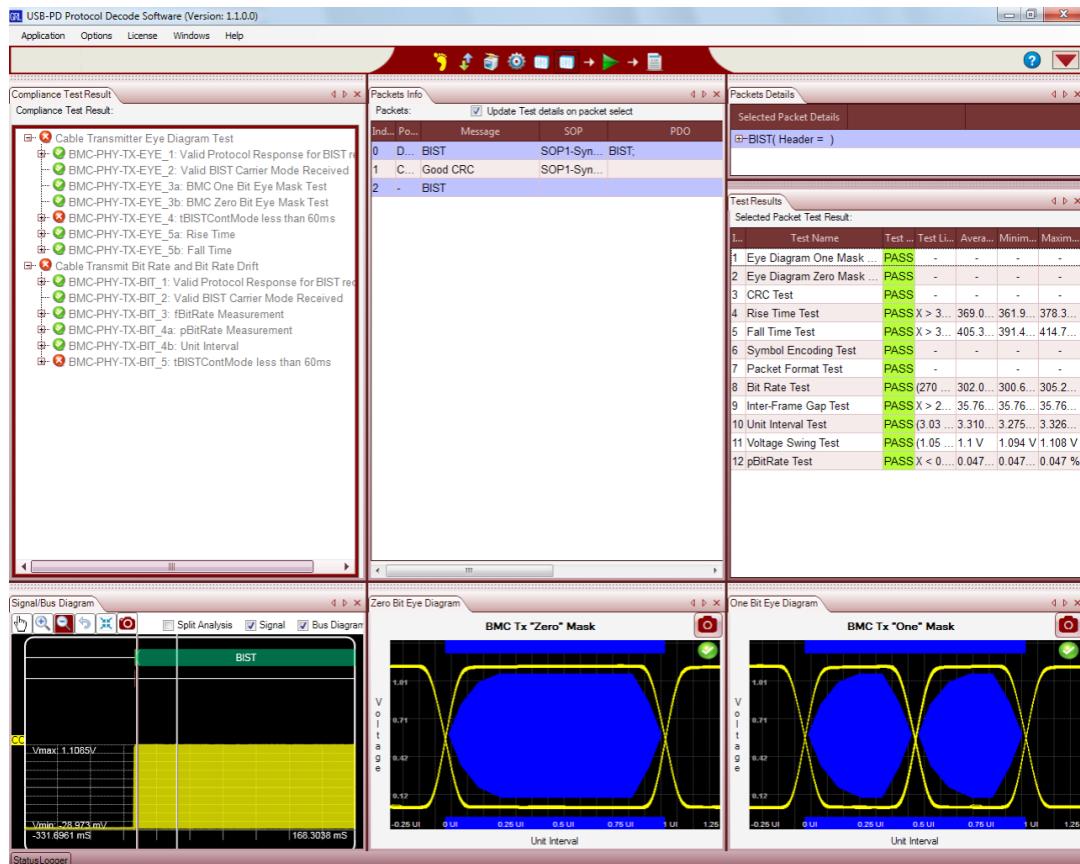


Keysight N8840A

USB Power Delivery Electrical and Protocol Compliance Test Software For Infiniium Oscilloscopes

Data Sheet



This application is available in the following license variation:

- Fixed to an oscilloscope

Easily Run USB Power Delivery Compliance and Validation Tests Using Your Infiniium Oscilloscopes

The Keysight Technologies, Inc. N8840A USB power delivery (PD) electrical and protocol compliance test software for Infiniium oscilloscopes gives you a fast, easy way to validate and debug your USB power delivery provider, consumer, dual-role device, and eMarker cable. USB power delivery electrical and protocol compliance test software allows you to automatically execute a USB Type-C power delivery compliance test plan for host/device and eMarker cable, and see the results in a comprehensive report format (.pdf, .csv, and .xml).

Features

USB PD electrical and protocol compliance software offers several features for design validation:

- Conforms to the latest USB-IF USB PD specification and test plan
- Performs electrical physical layer (BMC-PHY) tests
- Performs protocol layer (BMC-PROT) tests
- Performs power state (BMC-POW) tests
- Fully automates all tests required for USB PD certification
- Supports a full range of USB-PD devices test – provider, consumer, dual-role device and eMarker cable
- Automatically saves all waveforms for further analysis and debug
- Fully automates the USB PD compliance test process from product registration to certification approval

Using USB PD compliance software, you can perform required USB PD compliance test in your lab for everyday debugging and shorten your product development time.

