# 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 through 28 Gb/s
- Very low noise and jitter
- Fast sampling rates for high throughput

KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

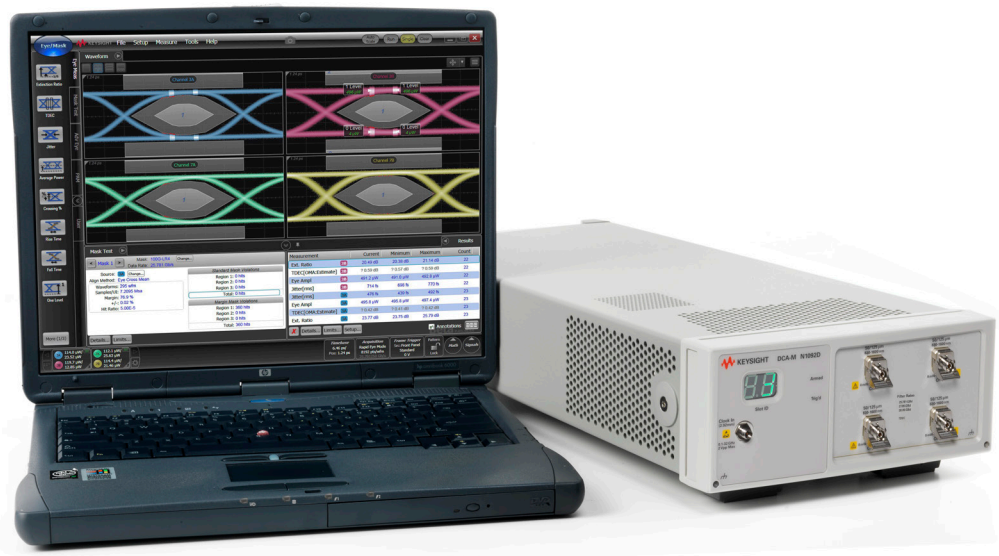
# Get 86100 DCA Accuracy with a Test Solution Designed for Manufacturing

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 and N1094 are for use from 20 to 28 Gb/s. (Data rate ranges of the N1092 can be extended using Options PLK and IRC.)

Designed specifically for high-volume manufacturing test applications, the DCA-M provides the measurement accuracy of the 86100, without the extra cost associated with an R&D test solution. Be confident that your test results will never be questioned when performed with an N109X because end users of your transceivers and components are likely to use similar accurate, high-quality test systems to verify component performance.

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.

