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Agilent Technologies
High-Resolution LXI Digitizers



L4532A 2-channel, 20 MSa/s, 16-bit, ± 250 V
L4534A 4-channel, 20 MSa/s, 16-bit, ± 250 V

Key Features

- Up to 20 M samples per second sample rate
- 16 bit ADC resolution
- 2 or 4 simultaneously sampled channels
- ± 250 mV to ±250 V isolated inputs
- AC or DC coupling
- On-board measurements
- Built-in web interface
- 1U, full-rack standalone instrument
- Gigabit LAN and USB 2.0 interfaces
- Standard 32 MSa/ch or extended 128 MSa/ch segmented memory
- LXI Class C compliant

LXI

Agilent Technologies

High-Resolution LXI Digitizers

The Agilent Technologies L4532A and L4534A are high-resolution, stand-alone LXI digitizers. They offer 2 or 4 channels of simultaneous sampling at up to 20 MSa/s, with 16 bits of resolution. Inputs are isolated and can measure up to ±250 V to handle your most demanding applications.

Input channels with the ability to measure waveforms up to 250 V are ideal for analyzing high-voltage and transient signals as seen in automotive and aerospace defense applications. Most oscilloscopes and PXI digitizers have a maximum input range less than 40 Vpk. The L4532A and L4534A can make measurements that other products cannot. For example, since the ±250 V input range is combined with 16-bit analog-to-digital converters (ADCs), the isolated front-end and low input offset allows a small voltage, such as a 250 mV, and a larger voltage, such as 250 V, to be measured at the same time.

The digitizers are LXI Class C compliant providing the benefits of an Ethernet connection, standard software drivers, an enhanced web interface, and more. Multiple vendors support the LXI standard making it easy to integrate the digitizers into your test system.

Save test time and money with high-performance analog inputs

The digitizer's individually isolated channel inputs have been designed for high performance with an A/D converter per channel to ensure the signals you measure are accurately digitized without distortion or additional noise. Channel input range is configurable from ±250 mV up to ±250 V, with a floating voltage up to ±40 V to accommodate differential waveform acquisition. You can also choose to enable 2 MHz and 200 KHz input filters to your digitizer. The high voltage input, isolated inputs, and selection of noise filters reduces the need to add expensive input signal attenuation and signal conditioning circuitry, saving test development time and money.

The 16-bit dynamic range combined with the ±250 V range is an advantage for test throughput since there is no need to make repeated "passes" with different range settings to capture both the smaller waveform details and larger waveform signals.

Minimize post processing with onboard measurements

The L4532A and L4534A digitizers include a collection of on-board "scope-like" measurements such as Vmin/Vmax, Vp-p, frequency, rise/fall time, and more that can be applied to a selected portion or the overall waveform. There is no need for post processing data to get the measurement results you need, saving time and minimizing the need to transfer and store large amounts of data. The waveform measurements are made within a user-selected region of the digitized waveform and include their time position. The following measurements are supported by the digitizers:

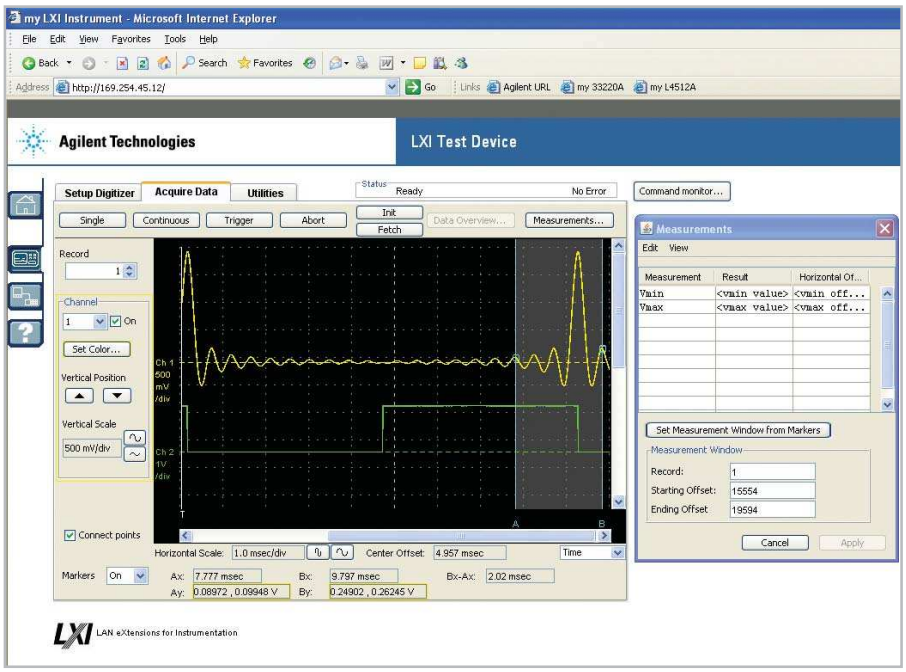
- V min/V max
- VPP
- V avg/V rms
- V top/V base
- Rise/fall time
- Overshoot/preshoot
- Frequency/period
- Pulse width
- Duty cycle

