Keysight Technologies

N1090A, N1092A/B/C/D/E and N1094A/B DCA-M Optical and Electrical Sampling Oscilloscopes

Data Sheet

High accuracy, low cost solutions for optical and electrical waveform analysis

- Solutions for 1 Gb/s through 53 GBaud
- Very low noise and jitter
- Fast sampling rates for high throughput



KEYSIGHT TECHNOLOGIES

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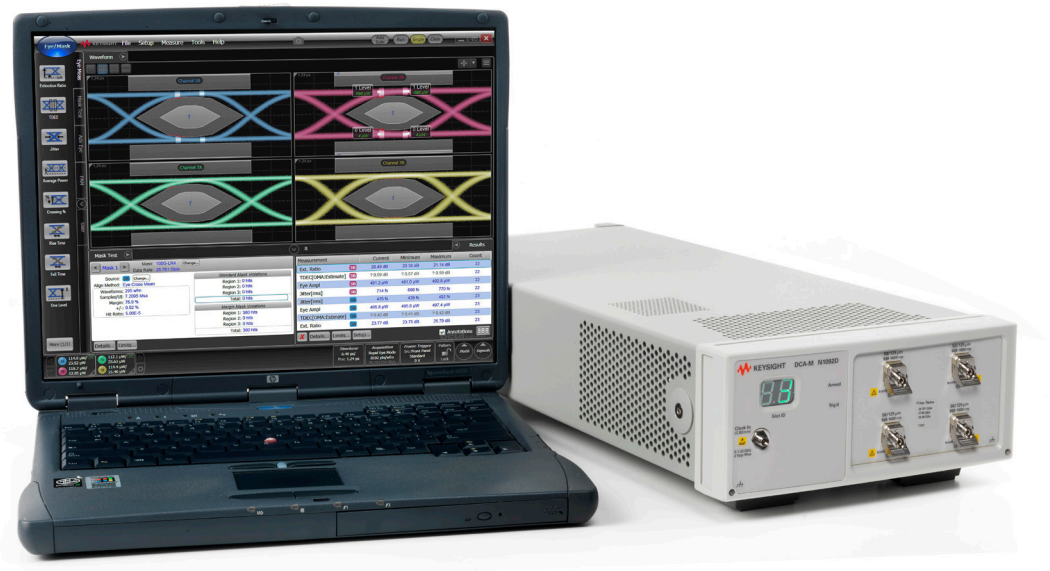
Legendary DCA Accuracy in a Smaller Platform Ideal for Both Manufacturing and R&D Applications

The Keysight Technologies, Inc. 86100 digital communication analyzer (DCA) family is recognized as the industry standard for verifying optical transmitter compliance to communications standards. For years engineers have trusted the DCA to provide accurate and easy measurement of digital communication waveforms. The Keysight N109X DCA-M family has built on that legacy by using the high-performance elements of both the 86100 oscilloscope mainframe acquisition system and the optical and electrical channel hardware of the 861XX plug-in modules. The N1090A supports 1 to 10 Gb/s measurements, while the N1092 is for use from 20 Gb/s through 53 GBaud. (Data rate ranges of the N1092 can be extended using Options PLK and IRC.)

Unlike the 86100, which uses modules to create a waveform analysis system, the N109X are completely integrated instruments built in a small form factor. Low-noise, high-sensitivity calibrated reference receivers – compliant to industry standard tolerances – are available for both multimode and single-mode signals at wavelengths from 750 to 1630 nm. N1090A noise is as low as 1 µW, while N1092 noise is as low as 4 µW, creating a measurement system with very high dynamic range. The sensitivity of the N1092 is significantly better than the comparable 86100 system making it an excellent solution for PAM-4 waveform analysis. Electrical channels are available with 20 GHz (N1090A), 30 GHz, and 50 GHz bandwidths (N1092/4).

The N109X user interface and operating system is identical to the modern FlexDCA interface of the 86100D. A user-provided PC running N1010A FlexDCA software controls the N109X over a simple USB 2.0 or 3.0 connection.