Simple Test Setup Connections

Depending on the unit under test (UUT) type, the N8840A software provides a simple connection diagram for each of test.

Supported UUT types

- Consumer only
- Provider/consumer
- Consumer/provider
- Cable
- DRP
- Provider only

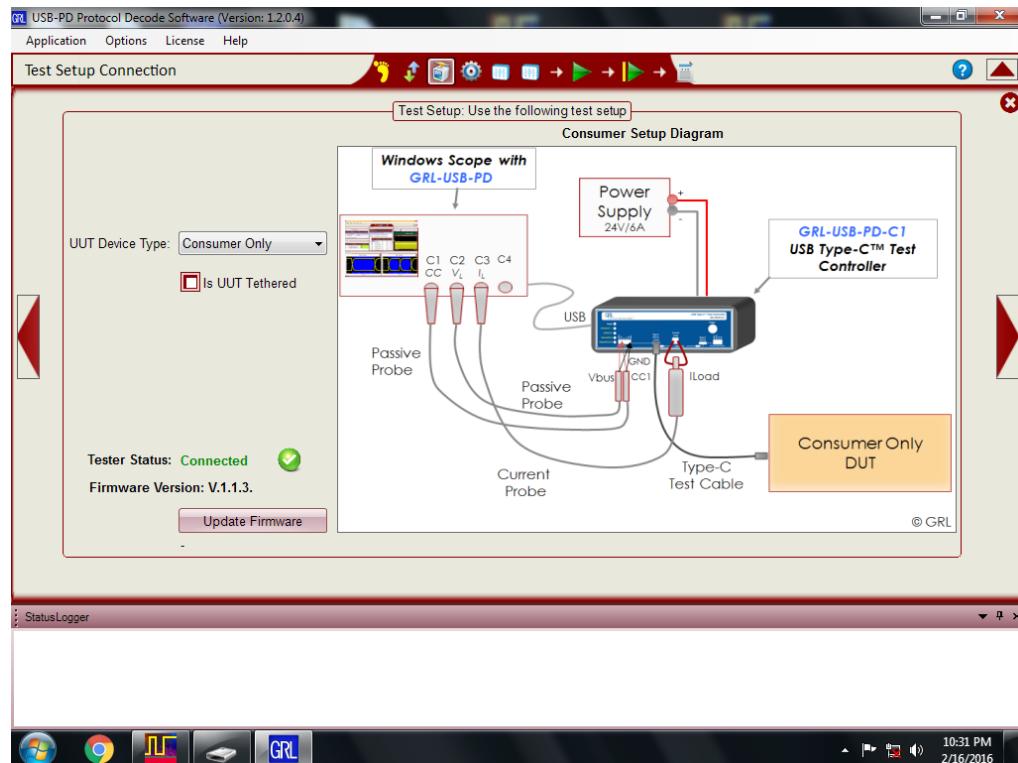


Figure 1. Test set up diagram provided by USB-PD software.

Simple Test Setup Connections (Continued)

Simplify configuration setup with capabilities identification

Keysight N8840A USB PD compliance software provides a comprehensive way to determine what kind of power data object (PDO) it is supporting, without needing the product capabilities profile that is typically provided by the developer.

If specific capabilities of UUT are unknown, the software verifies the UUT's capabilities with the USB PD controller. This function helps prevent UUT damage during testing.

For example, if the provider UUT's maximum current is entered as 3 A, and the UUT actually supports 1.5 A, test gear will perform 3 A load test for this UUT and it will probably destroy UUT. However, using the software's capabilities check feature before testing prevents such testing since the reading capabilities do not support that power profile.

