CONFIGURATION GUIDE

# DCA Wide-Bandwidth Oscilloscope Family

Keysight's Digital Communication Analyzer (DCA) family consists of the DCA-X mainframe, modules, standalone mini-DCAs (DCA-Ms), and clock recovery solutions.

KEYSIGHT TECHNOLOGIES

# Table of Contents

## Legend

The configuration drawings used in this document indicate mandatory features in bold with a dark red background and optional ones in italic with a light gray background. In addition, switches indicate what choices you can make. Figure 1 shows a generic example:

- The product must always have option 1.
- The product must have either option 2 or option 3 or option 4 (always select exactly one). Option 2 is the default or recommended choice.
- The product may or may not have option 5. Option 5 is recommended or selected by default.
- The product may or may not have option 6. Option 6 is not selected by default.
- The product may or may not have option 7 or 8 (if desired then select exactly one). There is no default or recommendation.
- If you want the feature of option 9 then you must first choose option 8.

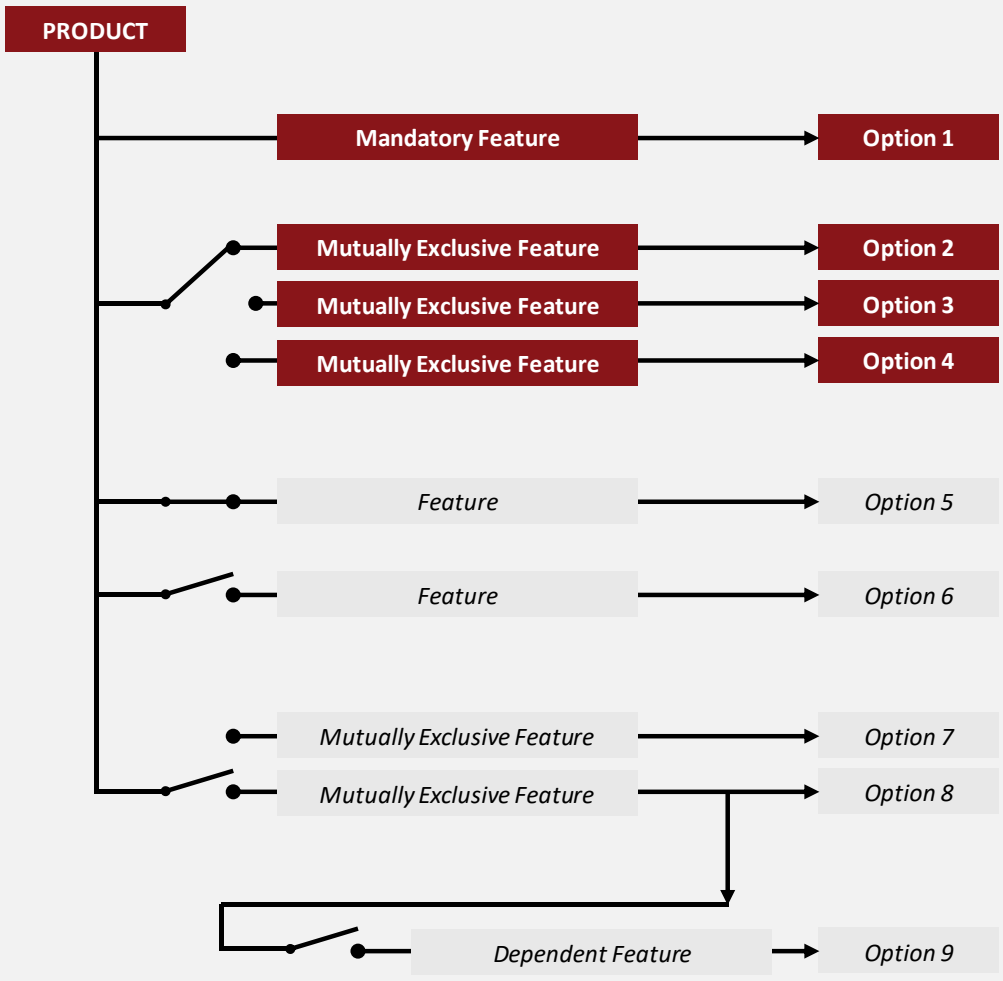



Figure 1. Legend for configuration drawings.

## N1000A DCA-X Wide-Bandwidth Oscilloscope Mainframe

The N1000A DCA-X Wide-Bandwidth Oscilloscope is a modular platform that provides accurate and precise measurements on high-speed digital designs from 50 Mb/s to more than 80 Gb/s. Users configure the N1000A DCA-X mainframe by selecting from a variety of plug-in modules that perform precision optical, electrical, and TDR/TDT measurements. Select specific modules to obtain the desired bandwidth, filtering, and sensitivity that match your measurement needs.

- Flexible, modular platform
- Precision measurements on high-speed signals
- Powerful analysis features

| Product/option | Description |
|---|---|
| N1000A | DCA-X Wide-bandwidth oscilloscope mainframe |
| N1000A-STB | Standard timebase |
| N1000A-LOJ | Low jitter timebase |
| N1000A-PTB | Internal precision timebase (requires # LOJ) |
| N1000A-PLK | Pattern lock trigger hardware |
| N1000A-GPI | GPIB card interface |
| N1000A-C0C | Certificate of calibration |
| N1000A-UK6 | Commercial calibration certificate with test data |
| N1010100A | R&D package for FlexDCA (requires pattern lock capability) |
| N1010200A | Manufacturing package for FlexDCA (requires pattern lock capability) |
| N1010300A | Signal integrity package for FlexDCA |


Figure 2. N1000A DCA-X mainframe (without option PTB)

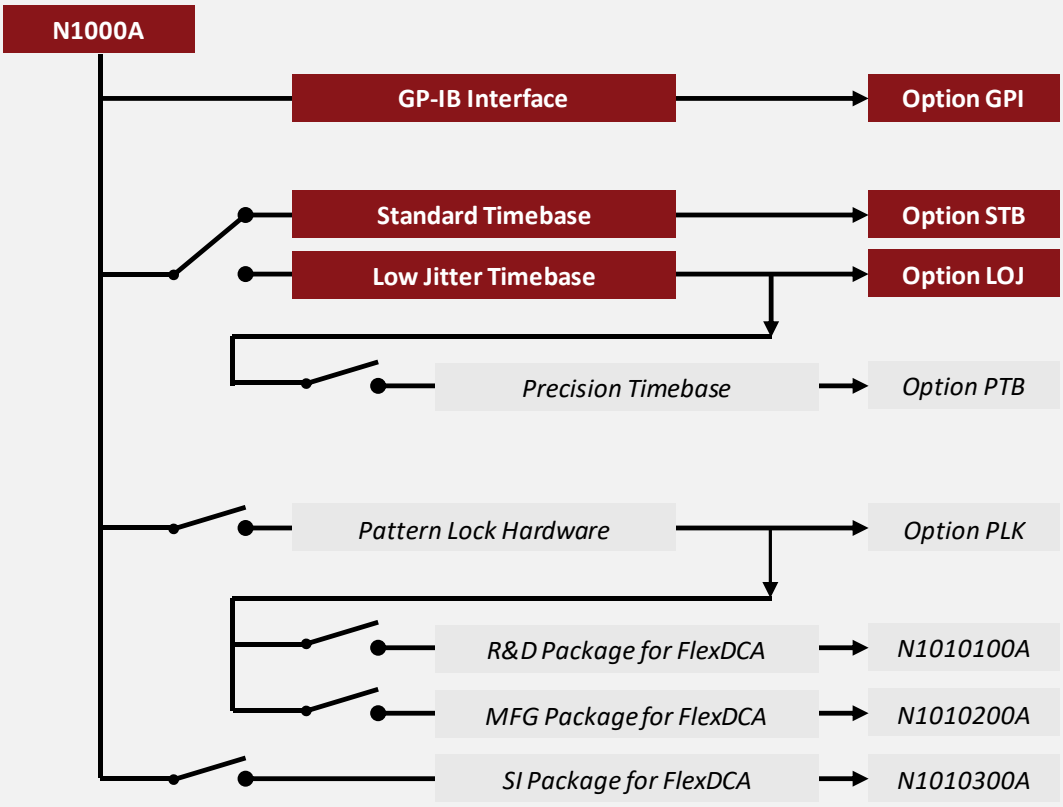



Figure 3. N1000A configuration chart

# N1032A/B 90/120 GHz Single/Dual Channel Optical Mini-Module

The N1032A/B are unamplified mini-modules that provide:

- Up to 120 GHz optical bandwidth
- 1 to 8 channels per mainframe
- Ideal for analyzing 112 GBd (224 Gbps) optical signals or any application that require ultra-wide optical receiver > 65 GHz bandwidth (-3 dBo)
- Impulse response correction (Option IRC) is a standard feature and hardware filters for standards-based rates are optional
- Maximum sampling rate:
  - In 86100D mainframe: 40 kSa/s
  - In N1000A mainframe: 250 kSa/s

| Product/option | Description |
|---|---|
| N1032A | Single optical channel module |
| N1032A-09U | 90 GHz Unamplified Optical Channel |
| N1032A-13U | 120 GHz Unamplified Optical Channel |
| N1032A-112 | Hardware filters for Standards-based rates |
| N1032A-IRC | Impulse response correction |

| Product/option | Description |
|---|---|
| N1032B | Dual optical channel module |
| N1032B-09U | 90 GHz Unamplified Optical Channel |
| N1032B-13U | 120 GHz Unamplified Optical Channel |
| N1032B-112 | Hardware filters for Standards-based rates |
| N1032B-IRC | Impulse response correction |


