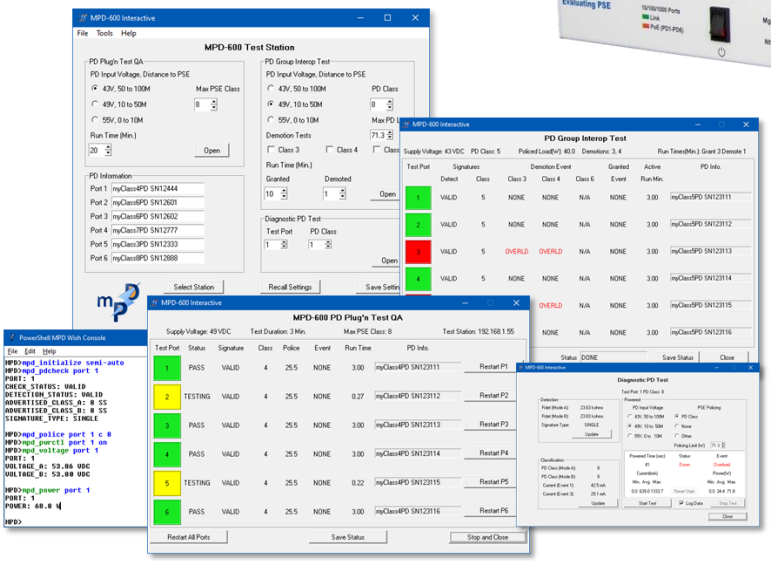
MPD-600
Multi-PD Evaluating PSE
IEEE 802.3at & 802.3bt Power over Ethernet

Product Overview

MPD-600



MPD Interactive Software

Key Features

- ❑ **Evaluate Up To 6 PDs Simultaneously (Class 0, 1, 2, 3, 4, 5, 6, 7, or 8)**
- ❑ **Plug'n Test: Connect Any PD and Testing Automatically Begins**
- ❑ **Pick A Voltage: Test Your PDs with 43VDC, 49VDC, and 55VDC Inputs to Simulate Long, Medium, and Short Length Network Connections**
- ❑ **Automatically Detect Inrush, Overload, Transient, and MPS Violations**
- ❑ **Group Interop Test: Evaluate Power Demotion, Signature Validity, and Power Loading Compliance on Up To 6 PDs Concurrently**
- ❑ **Over 480W Total PD Power Capacity (> 80W per port)**
- ❑ **Diagnostic Test: Troubleshoot Individual PDs for Detection and Class Signature Values, Min-Max-Average Current and Power Draw with User-Specified Power Policing**
- ❑ **10/100/1000Base-T Management and Network Access Ports**
- ❑ **Capture and Report Network-Assigned IP Addresses to Each PD**
- ❑ **Highly Intuitive MPD Interactive Software Option**
- ❑ **Powerful Program Development API for Windows and Linux**

Verification, *Simplified.*

One Box Solution

- **Replaces Injectors, Cable Spools, DC Power Supplies, System PSE's, Break-out Boards, DC Meters**
- **Just *Plug and Test***

IEEE 802.3bt & 802.3at PD's

- **Type-1 (≤ 13W) PDs**
- **Type-2 (≤ 25.5W) PDs**
- **Type-3 (≤ 51W) PD's**
- **Type-4 (≤ 71.3W) PD's**

In The Factory

- **Test 6 PDs Together**
- **Full Voltage Range Testing**
- **Assure Signature Validities**
- **Automatically Capture 802.3 Powering Violations (Inrush, Average, Peak, DC MPS) with User-Specified Policing**
- **Monitor Current and Power Draw in Real Time**
- **Assess Power Demotion Responses**
- **Automation Friendly Software**

In The Field

- **Qualify PDs in Any Application or Environment**
- **Pre-Screen Problem PD's**
- **Troubleshoot Problem PD's**
- **Test Over Long Durations to Trap Rare Intermittent Issues**
- **Operate PDs While Testing Runs on Up To 6 PD's**

Overview

From the industry leader in highly automated Powered Device (PD) 802.3 specification conformance testing comes a one-box solution for volume testing of PDs in QA, manufacturing, and field settings. The MPD-600 is a compact 1U rack-mountable instrument that tests groups of up to 6 PDs simultaneously, reducing average verification time for each PD. Powerful MPD-600 software enables everything from simple "zero-click" PD evaluation to highly customized PD test automation from a variety of platforms and programming languages.

What Makes the MPD-600 Unique?