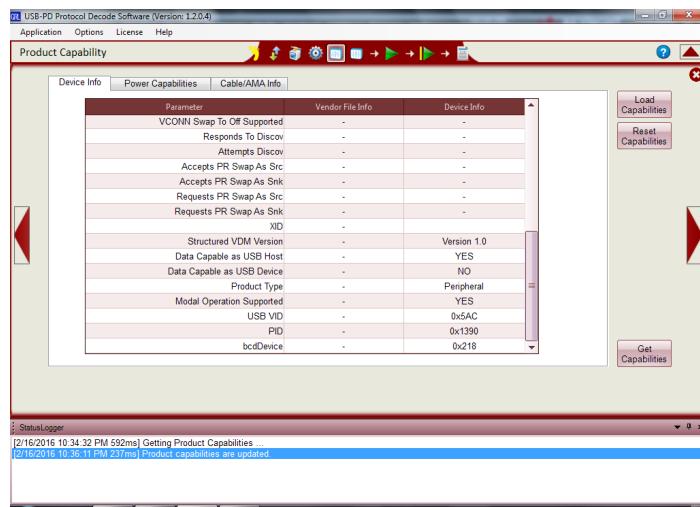


Figure 2. Device information of UUT.

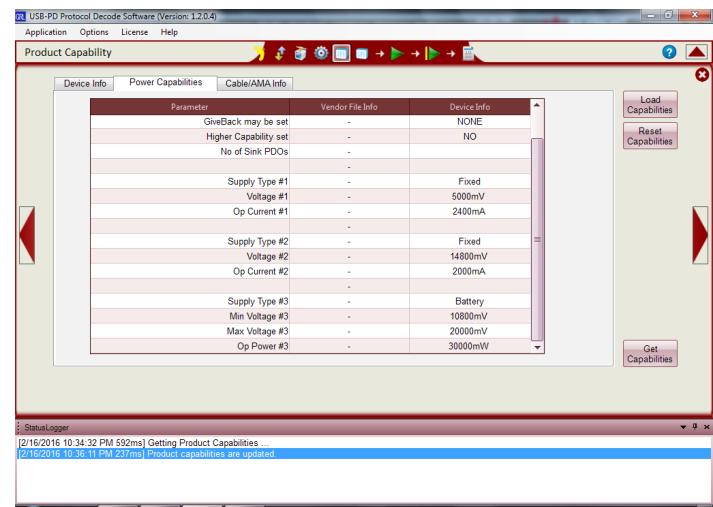
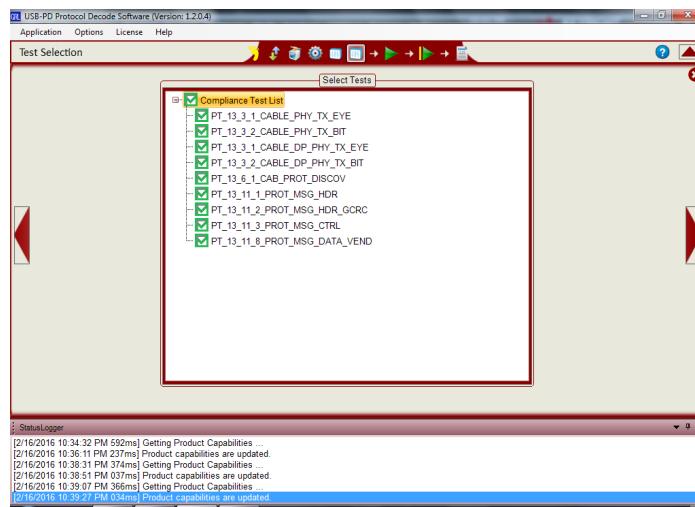


Figure 3. Power capabilities of UUT.

Solid Test Results

Software can be tested using live signals from an oscilloscope as well as saved waveforms. N8840A provides a convenient way to share test results with other teams or team members to streamline efforts to identify the root of issues. It helps you confidently launch reliable products and get to market quickly.

By using a real oscilloscope and an advanced software-based BMC clock recovery algorithm, N8840A USB PD compliance software provides the most accurate bi-phase marking coding (BMC) eye diagram with UUT's built-in self-test (BIST) waveform. This helps ensure the accuracy of signal integrity for UUT.



Selectable test items

Test items configured by the device information feature eliminates the need to test item parameters.