Figure 4. N1032A, N1032B mini-modules

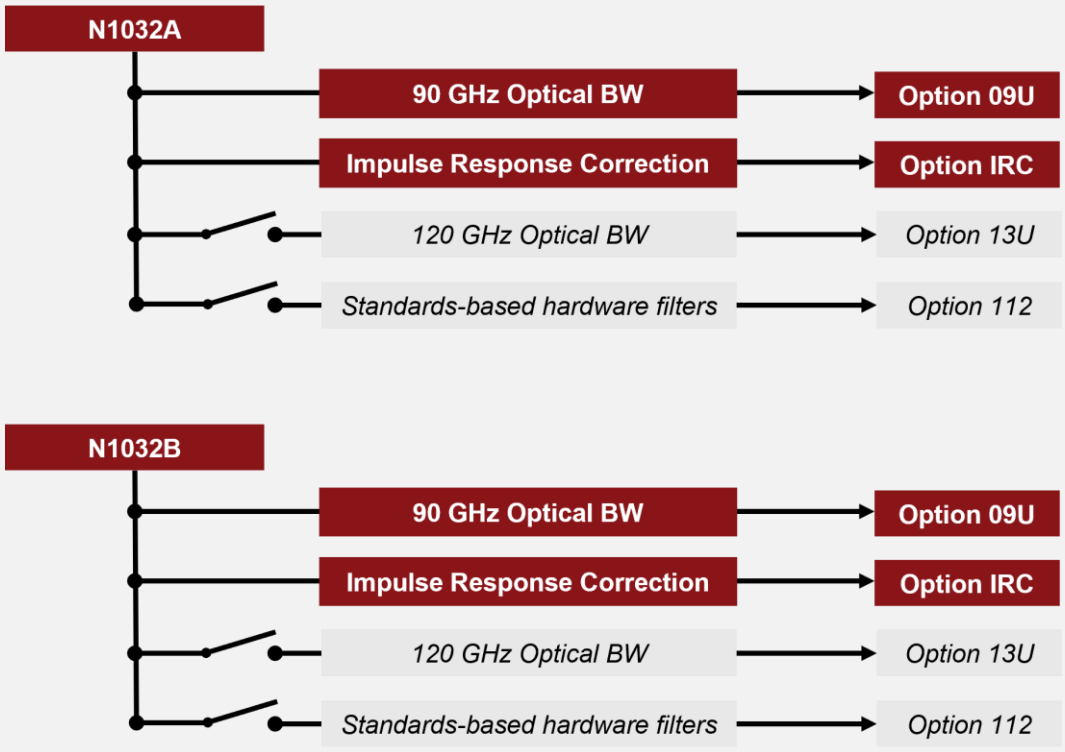



Figure 5. N1032A/B configuration chart

## N1030A/B 65 GHz Single/Dual Channel Optical Mini-Module

The N1030A/B are unamplified mini-modules that provide:

- 65 GHz optical bandwidth
- Optional electrical channel (N1030A only) with 33/40/50/70/85/95 GHz BW settings
- 1 to 8 channels per mainframe
- Simultaneous data acquisition on all channels
- Impulse response correction on all channels (optical and electrical)
- Maximum sampling rate:
  - In 86100D mainframe: 40 kSa/s
  - In N1000A mainframe: 250 kSa/s

| Product/option | Description |
|---|---|
| N1030A | Single optical channel module |
| N1030A-280 | Hardware filters for 25-28 NRZ Gbaud rates |
| N1030A-490 | Hardware filter for 49.77 Gbaud ITU-T G.hsp (PON) rate |
| N1030A-560 | Hardware filters for 53-56 Gbaud rates |
| N1030A-65U | 65 GHz unamplified optical channel |
| N1030A-EC1 | Add 95 GHz single electrical channel |
| N1030A-IRC | Impulse response correction (optical and electrical channels) |

| Product/option | Description |
|---|---|
| N1030B | Dual optical channel module |
| N1030B-280 | Hardware filters for 25-28 NRZ Gbaud rates |
| N1030B-490 | Hardware filter for 49.77 Gbaud ITU-T G.hsp (PON) rate |
| N1030B-560 | Hardware filters for 53-56 Gbaud rates |
| N1030B-65U | 65 GHz unamplified optical channel |
| N1030B-IRC | Impulse response correction |


Figure 6. N1030A, N1030A with option EC1, N1030B mini-modules

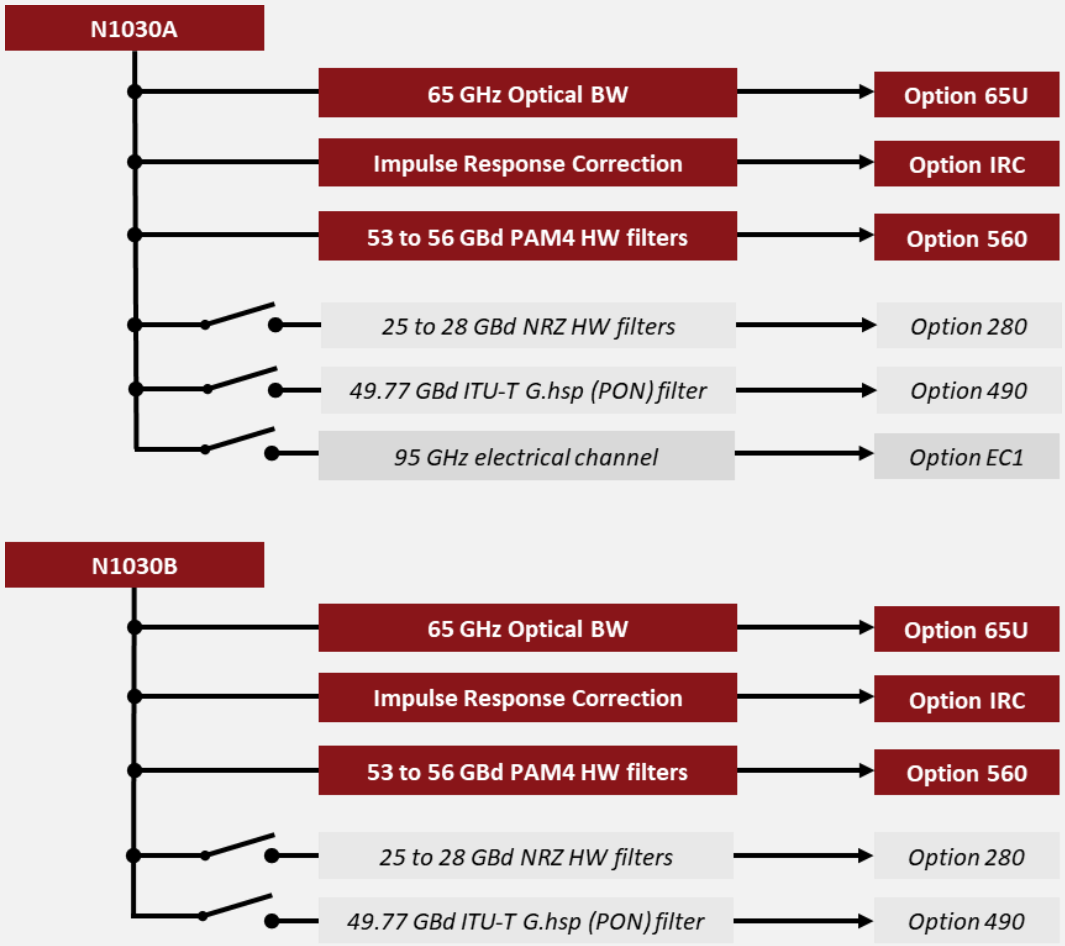



Figure 7. N1030A/B configuration chart

## N1040A 33/60 GHz Dual Channel Electrical Mini-Module

The N1040A electrical mini-module provides two electrical channels.

- 20 to 60 GHz bandwidth settings
- Independent skew control for each channel
- 2 to 8 channels per mainframe
- Simultaneous data acquisition on all channels
- Impulse response correction
- Maximum sampling rate:
  - In 86100D mainframe: 40 kSa/s
  - In N1000A mainframe: 250 kSa/s

| Product/option | Description |
|---|---|
| N1040A | Dual electrical channel module |
| N1040A-033 | 20/33 GHz bandwidth, 2.92 mm inputs |
| N1040A-060 | 20/33/40/60 GHz bandwidth, 1.85 mm inputs |
| N1040A-IRC | Impulse response correction |


Figure 8. N1040A mini-module

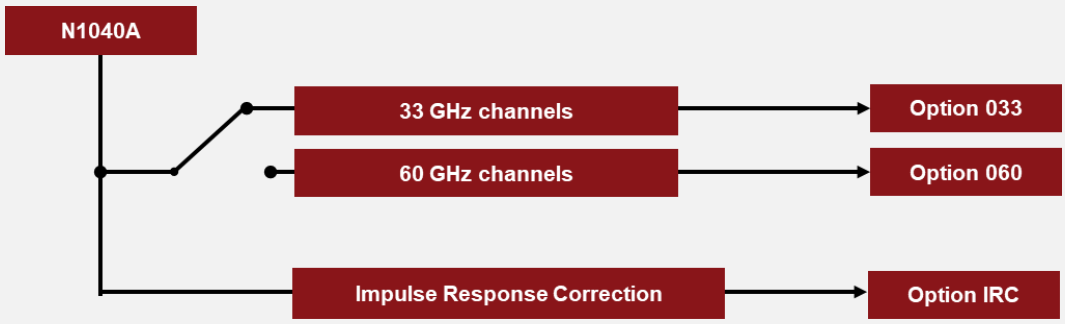



Figure 9. N1040A configuration chart

## N1045B 60 GHz 2/4 Port Electrical Remote Sampling Head Module

The N1045B 60 GHz remote sampling head module is engineered to provide superior measurement accuracy with the highest throughput for testing multi-lane electrical designs. The remote head design allows the high-bandwidth sampler to be located very near the device under test which minimizes loss due to cabling.