The MPD-600 is functionally an 802.3 compliant PSE with full capability to assess PD compliance to 802.3 powering specifications associated with any PD Class (0 to 8) while operating at both minimum (43VDC) and maximum (55VDC) voltage extremes. Stated another way, **the MPD-600 is the most demanding PSE a PD will ever encounter**.

Powering specifications such as **inrush loading**, **average power draw**, **peak transient power**, and **DC MPS** loading are monitored independently and simultaneously in real time to all PDs under test. PD responses to power demotions and **user-specified power policing** limits are readily obtained. Detection (KΩ) and classification signature (mA) parameters are easily accessible.

Overcome Limitations of Other Test Methods

Use of PoE injectors is a convenient, low cost way to power a PD and then manage the PD across the LAN. However, commercial PoE injectors introduce **severe limitations** as they don't necessarily represent a compliant PSE and have no ability to police power draw near to or at the 802.3 standard boundaries where PDs should be tested. Further, injectors don't support PD input voltage extremes such as low voltage where current levels are maximized.

Test strategies that add long cable spools between PSE and PD may add to "peace of mind" but the truth is that there is nothing "calibrated" about a 100 meter spool of cable in line with an uncharacterized PSE.

Designed for Factory Test Automation

The MPD-600 incorporates a 10/100/1000 LAN port for instrument management and a separate LAN port for remote management of the PDs under test. Host PC software manages the MPD-600 across the LAN. A robust command application programming interface enables construction of specialized PD test application software tailored to the unique characteristics of PDs to be tested while capitalizing on the ability to test up to 6 PDs at a time.

Assessing PDs in the Field and Field Service Environment

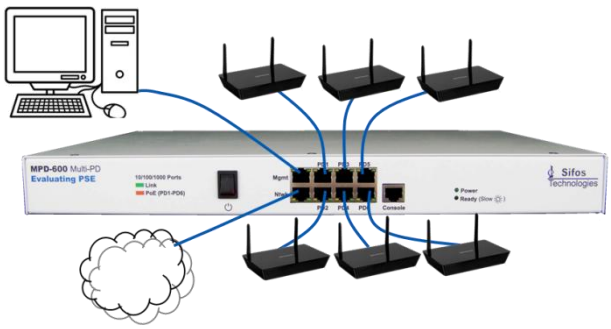
The optional MPD Interactive Software working with the MPD-600 makes easy work of pre-certifying or evaluating PDs placed in customer/end-user settings. Evaluating arbitrarily selected PDs can be as simple as plugging them into the MPD-600 with the **Plug'n Test** menu. More sophisticated interoperability testing is achieved with the **Group Interop** test application and **the PD Diagnostic** test application. PDs can be interactively managed over the network while testing runs using IP addresses recovered by MPD-600 software.

Verification, Simplified.

A Whole New Strategy for PD Verification

As the first and only product of its kind, the MPD-600 **Evaluating PSE** radically simplifies Powered Device verification/qualification in lab, manufacturing, and field settings. Replace injectors, cable spools, DC Power supplies, system PSEs, break-out boards, and DC meters with more comprehensive, more flexible, more effective, and more space efficient PD testing!

The old way of PD evaluation and validation



The new way of PD evaluation and validation

MPD Interactive: Plug'n Test Menu

PD verification doesn't get easier than this. Just plug any PD into any of the 6 PD ports and let the testing run. Testing is preconfigured to specify PD input voltage, maximum PSE (class) capacity, and testing duration.

