High-Speed Serial Bus Interface Solution for PCI Express, Thunderbolt, USB

Signal Quality Analyzer
MP1800A Series
Outline

• Traffic volumes at data centers are exploding due to the spread of cloud computing services. Consequently, faster interfaces such as 100 GbE, 400 GbE, InfiniBand EDR, etc., are being deployed for communications between the servers and network equipment, while on the other hand, speeding-up of equipment internal serial bus interfaces, such as PCI Express, is also being investigated.

• Moreover, USB Type-C connectors and cables are being deployed as high-end computing interfaces supporting faster Thunderbolt 3 and USB 3.1 speeds.

• This product introduction explains MP1800A measurement solutions for high-speed serial interfaces such as PCI Express, Thunderbolt, and USB.
Trends in Ethernet, Thunderbolt, PCI Express, USB Standards

- **Ethernet**
  - 100 GbE

- **Thunderbolt**
  - Thunderbolt 2
  - Thunderbolt 3
  - Thunderbolt

- **PCI Express**
  - Gen 3
  - Gen 4

- **USB**
  - USB 3.0
  - USB 3.1
  - USB 3.1

**Bit Rate (/lane) [Gbit/s]**

- 2016
- 2014
- 2012
- 2010
32 Gbit/s Wideband Multi-interface Test

All-in-one MP1800A SQA expandability to 32 Gbit/s and 8CH max. for multi-interface evaluations

(PCI Express Gen 4 (16 G), USB 3.1 Gen 2 (10 G), Thunderbolt 3 (20 G), 100 GbE (25.78 G), 400 GbE (26.6 G/53.1 G), InfiniBand (25.78 G), CEI (28 G))
MP1800A High-Speed Serial Bus Test Solution Features

Supports multi-interface PHY layer tests using 32 Gbit/s MP1800A

- Applications: PCI Express Gen 4 (16 G), USB 3.1 Gen 2 (10 G), Thunderbolt 3 (20 G), 100 GbE (25.28 G), 400 GbE (26.6 G/53.1 G), InfiniBand (25.28 G), CEI (28 G)
- Multiple channels and high expandability
- Supports both 100 GbE equipment interconnects and equipment internal interfaces (PCI Express)
- Supports both USB 3.1 Gen 2 and Thunderbolt 3 via USB 3.1 Type-C connectors and cables
- Useful Jitter Tolerance measurement software supporting each standard (MX183000A-PL001)

Link Sequence generation for device RX tests

- PCI Express Gen 1, 2, 3, 4 (MX183000A-PL011)
- USB 3.0/3.1 Link Sequence Generation (MX183000A-PL012)

Reduces engineering test workload with high-reproducibility calibration and Jitter measurement functions

- Automatic calibration and Jitter tests
  - Supports PCI Express Gen 4 base spec, Thunderbolt 3/2, USB 3.1 Gen 2

  *Automation software sold by Granite River Labs ([http://graniteriverlabs.com/](http://graniteriverlabs.com/))

Supports efficient device design tests with high-quality waveforms and high input sensitivity

- High-accuracy testing due to PPG outputting waveform with low Residual Jitter (RJ) of 200 fs (rms) and ED with high input sensitivity of 10 mV
MP1800A Series Software Products
- High-expandability software solutions supporting multi-interface tests
- Calibration and test automation for device receiver tests

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MX183000A</td>
<td>High-Speed Serial Data Test Software (standard accessory)</td>
</tr>
<tr>
<td>MX183000A-PL001</td>
<td>Jitter Tolerance Test</td>
</tr>
<tr>
<td>MX183000A-PL011</td>
<td>PCIe Link Sequence</td>
</tr>
<tr>
<td>MX183000A-PL012</td>
<td>USB Link Sequence</td>
</tr>
<tr>
<td>GRL-PCIE4-BASE-RXA*</td>
<td>PCIE Gen 4 Automation Software</td>
</tr>
<tr>
<td>GRL-TBT3-RXA*</td>
<td>Thunderbolt 3 Automation Software</td>
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*Automation software sold by Granite River Labs ([http://graniteriverlabs.com/](http://graniteriverlabs.com/))
Generating Stressed Signal for Rx Tests and Measuring BER using MP1800A