- 60 GHz bandwidth (65 GHz typical)
- Independent skew control on each sampler
- 2 to 16 electrical channels per mainframe
- Simultaneous data acquisition on all channels
- Maximum sampling rate:
  - In 86100D mainframe: 40 kSa/s
  - In N1000A mainframe: 250 kSa/s

| Product/option | Description |
|---|---|
| N1045B | 60 GHz 2/4 port electrical remote sampling head |
| N1045B-02F | 2 channel remote head, 1.85 mm, female inputs |
| N1045B-02M | 2 channel remote head, 1.85 mm, male inputs |
| N1045B-04F | 4 channel remote head, 1.85 mm, female inputs |
| N1045B-04M | 4 channel remote head, 1.85 mm, male inputs |
| N1045B-C0C | Certificate of calibration |
| N1045B-UK6 | Commercial calibration certificate with test data |
| N1027A-45A | Accessory kit for two N1045A/N1045B channels |

Figure 10. N1045B 60 GHz remote head module with option 04M

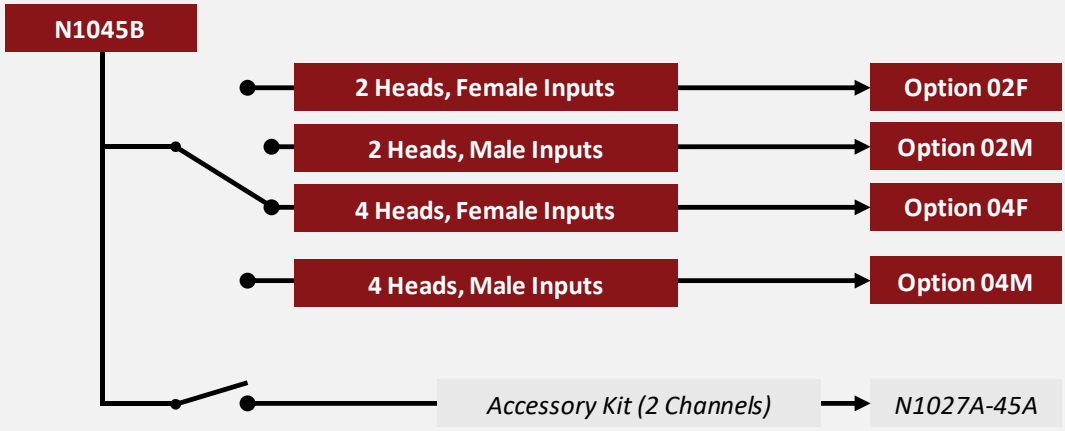



Figure 11. N1045B configuration chart

# N1046A 75/85/> 100 GHz 1/2/4 Port Electrical Remote Sampling Head Module

The N1046A is a group of remote sampling head modules designed for the fastest oscilloscope applications. The “soft roll-off” of their frequency response can capture wideband digital signals such as NRZ or PAM4, as well as narrowband.

- 75 GHz, 85 GHz or > 100 GHz maximum available bandwidth (selectable option, upgradable)
- 1, 2 or 4 channels per module
- 1 to 4 modules per mainframe
- Independent skew control on each sampler
- Simultaneous data acquisition on all channels
- User-selectable bandwidth settings starting at 60 GHz
- Maximum sampling rate:
  - In 86100D mainframe: 40 kSa/s
  - In N1000A mainframe: 250 kSa/s [1]

| Product/option | Description |
|---|---|
| N1046A | 75/85/100 GHz 1/2/4 Port Electrical Remote Sampling Head [2] |
| N1046A-11F | 100 GHz, 1 channel remote head, 1 mm, female |
| N1046A-12F | 100 GHz, 2 channel remote head, 1 mm, female |
| N1046A-14F | 100 GHz, 4 channel remote head, 1 mm, female |
| N1046A-71F | 75 GHz, 1 channel remote head, 1 mm, female |
| N1046A-72F | 75 GHz, 2 channel remote head, 1 mm, female |
| N1046A-74F | 75 GHz, 4 channel remote head, 1 mm, female |
| N1046A-81F | 85 GHz, 1 channel remote head, 1 mm, female |
| N1046A-82F | 85 GHz, 2 channel remote head, 1 mm, female |
| N1046A-84F | 85 GHz, 4 channel remote head, 1 mm, female |
| N1046A-C0C | Certificate of calibration |
| N1046A-UK6 | Commercial calibration certificate with test data |
| N1027A-46A | Accessory kit for two N1046A channels |

1 Modules with serial number prefix small than US5840 are limited to 40 kSa/s. Keysight will upgrade them to the full sampling rate free of charge during their next calibration cycle.
2 Module includes a custom System Impulse Response Correction (SIRC) file for each channel.


Figure 12. N1046A 100 GHz remote head module with option 12F, 1.0 mm input connector detail

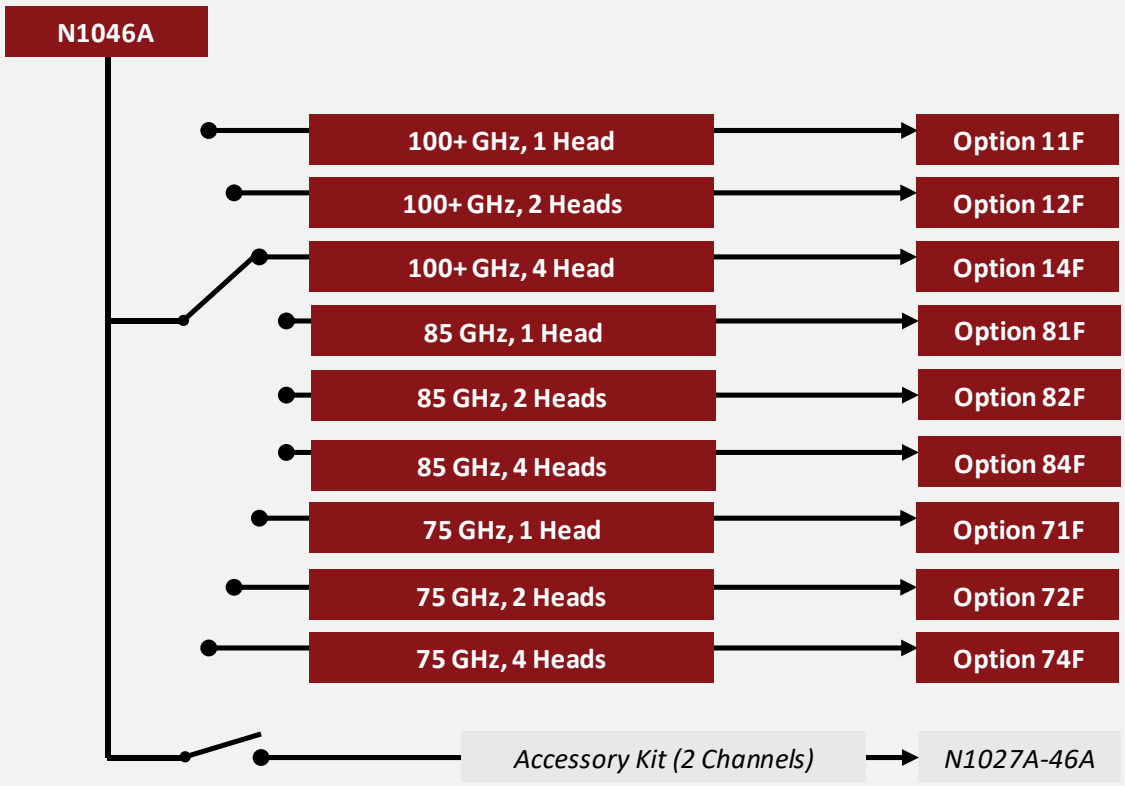



Figure 13. N1046A configuration chart

## N1055A 35/50 GHz 2/4 Port TDR/TDT Remote Sampling Head Module

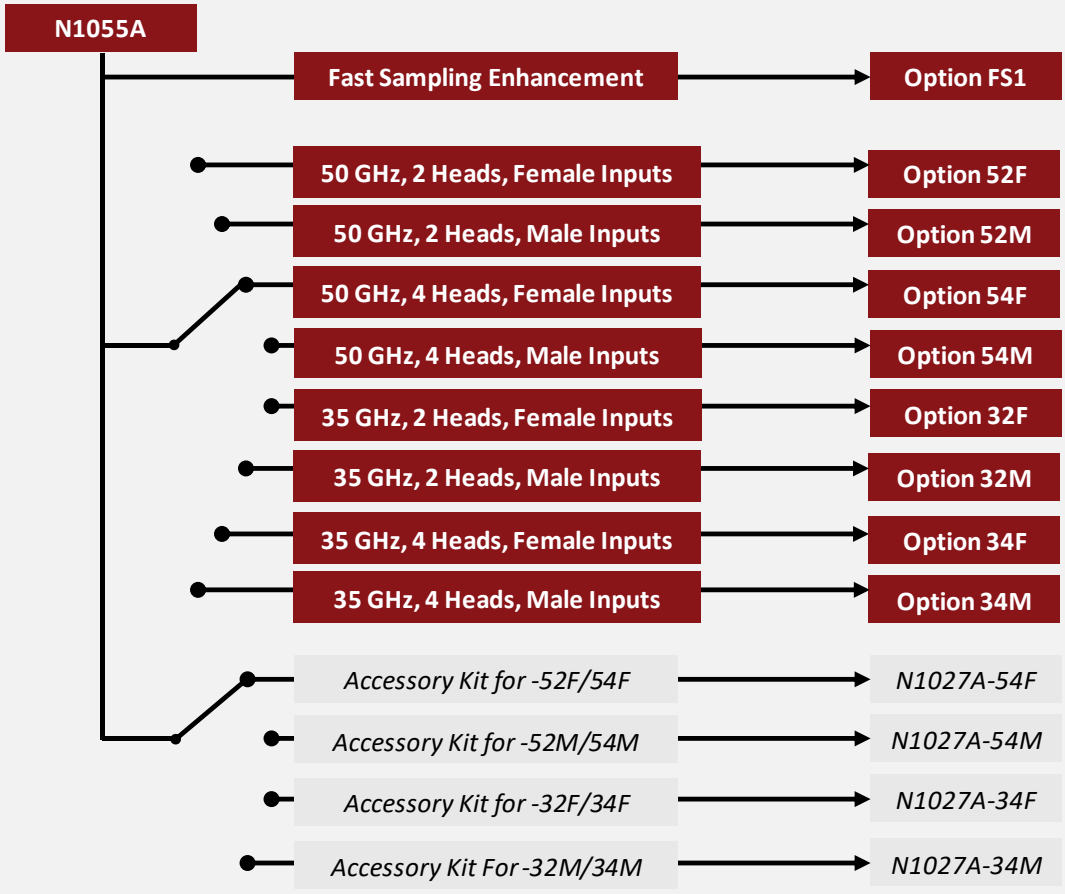
The Keysight N1055A 35/50-GHz (8-ps) time-domain reflectometry (TDR) and time-domain transmission (TDT) module for the Keysight 86100D DCA-X platform provides fast, accurate impedance and S-parameter measurements on high-speed designs that have up to 16 ports.