Easy-to-use graphical web interface

Connect to the digitizers' graphical web interface either by direct LAN or the Internet with your PC's Java-enabled web browser (such as Internet Explorer). Enter the IP address displayed on the front of the digitizer into the web browser address and you will be able to configure, acquire, and display waveforms and measurements without programming. The web interface simultaneously displays the channel signals and measurements, and provides an instrument command log that is very useful during development or debug.

The digitizer's web interface is easy to use, even from remote locations. The Setup Digitizer window allows you to select the configuration including sample rate, voltage range, record size, trigger source, and trigger mode. The Acquire Data window displays the waveforms and measurements. The waveform display has a similar look and feel to an oscilloscope with adjustable vertical and horizontal views. Markers allow you to select a portion of the waveform to make measurements on or view the waveform more closely.

The web interface records and displays the digitizers' instrument commands you select in the Setup window. The list of instrument commands can be copied and pasted directly into your test program to expedite your test development.



Deep memory for flexible data acquisition

- The L4532A and L4534A digitizers include a deep memory option (up to 128 MSa per channel) providing flexible waveform data acquisition.. The waveform data collected is determined by the user and digitizer configuration including sample rate, segmented memory, flexible trigger system, and data reduction feature for data transferred from memory.
- **Segmented memory** is used for sampling multiple bursts of readings. Memory can be segmented in 1 to 1024 records. Multiple records allow multiple bursts of data to be digitized without the need to re-initialize between bursts. The record size is configured by selecting the total number of samples including pre-trigger samples.
- A **flexible trigger system** allows you to capture only the data you need. Trigger events are used to initialize the digitization of data for each record. Configurable Trigger Delay and Trigger Holdoff allow you to better define where record data is collected relative to the trigger event.
- When retrieving **digitized data** users can take advantage of the built-in data reduction feature. This allows you to reduce the amount of unnecessary data through data decimation on select channels that were sampled at a faster rate than necessary.

Configurable sample rates

Based on a 20 Mhz sample clock, the L4532A and L4534A allow you to select the desired sample rate on each channel. The sample rate is configurable from 1 KS/s to 20 MSa/s.

External clock (reference clock 10 MHz)

The Clock In/Out allows synchronizing system clocks of multiple instruments. When used with the external trigger, the synchronized instrument clocks allow multiple digitizers to sample in a synchronized lock step.

Flexible triggering

The digitizer's flexible trigger capability allows you to digitize samples in close proximity to the data of interest, reducing the overall data that needs to be digitized. Each trigger event causes completion of the current record's post trigger samples. The configurable Trigger Delay feature allows precise positioning of acquisition relative to the trigger event, while the Trigger Hold-off feature allows avoiding false triggers.

The External TTL trigger output enables L4532A and L4534A digitizers to synchronize to other devices. Multiple L4532A and L4534A digitizers can be synchronized for higher channel count. The digitizers provide an Arm-Trigger model you can use to pace groups of records (groups of triggers) by gating them through Arm events that are different than trigger events. The Fast Re-arm feature reduces the dead-time between records, thus reducing the likelihood of missing a Trigger event.

Built-in self-test ensures proper operation

A built-in self-test ensures proper operation of all major subsystems of the digitizer and reports any errors. A high-level self-test automatically runs at startup, or a more thorough self-test can be initiated on command. Successful completion indicates the digitizer is ready to use.

Easy, semi-automatic calibration

Calibration is easily achieved using a 6.5 digit DMM to measure the Cal Src Out on a few defined ranges of the digitizer. Simply send a command, using your programming language of choice or the web interface, that contains the measured source values to the digitizer, and the rest of the calibration is done automatically.