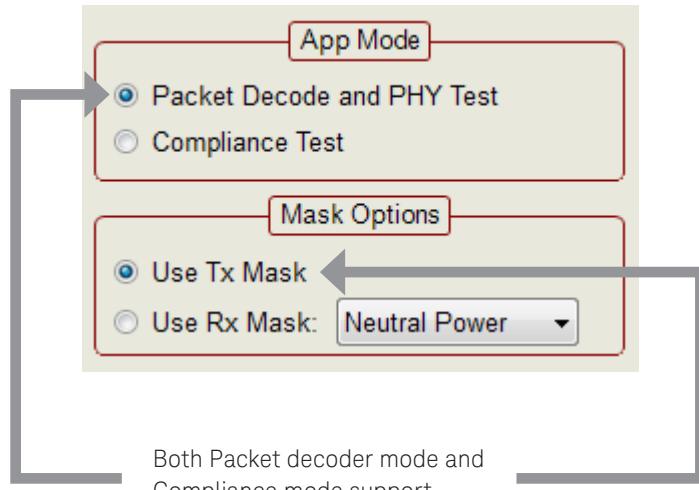


Oscilloscope-based solution

On-screen acquisition of data allows you to easily assess how well a UUT works.

Comprehensive Protocol Decoding Function

N8840A USB Type-C power delivery software provides compliance test results and a protocol decoding function of the configuration channel (CC) line signal. These capabilities give you more insight into test results and help you debug issues faster.



In...	Port...	Message	SOP	PDO	Message...	V...	Header...	Payload...
0	UFP	Good CRC	SOP-Sync...	Control	1	0x0...		
9	DFP	PS_RDY	SOP-Sync...	Control	2	0x0...		
10	UFP	Good CRC	SOP-Sync...	Control	2	0x0...		
11	DFP	Get Sink Capability	SOP-Sync...	Control	3	0x0...		
12	UFP	Good CRC	SOP-Sync...	Control	3	0x0...		
13	UFP	Sink Capabilities	SOP-Sync... Fixed Supply,	Data	1	0x1...	0x2A019...	
14	DFP	Good CRC	SOP-Sync...	Control	1	0x0...		
15	DFP	Vendor Defined	SOP-Sync... Discover Identity-Initiator	Data	4	0x1...	0xFF008...	
16	UFP	Good CRC	SOP-Sync...	Control	4	0x0...		
17	UFP	Vendor Defined	SOP-Sync... Discover Identity-Responde...	Data	2	0x5...	0x110000...	
18	DFP	Good CRC	SOP-Sync...	Control	2	0x0...		
19	DFP	Vendor Defined	SOP-Sync... Discover SVIDs-Initiator	Data	5	0x1...	0xFF008...	
20	UFP	Good CRC	SOP-Sync...	Control	5	0x0...		
21	UFP	Vendor Defined	SOP-Sync... Discover SVIDs-Responder...	Data	3	0x2...	0xFF010...	
22	DFP	Good CRC	SOP-Sync...	Control	3	0x0...		

Protocol packet decode supporting

Packet decode of BMC signals makes PHY testing on a new waveform or acquired waveform easy.

Selected Packet Details			
Source Capabilities: Header = 0x31 0x61) + PDO[1] = Fixed Supply-Source (0x96 0x00 0x01 0x28) + PDO[2] = Fixed Supply-Source (0x2C 0xC1 0x03 0x00)			
Bit(s)	Field Description	Raw Data	Value
B31..30	Supply Type	0x0	Fixed Supply
B29	Dual Role Power	0x0	False
B28	USB Suspend Supported	0x0	False
B27	Externally Powered	0x0	False
B26	USB Communications Capable	0x0	False
B25	Data Role Swap	0x0	False
B24..22	Reserved	0x0	
B21..20	Peak Current	0x0	Peak current equals IOC
B19..10	Voltage	0xF0	20000mV
B9..0	Maximum Current	0x12C	3000mA