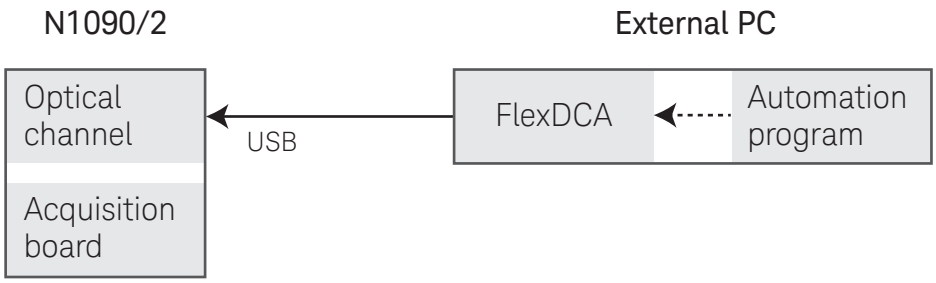


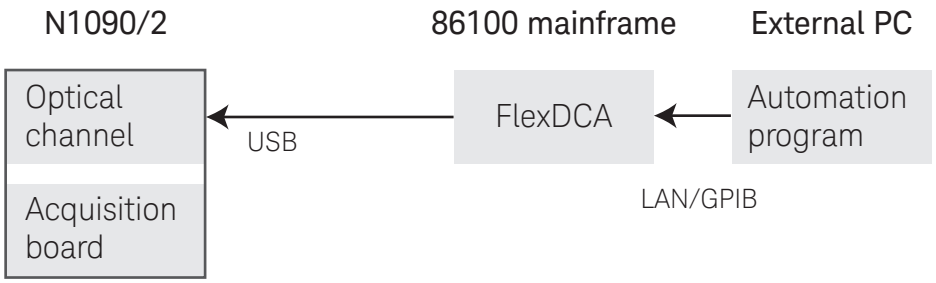
Controlling the N109X

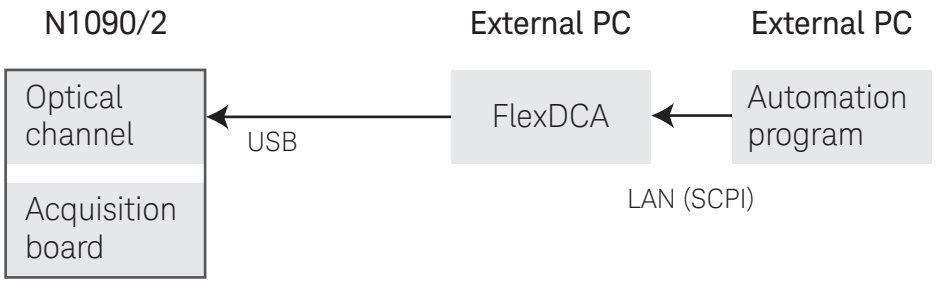
There are three ways to control the N109X system

- A PC directly connected to the N109X with a USB cable
- An 86100D mainframe connected to the N109X with a USB cable. (The 86100D can then be controlled via GPIB or LAN)
- For an automated test system environment, the simplest and preferred method to control the N109X is to connect the primary test system PC to a low-cost modern PC via LAN. The FlexDCA interface resides on the second PC. The second PC is then connected to the N109X via USB. This eliminates most issues of compatibility between an existing test system PC and the N109X hardware and can greatly simplify converting an 86100D system to an N109X system

Connection schemes







Controlling the N109X (Continued)

System setup

The following guidelines indicate the fundamental requirements for PC's connected to the N109X and running the FlexDCA interface:

For a single channel setup (N1090A or N1092A)
- Intel I3 processor or better
- 4 GB memory
- Windows 7 (32 or 64 bit)

For a parallel test setup (multiple instruments or multiple channels)
- Intel I5 or better
- 8 GB memory
- Windows 7 (64 bit)

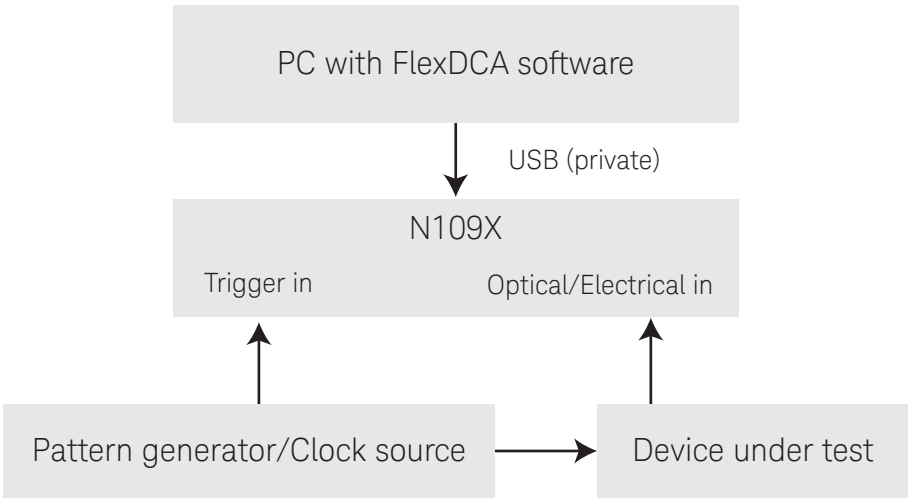
The communication API between your system controller and the PC is SCPI over LAN, either VXI-11 or HiSlip. If NI-VISA or IO Libraries are used to communicate with GPIB instruments, the switch to SCPI/LAN is very simple. It is important to note that there is no need to do any USB programming. This is all handled by the FlexDCA interface.