- Dual or quad remote heads with either 35 or 50 GHz bandwidth
- Edge speed (10 to 90%, typical): 18 ps (35 GHz) or 8 ps (50 GHz)
- Integrated diode limiters for ESD/EOS protection
- Maximum sampling rate:
  - In 86100A mainframe: 40 kSa/s (200 kSa/s [3])
  - In N1000A mainframe: 250 kSa/s

| Product/option | Description |
|---|---|
| N1055A | 35/50 GHz 2/4 Port electrical remote head module with TDR/TDT |
| N1055A-32F | 35 GHz 2 channels, 2.92 mm, female |
| N1055A-32M | 35 GHz 2 channels, 2.92 mm, male |
| N1055A-34F | 35 GHz 4 channels, 2.92 mm, female |
| N1055A-34M | 35 GHz 4 channels, 2.92 mm, male |
| N1055A-52F | 50 GHz 2 channels, 1.85 mm, female |
| N1055A-52M | 50 GHz 2 channels, 1.85 mm, male |
| N1055A-54F | 50 GHz 4 channels, 1.85 mm, female |
| N1055A-54M | 50 GHz 4 channels, 1.85 mm, male |
| N1055A-C0C | Certificate of calibration |
| N1055A-UK6 | Commercial calibration certificate with test data |
| *N1055A-FS1* | *Fast sampling (mandatory on all new units)* |
| N1027A-x4y [4] | TDT/TDT accessory kit with DC to 67 GHz ECal module and adapters |
| N4694D-0DC | DC to 67 GHz 2-port 1.85 mm ECal module [5] |

[3] In TDR mode when only channels from one module are active.
[4] x and y of N1027A option must match the N1055A option (e.g., use N1027A-54F for N1055A-52F/54F).
[5] Use N469xD with option M0M for N1055A-xxF remote heads, and N469xD-F0F for N1055A-xxM.

Figure 14. N1055A 50 GHz TDR/TDT modules with option 54M




Each accessory kit includes one DC-67 GHz coupled ECal module, adapters, torque wrenches, and more.

Figure 15. N1055A configuration chart

## N1060A 50/85 GHz 64 GBd Precision Waveform Analyzer

The N1060A precision Waveform Analyzer is a three-slot wide module that combines two electrical channels with a clock recovery (CDR) and a precision timebase (PTB). Integration minimizes path delay differences between the CDR, PTB and the samplers, resulting in more accurate jitter measurements.

- 50 or 85 GHz bandwidth
- 16, 32 or 64 GBd NRZ and PAM4 clock recovery
- Jitter Spectrum Analysis and Clock Recovery Emulation
- Electrical inputs: 1.0 mm male
  - Ships with 1.0 female to 1.85 female and 1.0 female to 2.92 female adapters

| Product/option | Description |
|---|---|
| N1060A | Precision waveform analyzer [6] |
| N1060A-050 | Two 50 GHz channels |
| N1060A-085 | Two 85 GHz channels |
| N1060A-216 | Supported input rates: 125 MBd to 16 GBd |
| N1060A-232 | Supported input rates: 125 MBd to 32 GBd |
| N1060A-264 | Supported input rates: 125 MBd to 64 GBd |
| N1060A-EVA | Integrated variable equalizer |
| N1060A-JSA | Jitter spectrum analysis and clock recovery emulation |
| N1060A-PTB | Precision timebase, ultra-low random jitter |
| N1060A-E33 | Integrated hardware filters for 33 GHz, 40 GHz, and 43 GHz |
| N1060A-C0C | Certificate of calibration |
| N1060A-UK6 | Commercial calibration certificate with test data |
| N1060A-A1F | Two 1.0 mm female to 1.0 mm female adapters |
| N1060A-CA1 | Cable pair, 1.0 mm |
| N1060A-CA2 | Cable pair (matched), 2.4 mm, 60 cm |
| N1060A-DC2 | Two DC blocks, 2.4 mm, 50 KHz – 50 GHz |
| N1060A-DC8 | Two DC blocks, 1.85 mm, 700 KHz-67 GHz |

6 Module includes a custom System Impulse Response Correction (SIRC) file for each channel.


Figure 16. N1060A Precision waveform analyzer with option 085

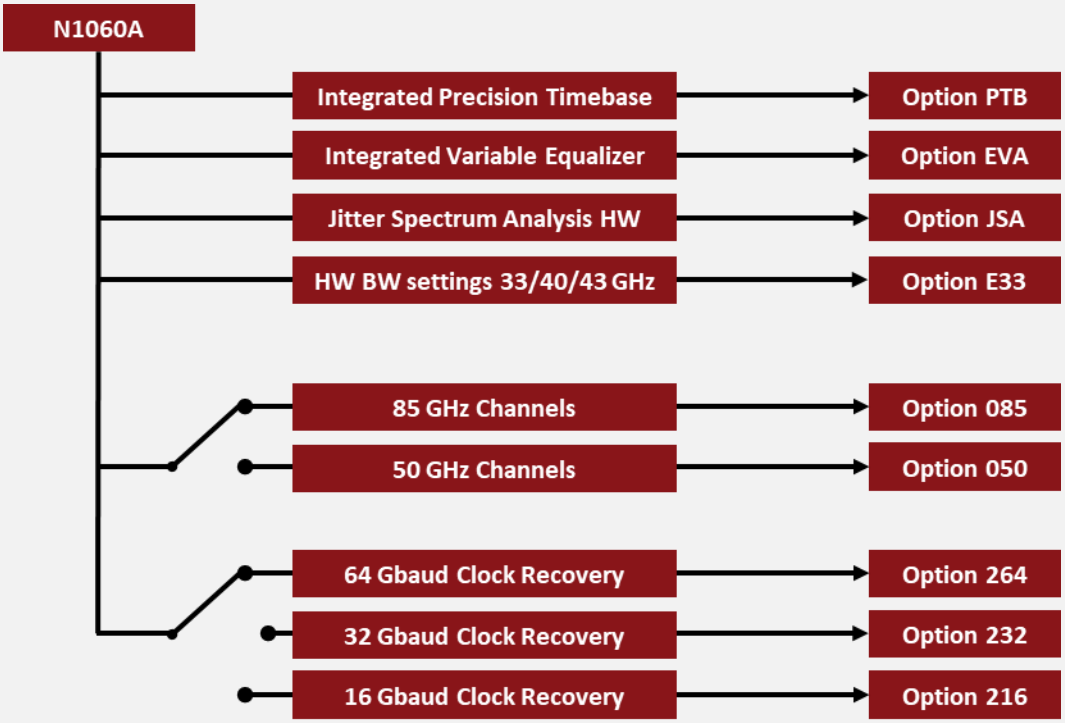



Figure 17. N1060A configuration chart

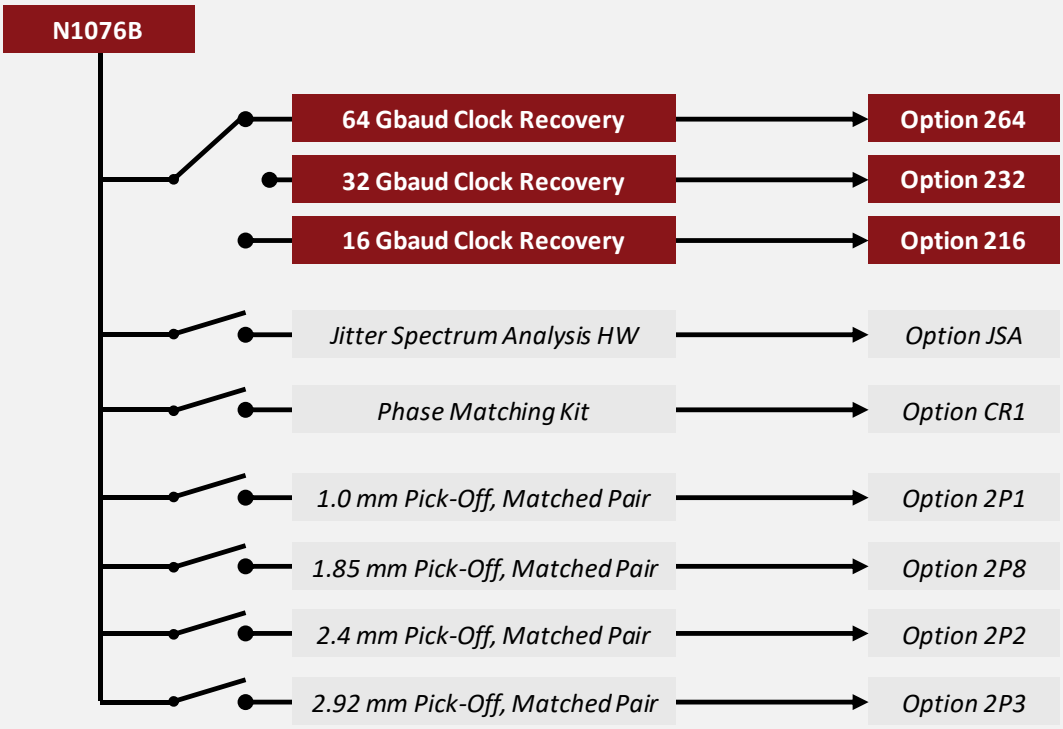
## N1076B 64 GBd Electrical Clock Recovery

Provides compliant clock recovery capabilities for electrical non-return-to-zero (NRZ) and pulse amplitude modulation 4-level (PAM4) signals

- Continuous unbanded tuning from 125 MBd to 64 GBd PAM4 and NRZ
- Adjustable clock recovery loop bandwidth (to 20 MHz) and peaking for “Golden PLL” performance
- Internal and external equalizers to recover clock from closed eyes
- Ultra-low residual random jitter < 100 fs RMS
- Jitter Spectrum Analysis (JSA) and “ideal” clock recovery emulation capability
- Phase noise analysis of clock or data signals using FlexPLL software in N1010300A Signal integrity package
- Controlled by N1010A FlexDCA application (free download) or DCA-X mainframe

| Product/option | Description |
|---|---|
| N1076B | Electrical clock recovery |
| N1076B-216 | Supported input rates: 125 MBd to 16 GBd |
| N1076B-232 | Supported input rates: 125 MBd to 32 GBd |
| N1076B-264 | Supported input rates: 125 MBd to 64 GBd |
| N1076B-EVA | Integrated variable equalizer |
| N1076B-JSA | Jitter spectrum analysis and clock recovery emulation |
| N1076B-C0C | Certificate of calibration |
| N1076B-UK6 | Commercial calibration certificate with test data |
| N1076B-1CM | Single DCA-M rack mount kit |
| N1076B-1CN | Dual DCA-M side by side rack mount |
| N1076B-CR1 | Clock recovery phase matching kit |
| N1076B-2P1 | Microwave pick-off tee 1.0 mm connectors, matched pair |
| N1076B-2P2 | Microwave pick-off tee 2.4 mm connectors, matched pair |
| N1076B-2P3 | Microwave pick-off tee 2.92 mm connectors, matched pair |
| N1076B-2P8 | Microwave pick-off tee 1.85 mm connectors, matched pair |


Figure 18. N1076B Electrical clock recovery with option 264




The pick-offs have 2.92 mm connectors on the clock recovery port. The other two ports are male and female with connector sizes as shown above.