- Generating Stressed Signal
  - Jitter Addition function: SJ/RJ/BUJ/SSC
  - Noise Addition function: Common Mode/Differential Mode (using MG3710A SG)
  - ISI Control (using Artek Variable ISI)
  - Emphasis Control
  - Crosstalk Signal Generation: 8CH max. with all-in-one MP1800A multichannel
  - Link sequence pattern generation for transitioning DUT state to Loopback

- BER Measurement
  - Jitter Tolerance measurement
  - High-sensitivity Input function: 10 mV (typ.) Eye Height input
  - CDR Function: 2.4 to 32.1 Gbit/s wideband
  - Auto-measurement function: Bathtub/Eye Diagram/Eye Contour/ Eye Margin

![Diagram of signal generation and measurement process]

MP1800A Multichannel 32G PPG/ED with Jitter Addition function
MG3710A CM/DM Noise function
Link Sequence pattern/Stress signal
Variable ISI
Receiver
Loopback signal BER measurement
Jitter Tolerance, CDR, Auto-measure functions
MP1825B Emphasis

Anritsu envision: ensure

7
PCI Express Gen 4 Base Specification Test Solution
Outline of PCI Express Gen 4 Base Spec. Rx Test

Flow of PCI Express PHY IP Device Rx Test

- Stressed Signal Calibration
- Transition to Loopback State
- Stressed Signal Input Test

**Software Used**

- Automation Software: GRL-PCIE4-BASE-RXA
- Link Sequence Pattern Generation Software: MX183000A-PL011

**Jitter Tolerance Margin Inspection:**
- MX183000A-PL001
- Jitter Sweep Test (Pass/Fail Evaluation): GRL-PCIE4-BASE-RXA

**PCI Express Measurement Set-up**

- Calibration/JTOL Software (GRL-PCIE4-BASE-RXA)
- MP1800A 32G PPG/ED for PCIe MX183000A
- MG3710A × 2 for CM-SI and DM-SI
- MP1825B 4Tap Emphasis
- Variable ISI Channel
- Real Time Oscilloscope
- DUT (Rx), DUT (Tx)
PCI Express Gen 4 Base Spec. Rx Test Features

✓ Key Features
  • Automatic measurement and automatic calibration using GRL-PCIE4-BASE-RX Automation Software
  • Logical Sub-Block evaluation using MX183000A
  • Jitter Tolerance testing by transitioning to device status by generating Link Sequence

Supported Standards

<table>
<thead>
<tr>
<th>Supported Standard</th>
<th>DUT</th>
<th>Calibration</th>
<th>Link Sequence Generation</th>
<th>Jitter Tolerance Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI Express 1.x/2.0/3.x/4.0</td>
<td>Host SERDES</td>
<td>Support v4.0</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>End Point SERDES</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

Jitter Tolerance Test Function (Option PL001)

✓ Impress SJ/RJ to test PHY device Jitter Tolerance
✓ Test device margin using low-rate estimate BER measurement
✓ Output measurement results report in HTML and CSV format

PCI Express Link Sequence Generation Function (Option PL011)

✓ Control status of PCIe Base Spec. Rev. 4.0 devices to support Logical Sub-Block evaluation
✓ Support 8B/10B, 128B/130B, Scramble, SKIP Insertion

*Control items: Only at following measurements
  • Common Clock Architecture
  • Loopback data from DUT only at SSC Off
Supported PCI Express Clock Architecture

Common Clock Architecture
- PCIe Device A
- PCIe Device B
- Ref Clk

Only Supports Common Clock Architecture

Data Clocked Architecture
- PCIe Device A
- PCIe Device B
- Ref Clk

Separate Ref Clk Architecture
- PCIe Device A
- PCIe Device B
- Ref Clk #1
- Ref Clk #2