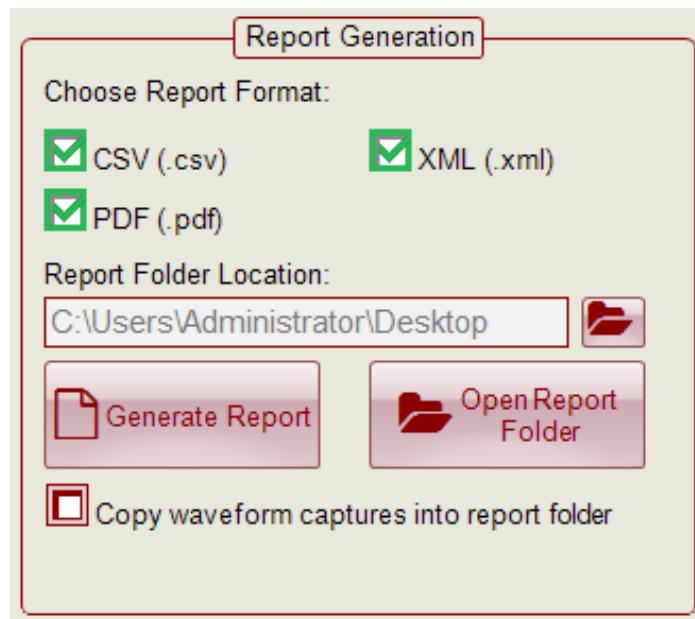
Source Capabilities: Header = 0x31 0x61) + PDO[3] = Fixed Supply-Source (0x2C 0x41 0x06 0x00)			
Bit(s)	Field Description	Raw Data	Value
B31..30	Supply Type	0x0	Fixed Supply
B29	Dual Role Power	0x0	False
B28	USB Suspend Supported	0x0	False
B27	Externally Powered	0x0	False
B26	USB Communications Capable	0x0	False
B25	Data Role Swap	0x0	False
B24..22	Reserved	0x0	
B21..20	Peak Current	0x0	Peak current equals IOC
B19..10	Voltage	0x190	20000mV
B9..0	Maximum Current	0x12C	3000mA

Protocol packet detail

Detailed protocol packet information is provided on specific packets. This example shows source support for three types of power data objects (PDOs) and shows specific PDO[2] and PDO[3] detail.

Report Generating

N8840A supports three report formats: .csv (comma separated value), XML, and PDF. This makes it easy to share result with several ways. Reports generated for saved packet lists can be printed for each test item, providing a helpful reference when the cause of test failures need to be located.



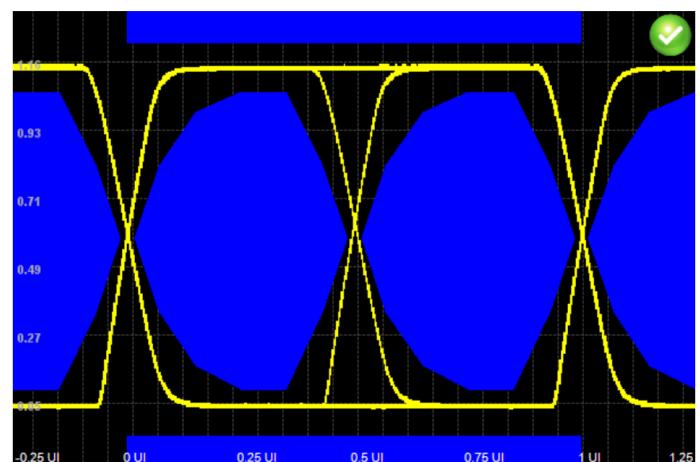
Report generation

Supporting .csv, XML, and PDF formats, N8840A makes it easy to generate test reports and see saved waveforms and results so debugging test results can be reviewed.

Compliance Test Result

Sl No	Test Sec	Test ID	Test Name	Test Result
1	13.7.1	TDA.2.1.1.1	BMC-PHY-TX-EYE_1 >> Valid Protocol response for BIST Request	PASS
			BMC-PHY-TX-EYE-2 >> Valid BIST response pattern	PASS
			BMC-PHY-TX-EYE-3 >> Eye diagram plot	PASS
			BMC-PHY-TX-EYE-4 >> BIST pattern duration 45.4214947 mS (Limit <= 60ms)	PASS
			BMC-PHY-TX-EYE_5 >> Rise time: Average value = 355.093053 nS Minimum value = 351.856881 nS Maximum value = 359.236903 nS Minimum Limit = 300 ns	
			Fall time: Average value = 440.244680 nS Minimum value = 435.320675 nS Maximum value = 444.906345 nS Minimum Limit = 300 ns	
2	13.7.2	TDA.2.1.1.2	BMC-PHY-TX-BIT_1 >> Valid Protocol response for BIST Request	PASS
			BMC-PHY-TX-BIT_2 >> Valid BIST response pattern	PASS

BMC Eye Diagram



Test result

Easy-to-understand test reports show details of results including the description of test item pass/fail criteria and the visualized BMC eye diagram test result so you can have confidence in the results.