Figure 19. N1076B configuration chart

## N1077A 32 GBd Single/Multimode Optical/Electrical Clock Recovery

Provides compliant clock recovery capabilities for single- and multimode optical as well as electrical signals

- Works with non-return-to-zero (NRZ) and pulse amplitude modulation 4-level (PAM4) modulation
- Continuous unbanded tuning from 50 MBd to 32 GBd
- 830 to 1600 nm, single-mode and multimode
- Integrated amplified optical-to-electrical (O/E) (high sensitivity)
- Adjustable clock recovery loop bandwidth (to 20 MHz) and peaking for “Golden PLL” performance
- Supports NRZ and PAM4 signals
- Ultra-low residual random jitter < 100 fs RMS
- Integrated single-mode (SM) and multimode (MM) splitters (optional)
- Jitter Spectrum Analysis (JSA) and “ideal” clock recovery emulation capability (optional)
- Supports phase noise analysis of clock or data signals using FlexPLL software in N1010300A Signal integrity package
- Controlled by N1010A FlexDCA application (free download) or DCA-X mainframe

| Product/option | Description |
|---|---|
| N1077A | Optical/electrical clock recovery |
| N1077A-216 | Supported input rates: 50 MBd to 16 GBd |
| N1077A-232 | Supported input rates: 50 MBd to 32 GBd |
| N1077A-SMS | Internal single-mode (9/125 µm) and multimode (50/125 µm) splitter |
| N1077A-SXT | External splitter (supplied by customer) |
| N1077A-JSA | Jitter spectrum analysis and clock recovery emulation |
| N1077A-C0C | Certificate of calibration |
| N1077A-UK6 | Commercial calibration certificate with test data |
| N1077A-1CM | Single DCA-M rack mount kit |
| N1077A-1CN | Dual DCA-M side by side rack mount kit |
| N1077A-CR1 | Clock recovery phase matching kit |

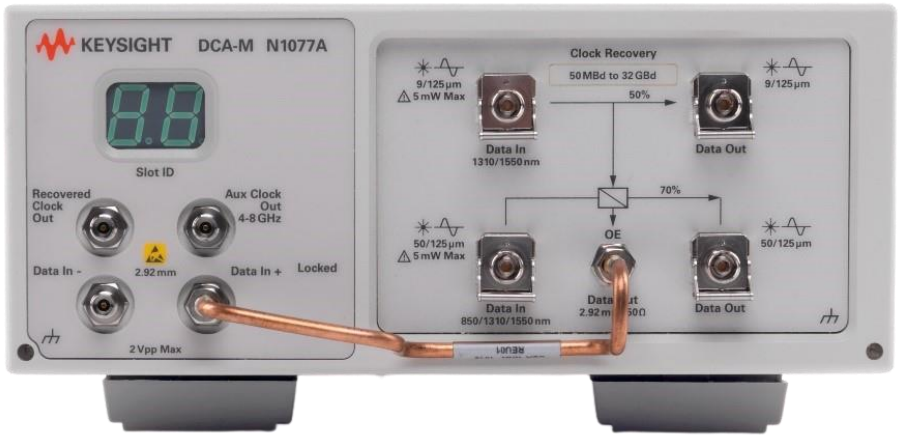
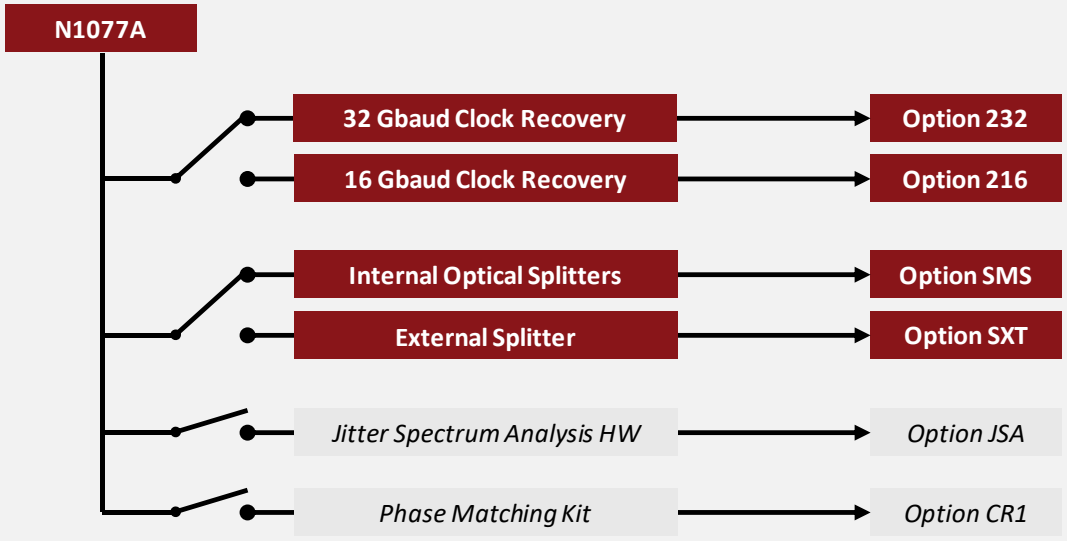



Figure 20. N1077A Single- & multimode optical/electrical clock recovery with options 232 and SMS




External splitters must be supplied by the customer.

Figure 21. N1077A configuration chart

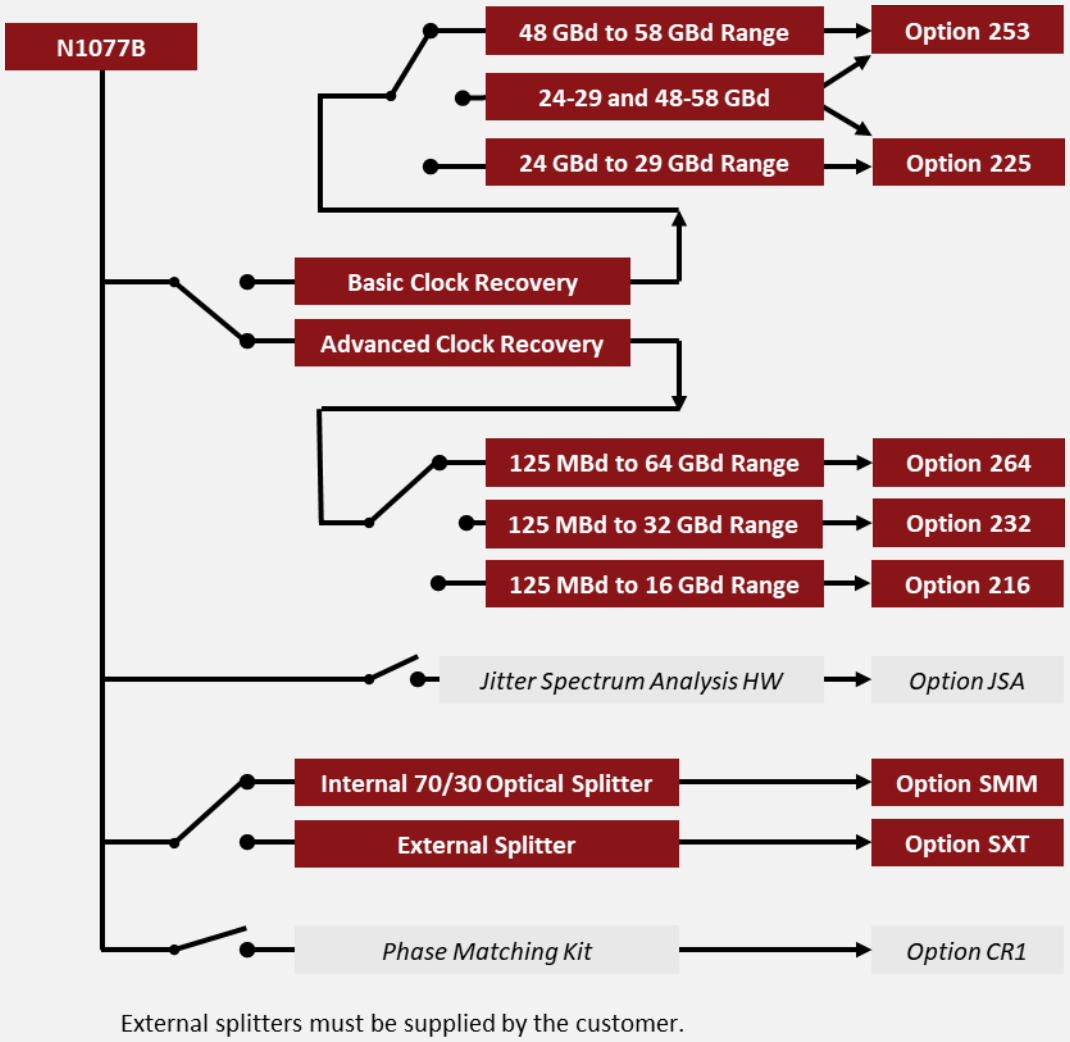
## N1077B 64 GBd Multimode Optical/Electrical Clock Recovery

Provides compliant clock recovery capabilities for multimode optical as well as electrical signals

- Works with non-return-to-zero (NRZ) and pulse amplitude modulation 4-level (PAM4) modulation
- Continuous unbanded tuning from 125 MBd to 64 GBd PAM4 and NRZ
- Adjustable clock recovery loop bandwidth (to 20 MHz) and peaking for “Golden PLL” performance
- Internal and external equalizers to recover clock from closed eyes
- Ultra-low residual random jitter < 100 fs RMS
- Jitter Spectrum Analysis (JSA) and “ideal” clock recovery emulation capability
- Phase noise analysis of clock or data signals using FlexPLL software in N1010300A Signal integrity package
- Controlled by N1010A FlexDCA application (free download) or DCA-X mainframe

| Product/option | Description |
|---|---|
| N1077B | Optical/electrical clock recovery |
| N1077B-216 | Supported input rates: 125 MBd to 16 GBd |
| N1077B-225 | Supported input rates 24 GBd to 29 GBd |
| N1077B-232 | Supported input rates: 125 MBd to 32 GBd |
| N1077B-253 | Supported input rates 48 GBd to 58 GBd |
| N1077B-264 | Supported input rates: 125 MBd to 64 GBd |
| N1077B-SMM | Internal 70/30 multimode splitter |
| N1077B-SXT | No splitter (splitter supplied by user) |
| N1077B-EVA | Integrated variable equalizer |
| N1077B-JSA | Jitter spectrum analysis |
| N1077B-C0C | Certificate of calibration |
| N1077B-UK6 | Commercial calibration certificate with test data |
| N1077B-CR1 | Clock recovery phase matching kit |


Figure 22. N1077B Multimode optical/electrical clock recovery with options 264 and SMM




External splitters must be supplied by the customer.