The FlexDCA interface is free and can be downloaded at **www.keysight.com/find/flexdca_download**. Remote programs previously developed using the 86100 FlexDCA interface can be leveraged directly to control an automated N109X system. Use FlexDCA SCPI programming tools to simplify conversion of legacy 86100-based automation to FlexDCA compatible code. Measurement results are generally 50 percent faster with the new N1090A, and up to 300 percent faster with the N1092/4 due to significantly faster sampling rates.

Similar to the 86100, a reference clock, synchronous with the signal being measured, is required to trigger the N109X. The clock input range for the N1090A is 500 MHz to 12 GHz, and the N1092 and N1094 are 500 MHz to 28.5 GHz. Timebase calibration, previously performed at service centers, can now be performed by users, reducing cost of ownership and instrument down time.

Controlling the N109X (Continued)

System setup (Continued)



Fundamental measurements required to perform transmitter compliance tests such as eye-masks, extinction ratio, and other eye diagram parameters, are standard features of the N109X with N1010A system. To reduce cost, the pattern lock feature of the 86100 is not available in the N1090A, but is optionally available with the N1092/4 Option PLK. Features that require pattern lock include Options 200 (advanced jitter analysis), 201 (advanced waveform analysis), 300 (advanced amplitude analysis/RIN), Option IRC (extends the operating range of the optical channels ± 50% and creates reference receivers at arbitrary data rates between 10 and 42 Gb/s), and SIM (Infinisim waveform transformation software). Measurement features that require pattern lock will not operate when used with the N1090A system. Basic oscilloscope mode measurements of pulses rather than eye diagrams are limited to patterns less than 2 ns in duration with the N1090A.

N1090A Configurations

Choose from the following reference receiver options to best meet your measurement needs. Select one option. Options cannot be combined. However if test needs change, the N1090A can be returned to a Keysight service center to convert from any of the five reference receiver options to one of the other four options listed. Unfiltered mode is not available in any option.



Model/option number	Description
N1090A-140	Reference receiver filters for 1.244/1.25/1.229 Gb/s
N1090A-160	Reference receiver filters for 2.458/2.488/2.5 Gb/s
N1090A-180	Reference receiver filters for 3.072/3.125 Gb/s
N1090A-200	Reference receiver filters for 8.5/9.95/10.3/10.5/10.66/10.71/11.1/11.3 Gb/s
N1090A-204	Reference receiver filters for 8.5/9.95/10.3/10.5 Gb/s
N1090A-EEC	Enable electrical channel
N1090A-PLK	Pattern lock trigger hardware
N1090A-IRC	Impulse response correction [1]
N1090A-C0C	Certificate of Calibration
N1090A-UK6	Commercial calibration certificate with test data
N1090A-1CM	Single instrument rack mount kit
N1090A-1CN	Dual instrument side-by-side rack mount kit

1. Requires option PLK.

N1092/4 Configurations



All optical channels include optical reference receivers for the common 25 to 28 GBaud rates, and with options LOJ, PLK, IRC and 9FP (or TFP) also support measurements on 26 and 53 GBaud PAM-4 signals. Using the FlexDCA user interface, simultaneous measurements of multiple channels can be performed in parallel without any degradation in speed or accuracy.