Gigabit ethernet for high-speed connection

The Gigabit Ethernet interface offers a high-speed connection that enables remote access and control of the digitizer. You can set up a private network to filter out unwanted LAN traffic and speed up the I/O throughput, or take advantage of the remote capabilities and distribute your tests worldwide. The Ethernet interface along with the web interface enables you to configure, monitor, and debug your application remotely.

The digitizers ship with Agilent E2094N I/O Libraries Suite making it easy for you to configure and integrate Agilent and other vendors' instruments into your system.

Standard software environments supported

Full support for standard programming environments ensures compatibility and efficiency. The digitizers can be automated using SCPI or standard IVI and LabVIEW software drivers that provide compatibility with the most popular development environments:

- Agilent Microsoft® Visual Studio® .NET, Agilent VEE Pro, Microsoft C/C++, Visual Basic
- National Instruments LabVIEW, LabWindows/CVI, Test Stand

Specifications

L4532A (2 channel) or L4534A (4 channel) digitizers with ADCs per channel	
Max sample rate	20 MSa/s
Sample resolution	16 Bits
Input configuration	Isolated inputs (each channel independently isolated)
Isolation voltage (low to chassis)	±40 V
Maximum input (Hi to Low)	±250 Vpk[1]
Maximum input range	±256 V
Input impedance	1 MΩ in parallel with 40 pF
Input coupling	DC or AC
AC cutoff freq (-3 dB)	< 10 Hz
Input ranges:	±256 V, ±128 V, ±64 V, ±32 V, ±16 V, ±8 V, ±4 V, ±2 V, ±1 V, ±500 mV, ±250 mV
Over voltage protection	Yes
Maximum overvoltage transient	±400 Vpk
Analog bandwidth (-3 dB)	20 MHz typical
Noise filtering (2-pole Bessel)	200 KHz, 2 MHz typical
Power requirements	
Line voltage	100 to 240 VAC (universal)
Line frequency	50 Hz or 60 Hz
Power consumption	45 W (100 VA)
Safety conforms to IEC/EN 61010-1:2001(EU) CAN/CSA-C22.2 No. 61010-1-04 (Canada) UL 61010-1 (2nd Edition) (US) AS 61010.1:2003 (Australia/New Zealand)	
EMC conforms to IEC 61326-1:2005-12 (EU) EN 61326-1:2006 ICES-001:2004 (Canada) AS/NZS CISPR 11:2004	

1. *CAT I IEC measurement Category I. Inputs may be connected only to circuits that are isolated from AC mains.*

Arm and trigger

Each Arm event gates one or more trigger events. Each trigger event causes acquisition of data into a single record at the configured sample rate. The number of data records is configurable from 1 to 1024.

Source	ARM	Trigger	Description
IMMediate	●	●	Trigger or ARM at INIT time
EXTernal 1	●	●	BNC TTL input edge (selectable rising/falling edge
Software	●	●	Instrument commands
Timer	●		0.0 s to 3600.0 s with 50 ns resolution
Channel/Edge		●	Selectable level, rising/ falling, hysteresis
Channel/Window		●	Selectable high and low levels, leaving/entering, hysteresis
OR [2]		●	Logical OR of channel trigger source and External

1. *EXTernal can be used as an ARM source or a trigger source, but not both at the same time.*
2. *OR can only be used if the EXTernal source is being used as a trigger source.*

Sampling

Programmable sample rates	1 KSa/s, 2 KSa/s, 5 KSa/s, 10 KSa/s, 20 KSa/s, 50 KSa/s, 100 KSa/s, 200 KSa/s, 500 KSa/s, 1 MSa/s, 2 MSa/s, 5 MSa/s, 10 MSa/s, 20 MSa/s
External event output	
Event types:	Trigger, end-of-record, end-of-acquisition
Output signal: [3,4]	TTL (rising edge)
Impedance:	25 ohm or 50 ohm
Trigger modes	
Pre trigger	0 to record length -4
Post trigger	Record length-pretrigger
Timestamp triggered event	Elapsed time since INIT, or CONTinuous running timestamp
Timestamp resolution	12.5 ns
Trigger delay	0 – 3600 s with 50 ns resolution
Trigger holdoff	0 – 10 s with 50 ns resolution
Trigger latency [5]	12.5 ns
Trigger reactive	
Ext input trigger latency	40 ns to 51 ns
Ext output trigger latency	4 ns to 21 ns

3. *Pulse width 1 µs (200 ns for records taking <2 µs to complete).*
4. *TTL output pulse can be configured for either rising or falling edge.*
5. *Latency between level/window trigger detection and first (trigger) sample.*