Figure 23. N1078A configuration chart

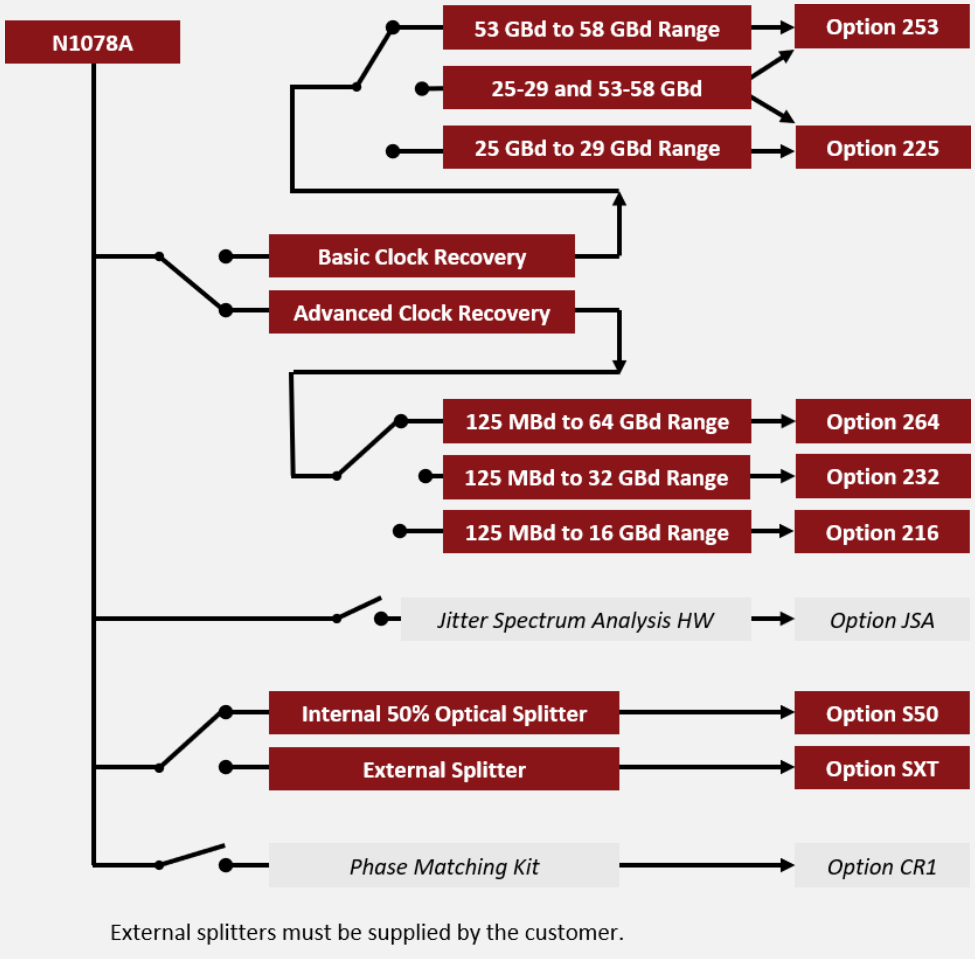
## N1078A 64 GBd Single-Mode Optical/Electrical Clock Recovery

Provides compliant clock recovery capabilities for single-mode optical as well as electrical signals

- Works with non-return-to-zero (NRZ) and pulse amplitude modulation 4-level (PAM4) modulation
- Continuous unbanded tuning from 125 MBd to 64 GBd PAM4 and NRZ
- Adjustable clock recovery loop bandwidth (to 20 MHz) and peaking for “Golden PLL” performance
- Internal and external equalizers to recover clock from closed eyes
- Ultra-low residual random jitter < 100 fs RMS
- Jitter Spectrum Analysis (JSA) and “ideal” clock recovery emulation capability
- Phase noise analysis of clock or data signals using FlexPLL software in N1010300A Signal integrity package
- Controlled by N1010A FlexDCA application (free download) or DCA-X mainframe

| Product/option | Description |
|---|---|
| N1078A | Optical/electrical clock recovery |
| N1078A-216 | Supported input rates: 125 MBd to 16 GBd |
| N1078A-225 | Supported input rates 25 GBd to 29 GBd |
| N1078A-232 | Supported input rates: 125 MBd to 32 GBd |
| N1078A-253 | Supported input rates 53 GBd to 58 GBd |
| N1078A-264 | Supported input rates: 125 MBd to 64 GBd |
| N1078A-S50 | Internal 50-50 SM optical splitter |
| N1078A-SXT | No splitter (splitter supplied by user) |
| N1078A-EVA | Integrated variable equalizer |
| N1078A-JSA | Jitter spectrum analysis |
| N1078A-C0C | Certificate of calibration |
| N1078A-UK6 | Commercial calibration certificate with test data |
| N1078A-CR1 | Clock recovery phase matching kit |


Figure 24. N1078A Single-mode optical/electrical clock recovery with options 264 and S50




External splitters must be supplied by the customer.

Figure 25. N1078A configuration chart

## N1090A DCA-M Sampling Oscilloscope

High accuracy, low cost solution for optical eye diagram analysis

- 750 to 1650 nm, single- and multimode
- Maximum sampling rate: 60 kSa/s
- Controlled by N1010A FlexDCA application (free download) or DCA-X mainframe

| Product/option | Description |
|---|---|
| N1090A | Optical sampling oscilloscope |
| 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 | Add 20 GHz electrical channel |
| N1090A-PLK | Pattern lock trigger hardware |
| N1090A-C0C | Certificate of calibration |
| N1090A-UK6 | Commercial calibration certificate with test data |
| N1090A-1CM | Single N1090A rack mount kit |
| N1090A-1CN | Dual instrument side by side rack mount kit |
| N1010100A | R&D package for FlexDCA (requires pattern lock capability) |
| N1010200A | Manufacturing package for FlexDCA (requires pattern lock capability) |


Figure 26. N1090A DCA-M (without option EEC)

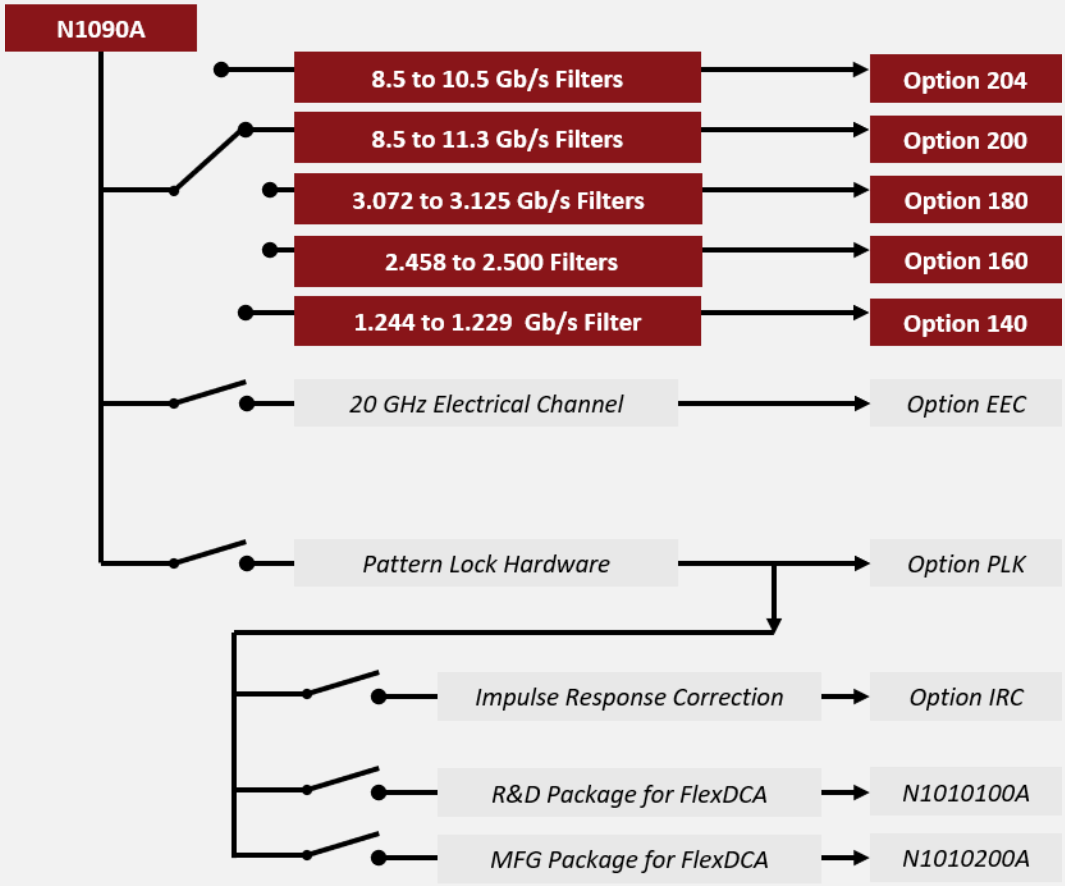



Figure 27. N1090A configuration chart

# N1092A/B/C/D/E 1/2/3/4 Channel Optical DCA-M Sampling Oscilloscope

High accuracy, low cost solution for optical eye, waveform and jitter analysis

- 830 to 1600 nm, single- and multimode
- 50 GHz electrical channels (N1092C/E)
- Characteristic intrinsic jitter: 400 fs (standard), 160 fs (option LOJ)
- Maximum sampling rate: 100 kSa/s (standard), 250 kSa/s (option FS1)
- Controlled by N1010A FlexDCA application (free download) or DCA-X mainframe

| Product/option | Description |
|---|---|
| N1092A/B/D | Single/dual/quad optical channel oscilloscope |
| N1092C/E | Single/dual optical, dual electrical channel oscilloscope |
| *N1092x-280* | *25.781, 26.563, 27.952, 28.050 Gbaud filters (mandatory)* |
| N1092x-30A | 30 GHz amplified optical |
| N1092A-N28 | 30 GHz amplified optical, 280 kHz high-pass |
| N1092x-40A | 40 GHz amplified optical and additional 53.125 GBd hardware filter |
| N1092x-168 | Additional 25.78 Gb/s TDEC filter |
| N1092x-CDR | Add 24-29 and 48-58 GBd Clock Recovery (N1092A/B models only, requires #40A) |
| N1092x-206 | Additional 20.625 Gb/s filter |
| N1092x-STB | Standard timebase |
| N1092x-LOJ | Low jitter timebase |
| N1092x-PLK | Pattern lock trigger hardware (requires option LOJ) |
| N1092x-FS1 | Fast sampling rate |
| N1092x-IRC | Impulse response correction (optical channels only) |
| 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 |
| N1010100A | R&D package for FlexDCA (requires options PLK and LOJ) |
| N1010200A | Manufacturing package for FlexDCA (requires options PLK and LOJ) |

TDECQ measurements compliant to IEEE 802.3bs/cd can be made with either option 30 A or 40 A, and requires options LOJ, PLK, IRC and the R&D or MFG package. Option 168 (TDEC HW filter) is recommended when making 25-28 GBd TDECQ measurements with option 30 A.