N1092A/B/C/D/E 1/2/3/4 channel optical DCA-M sampling oscilloscope

Model/option number	Description
N1092A	Single optical channel oscilloscope
N1092B	Dual optical channel oscilloscope
N1092C	Single optical, dual electrical channel oscilloscope
N1092D	Quad optical channel oscilloscope
N1092E	Dual optical, dual electrical channel oscilloscope
N1092x-30A	30 GHz amplified (mandatory)
N1092x-280	25.781, 27.739, 27.952, 28.050 Gbaud filters (mandatory)
N1092x-LOJ	Low jitter timebase
N1092x-STB	Standard timebase
N1092x-PLK	Pattern lock capability
N1092x-FS1	Fast sampling rate
N1092x-200	Enhanced jitter analysis software, fixed perpetual license
N1092x-201	Advanced waveform analysis software, fixed perpetual license
N1092x-300	Advanced amplitude analysis/Rin/Q-Factor, fixed perpetual license
N1092x-401	Advanced eye analysis software, fixed perpetual license
N1092x-500	Productivity package, fixed perpetual license
N1092x-9FP	PAM-N analysis SW, fixed perpetual license
N1092x-TFP	IEEE TDECQ analysis, fixed perpetual license
N1092x-PLK	Pattern lock trigger hardware
N1092x-IRC	Impulse response correction
N1092x-EFP	FlexEye Independent Channel Acquisition and Control
N1092x-SIM	InfiniiSim-DCA waveform transformation SW, fixed perpetual license
N1092x-IRC	Impulse response correction
N1092x-168	Additional 25.78 Gb/s TDEC filter (requires Option 500)
N1092x-206	Additional 20.625 Gb/s filter
N1092x-C0C	Certificate of Calibration
N1092x-UK6	Commercial calibration certificate with test data
N1092x-1CM	Single instrument rack mount kit
N1092x-1CN	Dual instrument side-by-side rack mount kit

N1092/4 Configurations (Continued)

N1094A/B 2/4 channel electrical DCA-M oscilloscope

Model/option number	Description
N1094A	Dual electrical channel oscilloscope
N1094B	Quad electrical channel oscilloscope
N1094x-030	20 and 30 GHz bandwidth settings
N1094x-050	20, 33, 40 and 50 GHz bandwidth settings
N1094x-LOJ	Low jitter timebase
N1094x-STB	Standard timebase
N1094x-PLK	Pattern lock capability
N1094x-FS1	Fast sampling rate
N1094x-200	Enhanced jitter analysis software, fixed perpetual license [1]
N1094x-201	Advanced waveform analysis software, fixed perpetual license
N1094x-300	Advanced amplitude analysis/Rin/Q-Factor, fixed perpetual license [1]
N1094x-401	Advanced eye analysis software, fixed perpetual license
N1094x-500	Productivity package, fixed perpetual license
N1094x-9FP	PAM-N analysis software, fixed perpetual license
N1094x-TFP	IEEE TDECQ analysis, fixed perpetual license
N1094x-PLK	Pattern lock trigger hardware
N1094x-EFP	FlexEye independent channel acquisition and control
N1094x-SIM	InfiniiSim-DCA waveform transformation software, fixed perpetual license
N1094x-C0C	Certificate of calibration
N1094x-UK6	Commercial calibration certificate with test data
N1094x-1CM	Single instrument rack mount kit
N1094x-1CN	Dual instrument side-by-side rack mount kit

1. Options 200 and 300 must be ordered together.

N1090A Optical Channel Specifications

Item	Description
Nominal wavelength range	750 to 1650 nm
Factory-calibrated wavelengths (OE conversion gains)	850/1310/1550 nm (± 20 nm)
Reference receiver filter options (select one)	
N1090A-140	GPON, 1.244 Gb/s and Gb Ethernet, 1.250 Gb/s, CPRI 1.229 Gb/s
N1090A-160	OC-48/STM-16, 2.488 Gb/s, 2 Gb Ethernet, 2.500 Gb/s, CPRI 2.458 Gb/s
N1090A-180	10 Gb Ethernet LX-4, 3.125 Gb/s, CPRI 3.072 Gb/s
N1090A-200	8x fibre channel, 8.500 Gb/s OC-192/STM-64, 9.953 Gb/s 10 Gb Ethernet, 10.3125 Gb/s 10x fibre channel, 10.51875 Gb/s OC-192/STM-64 FEC, 10.664 Gb/s OC-192/STM-64 FEC, 10.709 Gb/s 10 Gb Ethernet FEC, 11.0957 Gb/s 10x fibre channel FEC, 11.317 Gb/s
N1090A-204	8x fibre channel, 8.500 Gb/s OC-192/STM-64, 9.953 Gb/s 10 Gb Ethernet, 10.3125 Gb/s, CPRI 9.830 Gb/s 10x fibre channel, 10.51875 Gb/s, CPRI 10.138 Gb/s

Measured frequency response data during recertification falls within performance test line limits with allowance for system-to-system measurement uncertainty.

	Option 140	Option 160	Option 180	Options 200 and 204
RMS noise at 850 nm				
Characteristic	*1.3 µW*	*1.5 µW*	*2.5 µW*	*2.5 µW*
Maximum	2.0 µW	2.5 µW	4.0 µW	4.0 µW
RMS noise at 1310/1550 nm				
Characteristic	*0.8 µW*	*1.0 µW*	*1.4 µW*	*1.4 µW*
Maximum	1.3 µW	1.5 µW	2.5 µW	2.5 µW
Sensitivity [1] at 850 nm (Characteristic – smallest average power for mask test)	*–20 dBm*	*–20 dBm*	*–19 dBm*	*–16 dBm*
Sensitivity [1] at 1310/1550 nm (Characteristic – smallest average power for mask test)	*–21 dBm*	*–21 dBm*	*–20 dBm*	*–17 dBm*

1. Generally represents the power level where an ideal eye diagram will approach 0% mask margin due to noise of the oscilloscope. Provides a non-specified figure of merit to compare sensitivities of various optical channels.