Only Supports Common Clock Architecture

Only Supports Common Clock Architecture

Anritsu envision: ensure
PCI Express Gen 4 Base Spec. Calibration Points

Stressed Signal Calibration

Transition to Loopback State

Stressed Signal Input Test

Fixed TX EQ

16 GT/s PRBS Generator

Combiner

Replica Channel

Test Equipment

Table 9-8: Stressed Jitter Eye Parameters

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>2.5 GT/s</th>
<th>5.0 GT/s</th>
<th>8.0 GT/s</th>
<th>16.0 GT/s</th>
<th>Units</th>
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<tbody>
<tr>
<td>$V_{\text{RX-LAUNCH}}$</td>
<td>Generator launch voltage</td>
<td>800-1200</td>
<td>800-1200</td>
<td>800-1200</td>
<td>800-1200</td>
<td>mV PP</td>
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<tr>
<td>$T_{\text{RX-UI}}$</td>
<td>Unit Interval</td>
<td>400</td>
<td>200</td>
<td>125</td>
<td>62.5</td>
<td>ps</td>
</tr>
<tr>
<td>$T_{\text{RX-ST}}$</td>
<td>Eye width at TP2P</td>
<td>&lt;0.4</td>
<td>&lt;0.32</td>
<td>0.30</td>
<td>0.30</td>
<td>UI</td>
</tr>
<tr>
<td>$T_{\text{RX-ST-SJ}}$</td>
<td>Swept Sj</td>
<td>33 KHz</td>
<td>33 KHz</td>
<td>Figure 9-29, Figure 9-30</td>
<td>Figure 9-29, Figure 9-30</td>
<td>UI PP</td>
</tr>
<tr>
<td>$T_{\text{RX-ST-RJ}}$</td>
<td>Random Jitter</td>
<td>TBD</td>
<td>TBD</td>
<td>3.0 (max)</td>
<td>~1.0 (max)</td>
<td>ps RMS</td>
</tr>
<tr>
<td>$V_{\text{RX-DIFF-INT}}$</td>
<td>Differential noise</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>mV PP</td>
</tr>
<tr>
<td>$V_{\text{RX-CM-INT}}$</td>
<td>Common mode noise</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>mV PP</td>
</tr>
</tbody>
</table>

15 mV / .3 UI at E-12 BER

Post Processing Scripts:
- Rx pkg model
- Behavioral CTLE/DFE
- Behavioral CDR
PCI Express Gen 4 Base Spec. Calibration Points

Stressed Signal Calibration

Transition to Loopback State

Stressed Signal Input Test

Fixed TX EQ

16 GT/s PRBS Generator

Combiner

Calibration Channel

Replica Channel

Test Equipment

Post Processing Scripts:
- Rx pkg model
- Behavioral CTLE/DFE
- Behavioral CDR

15 mV / .3 UI at E-12 BER

MP1800A

MG3710A

Calibration Points

Stressed Signal Calibration

Transition to Loopback State

Stressed Signal Input Test

Fixed TX EQ

16 GT/s PRBS Generator

Combiner

Calibration Channel

Replica Channel

Test Equipment

Post Processing Scripts:
- Rx pkg model
- Behavioral CTLE/DFE
- Behavioral CDR

15 mV / .3 UI at E-12 BER

MP1800A

MG3710A
PCI Express Gen 4 Base Spec. Calibration Test Setup for TP2

- Stressed Signal Calibration
- Transition to Loopback State
- Stressed Signal Input Test

*Variable ISI filtered at TP1*
PCI Express Gen 4 Base Spec. Calibration

➤ Stressed Signal Calibration
Features of GRL-PCIE4-BASE-RXA Automation Software

One-button calibration and testing of stress input signals using GRL-PCIE4-BASE-RXA

- Supports PCIe Gen 4 Rev. 0.5 devices
- Calibration of high-reproducibility test signal and Rx tests
- Auto-control of variable ISI channel and Eye opening calibration
PCI Express Gen 4 Base Spec. Rx Test

- Generating Link Sequence using MX183000A-PL011

  - PPG Pattern control using MX183000A
    - GUI for easy setting of measurement conditions and simple test execution
    - Built-in PDF format reporting function
    - Control of PCIe device status using sequence generation and evaluation of Logical Sub-Block
    - 8B/10B, 128B/130B, Scramble SKIP Insertion

