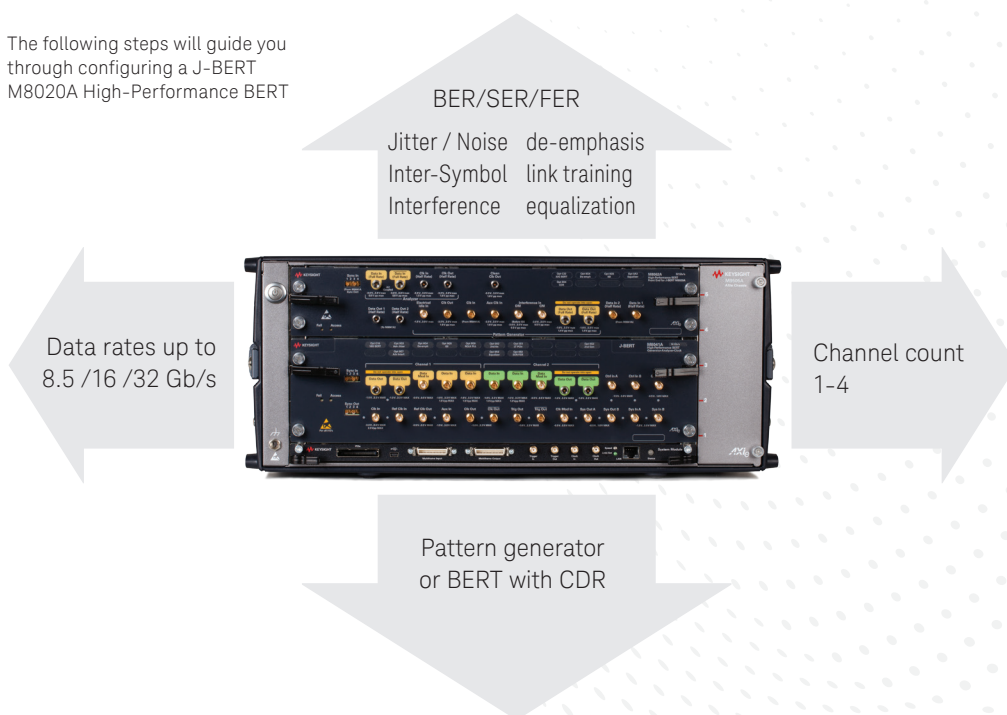# J–BERT M8020A
High–Performance BERT

Master Your Next Designs Version 4.0

The following steps will guide you through configuring a J–BERT M8020A High–Performance BERT

BER/SER/FER

Jitter / Noise   de-emphasis
Inter-Symbol   link training
Interference   equalization

Data rates up to
8.5 /16 /32 Gb/s

Channel count
1–4

Pattern generator
or BERT with CDR

KEYSIGHT
TECHNOLOGIES

Available Configurations

M8020A 16 Gb/s BERT

1 – 2 channels
- With embedded controller M9537A
- With external PC

Hardware selection required for this configuration:
- BERT module (refer to steps 1 and 2 below)
- 5-slot AXIe chassis required (refer to step 8 below)

M8020A 16 Gb/s BERT

Up to 4 channels
External controller, can be either laptop or desktop
- USB (any external controller will work)
- PCIe® for highest throughput

(please see the list of supported PCs in the document Tested Computer List
http://literature.cdn.keysight.com/litweb/pdf/5990-7632EN.pdf)

Hardware selection required for this configuration:
- BERT module (refer to steps 1 and 2 below)
- 2nd BERT module (refer to step 3 below)
- 5-slot AXIe chassis required (refer to step 8 below)

M8020A 32 Gb/s BERT

1 - 2 channels
With M8062A 32G Front End
Two 32 Gb/s channels possible with 2nd chassis.

Hardware selection required for this configuration:
- BERT module (refer to steps 1 and 2 below)
- 32G Front End (refer to step 5 below)
- 5-slot AXIe chassis required (refer to step 8 below)

Available Configurations (continued)

The J–BERT M8020A high-performance BERT is scalable containing:
- BERT modules M8041A, M8051A and M8062A
- Software
- Infrastructure such as chassis and embedded controller
- Accessories
- And services.

The following steps will guide your through configuring a turnkey J–BERT M8020A high-performance BERT.