Accuracy [1]

DC accuracy

Total specification (% of reading + % of range).[4]

	23 °C ± 5 °C		$T_{autozero}$ ±3 °C [5]	Temp coefficient outside 18-28 °C	
Range	**±% of reading**	**±% of range**	**±% of range**	**±% of reading/C**	**±% of range/C**
250 mV	0.10	0.30	0.11	0.010	0.015
500 mV	0.10	0.20	0.06	0.010	0.010
1 V, 2 V	0.10	0.12	0.04	0.010	0.010
4 V, 64 V	0.10	0.30	0.05	0.010	0.015
8 V, 128 V	0.10	0.20	0.04	0.010	0.010
16 V, 32 V, 256 V	0.10	0.12	0.04	0.010	0.010

1. 100,000 reading average @ 1 MSa/s

For 1 V range and greater, typical offset with constant temperature is 0.01% of range.

Integral nonlinearity	±5 LSB
Differential nonlinearity	±1 LSB typical, no missing codes
Input bias current	< 10 nA typical

Dynamic Characteristics [4] *(typical)*

(Measured using a 65536 point FFT)

	SFDR - dBc	THD - dBc	SNR - dB	SINAD - dB	ENOB [2]
Input range 980 kHz input (–1 dBFS)					
250 mV	71	79	67	66.7	10.8
500 mV	77	83	70	69.8	11.3
1 V	81	85	73	72.7	11.8
2 V	85	82	75	74.2	12.0
4 V	70	80	64	63.9	10.3
8 V	70	83	65	64.9	10.5
16 V	70	81	65	64.9	10.5
Input range 10 MHz input (-1 dBFS)					
250 mV	71	71	66	64.8	10.5
500 mV	71	73	68	66.8	10.8
1 V	69	68	72	66.5	10.8
2 V	63	62	72	61.6	9.9

3. ENOB = (SINAD - 1.76)/6.02

4. External timebase measurements made with 1 Vpp sinewave with <2 ps RMS jitter.

AC flatness (DC-4 MHz)	
250 mV	±0.28 dB relative to 1 kHz
500 mV, 1 V, 2 V, 4 V, 8 V, 16 V, 32 V	±0.20 dB relative to 1 kHz
64 V, 128 V, 256 V	±0.40 dB (±0.01 dB/°C temperature coefficient outside 18-28° C) relative to 1 kHz
Crosstalk (Ch to Ch) R_s = 50 Ohm	<–90 dB @ 1 MHz

Timing and synchronization

Internal timebase accuracy	±50 ppm
Internal timebase output (Clock out BNC)	
Frequency	10 MHz
Level	>1 Vpp
External timebase reference (Clock in BNC)	
Lock range	10 MHz ±5000 pp (10 MHz ±50 kHz)
Clock lock skew (typical)	±10 ns (typical)
Level	1 Vpp sinewave min <2 psec rms jitter
Input resistance nominal	100 kΩ nominal

Waveform memory

Data memory	
Standard [5]	32 MSa/ch
Extended [5]	128 MSa/ch
Random access to readings	Capture multiple records from
Multiple record mode	multiple triggers

5. Nominal values. Specific sample max is 33,554,432 and 134,205,440 samples.

Waveform measurements

Voltage	Peak-to-peak, minimum, maximum, average, RMS, amplitude, base, top, overshoot, preshoot, upper, middle, lower
Time	Rise, fall, period, frequency, positive width, negative width, duty cycle

Utilities

Calibration	
Calibration cycle	1 year
Internal calibration source	0 to ±16 V typical
Electronic calibration	Requires an external 6.5 digit DMM and PC
Self-test	Power on self-test, Complete test performed via *TST? command

Hardware

1U full rack LXI	425.7 mm W x 44.5 H x 367.9 mm D
Weight	
L4532A (2-ch)	3.3 kg
L4534A (4-ch)	3.63 kg
Front panel	Power switch and display
Back panel (Connectors)	
Power input	
Input channels	BNC
Cal Src Out	BNC
10 MHz In	BNC
10 MHz Out	BNC
Trig In/Out	BNC
I/O interface	LAN (Gbit), USB 2.0