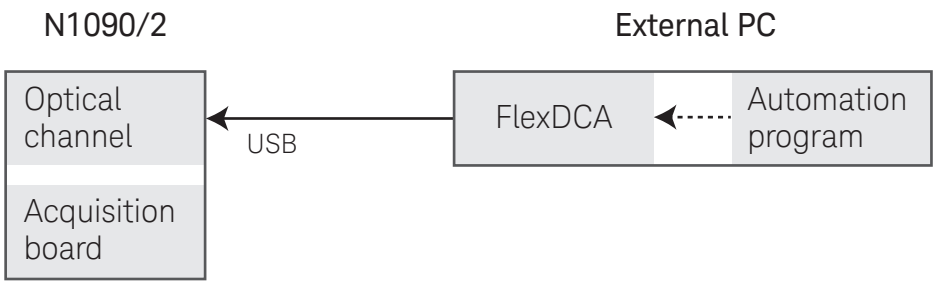


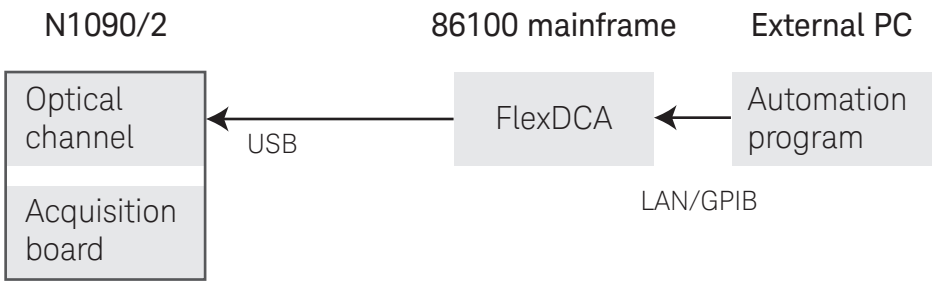
# Controlling the N109X

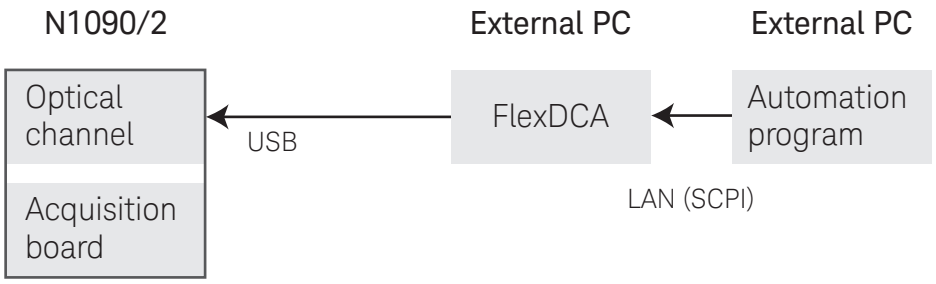
There are three ways to control the N109X system

- 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)

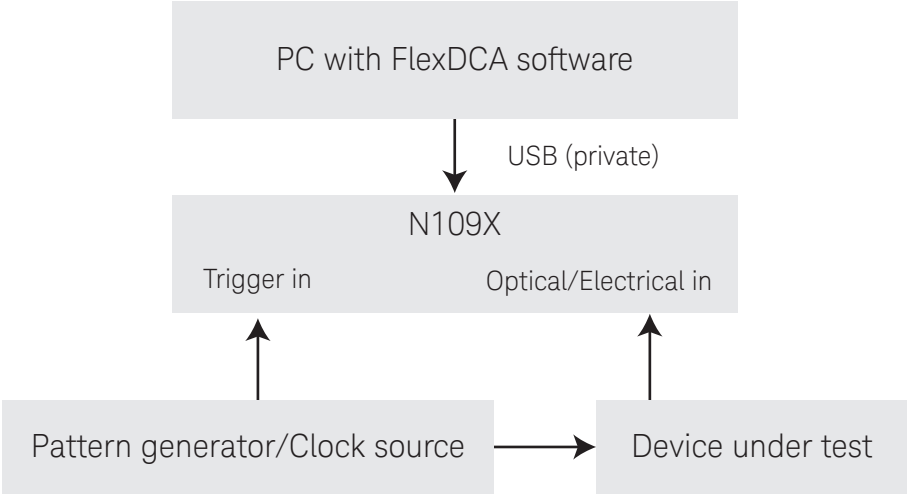
The communication API between your system controller and the PC is SCPI over LAN, either VXI-11 or HiSlip. If NI-VISA or IO Libraries are used to communicate with GPIB instruments, the switch to SCPI/LAN is very simple. It is important to note that there is no need to do any USB programming. This is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

| Option | Description |
|---|---|
| Option 140 | 1.244/1.25/1.229 Gb/s |
| Option 160 | 2.458/2.488/2.5 Gb/s |
| Option 180 | 3.072/3.125 Gb/s |
| Option 200 | 8.5/9.95/10.3/10.5/10.66/10.71/11.1/11.3 Gb/s |
| Option 204 | 8.5/9.95/10.3/10.5 Gb/s |

A 20 GHz electrical channel is also available:

| Option | Description |
|---|---|
| Option EEC | Add 20 GHz electrical channel |

# N1092/4 Configurations

All optical channels include optical reference receivers at 25.78, 26.56, 27.95, and 28.05 Gb/s. Using the FlexDCA user interface, simultaneous measurements of multiple channels can be performed in parallel without any degradation in speed or accuracy.

| 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 |

# N1092/4 Configurations

The N1092/4 models have the following options available.