Step 1	Choose the 1st BERT module – basic selection

M8041A 8.5/16 Gb/s Generator Analyzer Clock, 3-slot AXIe module
1 selection out of the following 4 options is required

Option	Description
M8041A-C08	BERT one channel, data rate up to 8.5 Gb/s
M8041A-C16	BERT one channel, data rate up to 16 Gb/s
M8041A-G08	Pattern generator one channel, data rate up to 8.5 Gb/s
M8041A-G16	Pattern generator one channel, data rate up to 16 Gb/s

Step 2	Choose the 1st BERT module – optional selections M8041A 8.5/16 Gb/s Generator Analyzer Clock, 3-slot AXIe module

Option	Description
M8041A-0A2	Second channel for analyzer, license, only valid if option M8041A-C08 or M8041A-C16 are ordered
M8041A-0A3	Analyzer equalization, module-wide license, only valid if option M8041A-C08 or M8041A-C16 are ordered
M8041A-0G2	Second channel for pattern generator, license
M8041A-0G3	Advanced jitter sources for receiver characterization, module wide license
M8041A-0G4	8-tap de-emphasis, module-wide license
M8041A-0G5	Adjustable Intersymbol Interference (ISI), module wide license
M8041A-0G6	Reference clock input with multiplying PLL, clock group wide license
M8041A-0G7	Level interference sources for receiver characterization, module wide license
M8041A-0S1	Interactive link training for PCI Express 8 GT/s, clock group wide license[1]. Only valid if option C08 or C16 are ordered
M8041A-0S2	SER/FER Analysis for coded and retimed loopback, clock group wide license. Only valid if option C08 or C16 are ordered
M8041A-0S3	Interactive link training for USB 3.0 and USB 3.1, clockgroup-wide license
M8041A-0S4	Interactive link training for PCI Express 8 GT/s and 16 GT/s, clockgroup-wide license[1]
M8041A-0S6	SAS-3 transmitter equalization training, module-wide license[1]
M8041A-0SX	10GBASE-KR transmitter equalization training, module wide license[1]

1. Requires option M8041A-0G4 to allow de-emphasis negotiation.

Step 3	Choose the 2nd BERT module – basic selection

M8051A 8.5/16 Gb/s Generator Analyzer, 2-slot AXIe module
Requires a M8041A module. If more than 2 channels are needed, 1 out of the following 4 options is required

Option-No	Description
M8051A-C08	BERT one channel, data rate up to 8.5 Gb/s
M8051A-C16	BERT one channel, data rate up to 16 Gb/s
M8051A-G08	Pattern generator one channel, data rate up to 8.5 Gb/s
M8051A-G16	Pattern generator one channel, data rate up to 16 Gb/s

Note: In case a M8041A and a M8051A is ordered, you also need an external controller. All 5 slots in a 5 slot AXIe slot are used.

Step 4	Choose the 2nd BERT module – optional selections M8051A 8.5/16 Gb/s Generator Analyzer, 2-slot AXIe module
Option-No	Description
M8051A-0A2	Second channel for analyzer, license, only valid if option M8051A-C08 or M8051A-C16 are ordered
M8051A-0A3	Analyzer equalization, module-wide license, only valid if option M8051A-C08 or M8051A-C16 are ordered
M8051A-0G2	Second channel for pattern generator, license
M8051A-0G3	Advanced jitter sources for receiver characterization, module wide license
M8051A-0G4	8-tap de-emphasis, module-wide license
M8051A-0G5	Adjustable Intersymbol Interference ISI, module wide license
M8051A-0G7	Level interference sources for receiver characterization, module wide license
M8051A-0S6	SAS-3 transmitter equalization training, module-wide license[1]
M8051A-0SX	10GBASE-KR transmitter equalization training, module wide license[1]

1.   Requires option M8051A-0G4 to allow de-emphasis negotiation.

Step 5	Choose the 3rd module M8062A 32G Front End

Single channel 32 Gb/s when used with two channel M8020A.