---

<table>
<thead>
<tr>
<th>Item</th>
<th>MX183000A-PL011 Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported Standards</td>
<td>PCIe Rev 1.x (2.5 GT/s), 2.0 (5 GT/s), 3.x (8 GT/s), 4.0 (16 GT/s)</td>
</tr>
<tr>
<td>Test Pattern</td>
<td>Compliance (MCP, CP), PRBS (7, 9, 10, 11, 15, 20, 23, 31)</td>
</tr>
<tr>
<td>LTSSM State</td>
<td>Transition to Detect, Polling, Configuration, Recovery, Loopback</td>
</tr>
<tr>
<td>Loopback Through</td>
<td>Configuration, Recovery</td>
</tr>
<tr>
<td>TS Setting Parameters</td>
<td>SKIP Insertion, 8B/10B, 128B/130B, FTS, Link Number, Lane Number, Scrambling</td>
</tr>
</tbody>
</table>
PCI Express Gen 4 Base Spec. Rx Test

- **Stressed Signal Input Test (Jitter Tolerance Margin test using MX183000A-PL001)**
  - Control Jitter and measure Jitter Tolerance using MX183000A
    - Impress SJ/RJ to test Jitter Tolerance of PHY devices
    - Test device margin using low-rate estimate BER measurement
    - Create measurement results reports in HTML and CSV format

<table>
<thead>
<tr>
<th>Item</th>
<th>MX183000A-PL001 Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitter Setting Range</td>
<td>Based on MU181500B Jitter Modulation Source spec.</td>
</tr>
<tr>
<td>Direction Search</td>
<td>Binary, Downward Linear, Downward Log, Upward Linear, Upward Log, Binary + Linear</td>
</tr>
<tr>
<td>Detection</td>
<td>Error Rate, Error Count, Estimate</td>
</tr>
<tr>
<td>Error Threshold</td>
<td>1.0E-3 to 1.0E-14</td>
</tr>
<tr>
<td>Highlight Error Rate</td>
<td>9.9E-9 to 1.0E-20 (at estimate)</td>
</tr>
<tr>
<td>Report Function</td>
<td>Reports results in HTML and CSV formats</td>
</tr>
</tbody>
</table>
PCI Express Gen 4 Base Spec. Rx Test

- Stressed Signal Input Test (GRL-PCIE4-BASE-RXA Pass/Fail Test)

  (2) Run Tests (Go/No Go at test points)

  (3) Generate report
Thunderbolt 3 Test Solution
Thunderbolt 3 Rx Test Outline

Flow of Thunderbolt 3 Rx Test

- Stressed Signal Calibration
- Stressed Signal Input Test

Automation Software:
GRL-TBT3-RXA

Thunderbolt Measurement Set-up

Control Signal

MP1800A 32G PPG for TBT
MP1825B 4Tap Emphasis
Jittered Data

GRL Automation software (GRL-TBT3-RXA)

Real Time Oscilloscope

MG3710A*1 SG for CM-SI

Data

DUT (Rx)
Thunderbolt 3 Rx Test Features

✓ Key Features

• Supported Standard: Thunderbolt 2/3
• As in Recommended Equipment for Thunderbolt Compliance Test Standard
• As in Thunderbolt 3 (including USB Type-C Thunderbolt Alternate Mode Electrical Host/Device Compliance Test Specification) Standard, automatic calibration of signal loss due to Stressed Rx Jitter parameter configuration
• Rx BER measurement as required by Host/Device compliance test
• Automatic Rx test using Tenlira scripts

<table>
<thead>
<tr>
<th>Supported Standard</th>
<th>DUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thunderbolt 2 (10 G)</td>
<td>Device</td>
</tr>
<tr>
<td>Thunderbolt 3 (20 G)</td>
<td>Device</td>
</tr>
</tbody>
</table>
Thunderbolt 3 Rx Test

Stressed Signal Calibration

- Stressed Signal Input Test

MP1800A Signal Quality Analyzer

- MU181000A Synthesizer
- MU181500B Jitter Modulation Source
- MU183020A PPG

J1551A 80 cm Skew Matched Cable

J1624A 30 cm Cable

J1625A x2 1 m Cable

J1615A Cable Set

(For Crosstalk, Diff.)