N1090A Optical Channel Specifications (Continued)

Scale factor (per division)	
Minimum	2 µW
Maximum	100 µW
CW accuracy (single marker, referenced to average power monitor)	
Single-mode	± 25 µW ± 3%
Multimode	± 25 µW ± 10%
CW offset range (referenced two divisions from screen bottom)	+0.2 to –0.6 mW
Average power monitor	–30 to 0 dBm
Average power monitor accuracy	
Single-mode	± 5% ± 200 nW ± connector uncertainty
Multimode (characteristic)	*± 10% ± 200 nW ± connector uncertainty*
Due to variations in mode-filling conditions, the measured power in multimode fiber will vary more than the measured power in single-mode fiber. For users needing the most accurate power measurements, use an optical power meter for multimode power measurements	
User-calibrated accuracy (assumes connector is continually attached)	
Single-mode	± 3% ± 200 nW ± power meter uncertainty, < 5 °C change
Multimode (characteristic)	*± 10% ± 200 nW ± power meter uncertainty, < 5 °C change*
Maximum input power	
Maximum non-destruct average	0.5 mW (–3 dBm)
Maximum non-destruct peak	5 mW (+7 dBm)
Input return loss (FC/PC connector fully filled fiber)	
Fiber input	62.5/125 µm
1310/1550 nm	> 24 dB

N1090A Electrical Channel Specifications (Requires Option EEC)

Electrical channel specifications	
Electrical channel bandwidth	12.4 and 20 GHz
Transition time (10 to 90% calculated from TR = 0.35/BW)	28.2 ps (12.4 GHz)
	17.5 ps (20 GHz)
RMS noise	
Characteristic	*0.25 mV (12.4 GHz)*
	0.5 mV (20 GHz)
Maximum	0.5 mv (12.4 GHz)
	1 mV (20 GHz)
Scale factor (per division)	
Minimum	1 mV/division
Maximum	100 mV/division
DC accuracy (single marker)	± 0.4% of full scale ± 2 mV ± 1.5% of (reading-channel offset), 12.4 GHz
	± 0.4% of full scale ± 2 mV ± 3% of (reading-channel offset), 20 GHz
DC offset range (referenced to center of screen)	± 500 mV
Input dynamic range (relative to channel offset)	± 400 mV
Maximum input signal	± 2 V (+16 dBm)
Nominal impedance	*50 Ω*
Reflections (for 30 ps rise time)	*5%*
Electrical input	3.5 mm (male)

N1090A Clock Trigger Input Specifications

Item	**Description**
Clock input bandwidth	0.5 to 12 GHz
Clock input sensitivity	200 mVpp
Maximal input signal	± 2 V
Nominal impedance	50 Ω
Clock input connector	SMA (female)

N1090A Horizontal Timebase Specifications

Item	Description
Scale factor	Full scale is ten divisions
Minimum	100 fs/div
Maximum	100 us/div
Sample delay	Less than 10 ns. Time offset between the front panel clock input and the front panel channel input
Time interval accuracy (Dual marker measurement performed at a temperature within ± 5 °C of horizontal calibration temperature)	1 ps + 0.2% of the measured time interval while the delay settings is less that the absolute minimum delay plus 1 ns
	If the delay setting is greater than the absolute minimum delay plus 1 ns then the accuracy is 5 ps + 0.1% of the measured time interval
Jitter (slew rate ≥ 2 V/ns)	500 fs rms
Time interval resolution (The time interval resolution is the smallest time you can characterize between two points)	(Screen diameter)/(Record length) or 40 fs, whichever is larger
Display units	Bits or time
Record length	16 to 65,536 samples. Increments of 1
Sample rate	60 kHz