Software Ordering Information

USB PD electrical and protocol compliance test software

Fixed	User-installed	N8840A-1TP
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Order Configuration

eMarker cable test

(Requires scope configuration and common configuration)

Scope configuration

1. S-Series

Product name	Description	Qty
Any bandwidth of S-Series scope	S-Series oscilloscope	1
N2873A	Passive probe (included in scope)	2

2. V-Series

Product name	Description	Qty
Any model of V-Series scope	V-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	2

3. 9000 Series

Product name	Description	Qty
Any model of 9000 Series scope	9000 Series oscilloscope	1
N2873A	Passive probe (included in scope)	2

4. 90000 Series

Product name	Description	Qty
Any model of 90000 Series scope	90000 Series oscilloscope	1
E2697A	High impedance adopter and passive probe	2

5. Q-Series

Product name	Description	Qty
Any model of Q-Series scope	Q-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	2

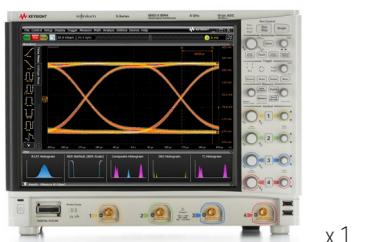
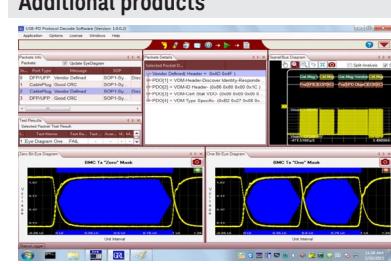
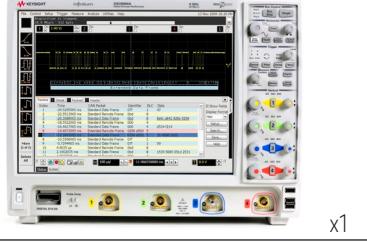
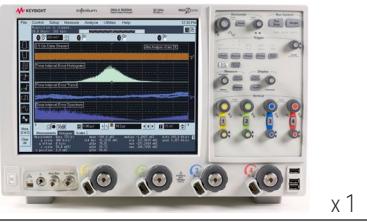
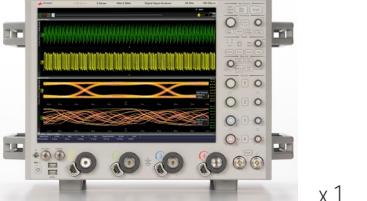
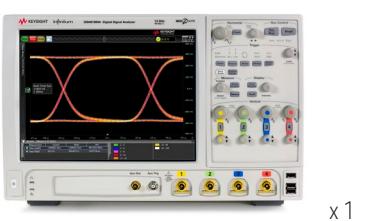
6. Z-Series

Product name	Description	Qty
Any model of Z-Series scope	Z-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	2

Order Configuration (Continued)

Common configuration for eMarker cable

Product name	Description	Qty
N8840A	PD compliance software	1
N6705B (optional)	Modular power supply frame	1
N6752A (optional)	Power supply module	1
Coupon (optional)	Test fixture	1
PD controller	Power delivery controller	1

Series	Scope	Probe	Additional products
S-Series	 x 1		 N8840A x 1
9000 Series	 x1	N2873A x 2 (included)	 N6705B x 1
V-Series	 x 1		 N6752A x 1
Q-Series	 x 1	N5449A x 2	 PD coupon x 1
Z-Series	 x 1		 PD controller x 1
90000 Series	 x 1		

Order Configuration (Continued)

Provider test

(Requires scope configuration and common configuration)

Scope configuration

1. S-Series

Product name	Description	Qty
Any bandwidth of S-Series scope	S-Series oscilloscope	1
N2873A	Passive probe (included in scope)	2
1147A/N2893A	Current probe	1

