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
- PCI Express: Gen 3, Gen 4
- USB: USB 3.0, USB 3.1, USB 3.1 Gen 4, To 400 GbE
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/)

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

Anritsu envision: ensure
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>
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<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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</tbody>
</table>

*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:
- MP1800A Multichannel 32G PPG/ED with Jitter Addition function
- MG3710A CM/DM Noise function
- MP1825B Emphasis
- Variable ISI
- Link Sequence pattern/Stress signal
- Receiver

Jitter Tolerance, CDR, Auto-measure functions

Loopback signal BER measurement
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**
  
  Automation Software: 
  GRL-PCIE4-BASE-RXA
  
  **Transition to Loopback State**
  
  Link Sequence Pattern Generation Software: 
  MX183000A-PL011
  
  **Stressed Signal Input Test**
  
  - Jitter Tolerance Margin Inspection: 
    MX183000A-PL001
  
  or
  
  - Jitter Sweep Test (Pass/Fail Evaluation): 
    GRL-PCIE4-BASE-RXA

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**PCI Express Measurement Set-up**

- Calibration/JTOL Software (GRL-PCIE4-BASE-RXA)
- Refclk
- MG3710A × 2 for CM-SI and DM-SI
- MP1825B 4Tap Emphasis
- CM, DM, TS
- Variable ISI Channel
- Data
- Jittered Data
- Jittered Data
- DUT (Rx)
- DUT (Tx)
- Real Time Oscilloscope

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Anritsu envision: ensure
### 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>
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</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

- **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

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Only Supports Common Clock Architecture

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Supported PCI Express Clock Architecture

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

- **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

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Anritsu envision: ensure
PCI Express Gen 4 Base Spec. Calibration Points (1/2)

**Stressed Signal Calibration**

1. **Fixed TX EQ**
   - 16 GT/s PRBS Generator
   - Combiner
   - Replica Channel
   - Test Equipment

**Transition to Loopback State**

1. Stressed Signal Calibration
2. Transition to Loopback State

**Stressed Signal Input Test**

1. Stressed Signal Input Test

---

**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>$V_{RX-LAUNCH}$</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>
</tr>
<tr>
<td>$T_{RX-Ul}$</td>
<td>Unit Interval</td>
<td>400</td>
<td>200</td>
<td>125</td>
<td>62.5</td>
<td>ps</td>
</tr>
<tr>
<td>$T_{RX-ST}$</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>$T_{RX-ST-SJ}$</td>
<td>Swept Sj</td>
<td>33 KHz spur only</td>
<td>33 KHz spur only</td>
<td>Figure 9-29, Figure 9-30</td>
<td>Figure 9-29, Figure 9-30</td>
<td>UI PP</td>
</tr>
<tr>
<td>$T_{RX-ST-RJ}$</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>$V_{RX-DIFF-INT}$</td>
<td>Differential noise</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>mV PP</td>
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<tr>
<td>$V_{RX-CM-INT}$</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
PCI Express Gen 4 Base Spec. Calibration Points (2/2)

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

Flowchart:

1. 16 GT/s PRBS Generator
2. Combiner
3. Calibration Channel (EH or EW Adjust)
4. Replica Channel
5. Test Equipment

Adjustments:
- Fixed TX EQ
- TP1
- TP2
- TP2P

Equipment: MP1800A, MG3710A

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

Specifications:
- 15 mV / .3 UI at E-12 BER

Anritsu: Envision: Ensure
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
- Transition to Loopback State
- Stressed Signal Input Test

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 (1/3)

- 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 (2/3)

- 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,</td>
</tr>
<tr>
<td></td>
<td>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 (3/3)

- 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
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 (1/4)

- Stressed Signal Calibration

**Stressed Signal Calibration**

**Stressed Signal Input Test**

**MP1800A Signal Quality Analyzer**

- MU181000A Synthesizer
- MU181500B Jitter Modulation Source
- MU183020A PPG

**Automation Software:** GRL-TBT3-RXA

**Control PC**

**Ethernet**

**J1551A** 80 cm Skew Matched Cable

**J1624A** 30 cm Cable

**J1624A** 30 cm Cable

**J1625A** x2 1 m Cable

**J1615A** Cable Set

**J1510A** x2 Pickoff Tee

**K261** x2

**J1551A** 80 cm Skew Matched Cable

**Compliance board and Standard cable**

**Real-time scope**

**MC3710A** SG for CM
Thunderbolt 3 Rx Test (2/4)

- 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**

**Automation Software:**

**GRL-TBT3-RXA**

**Control PC**

**Ethernet**

**MP1800A**

**J1510A x2 Pickoff Tee**

**J1624A 30 cm Cable**

**J1615A Cable Set**

**J1625A x2 1 m Cable**

**J1551A 80cm Skew Matched Cable**

**K261 x2**

**Compliance board and Standard cable**

**DUT**

**USB Type-C**
Thunderbolt 3 Rx Test (3/4)

- **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 (4/4)