N1090A Environmental Specifications

Item	Description
Use	Indoor
Temperature	
Operating	10 to +40 °C (50 to +104 °F)
Non-operating	–40 to +70 °C (–40 to +158 °F)
Altitude (operating)	Up to 4,600 meters (15,000 ft)
Maximum relative humidity	80% for temperatures up to 31 °C (87.8 °F) decreasing linearly to 50% relative humidity at 40 °C (104 °F)
Line power	100/120 Vac 50/60/400 Hz
	220/240 Vac 50/60 Hz
	50 W maximum
	The products can operate with mains supply voltage fluctuations up to ± 10% of the nominal voltage
Weight	
Mainframe (characteristic)	6.20 kg (13.68 lb)
Without front connectors and rear feet	88.26 mm H x 207.40 mm W x 485 mm D (3.48 in x 8.17 in x 19.01 in)
With front connectors and rear feet	103.31 mm H x 219.56 mm W x 517.80 mm D (4.07 in x 8.64 in x 20.39 in)
With front cover and rear feet	110.18 mm H x 219.56 mm W x 550.71 mm D (4.34 in x 8.64 in x 21.68 in)

N1092 Optical Channel Specifications

Item	Description	
Nominal wavelength range	830 to 1600 nm	
Factory-calibrated wavelengths (OE conversion gains)	850/1310/1550 nm (± 20 nm)	
Reference receiver filter options:	NRZ	PAM-4 [1]
The standard N1092 includes filters to test the following data rates	25.78 Gb/s (25/50/100 Gb Ethernet)	26.6 GBaud
	26.56 Gb/s (400 Gb Ethernet)	53.1 GBaud
	27.95 Gb/s (OTU4)	
	28.05 Gb/s (32x fibre channel)	
N1092-168	100GBASE-SR4 TDEC (12.4 GHz)	
N1092-206	20.6 Gb/s	

1. Requires Options LOJ, PLK and IRC.

Maximum optical channel –3 dBo bandwidth is 28 GHz, achieved using the 32xFC filter setting. Measured frequency response data during recertification falls within performance test line limits with allowance for system-to-system measurement uncertainty.

	20.6 Gb/s filter	25.78/26.56 Gb/s	27.95/28.05 Gb/s
NRZ Sensitivity [2] at 850 nm (Characteristic – smallest average power for mask test)	*–11.5 dBm*	*–11 dBm*	*–10 dBm*
NRZ Sensitivity [2] at 1310/1550 nm (Characteristic – smallest average power for mask test)	*–13 dBm*	*–12.5 dBm*	*–12 dBm*

2. Generally represents the power level where an ideal eye diagram will approach 0% mask margin due to noise of the oscilloscope. Provides a non-specified figure of merit to compare sensitivities of various optical channels. These values are calculated from the characteristic noise values.

	TDEC filter	20.6 Gb/s filter	25.78/26.56 Gb/s	27.95/28.05 Gb/s	26.6 GBaud	53.1 GBaud
RMS noise at 850 nm						
Characteristic	*5 µW*	*7 µW*	*8 µW*	*9.5 µW*	*8 µW*	*9.5 µW*
Maximum	7 µW	9 µW	10 µW	11 µW		
RMS noise at 1310 nm						
Characteristic	*3 µW*	*5 µW*	*5.5 µW*	*6 µW*	*5.5 µW*	*6 µW*
Maximum	5 µW	7 µW	7 µW	8 µW		
RMS noise at 1550 nm						
Characteristic	*3.5 µW*	*5 µW*	*5.5 µW*	*6 µW*	*5.5 µW*	*6 µW*
Maximum	5.5 µW	7.5 µW	7.5 µW	8.5 µW		

N1092A/B/D Optical Channel Specifications

Scale factor (per division)	
Minimum	5 µW
Maximum	500 µW
CW accuracy (single marker, referenced to average power monitor)	
Single-mode	± 30 µW ± 3% ± connector uncertainty
CW offset range (referenced two divisions from screen bottom)	0 mW to 3 mW
ADC resolution	16 bits
Average power monitor	–30 to 0 dBm
Average power monitor accuracy	
Single-mode	± 5% ± 200 nW ± connector uncertainty
Multimode (characteristic)	*± 10% ± 200 nW ± connector uncertainty*
Due to variations in mode-filling conditions, the measured power in multimode fiber will vary more than the measured power in single-mode fiber. For users needing the most accurate power measurements, use an optical power meter for multimode power measurements	
User-calibrated accuracy (assumes connector is continually attached)	
Single-mode	± 3% ± 200 nW ± power meter uncertainty, < 5 °C change
Multimode (characteristic)	*± 10% ± 200 nW ± power meter uncertainty, < 5 °C change*
Maximum input power	
Maximum displayed input	4 mW (6 dBm)
Maximum non-destruct peak	5 mW (+7 dBm)
Input return loss (FC/PC connector fully filled fiber)	
Fiber input	50/125 µm
1310/1550 nm	> 24 dB