Figure 28. N1092D quad optical DCA-M with options 30 A, 280 and 168

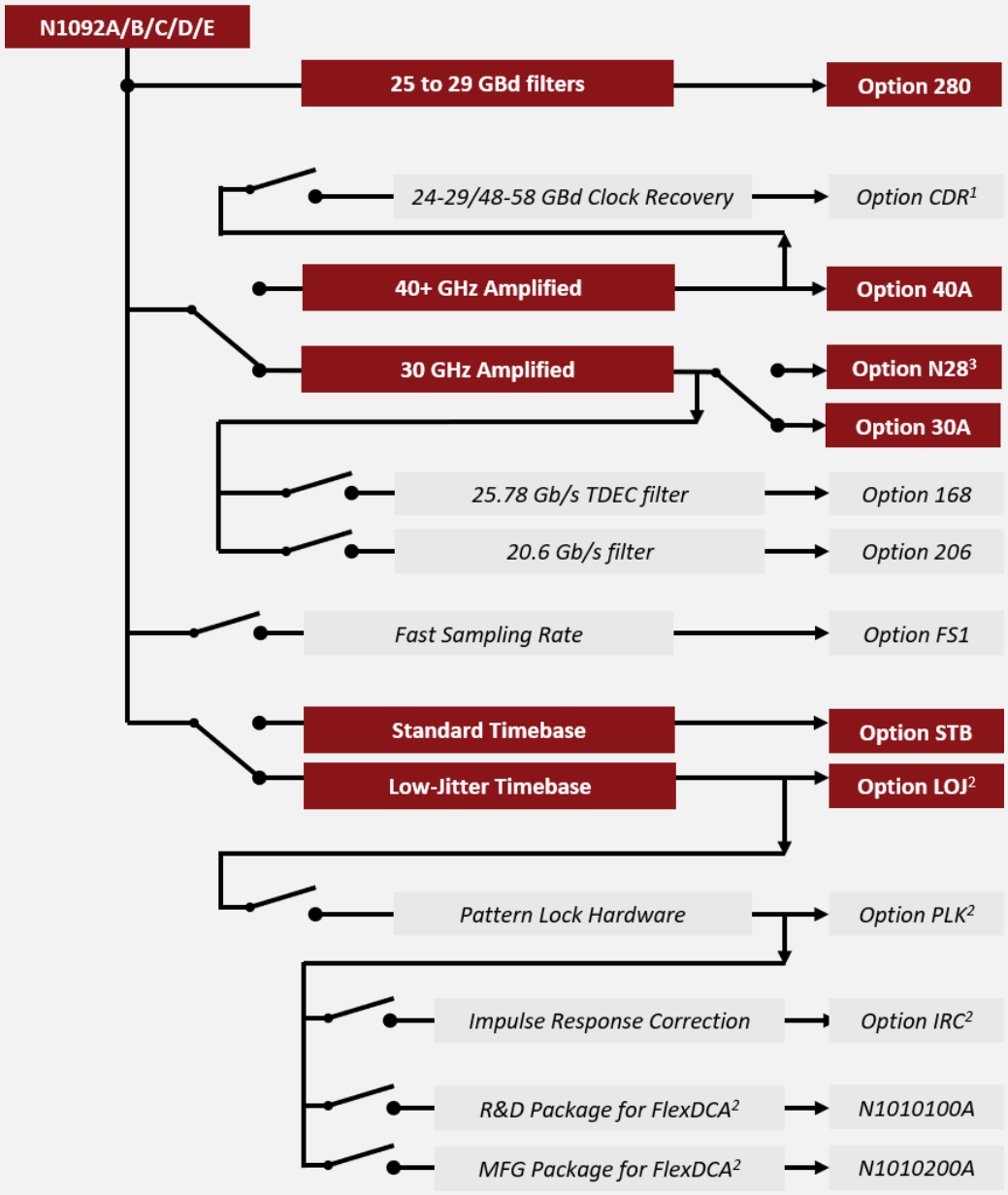



Figure 29. N1092A/B/C/D/E configuration chart

1. Option CDR is available only on the N1092A and N1092B.
2. TDECQ measurements require options LOJ, PLK, IRC and the R&D or MFG package. See document 5992-3635EN for TDECQ measurement details.
3. Option N28 with 50 Hz – 280 kHz notch filter is available only on the N1092A.

## N1094A/B 2/4 Channel Electrical DCA-M Oscilloscope

High-accuracy, low-cost solution for electrical eye, waveform and jitter analysis

- 20/33 GHz and 20/33/40/50 GHz bandwidth settings support OIF and Ethernet standards
- Characteristic intrinsic jitter: 400 fs (standard), 135 fs (option LOJ)
- Maximum sampling rate: 100 kSa/s (standard), 250 kSa/s (option FS1)
- Controlled by N1010A FlexDCA application (free download) or DCA-X mainframe

| Product/option | Description |
|---|---|
| N1094A | Dual electrical channel oscilloscope |
| N1094B | Quad electrical channel oscilloscope |
| N1094A/B-030 | 33 GHz maximum bandwidth |
| N1094A/B-050 | 50 GHz maximum bandwidth |
| N1094A/B-STB | Standard timebase |
| N1094A/B-LOJ | Low jitter timebase |
| N1094A/B-PLK | Pattern lock trigger hardware (requires option LOJ) |
| N1094A/B-FS1 | Fast sampling rate |
| N1094A/B-C0C | Certificate of calibration |
| N1094A/B-UK6 | Commercial calibration certificate with test data |
| N1094A/B-1CM | Single instrument rack mount kit |
| N1092A/B-1CN | Dual instrument side by side rack mount kit |
| N1010100A | R&D package for FlexDCA (requires pattern lock capability) |
| N1010200A | Manufacturing package for FlexDCA (requires pattern lock capability) |


Figure 30. N1094B quad electrical DCA-M with option 050

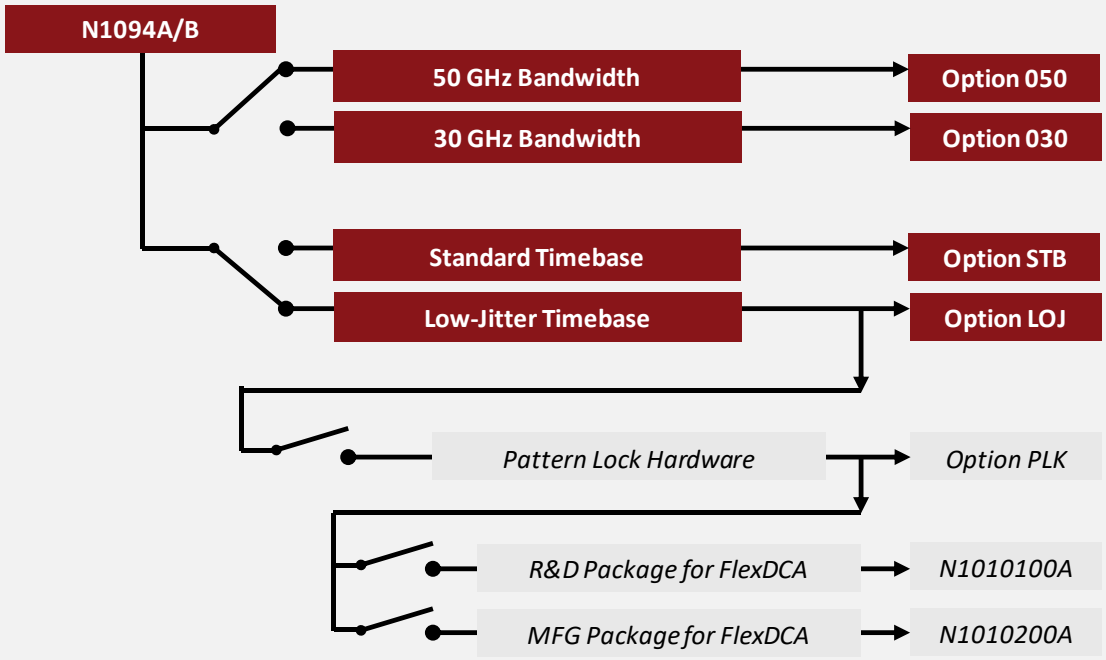



Figure 31. N1094A/B configuration chart

## N1010x00A Analysis Packages

Analysis Packages offer additional features that provide deep insights into signal or DUT properties, significantly improve throughput, and transform raw data into powerful graphics. The following table shows how their major features sets map into older N1010AT-xxx licenses and the newer N1010100A R&D, N1010200A MFG, and N1010300A SI packages.