- Stressed Signal Calibration
- 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
USB 3.1 Test Solution
USB 3.1 Rx Test Outline

Flow of USB 3.1 Rx Test

1. Stressed Signal Calibration
2. Transition to Loopback State
3. Stressed Signal Input Test

Automation Software: GRL-USB31-RXA

Link Sequence Pattern Generation Software: MX183000A-PL012

Jitter Sweep Test (Pass/Fail Evaluation): GRL-USB31-RXA

Software:
- USB 3.1 Measurement Set-up
- Automation Software: GRL-USB31-RXA
- Generation Software: MX183000A-PL012
- Jitter Sweep Test: GRL-USB31-RXA

Diagram of USB 3.1 Measurement Set-up:
- MP1800A 32G PPG for USB
- MX183000A
- MP1825B 4Tap Emphasis
- LFPS Tx
- USB3.1 Receiver Test Adapter G0373A
- Real Time Oscilloscope
- DUT (Rx)
- DUT (Tx)

Control Signal
USB 3.1 Rx Test Features

✔ Key Features
  • Automatic measurement and automatic calibration using automation software GRL-USB31-RXA
  • Transition to Loopback mode for evaluating USB 3.1 Gen 1–2 devices
  • BER Measurement

<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 Device</td>
<td>Supported</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>USB 3.0/3.1 Host</td>
<td>Supported</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

**Supported Standard**

**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 (1/4)

Features of automation software GRL-USB31-RXA

- One-button calibration and testing of stressed input signal using GRL-USB31-RXA
  - 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 (2/4)

- Generating Link Sequence using MX183000A-PL012

Support Standards
- USB 3.0, 3.1 Gen 1 (5 Gbit/s), 3.1 Gen 2 (10 Gbit/s)

Test Pattern
- Compliance (Gen 1: CP0, CP1, CP2, CP4, CP5, CP6, Gen 2: CP9), User

LTSSM State
- Transition to eSS.Inactive, Rx.Detect, Polling, Loopback

Loopback Through
- Configuration

TS Setting Parameters
- SKIP Insertion, 8B/10B, 128B/132B, Scrambling

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 (3/4)

Transition to Loopback State and Stressed Signal Input Test

(Configuration using Artek USB Test Adapter)

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

J1510A x2 Pickoff Tee
J1551A 80cm Skew Matched Cable
J1625A x3 1 m Cable
Artek USB Test Adapter
DUT(Rx)
DUT(Tx)
USB 3.1 Rx Test (4/4)

- Stressed Signal Input Test (GRL-USB31-RXA Pass/Fail Test)
Appendix
## Ordering Information (1/2)

<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>1</td>
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<tr>
<td>MU181000A/B</td>
<td>Synthesizer</td>
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<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>
<td>1</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>
<td>2</td>
<td>1</td>
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<tr>
<td>MX183000A</td>
<td>High-Speed Serial Data Test Software</td>
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<td>G0373A</td>
<td>USB3.1 Receiver Test Adaptor</td>
<td>-</td>
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*Automation  software sold by Granite River Labs ([http://graniteriverlabs.com/](http://graniteriverlabs.com/))
## Ordering Information (2/2)

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<thead>
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<th>Model</th>
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<td>N-SMA ADAPTER</td>
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<td>41KC-20</td>
<td>20 dB ATT</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>
<td>2*</td>
</tr>
<tr>
<td></td>
<td>J1508A</td>
<td>BNC-SMA Connector Cable</td>
<td>2*</td>
</tr>
<tr>
<td></td>
<td>J1615A</td>
<td>Cable Set</td>
<td>1*</td>
</tr>
<tr>
<td></td>
<td>J1551A</td>
<td>Coaxial Skew Matched Cable (0.8 m,</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>K-connector)</td>
<td></td>
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<td>J1624A</td>
<td>Coaxial Cable 0.3 m</td>
<td>2*</td>
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<td>J1625A</td>
<td>Coaxial Cable 1 m</td>
<td>6</td>
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<td>J1715A</td>
<td>Coaxial Cable 0.1 m (SMP-J, SMA-J)</td>
<td>4</td>
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*Standard accessory for MP1800A series*