N1092/4 Electrical Channel Specifications

Electrical input channels	
Input connectors	
2.4 mm (m) bulkhead	
Bandwidth, 3 dB (user selectable)	*20, 33, 40, and 50 [1] GHz (characteristic)*
Transition time (10 to 90% calculated from TR = 0.35/BW)	
20 GHz bandwidth	17.5 ps (calculated)
33 GHz bandwidth	10.6 ps (calculated)
40 GHz bandwidth [1]	8.8 ps (calculated)
50 GHz bandwidth [1]	7.0 ps (calculated)
Channel-to-channel skew range	
	± 100 ps
RMS noise	
20 GHz bandwidth	*310 µV (characteristic)*
33 GHz bandwidth	*450 µV (characteristic)*
40 GHz bandwidth [1]	*500 µV (characteristic)*
50 GHz bandwidth [1]	*600 µV (characteristic)*
RMS noise (Maximum)	700 µV (50 GHz bandwidth setting)
Scale factor (per division)	
Minimum	1 mV/division
Maximum	100 mV/division
DC accuracy (V_{AVG} measurement)	
20, 33, 40, 50 GHz	*± 1.15 mV (characteristic)*
20, 33, 40, 50 GHz	± 2 mV ± 4% of (reading – channel offset)
ADC resolution	16 bits
DC offset range	
Referenced to center of screen	± 500 mV
Input dynamic range	
Relative to channel offset	± 400 mV
Maximum input signal	
	± 2V (+16 dBm)
Nominal input impedance	
	50 Ω (characteristic)
Reflections (for 30 ps rise time)	
	20% (characteristic)

1. 40 and 50 GHz performance is only available with N1094 Option 050 and N1092C/E.

N1092/4 Clock Trigger Input Specifications

Item	Description
Clock input bandwidth [1]	0.5 to 28.5 GHz
Clock input sensitivity	200 mVpp
Maximal input signal	2.6 Vp-p
Nominal impedance (AC coupled)	50 Ω
Clock input connector	2.92 mm (female)

1. Minimum clock input frequency can be reduced to 100 MHz when it is a sub-rate clock of a channel input data rate in excess of 500 Mb/s and the clock divide ratio is a power of 2 (e.g. 2, 4, 8, 16...).

N1092/4 Horizontal Timebase Specifications

Item	Description
Scale factor	Full scale is ten divisions
Minimum	100 fs/div
Maximum	100 us/div
Sample delay	Less than 10 ns. Time offset between the front panel clock input and the front panel channel input
Time interval accuracy (Dual marker measurement performed at a temperature within ± 5 °C (± 41 °F)of horizontal calibration temperature)	1 ps + 0.2% of the measured time interval while the delay settings is less that the absolute minimum delay plus 1 ns
	If the delay setting is greater than the absolute minimum delay plus 1 ns then the accuracy is 5 ps + 0.1% of the measured time interval
Jitter (Slew rate ≥ 2 V/ns)	< 450 fs rms
Option LOJ	< 160 fs rms
Time interval resolution (The time interval resolution is the smallest time you can characterize between two points)	(Screen diameter)/(Record length) or 40 fs, whichever is larger
Display units	Bits or time
Record length	16 to 131,072 samples. Increments of 1
Sample rate	
Sample rate does not change for multiple channel configurations	100 kHz
Option FS1	250 kHz

N1092/4 Environmental Specifications

Item	Description
Use	Indoor
Temperature	
Operating	10 to +40 °C (50 to +104 °F)
Non-operating	–40 to +70 °C (–40 to +158 °F)
Altitude (operating)	Up to 4,600 meters (15,000 ft)
Maximum relative humidity	80% for temperatures up to 31 °C (87.8 °F) decreasing linearly to 50% relative humidity at 40 °C (104 °F)
Line power	100/120 Vac 50/60/400 Hz
	220/240 Vac 50/60 Hz
	290 W maximum
	The products can operate with mains supply voltage fluctuations up to ± 10% of the nominal voltage
Weight	
Mainframe (characteristic)	6.20 kg (13.68 lb)
Without front connectors and rear feet (H x W x D)	88.26 mm x 207.40 mm x 485 mm (3.48 in x 8.17 in x 19.01 in)
With front connectors and rear feet (H x W x D)	103.31 mm x 219.56 mm x 517.80 mm (4.07 in x 8.64 in x 20.39 in)
With front cover and rear feet (H x W x D)	110.18 mm x 219.56 mm x 550.71 mm (4.34 in x 8.64 in x 21.68 in)

Ordering Information – N1090A

The N1090A, when controlled by a PC through a USB connection, is a complete measurement system. No oscilloscope mainframe is required. Choose one reference receiver option (140, 160, 180, 200 or 204) to complete the configuration.