Compliance board and Standard cable

Control PC

Automation Software: GRL-TBT3-RXA

J1625A x2 1 m Cable

Ethernet

Real-time scope

K261 x2

J1510A x2 Pickoff Tee

MU183020A PPG

Data / Xdata Output

Clock Output

Data output

Clock Output

Real-time scope

Compliance board and Standard cable

J1551A 80 cm Skew Matched Cable

J1551A 80 cm Skew Matched Cable
Thunderbolt 3 Rx Test

- Stressed Signal Input Test (Jitter Sweep Test (Pass/Fail Evaluation))

Stressed Signal Calibration → Stressed Signal Input Test

MP1800A Signal Quality Analyzer
- MU181000A Synthesizer
- MU181500B Jitter Modulation Source
- MU183020A PPG

J1551A 80cm Skew Matched Cable

J1624A 30 cm Cable

J1615A Cable Set

J1510A x2 Pickoff Tee

K261 x2

J1551A 80cm Skew Matched Cable

Compliance board and Standard cable

DUT

USB Type-C

Control PC

Automation Software: GRL-TBT3-RXA

J1625A x2 1 m Cable

Ethernet

USB Type-C

MP18525B

J1624A 30 cm Cable

J1625A x2 1 m Cable
Thunderbolt 3 Rx Test

- Stressed Signal Calibration

Features of Automation Software GRL-TBT3-RXA

Performs one-button calibration of stressed input signal using GRL-TBT3-RXA

- Supports Thunderbolt 3 (USB Type-C Thunderbolt Alternate Mode Electrical Host/Device Compliance Test Specification)
- Performs calibration of high-reproducibility test signal and executes receiver test
Thunderbolt 3 Rx Test

- Stressed Signal Input Test

Features of automation software GRL-TBT3-RXA

- Performs one-button stressed input signal test using GRL-TBT3-RXA
  - Performs calibration of high-reproducibility test signal and executes Rx test
  - GUI screen for easy setting of test conditions and test execution
  - Built-in PDF format reporting function

Measurement Screen
USB 3.1 Test Solution
USB 3.1 Rx Test Outline

Flow of USB 3.1 Rx Test

- Stressed Signal Calibration
- Transition to Loopback State
- Stressed Signal Input Test

Automation Software:
GRL Automation Software (TBT)

Link Sequence Pattern Generation Software:
MX183000A-PL012

· Jitter Sweep Test (Pass/Fail Evaluation):
  GRL Automation Software (TBT)

USB 3.1 Measurement Set-up

[Diagram showing the setup with various test equipment and connections]

MP1800A 32G PPG for USB MX183000A
MP1825B 4Tap Emphasis
Jittered Data
LFPS Tx
LFPS Rx
For Calibration
Real Time Oscilloscope

DUT (Rx)
DUT (Tx)

ARTEK USB Test Adaptor*1

BER*2

[Diagram showing connections and equipment used for testing]
USB 3.1 Rx Test Features

Key Features

- Automatic measurement and automatic calibration using automation software GRL Automation Software (TBT)
- Transition to Loopback mode for evaluating USB 3.1 Gen 1–2 devices

<table>
<thead>
<tr>
<th>Supported Standard</th>
<th>DUT</th>
<th>Link Sequence Generation</th>
<th>Jitter Tolerance Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB 3.0/3.1</td>
<td>Device</td>
<td>Supported</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Host</td>
<td>Supported</td>
<td>*</td>
</tr>
</tbody>
</table>

USB Link Sequence Generation Function (MX183000A-PL012)

- Supports transition to Loopback Mode for evaluation of USB 3.1 Gen 1–2 devices
- 8B/10B, 128B/132B, Scramble, SKIP Insertion, LFPS generation

*Enquire about BER-related and Jitter power measurements*
USB 3.1 Rx Test

- Stressed Signal Calibration
- Transition to Loopback State
- Stressed Signal Input Test

Features of automation software GRL Automation Software (TBT)

One-button calibration and testing of stressed input signal using GRL Automation Software (TBT)

- Supports USB 3.1 Gen 1–2 devices
- Performs calibration and Rx test of high-reproducibility test signal
- Supports automatic control of variable ISI and calibration of EYE opening
USB 3.1 Rx Test