Option-No	Description
M8062A-C32	32 Gb/s BERT front end. Requires M8041A-C16 with options M8041A-0A2 and M8041A-0G2
M8062A-G32	32 Gb/s Pattern generator front end. Requires M8041A-G16 or M8041A-C16 with option M8041A-0G2
M8062A-0G4	Multi-tap de-emphasis license
M8062A-OG5	Adjustable intersymbol interference license
M8062A-0A3	Analyzer equalization license, only valid if option M8062A-C32 is ordered
M8062A-0A4	Clock recovery license, only valid if option M8062A-C32 is ordered
M8062A-0S6	SAS-3/SAS-4 transmitter equalization training, module-wide license[1]
M8062A-0SC	100GBASE-KR4 and 25GBASE-KR transmitter equalization training, module-wide license[1]
M8062A-US6	Upgrade of M8041A to SAS-3 transmitter equalization training, module-wide License[1]
N4877A-232	Clock data recovery with demultiplexer 1:2 for maximum Bit Rate 32 Gb/s

Step 6	M8070B BER Test System Software is free and available for download at Keysight. Choose Advanced Measurement Package and/or Error Distribution Analysis options, require license and subscription fees.
Option-No	**Description**

M8070ADVB	Advanced Measurement Package for M8000 Series BERT Test Solutions, node-locked license
	  Choose your license term: perpetual or time-based.
	  Choose your license type: node-locked, transportable, USB portable, or floating.Depending on the license term, choose your
	  support subscription duration.

M8070EDAB	Error Distribution Analysis Package for M8000 Series BERT Test Solutions, node-locked license
	  Choose your license term: perpetual or time-based.
	  Choose your license type: node-locked, transportable, USB portable, or floating.
	  Depending on the license term, choose your support subscription duration.

License Terms	
Perpetual	– Perpetual licenses can be used indefinitely.
Time-based	– Time-based licenses can be used through the term of the license only (6, 12, 24, or 36 months).
Node-locked	– License can be used on one specified instrument/computer.
Transportable	– License can be used on one instrument/computer at a time but may be transferred to another using Keysight Software Manager (Internet connection required).
USB Portable	– License can be used on one instrument/computer at a time but may be transferred to another using a certified USB dongle (available for additional purchase with Keysight part number E8900-D10).
Floating (single site)	– Networked instruments/computers can access a license from a server one at a time. Multiple licenses can be purchased for concurrent usage.

Step 7	Choose the chassis and controller. Usage of standard AXIe chassis is possible, but please be aware that Keysight Technologies, Inc. is the only vendor that provides the USB interface. Usage without a chassis is not possible.
Option	**Description**
M8020A-BU1	AXIe chassis, 5-slot with embedded AXIe controller. Software is pre-installed on embedded controller. Recommended configuration if the user needs a M8041A. Cannot be ordered when a M8051A is selected
M8020A-BU2	AXIe chassis, 5-slot, does not include a PC. Customer requires an external PC. Recommended configuration if the user needs a M8041A with M8051A or M8062A.
M9048A	PCIe desktop adapter: Gen2, x8, clock isolation only needed if option M8020A-BU2 is selected and highest download speed is required. Not needed if the USB interface is used.

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1. Upgrade of M8041A to SAS-3 transmitter equalization training, module-wide License

Step 8	Test Automation Software for PCIe, USB, SATA DisplayPort, Thunderbolt, SD UHS-II RX test with M8000, is not part of the J-BERT M8020A structure. Don't forget to order, if needed
Option-No	**Description**
N5990A-010	Required option
N5990A-101	Support for PCI Express Gen1, Gen2 and Gen3 receiver tests for J-BERT M8020A
N5990A-102	Support for USB 2.0 and USB 3.0 receiver tests for J-BERT M8020A (USB 3.0 only)
N5990A-103	Support for SATA 1.0, 2.0 and 3.0 RSG tests for J-BERT M8020A
N5990A-104	Support for Thunderbolt receiver tests
N5990A-105	Support for SAS-3/SAS-4 tests
N5990A-120	Support for SD UHS-II receiver tests
N5990A-155	DisplayPort receiver test for J-BERT M8020A
N5990A-165	MIPI M-PHY receiver test for J-BERT M8020A
N5990A-301	PCI Express 3.0 link training suite for J-BERT M8020A
N5990A-302	USB 3.0 and 3.1 link training suite for J-BERT M8020A
N5990A-303	SATA link training suite for J-BERT M8020A
N5990A-305	SAS-3/SAS-4 link training suite for J-BERT M8020A
N5990A-365	MIPI M-PHY frame generator for J-BERT M8020A or 13.5 Gb/s
N5990A-366	MIPI M-PHY Frame Generator for J-BERT M8020A
N5990A-368	MIPI M-PHY Protocol-Specific Macros for LLI, SSIC and DigRF v4 for J-BERT M8020A
N5990A-501	PCI Express link equalization tests
Step 9	**Choose accessories**
Option	**Description**
M8041A-801	Matched cable pair, 2.92 mm (m f), 0.85 m (This 2.92 mm cable is compatible with 3.5 mm front panel connectors of M8041A/51A)
M8041A-802	Bandpass filter 11.4 to 15.6 GHz
M8041A-803	Bandpass filter 11.1 to 17.5 GHz
M8048A-001	ISI channels, four short traces, 8 to 13 inches
M8048A-002	ISI channels, four long traces, 14 to 34 inches
M8048A-801	Short matched cable pair, SMA (f) to SMA (f) for cascading M8048A ISI channels
M8051A-801	Clock distribution cable for M8051A
15442A	Four SMA cables, unmatched
N4910A	Matched cable pair, 85 cm long, 2.4 mm (m f) to 2.4 mm (m f) for data outputs and inputs
8490D	2.4mm (m f) 6 dB attenuator, 50 GHz (when data outputs is driving into non- 50 Ω inputs and for over-voltage protection, e.g. for some high-performance oscilloscopes)
N9398F	2.4mm (m) DC block, 50 GHz (when data output drives into a single ended, AC coupled input, such as 81490A ref. transmitter)
Y1225A	Rack-mount kit for AXIe 2-slot chassis M9502A 5-slot AXIe chassis with USB option M9505A-U20
Y1226A	Rack-mount kit for AXIe 5-slot chassis M9505A