| Option | Description |
|---|---|
| Option 168 | 25.78 Gb/s TDEC filter (100GBASE-SR4) (not available with the N1094) |
| Option 206 | 20.6 Gb/s reference receiver (not available with the N1094) |
| Option FS1 | Increase sampling rate from 100 to 250 kSa/s |
| Option LOJ | Reduce residual jitter from 400 to < 200 fs |
| Option PLK | Add pattern lock capability |
| Option IRC | Extend optical channel bandwidth to 45 GHz and allow creation of reference receiver filters at any data rate from 8 to 42 Gb/s (not available with the N1094) |
| Option 200 | Advanced jitter analysis. Provides extensive and accurate jitter decomposition, which is increasingly important as data rates increase and margins reduce. Quickly customize your view of many parameters and take advantage of advanced features such as jitter spectrum analysis |
| Option 201 | Advanced waveform analysis. Its powerful features allow you to generate much deeper waveform files, integrate MATLAB analysis, and use the built-in linear feed-forward equalizer |
| Option 300 | Advanced amplitude/noise analysis. Extends jitter mode capabilities into the amplitude domain and allows you to see the decomposition of the amplitude into several factors. Option 300 also reports relative intensity noise (RIN) and Q-factor |
| Option 401 | Advanced eye analysis. For device testing with long patterns and obtaining BER-contour mask testing, Option 401 integrates with the classic or FlexDCA interfaces to decompose the jitter and amplitude interference measurements into the key parameters. When using the embedded capability within FlexDCA or the included automation application, you may characterize jitter on simultaneous multiple lanes and obtain concise and visual results |
| Option 500 | Productivity package (Rapid eye, TDEC). Enables rapid eye acquisition, providing two significant benefits. First, unlike conventional sampling and data display, when an eye mask test is performed, every acquired sample will be compared to the mask, as the central eye is composed of all acquired samples. Effective throughput is improved at least 60 percent. Second, incomplete eye diagram displays that can occur when triggering at sub-rates are eliminated. Option 500 also includes the TDEC analysis required for 100GBASE-SR4 test |
| Option 9FP | PAM-N analysis. Eye width, eye height, eye skew, level amplitude, level noise, level skew, and linearity measurements |
| Option SIM | Infinisim Waveform Transformation software |
| Option 030 | Configure electrical channels with a 30 GHz bandwidth (not available with the N1092) |
| Option 050 | Configure electrical channels with a 50 GHz bandwidth (N1092C/E have standard 50 GHz bandwidths for the electrical channels) |

The N1092C and N1092E electrical channels have 50 GHz bandwidths that can be reduced by the user to 20, 33 and 40 GHz. Note that operation of Options 200, 201, 300, 401, 500, 9FP, 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.

# 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<br>OC-192/STM-64, 9.953 Gb/s<br>10 Gb Ethernet, 10.3125 Gb/s<br>10x fibre channel, 10.51875 Gb/s<br>OC-192/STM-64 FEC, 10.664 Gb/s<br>OC-192/STM-64 FEC, 10.709 Gb/s<br>10 Gb Ethernet FEC, 11.0957 Gb/s<br>10x fibre channel FEC, 11.317 Gb/s |
| N1090A-204 | 8x fibre channel, 8.500 Gb/s<br>OC-192/STM-64, 9.953 Gb/s<br>10 Gb Ethernet, 10.3125 Gb/s, CPRI 9.830 Gb/s<br>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<br>(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<br>(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<br>50/60/400 Hz |
| | 220/240 Vac<br>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<br>(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<br>(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<br>(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:** | |
| The standard N1092 includes filters to test the following data rates | 25.78 Gb/s (25/50/100 Gb Ethernet) |
| | 26.56 Gb/s (400 Gb Ethernet) |
| | 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 |

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 |
|---|---|---|---|
| Sensitivity [1] at 850 nm (Characteristic – smallest average power for mask test) | –11.5 dBm | –11 dBm | –10 dBm |
| Sensitivity [1] at 1310/1550 nm (Characteristic – smallest average power for mask test) | –13 dBm | –12.5 dBm | –12 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. 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 |
|---|---|---|---|---|
| **RMS noise at 850 nm** | | | | |
| Characteristic | 5 µW | 7 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 |
| 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 |
| 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<br>(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<br>(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<br>50/60/400 Hz |
| | 220/240 Vac<br>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<br>(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<br>(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<br>(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 |
| 1090A-EEC | 20 GHz electrical channel |
| 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 |

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.

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 to 42 Gb/s |

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 |

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**.

www.axiestandard.org

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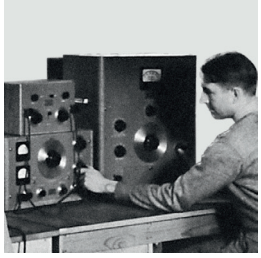

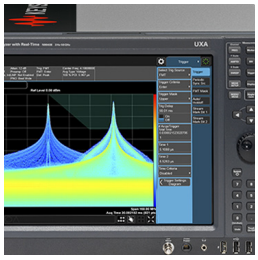

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