- Generating Link Sequence using MX183000A-PL012

### Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>MX183000A-PL012 Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Support Standards</strong></td>
<td>USB 3.0, 3.1 Gen 1 (5 Gbit/s), 3.1 Gen 2 (10 Gbit/s)</td>
</tr>
<tr>
<td><strong>Test Pattern</strong></td>
<td>Compliance (Gen 1: CP0, CP1, CP2, CP4, CP5, CP6, Gen 2: CP9), User</td>
</tr>
<tr>
<td><strong>LTSSM State</strong></td>
<td>Transition to eSS.Inactive, Rx.Detect, Polling, Loopback</td>
</tr>
<tr>
<td><strong>Loopback Through</strong></td>
<td>Configuration</td>
</tr>
<tr>
<td><strong>TS Setting Parameters</strong></td>
<td>SKIP Insertion, 8B/10B, 128B/132B, Scrambling</td>
</tr>
</tbody>
</table>

Control PPG pattern using MX183000A

- Transition to Loopback Mode for evaluation of USB 3.1 Gen 1–2 devices
- 8B/10B, 128B/132B, Scramble, SKIP Insertion, LFPS generation function
USB 3.1 Rx Test

Transition to Loopback State and Stressed Signal Input Test ① (Configuration using Artek USB Test Adapter)

MP1800A Signal Quality Analyzer
MX183000A-PL012 USB Link Sequence (Installed in MP1800A or external PC)

- MU181000 A Synthesizer
- MU181500 B Jitter Modulation Source
- MU183020 A PPG

J1510A x2 Pickoff Tee
- J1551A 80cm Skew Matched Cable

LFPS Tx Out
- LFPS Rx In

DUT(Rx)
DUT(Tx)

*Contact us about BER measurements
USB 3.1 Rx Test

- Stressed Signal Input Test (GRL Automation Software (TBT) Pass/Fail Test)
Appendix
## Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>Option</th>
<th>PCIe</th>
<th>TBT</th>
<th>USB</th>
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<tbody>
<tr>
<td>MP1800A</td>
<td>Signal Quality Analyzer</td>
<td>X02, x07, x32</td>
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<td>MU181000A/B</td>
<td>Synthesizer</td>
<td>-</td>
<td>-</td>
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<td>MU181500B</td>
<td>Jitter Source</td>
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<td>MU183020A</td>
<td>32G PPG</td>
<td>X12/x30</td>
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<td>MU183040B</td>
<td>32G ED</td>
<td>X10/X22</td>
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<td>-</td>
<td>-</td>
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<td>MP1825B</td>
<td>Emphasis</td>
<td>x02</td>
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<td>MG3710A</td>
<td>Vector signal generator</td>
<td>x02, x29, x36, x41, x42, x66, x71, x72</td>
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<td>1</td>
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<tr>
<td>MX183000A</td>
<td>High-Speed Serial Data Test Software</td>
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<tr>
<td>GRL-PCIE4 – BASE-RXA</td>
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<td>GRL-TBT3-RXA</td>
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<td>USB Test Adapter</td>
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*Automation software sold by Granite River Labs ([http://graniteriverlabs.com/](http://graniteriverlabs.com/))

USB Test Adapter sold by Artek ([http://www.artek.co.jp/jp/index.html](http://www.artek.co.jp/jp/index.html))
## Ordering Information

<table>
<thead>
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<td>41KC-3</td>
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<td>K241C</td>
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<td>Pickoff Tee</td>
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<td>Z1927A</td>
<td>USB Measurement Kit</td>
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<td>J1508A</td>
<td>BNC-SMA Connector Cable</td>
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<td>Cable Set</td>
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<td>J1551A</td>
<td>Coaxial Skew Matched Cable (0.8 m, K-connector)</td>
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<td>J1624A</td>
<td>Coaxial Cable 0.3 m</td>
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<td>J1715A</td>
<td>Coaxial Cable 0.1 m (SMP-J, SMA-J)</td>
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*Standard accessory for MP1800A series
*1: Configuration without using Artek USB Test Adapter
*2: Configuration using Artek USB Test Adapter