2. V-Series

Product name	Description	Qty
Any model of V-Series scope	V-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	3
1147A/N2893A	Current probe	1

3. 9000 Series

Product name	Description	Qty
Any model of 9000 Series scope	9000 Series oscilloscope	1
N2873A	Passive probe (included in scope)	2
1147A/N2893A	Current probe	1

4. 90000 Series

Product name	Description	Qty
Any model of 90000 Series scope	90000 Series oscilloscope	1
E2697A	High impedance adopter and passive probe	3
N2782B/N2893B	Current probe	1
N2279A	Current probe power supply	1

5. Q-Series

Product name	Description	Qty
Any model of Q-Series scope	Q-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	3
1147A/N2893A	Current probe	1

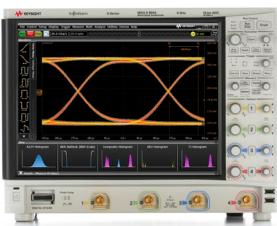
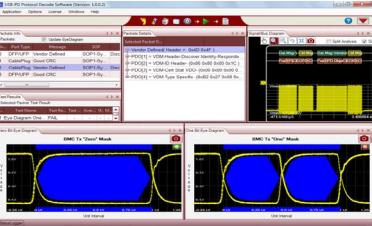
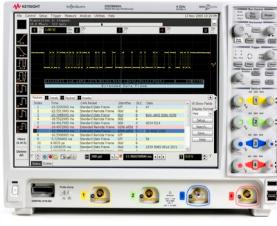
6. Z-Series

Product name	Description	Qty
Any model of Z-Series scope	Z-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	3
1147A/N2893A	Current probe	1

Order Configuration (Continued)

Common configuration for provider

Product name	Description	Qty
N8840A	PD compliance software	1
N3301A	eLoad frame	1
N3303A	eLoad module	1
82357B	USB-GPIB interface	1
Coupon (optional)	Test fixture	1
PD controller	Power delivery controller	1

Series	Scope	Probe	Additional products
S-Series		 N2873A x 2 (included)	
9000 Series		 1147A or N2893A x 1	N8840A x 1
V-Series			 N3301A x 1
Q-Series		 N5449A x 3	 N3303A x 1
Z-Series			 82357B x 1
90000 Series		 N2697A x 3	 PD coupon x 1
			 PD controller x 1

Order Configuration (Continued)

Consumer test

(Requires scope configuration and common configuration)

Scope configuration

1. S-Series

Product name	Description	Qty
Any bandwidth of S-Series scope	S-Series oscilloscope	1
N2873A	Passive probe (included in scope)	2

2. V-Series

Product name	Description	Qty
Any model of V-Series scope	V-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	2

3. 9000 Series

Product name	Description	Qty
Any model of 9000 Series scope	9000 Series oscilloscope	1
N2873A	Passive probe (included in scope)	2

4. 90000 Series

Product name	Description	Qty
Any model of 90000 Series scope	90000 Series oscilloscope	1
E2697A	High impedance adopter and passive probe	2

5. Q-Series

Product name	Description	Qty
Any model of Q-Series scope	Q-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	2

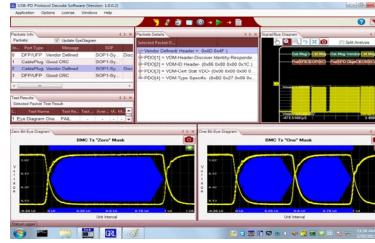
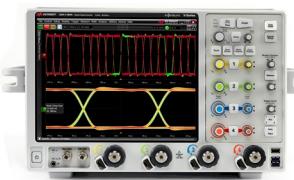
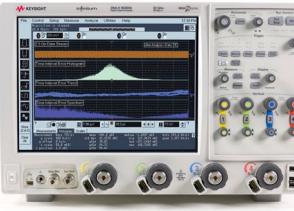
6. Z-Series

Product name	Description	Qty
Any model of Z-Series scope	Z-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	2

Order Configuration (Continued)

Common configuration for consumer

Product name	Description	Qty
N8840A	PD compliance software	1
N6705B (optional)	Modular power supply frame	1
N6752A (optional)	Power supply module	1
Coupon (optional)	Test fixture	1
PD controller	Power delivery controller	1