Reference	Description
N1090A	Optical sampling oscilloscope
N1090A-140	1.244/1.25 Gb/s reference receiver
N1090A-160	2.488/2.5 Gb/s reference receiver
N1090A-180	3.125 Gb/s reference receiver
N1090A-200	8.5 to 11.3 Gb/s reference receivers
N1090A-204	8.5 to 10.5 Gb/s reference receivers
N1090A-EEC	20 GHz electrical channel
N1090A-PLK	Pattern lock trigger hardware
N1090A-IRC	Impulse response correction [1]
N1090A-1CM	Single instrument rackmount kit
N1090A-1CN	Dual instrument (side-by-side) rackmount kit
The N1090A can also be converted from one reference receiver option to a different option through a return to factory upgrade:	N1090AU-140
	N1090AU-160
	N1090AU-180
	N1090AU-200
	N1090AU-204

1. Requires option PLK.

Note: The N1090A cannot be upgraded to an N1092.

N1010A FlexDCA software is required on the PC controlling the N101A DCA. It is available as a free download at **www.keysight.com/find/flexdca_download**

Ordering Information – N1092A/B/C/D/E and N1094A/B

The N1092/4, when controlled by a PC through a USB connection, is a complete measurement system. No oscilloscope mainframe is required. The N1092 comes standard with optical reference receivers for 25.78, 26.56, 27.95, and 28.05 Gb/s compliance test. N1092C and N1092E include 50 GHz electrical channels. The N1094 electrical channels can be configured with 33 or 50 GHz electrical bandwidths.

Model number	Description
N1092A	One optical channel
N1092B	Two optical channels
N1092C	One optical, two electrical channels
N1092D	Four optical channels
N1092E	Two optical, two electrical channels
N1094A	Two electrical channels
N1094B	Four electrical channels

The following options [1] are available on all N1092 and N1094 models. The price is the same, independent of a one, two, or four channel model number:

Option	Description
Option FS1	Increase sampling rate from 100 to 250 kSa/s
Option LOJ	Reduce residual jitter from 400 fs to < 200 fs
Option PLK	Add pattern lock capability
Option 200	Advanced jitter analysis
Option 201	Advanced waveform analysis
Option 300	Advanced amplitude/noise analysis
Option 401	Advanced eye analysis
Option 500	Productivity package (Rapid eye, TDEC)
Option 9FP	PAM-N analysis
Option SIM	Infinisim waveform transformation software
Option COC	Certificate of calibration
Option UK6	Commercial calibration certificate with test data
Option 1CM	Single instrument rackmount kit
Option 1CN	Dual instrument side-by-side rackmount kit
Option EFP	Flex eye independent channel acquisition
Option TFP	IEEE 802.3 TDECQ analysis option

1. Note that operation of Options 200, 201, 300, 401, 500, 9FP, EFP, TFP, and SIM can be achieved by having the appropriate licenses installed on the N1092, the computer controlling the N1092, or an 86100 mainframe used to control the N1092.

Ordering Information – N1092A/B/C/D/E and N1094A/B (Continued)

The following options are available for the N1092 models. Option prices depend on the model number and its number of optical channels (one, two or four for the N1092A/C, N1092B/E and N1092D respectively).

Option	Description
Option 168	25.78 Gb/s TDEC filter (100GBASE-SR4)
Option 206	20.6 Gb/s reference receiver
Option IRC	Extend optical channel bandwidth to 45 GHz (–3 dBo) and allow creation of reference receiver filters at any data rate from 8.4 to 42 GBaud, as well as creates the correct filters for measurements on 26 and 53 GBaud PAM-4 signals. (Requires Options PLK and LOJ)
Option PLK	Pattern lock trigger hardware

The following options are available with the N1094A/B.

Option	Description
Option 030	33 GHz electrical channel bandwidth
Option 050	50 GHz electrical channel bandwidth
Option PLK	Pattern lock trigger hardware

N1010A FlexDCA software is required on the PC controlling the N101A DCA. It is available as a free download at **www.keysight.com/find/flexdca_download**.

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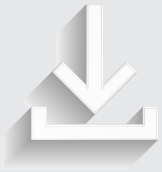

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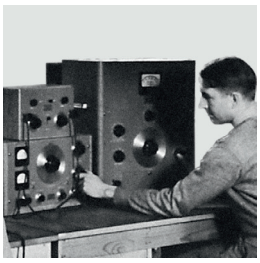
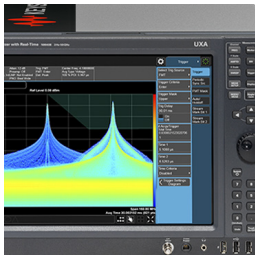


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