpts to 500 Mpts / channel |
| | SUP6-RL-1T4 | SUP6-RL-1T4-FL | Extend record length from 125 Mpts to 1 Gpts / channel |
| | SUP6-RL-2T3 | SUP6-RL-2T3-FL | Extend record length from 250 Mpts to 500 Mpts / channel |
| | SUP6-RL-2T4 | SUP6-RL-2T4-FL | Extend record length from 250 Mpts to 1 Gpts / channel |
| | SUP6-RL-3T4 | SUP6-RL-3T4-FL | Extend record length from 500 Mpts to 1 Gpts / channel |

Table continued…

| Upgrade feature | Node-locked license upgrade | Floating license upgrade | Description |
|---|---|---|---|
| Add protocol analysis | SUP6-SRAERO | SUP6-SRAERO-FL | Aerospace serial triggering and analysis (MIL-STD-1553, ARINC 429) |
| | SUP6-SRAUDIO | SUP6-SRAUDIO-FL | Audio serial triggering and analysis ($I^2S$, LJ, RJ, TDM) |
| | SUP6-SRAUTO | SUP6-SRAUTO-FL | Automotive serial triggering and analysis (CAN, CAN FD, LIN, FlexRay, and CAN symbolic decoding) |
| | SUP6-SRAUTOSEN | SUP6-SRAUTOSEN-FL | Automotive sensor serial triggering and analysis (SENT) |
| | SUP6-SRCOMP | SUP6-SRCOMP-FL | Computer serial triggering and analysis (RS-232/422/485/UART) |
| | SUP6-SREMBD | SUP6-SREMBD-FL | Embedded serial triggering and analysis ($I^2C$, SPI) |
| | SUP6-SRENET | SUP6-SRENET-FL | Ethernet serial triggering and analysis (10Base-T, 100Base-TX) |
| | SUP6-SRI3C | SUP6-SRI3C-FL | MIPI I3C serial decoding and analysis |
| | SUP6-SRPM | SUP6-SRPM-FL | Power Management serial triggering and analysis (SPMI) |
| | SUP6-SRSPACEWIRE | SUP6-SRSPACEWIRE-FL | Spacewire (decode and search only) |
| | SUP6-SRSVID | SUP6-SRSVID-FL | Serial Voltage Identification (SVID) serial decoding and analysis |
| | SUP6-SRUSB2 | SUP6-SRUSB2-FL | USB 2.0 serial bus triggering and analysis (LS, FS, HS) |
| | SUP6-SREUSB2 | SUP6-SRESUB2-FL | Embedded USB2 (eUSB2) serial decoding and analysis |
| Add serial compliance<br>All serial compliance products require option 6-WINM2 (Microsoft Windows 10 operating system) | SUP6-CMNBASET | SUP6-CMNBASET-FL | Ethernet automated compliance test solution. |

Table continued…

| Upgrade feature | Node-locked license upgrade | Floating license upgrade | Description |
|---|---|---|---|
| Add advanced analysis | SUP6-DBLVDS | SUP6-DBLVDS-FL | LVDS debug and analysis (requires option 6-DJA and 6-WINM2) |
| | SUP6-DJA | SUP6-DJA-FL | Advanced jitter and eye analysis |
| | SUP6-PWR | SUP6-PWR-FL | Advanced power measurements and analysis |
| | SUP6-DPM | SUP6-DPM-FL | Digital power management |
| | SUP6-SV-RFVT | SUP6-SV-RFVT-FL | Spectrum View RF versus time analysis and trigger |
| | SUP6-SV-BW-1 | SUP6-SV-BW-1-FL | Increase Spectrum View capture bandwidth to 2 GHz |
| | SUP6-PAM3 | SUP6-PAM3-FL | PAM3 analysis (requires option 6-DJA) |
| | SUP6-UDFLT | SUP6-UDFLT-FL | User Defined Filter Creation Tool |
| Add memory analysis | SUP6-DBDDR3 | SUP6-DBDDR3-FL | DDR3 and LPDDR3 debug and analysis |
| Add digital voltmeter | SUP6-DVM | N/A | Add digital voltmeter / trigger frequency counter<br>(Free with product registration at *www.tek.com/register6mso*) |

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

GPIB IEEE-488

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

Product Area Assessed: The planning, design/development and manufacture of electronic Test and Measurement instruments.

**ASEAN / Australasia** (65) 6356 3900
**Belgium** 00800 2255 4835*
**Central East Europe and the Baltics** +41 52 675 3777
**Finland** +41 52 675 3777
**Hong Kong** 400 820 5835
**Japan** 81 (3) 6714 3086
**Middle East, Asia, and North Africa** +41 52 675 3777
**People's Republic of China** 400 820 5835
**Republic of Korea** +822 6917 5084, 822 6917 5080
**Spain** 00800 2255 4835*
**Taiwan** 886 (2) 2656 6688

**Austria** 00800 2255 4835*
**Brazil** +55 (11) 3759 7627
**Central Europe & Greece** +41 52 675 3777
**France** 00800 2255 4835*
**India** 000 800 650 1835
**Luxembourg** +41 52 675 3777
**The Netherlands** 00800 2255 4835*
**Poland** +41 52 675 3777
**Russia & CIS** +7 (495) 6647564
**Sweden** 00800 2255 4835*
**United Kingdom & Ireland** 00800 2255 4835*

**Balkans, Israel, South Africa and other ISE Countries** +41 52 675 3777
**Canada** 1 800 833 9200
**Denmark** +45 80 88 1401
**Germany** 00800 2255 4835*
**Italy** 00800 2255 4835*
**Mexico, Central/South America & Caribbean** 52 (55) 56 04 50 90
**Norway** 800 16098
**Portugal** 80 08 12370
**South Africa** +41 52 675 3777
**Switzerland** 00800 2255 4835*
**USA** 1 800 833 9200

* European toll-free number. If not accessible, call: +41 52 675 3777

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1 Jul 2021 48W-61595-5
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