Note: Content of default accessories included in shipment.

Step 10	Choose calibration and service plan
Option-No	**Description**
R-50C-011-3	Calibration Assurance Plan – Return to Keysight – 3 years
R-50C-011-5	Calibration Assurance Plan – Return to Keysight – 5 years
R-1380-M8000	Productivity assistance
PS-S10	Remote scheduled productivity assistance. Select 1 to 999 hours.
PS-S20	Startup assistance (day)

Upgrades for J-BERT M8020A High-performance BERT

All upgrades all license upgrades without return-to-factory.

M8020AU	Upgrades to J-BERT High-performance BERT modules

Upgrades for M8041A

M8041A-U14	Upgrade of M804A-0S1 to 0S4, interactive link training for PCI Express 8 GT/s and 16 GT/s, clockgroup-wide license
M8041A-U16	Upgrade to 16 Gb/s data rate from M8041A-G08 and M8041A-C08, module-wide license
M8041A-UA2	Upgrade of M8041A to second channel for analyzer, license
M8041A-UA3	Upgrade of M8041A to analyzer equalization, module-wide license
M8041A-UED	Upgrade to BERT from M8041A-G08 and M8041A-G16, module-wide license
M8041A-UG2	Upgrade of M8041A to second channel for pattern generator, license
M8041A-UG3	Upgrade of M8041A to advanced jitter sources for receiver characterization, module-wide license
M8041A-UG4	Upgrade of M8041A to multi-tap de-emphasis, module-wide license
M8041A-UG5	Upgrade of M8041A to adjustable intersymbol interference (ISI) for all S/N, module-wide license[1]
M8041A-UG6	Upgrade of M8041A to reference clock input with multiplying PLL, clockgroup-wide license
M8041A-UG7	Upgrade of M8041A to advanced interference sources for receiver characterization, module-wide license
M8041A-UR3	Upgrade of M8041A-0A3 with latest CTLE presets, return-to-factory
M8041A-UR5	Upgrade of M8041A to Adjustable ISI. Option M8041A-UR5 only available for S/N below DE55300500, return-to-factory
M8041A-US1	Upgrade of M8041A to interactive link training for PCI Express, clockgroup-wide license
M8041A-US2	Upgrade of M8041A to SER/FER analysis for coded and retimed loopback, clockgroup-wide license
M8041A-US3	Upgrade of M8041A to interactive link training for USB 3.0 and USB 3.1, clockgroup-wide license
M8041A-US4	Upgrade of M8041A to interactive link training for PCI Express 8 GT/s and 16 GT/s, clockgroup-wide license
M8041A-USX	Upgrade of M8041A to 10GBASE-KR transmitter equalization training, module-wide license
M8041A-US6	Upgrade of M8041A to SAS-3 transmitter equalization training, module-wide license[2]