Software

Web interface:	Internet Explorer, IE (version 6 & 7), Mozilla Firefox and Netscape; requires Java-enabled browser (Java 1.6 or greater)
Programming language:	ASCII commands, IEEE 488.2 compliant
Computer interfaces:	
LAN: Standard LAN 10/100/1000BaseTx	(VXI-11* compliant), Sockets (service at port 5025), Telnet (service at port 5024))
USB: Standard USB 2.0	(USBTMC** compliant)
Programming via direct native command set:	
VISA IO control (LAN or USB)	Agilent IO Libraries Suite 15.0 or greater recommended
LAN sockets control (LAN only)	<Sockets programming>
Programming via software driver:	
IVI-COM, IVI-C Driver for Window 2000/XP/Vista, G driver for LabVIEW	
Compatible with programming tools and environments:	
Agilent VEE Pro, Microsoft Visual Studio.NET, C/C++, Visual Basic 6, National Instruments Test Stand, Measurement Studio, LabWindows/CVI, LabVIEW	

* *VXI-11 allows transfer of IEEE 488.1 and IEEE 488.2 messages over a TCP/IP network. Supported by Agilent IO Library Suite (included).*

** *USB Test and Measurement Class (TMC) that communicates over USB, complying with IEEE 488.1 and IEEE 488.2 standards. Supported by Agilent IO Library Suite (included).*

Minimum system requirements (I/O libraries & drivers)

Operating system	Windows XP SP2 (or later) Windows 2000 Professional SP4 (or later)	Windows Vista 32-bit (Home, Basic, Premium, Business, Ultimate, Enterprise)
Processor	450 MHz Pentium II or higher required; 800 MHz recommended	1 GHz 32-bit (x86)
Available memory	128 MB minimum, (256 MB or greater recommended)	512 MB minimum (1 GB recommended)
Available disk space	280 MB minimum, 1 GB recommended for Microsoft.NET framework 2.0 65 MB for Agilent IO Libraries Suite	
Video	Super VGA (800 x 600), 256 colors or more	Support for Direct X 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)
Browser	Microsoft Internet Explorer 5.01 or greater	Microsoft Internet Explorer 7 or greater

Environmental

Operational environment	Pollution degree 2, indoors
Operating temperature	0 to 55 °C
Storage temperature	–40 to+70 °C
Warm-up period	<60 min to rated specs
Relative humidity @ 40 °C	20 to 95% non-condensing
Vibration:	Agilent's ETM limits

Data storage/transfer

Pre-trigger data	Up to full record length -4 samples
Record length	8 samples to 32 MSa/128 MSa
Post-trigger data	4 samples to 128 MSamples
Maximum number of triggers	Number of records (triggers) configurable to 1024 records
Resolution	One sampling interval
Timestamp rollover	>1.5 years
Maximum data transfer rate from memory	
USB 2.0	8 MB/s
Gbit LAN	15.0 MB/s

Ordering Information

L4532A	2-channel 20 MSa/s digitizer
Opt 001	Standard memory (32 MS/ch)
Opt 002	Extended memory (128 MS/ch)
L4534A	4-channel 20 MSa/s digitizer
Opt 001	Standard memory (32 MS/ch)
Opt 002	Extended memory (128 MS/ch)
Includes product reference CD (products doc and examples), IO Libraries CD, and power cord.	
Accessories	
Opt 908	Rack mount kit L4532-67001
Option 0B0	Deletes printed manual set (Full documentation included on CD ROM)
Option ABA	English printed manual set

For additional information please visit:
http://www.agilent.com/find/L4534A

Related Agilent Literature

Agilent VEE Pro, data sheet, literature number 5989-7427EN

Agilent E2094N IO Libraries Suite, data sheet, literature number 5989-1439EN

Definitions for Specifications

Specifications describe the warranted performance of calibrated instruments that have been stored for a minimum of 2 hours within the operating temperature range of 0 to 55°C, unless otherwise stated, and after a 60 minute warm-up period. Data represented in this document arespecifications unless other wise noted.

Characteristics describe product performance that is useful in the application of the product, but that is not covered by the product warranty. Characteristics are often referred to as Typical or Nominal values.

• Typical describes characteristic performance, which 80% of the instruments will meet when operated over a 18 to 28°C temperature range. Typical performance is not warranted.

• Nominal describes representative performance that is useful in the application of the product when operated over a 18 to 28°C temperature range. Nominal performance is not warranted.

Note: All graphs contain measure data from several units at room temperature unless otherwise noted.

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LXI

www.lxistandard.org
LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Agilent is a founding member of the LXI consortium.

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Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 375 8100

Europe & Middle East

Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700*
	*0.125 €/minute
Germany	49 (0) 7031 464 6333
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
United Kingdom	44 (0) 131 452 0200

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Agilent Technologies

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