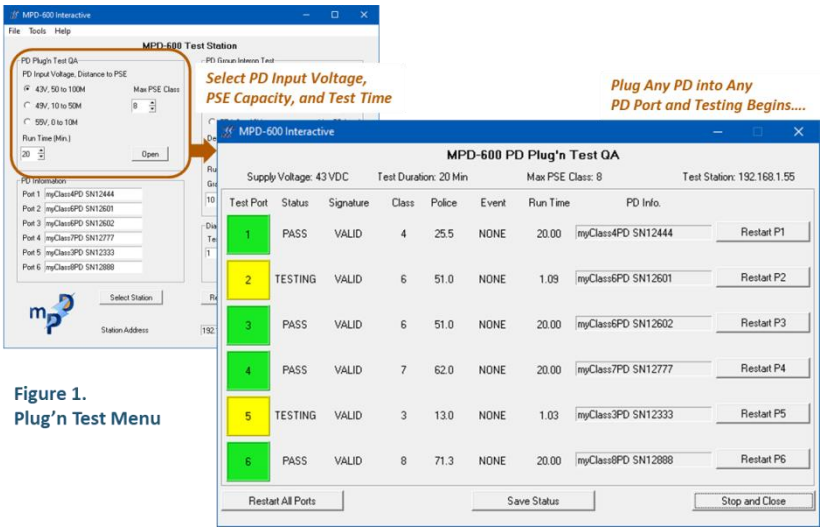


Figure 1.
Plug'n Test Menu

Opening the **Plug'n Test** menu (*see Figure 1*) initiates testing on any PDs plugged into any of the 6 PD ports. Testing also starts when a PD is plugged into an unoccupied PD port. Push buttons enable re-start of testing on individual or all PD ports.

PDs may be a heterogeneous mix of different PD classes and power loads. In Figure 1, there are two Class 6 PD's, and 1 each of a Class 4, Class 3, Class 7, and Class 8 PD.

Virtual LED indicators show when a PD is powered, when it is linked, and if it passes or fails testing.

The testing will police the PD power draw to the maximum wattage allowed to each PD class. For example, the Class 6 PDs are allowed to draw 51 watts. If the PD draws more than 51 watt (**Pclass_pd**) for a period of longer than 60msec or for a duty cycle of greater than 5%, the port will shut down with an **OVERLOAD** event. The policed power values are displayed in the menu as testing is running and when testing is completed.

If the PD exceeds 420mA inrush current for longer than 60 msec during power-up, the test will shut down with an **INRUSH** violation event. If the PD draws less than 16mA for longer than 320msec, the test will shut down with an **MPS** violation event. Timing of any shutdown events is displayed and recorded.

Testing runs for the duration, in minutes, specified by the user. Once a PD is powered and linked, MPD Interactive can provide network-assigned IP addresses for each PD from the [**Tools**] dropdown menu. PDs can then be manipulated over the network while testing is conducted.

A text file report depicting test status and test results can be opened while testing runs or when testing completes.

MPD Interactive: Group Interop Test Menu

A more robust form of PD verification is easily performed using the **Group Interop Test** menu (*see Figure 2*). The Group Interop Test is configured to test a homogenous group of PDs with equivalent PD class. Unlike the Plug'n Test menu, the Group Interop Tests run on up to 6 PD ports synchronously making it more suited to batch testing of similar or identical PDs. The Group Interop test adds two forms of additional coverage.

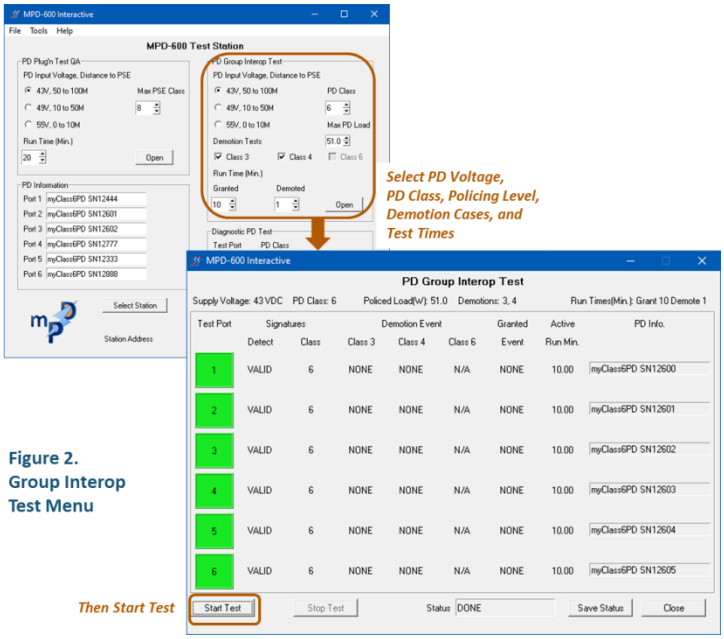


Figure 2. Group Interop Test Menu

Demotion Case Testing

For PDs of Class 4 or higher, the testing will optionally run demotion cases to assess how the PD responds when connected to PSE ports that don't have the power capacity desired by the PD. So for example, Class 6 PDs will get powered by a Type-1 (Class 3 capable) and a Type-2 (Class 4 capable) PSE to verify that the PD operates properly in the demoted power class range. If the PD does not accept those power demotions, indications of **OVERLOAD** events will occur and testing will then move on to the full power grant test case.