Series	Scope	Probe	Additional products
S-Series	 x 1		 N8840A x 1
9000 Series	 x 1	N2873A x 2 (included)	 N6705B x 1
V-Series	 x 1		 N6752A x 1
Q-Series	 x 1	N5449A x 2	 PD coupon x1
Z-Series	 x 1		 PD controller x 1
90000 Series	 x 1		

Order Configuration (Continued)

Dual-role device

(Requires scope configuration and common configuration)

Scope configuration

1. S-Series

Product name	Description	Qty
Any bandwidth of S-Series scope	S-Series oscilloscope	1
N2873A	Passive probe (included in scope)	2
1147A/N2893A	Current probe	1

2. V-Series

Product name	Description	Qty
Any model of V-Series scope	V-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	3
1147A/N2893A	Current probe	1

3. 9000 Series

Product name	Description	Qty
Any model of 9000 Series scope	9000 Series oscilloscope	1
N2873A	Passive probe (included in scope)	2
1147A/N2893A	Current probe	1

4. 90000 Series

Product name	Description	Qty
Any model of 90000 Series scope	90000 Series oscilloscope	1
E2697A	High impedance adopter and passive probe	3
N2782B/N2893B	Current probe	1
N2279A	Current probe power supply	1

5. Q-Series

Product name	Description	Qty
Any model of Q-Series scope	Q-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	3
1147A/N2893A	Current probe	1

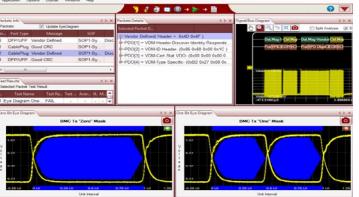
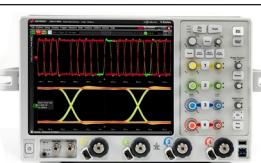
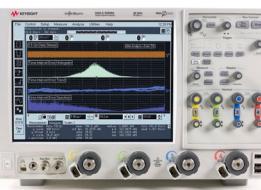
6. Z-Series

Product name	Description	Qty
Any model of Z-Series scope	Z-Series oscilloscope	1
N5449A	High impedance adopter and passive probe	3
1147A/N2893A	Current probe	1

Order Configuration (Continued)

Common configuration for DRD

Product name	Description	Qty
N8840A	PD compliance software	1
N3301A	eLoad frame	1
N3303A	eLoad module	1
82357B	USB-GPIB interface	1
N6705B (optional)	Modular power supply frame	1
N6752A (optional)	Power supply module	1
Coupon (optional)	Test fixture	1
PD controller	Power delivery controller	1

Series	Scope	Probe	Additional products
S-Series	 x1	 N2873A x 2 (included)	 N8840A x 1
9000 Series	 x1	 1147A or N2893A x 1	 N3301A x 1
V-Series	 x1	 N5449A x 3	 N3303A x 1
Q-Series	 x1		
Z-Series	 x1		 82357B x1
90000 Series	 x1	 N2697A x 3	 PD coupon x1
		 N2782B + N2279A	 PD controller x1

Related Literature

Publication title	Publication number
<i>Infiniium 90000 Series Oscilloscopes - Data Sheet</i>	5989-7819EN
<i>Infiniium 9000 Series Oscilloscopes - Data Sheet</i>	5990-3746EN
<i>Infiniium Z-Series Oscilloscopes - Data Sheet</i>	5991-3868EN
<i>Infiniium S-Series High-Definition Oscilloscopes - Data Sheet</i>	5991-3904EN
<i>Infiniium V-Series Oscilloscopes - Data Sheet</i>	5992-0425EN
<i>N7015A and N7016A Type-C Test Fixtures - Data Sheet</i>	5992-1073EN
<i>N8837A USB-PD Protocol Triggering and Decode for Infiniium Series Oscilloscopes - Data Sheet</i>	5992-1207EN

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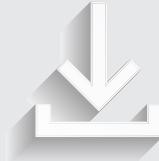
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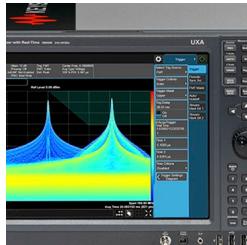
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