| Feature description | Legacy option | N1010100A (RND) | N1010200A (MFG) | N1010300A (SI) |
|---|---|---|---|---|
| Advanced amplitude analysis/RIN/Q-Factor | 300 | X | | |
| Advanced eye analysis | 401 | X | | |
| Automatic fixture removal in TDR mode | BFP | | | X |
| Enhanced impedance and S-Parameters | 202 | | X | X |
| Enhanced jitter analysis | 200 | X | | |
| Equalizers (CTLE, DFE, LFE) | 201 | X | | |
| Access to licenses on remote DCA | DCA | X | X | X |
| Independent eye acquisition and analysis (FlexEye) | EFP | X | X | |
| PAM-N analysis (basic: includes TDECQ, EW/EH, Linearity: excludes 802.3cu measurements) | 9FP | X | X | |
| Send data to analytics web service | - | X | X | X |
| TDEC Transmitter and Dispersion Eye Closure for NRZ | 500 | X | X | |
| TDECQ measurement and equalizer, OOMA, OER, Ceq, noise margin | TFP | X | X | |
| Partial TDECQ, noise margin, and SER measurements | TFP/9FP | X | | |
| Unrestricted data file import | - | X | | |
| User defined measurements and operators | 201 | X | | X |
| Waveform transformations (embedding/de-embedding) | SIM | X | | |
| AWG waveform optimization | - | X | | |
| Keysight arbitrary waveform generator control | - | X | | |
| Chord operators (CNRZ-5-EE, ENRZ) | - | X | | |
| Overshoot, undershoot and peak-to-peak amplitude (802.3cu) | - | X | X | |
| PAM4 mask test measurements (OpenEye MSA) | - | X | X | |
| IEEE 802.3ck 53 GBd PAM4 electrical test (CTLE, DFE, VEC in jitter mode) | - | X | | |
| FlexPLL Phase-Locked Loop (PLL) analysis | - | | | X |
| FlexRT – Basic (includes optical TX measurements such as TDECQ, OOMA, OER, power) | - | X | X | |
| FlexRT – Advanced (basic and advance optical measurements, remote connection from PC to RT scope) | - | X | | |

# Appendix

## Application software

| SW application model | SW application description<br>*See the application software datasheet to confirm hardware requirements.* |
|---|---|
| N109228CA | Electrical TX Test SW for OIF-CEI-3.1 |
| N109310CA | Electrical TX Test SW for SFF-8431 (SFP+) |
| D9010UDAA | User Defined Application Software (for DCA-X and RT Scopes) |
| N1091APCA | Electrical TX Test SW for IEEE 802.3ap/bj (10G/40G) |
| N1091BMCA | Electrical TX Test SW for IEEE 802.3bm |
| N1091BACA | Electrical TX Test SW for IEEE 802.3ba (40G/100G) |
| N1091BJCA | Electrical TX Test SW for IEEE 802.3bj (100G) |
| N1091BSCB | Electrical TX Test SW for IEEE 802.3bs/cd |
| N109256CB | Electrical TX Test SW for OIF-CEI-4.0 |
| N1095BSCA | Optical TX Test SW for IEEE 802.3bs/cd |
| N1094BS1A | PAM4 Measurement Software Development Kit. |
| N1091CKCA | Electrical TX test SW for IEEE 802.3ck |
| N109212CA | Electrical TX Test SW for OIF-CEI-112G |
| N1081PLCA | PLL Test SW for PCI Express |

## Common DCA accessories

Keysight offers a collection of accessories for the N10xxx series of Digital Communication Analyzers (DCA-Xs, DCA-Ms). Popular accessories/spare parts include:

**Cables**

| | |
|---|---|
| N1027A-1C1 | Coaxial RF cable, 1.85 mm, 67 GHz, 100 mm |
| N1027A-3C1 | Coaxial RF cable, 2.92 mm, 2.37 ns delay, 0.55 m length |
| N1027A-3C2 | Coaxial RF cable, 2.92 mm, 4.33 ns delay, 1.0 m |
| N1027A-3C3 | Coaxial RF cable, SMA, for N1076A/B data out/data in |

**Pick-offs, equalizers**

| | |
|---|---|
| N1027A-2P1 | Microwave pick-off tee 1.0 mm connectors, matched pair |
| N1027A-2P8 | Microwave pick-off tee 1.85 mm connectors, matched pair |
| N1027A-2P2 | Microwave pick-off tee 2.4 mm connectors, matched pair |
| N1027A-2P3 | Microwave pick-off tee 2.92 mm connectors, matched pair |
| N1027A-EF6 | Equalizer, 2.92 mm (m) to 2.92 mm (f), 6 dB, up to 56 GBd |
| N1027A-EQ3 | Equalizer, 2.92 mm (m) to 2.92 mm (f), 3dB |
| N1027A-EQ6 | Equalizer, 2.92 mm (m) to 2.92 mm (f), 6dB |
| N1027A-EQ9 | Equalizer, 2.92 mm (m) to 2.92 mm (f), 9dB |

**Adapters, DC blocks**

| | |
|---|---|
| 11920A/B/C | 1.0 mm to 1.0 mm adapters (e.g., for N1046A) |
| 11921E/F/G/H | 1.0 mm to 1.85 mm adapters (e.g., for N1046A) |
| Y1900B/1B/3B | Ruggedized 1.0 mm to 1.0/1.85/2.92 mm adapters (e.g., for N1060A) |
| 11904A/B/C/D | 2.4 mm to 2.92 mm adapters (e.g., for N1092X, N1094X) |
| N9398C/F/G | DC blocks |
| 11636B/C | DC coupled RF/microwave power dividers |

For a comprehensive list of DCA accessories see literature number 5991-2340EN.

## DCA input connectors

| Product | 3.5 mm | 2.92 mm | 2.4 mm | 1.85 mm | 1.0 mm | Optical | Comment |
|---|---|---|---|---|---|---|---|
| N1000A | | f/f CS | | | | | |
| N1030A/B | | | | | m fixed (#EC1) | FC/PC | #EC1 ships with 1.0 (f) to 1.85 (f) adapter(s) |
| N1040A | | f/f CS (#033) | | f/f CS (#060) | | | |
| N1045A/B-xxF | | | | f fixed | | | |
| N1045A/B-xxM | | | | m fixed | | | |
| N1046A | | | | | f fixed | | Ships with 1.0 (m) to 1.85 (f) adapter(s) |
| N1055A-3xF | | f fixed m fixed | | | | | |
| N1055A-3xM | | | | | | | |
| N1055A-5xF | | | | f fixed m fixed | | | |
| N1055A-5xM | | | | | | | |
| N1060A Channel A/B | | | | | m fixed | | Ships with 1.0 (f) to 1.85 (f) and 1.0 (f) to 2.92 (f) adapters |
| N1060A PTB, Clock Out | | f fixed | | | | | |
| N1076A/76B | | f fixed | | | | | |
| N1077A/77B/78A | | f fixed | | | | FC/PC | |
| N1090A | f SMA | | | | | FC/PC | |
| N1092A/B/D | | | | | | FC/PC | |
| N1092C/E | | | f/f CS | | | FC/PC | |
| N1094A/B | | | f/f CS | | | | #030 ships with 2.4 (f) to 2.92 (f) adapters |

- **f/f CS:** Female/female connector saver (bulkhead is male, customer can remove connector saver)
- **f fixed:** Female fixed interface
- **m fixed:** Male fixed interface
- **f SMA:** Female SMA input (fixed)
- **FC/PC:** Cleanable FC/PC interface
- **1.0 mm inputs** ship with adapters to 1.85 mm (f) standard
- **DCA-M clock:** Clock inputs of the N109XX DCA-M series have 2.92 female connectors

## RF/Microwave connectors

### 3.5 mm connector

The 3.5 mm connector was primarily developed at Hewlett Packard—now Keysight Technologies, Inc. with early manufacturing at Amphenol. Its design strategy focused on highly-rugged physical interfaces that would mate with popular SMA dimensions, allowing thousands of repeatable connections. It is mode-free to 34 GHz.

### 2.92 mm connector

The 2.92 mm connector mates with SMA and 3.5 mm connectors and offers mode-free performance to 40 GHz.

### 2.4 mm connector

The 2.4 mm connector was developed by Hewlett Packard, Amphenol, and M/A-COM for use to 50 GHz. This design eliminates the fragility of the SMA and 2.92 mm connectors by increasing the outer wall thickness and strengthening the female fingers. It can mate with SMA, 3.5 mm and 2.92 mm, with the use of precision adapters. The 2.4 mm product is offered in three quality grades: general purpose, instrument, and metrology. General-purpose grade is intended for economy use on components, cables, and microstrip where limited connections and low repeatability is acceptable. Instrument-grade is best suited for measurement applications where repeatability and long life are primary considerations. Metrology-grade is best suited for calibration applications where the highest performance and repeatability are required.

### 1.85 mm connector

The 1.85 mm connector was developed in the mid-1980s by Hewlett Packard (now Keysight Technologies) for mode-free performance to 65 GHz. Hewlett Packard offered their design as public domain in 1988 to encourage standardization of connector types; a few devices are available from various manufacturers for research work. The 1.85 mm connector mates with the 2.4 mm connector and has the same ruggedness. In recent years, the 1.85 mm connector has been optimized to operate mode-free to 67 GHz.

### 1.0 mm connector

The 1.0 mm connector was designed for ultra-high frequency coaxial signals DC to at least 110 GHz. It utilizes an air dielectric interface for the highest accuracy and repeatability. The coupling diameter and thread size were chosen to maximize strength, increase durability and provide highly repeatable connections. The connector is designed so that the outer conductor engages before the center conductor.

## Literature References

| Description | Literature |
|---|---|
| DCA Family - *Brochure* | 5992-3301EN |
| Keysight DCA Family FlexDCA Sampling Oscilloscope Software - *Technical Overview* | 5992-3319EN |
| N1000A DCA-X Mainframe and Modules - *Data Sheet* | 5992-3271EN |
| N1092A/B/C/D/E DCA-M - *Data Sheet* | 5992-3886EN |
| N1094A/B DCA-M - *Data Sheet* | 5992-3700EN |
| N1090A DCA-M - *Data Sheet* | 5992-3655EN |
| Keysight DCA Family Clock Data Recovery Solutions - *Data Sheet* | 5992-1620EN |
| DCA Accessories – *Technical Overview* | 5991-2340EN |
| DCA Wide-Bandwidth Oscilloscope Family - *Configuration Guide* | 5992-3372EN |

## Web Resources

Generic: www.keysight.com/find/<product number> for any product number mentioned here

- Keysight Digital Communication Analyzer (DCA) Solutions: www.keysight.com/find/dca
- DCA-X Family: www.keysight.com/find/dca-x
- DCA-M Family: www.keysight.com/find/dca-m
- Clock Recovery Solutions: www.keysight.com/find/cdr
- FlexDCA (main page): www.keysight.com/find/flexdca_pro
- FlexDCA (download page): www.keysight.com/find/flexdca_download

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