Upgrades for M8051A

M8051A-U16	Upgrade to 16 Gb/s data rate from M8051A-G08 and M8051A-C08, module-wide license
M8051A-UA2	Upgrade of M8051A to second channel for analyzer, license
M8051A-UA3	Upgrade of M8051A to analyzer equalization, module-wide license
M8051A-UED	Upgrade to BERT from M8051A-G08 and M8051A-G16, module-wide license
M8051A-UG2	Upgrade of M8051A to second channel for pattern generator, license
M8051A-UG3	Upgrade of M8051A to advanced jitter sources for receiver characterization, module-wide license
M8051A-UG4	Upgrade of M8051A to multi-tap de-emphasis, module-wide license
M8051A-UG5	Upgrade of M8051A to adjustable intersymbol interference (ISI) for all S/N, module-wide license[1]
M8051A-UG7	Upgrade of M8051A to advanced interference sources for receiver characterization, module-wide license
M8051A-UR3	Upgrade of M8051A-0A3 with latest CTLE presets, return-to-factory
M8051A-UR5	Upgrade of M8051A-UR5 to Adjustable ISI. Option M8051A-UR5 only available for S/N below DE55300500, return-to-factory
M8051A-US6	Upgrade of M8051A to SAS-3 transmitter equalization training, module-wide license[2]
M8051A-USX	Upgrade of M8051A to 10GBASE-KR transmitter equalization training, module-wide license

1. For serial numbers < DE55300500 this upgrade requires return-to-factory.
2. Requires option M8041A-0G4 to allow de-emphasis negotiation.

Upgrades for M8062A	
M8062A-UA3	Upgrade of M8062A to analyzer equalization, license
M8062A-UA4	Upgrade of M8062A to clock recovery, license
M8062A-UED	Upgrade to 32 Gb/s BERT front end from M8062-G32, License
M8062A-UG4	Upgrade of M8062A to multi-tap De-emphasis, License
M8062A-UG5	Upgrade of M8062A to adjustable intersymbol interference, license
M8062A-US6	Upgrade of M8062A to SAS-3 transmitter equalization training, module-wide License[1]
M8062A-USC	Upgrade of M8062A to 100GBASE-KR4 and 25GBASE-KR transmitter equalization training, module-wide license

Related literature

Publication title	Pub number
M8020A J-BERT High-Performance BERT - Data Sheet	5991-3647EN
M8048A ISI Channel - Data Sheet	5991-3648EN
M9052A and M9505A 2-and 5 slot AXIe Chassis - Data Sheet	5990-6584EN
M8062A 32 Gb/s Front-End for J-BERT M8020A High-Performance BERT - Data Sheet	5992-0987EN
M8040A High-Performance BERT 64 GBaud - Data Sheet	5992-1525EN
M8030A Multi-channel BERT - Data Sheet	5992-1287EN
M9505A AXIe Chassis 5-slot - Data Sheet	5990-6584EN
N1076A/N1077A Electrical and Optical Clock Data Recovery Solutions - Data Sheet	5992-1620EN
Master Your MIPI M-PHY Receiver Test Using J-BERT M8020A - Application Brief	5991-3959EN
How to Pass Receiver Test According PCI Express CEM Specification - Application Note	5990-9208EN
Accurate Calibration of PCIe 3.0 Receiver Stress Signals - Application Note	5990-6599EN
How to Test a MIPI M-PHY High-speed Receiver- Application Note	5991-2848EN
Master Your Next PCIe3 Receiver Test Using J-BERT M8020A - Application Note	5991-4190EN
Master Your Next USB 3.x Designs with J-BERT M8020A - Application Note	5991-4357EN
Characterizing and Verifying Compliance of 100 Gb Ethernet Components and Systems - Application Note	5992-0019EN

1. Requires option M8041A-0G4 to allow de-emphasis negotiation.

Default Accessories Included With Shipment

– M8041A module: eight 50 Ω terminations, commercial calibration report ("UK6"), certificate of calibration, ESD protection kit.

– M8051A module: four 50 Ω terminations, clock synchronization cable (M8051A-801), commercial calibration report ("UK6"), certificate of calibration

– M8062A Module: two 50 Ω terminations, clock synchronization cable, semi-rigid interconnect cable set, commercial calibration report ("UK6"), certificate of calibration.

– M8020A-BU1: M9505A AXIe chassis with embedded controller, USB cable, getting started guide, AXIe filler panel, power cord

– M8020A-BU2: M9505A AXIe chassis, USB cable, getting started guide, AXIe filler panel, power cord

– M8070B System Software is available for download at www.keysight.com/find/M8070B

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

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