Refined Power Policing

A second option available to the Group Interop Test is the ability to reduce the maximum expected PD power draw. For example, a Class 7 PD that draws 56 watts can convey that maximum power draw using PoE LLDP. So a user, knowing this PD attribute, can specify the reduced power policing level to use – in this case 56 watts rather than the default 62 watts. If during the full grant portion of the testing, the PD draws more than 56 watts for longer than 60msec or greater than 5% duty cycle, it will be flagged with an **OVERLOAD** event and the testing will be shut down.

Beside the demotion case testing and refined power policing, the **Group Interop Test** offers coverage equivalent to the **Plug'n Test** menu including **Inrush violations** and **DC MPS violations**.

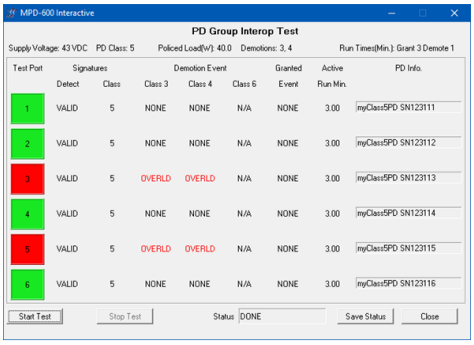


Figure 3. Group Interop Demotion Failures

The testing is initially configured by specifying the PD input voltage (43VDC, 49VDC, or 55VDC), the PD Class, the desired demotion cases if applicable, any non-default policed power level, and the duration of granted and demoted case testing in minutes. Test durations can be specified to allow network interaction with PD while the testing is running. Test Port virtual LED indicators will turn green when a test completes with no violations, yellow while testing is active, amber if PD is linked during testing, and red when a violation event is detected (*see Figure 3*). As with the Plug'n Test, a text file report depicting test results can be opened when testing completes.

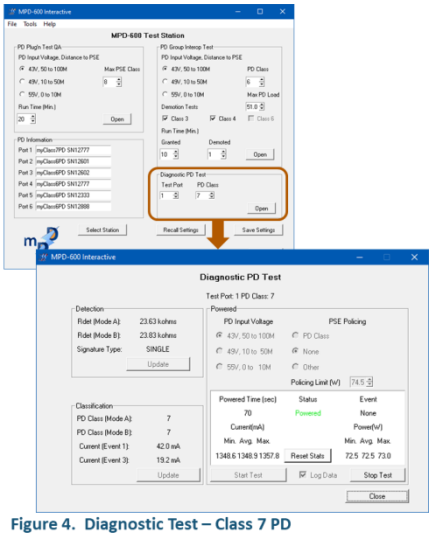


Figure 4. Diagnostic Test – Class 7 PD

MPD Interactive: Diagnostic PD Test

With MPD Interactive software, the **Diagnostic PD Test** is a third testing application designed for more resolved analysis and troubleshooting of a single PD. As an example, a PD failing in the Plug'n Test or Group Interop Test could be a candidate for this form of testing.

Before initiating the Diagnostic PD Test, a user specifies the PD port to be used (PD1-PD6) and PD Class (0-8). Upon entering the Diagnostic PD Test menu (*see Figure 4*), the user specifies the PD input voltage (43V, 49V, or 55V) to be applied and the **PSE Policing** policy. By default, the **PSE Policing** will be to PD Class (**Pclass_pd**), the maximum power allowed to the PD class. As a second alternative, the test can be run with

no PSE power policing meaning testing will not terminate for any PD power overloads. A third alternative is to specify a power limit below **Pclass_pd**, such as would apply to a PD that uses LLDP to furnish power requests. For example, if a Class 6 PD is known to request 46watts, then it can be policed at that power level.

The **Diagnostic PD Test** menu offers ability to measure the PDs detection signature (KΩ) and classification signature currents (mA) prior to initiating the diagnostic testing. These measurements would be very relevant if a PD failed to power during either the Plug'n Test or Group Interop Test applications.

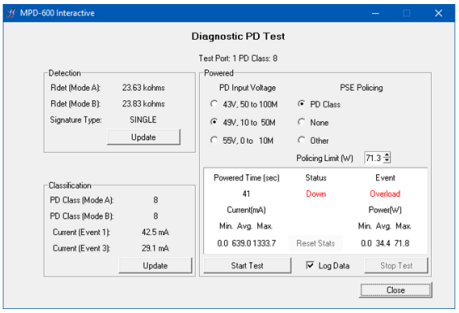


Figure 5. Diagnostic Test – Overload Violation

While the Diagnostic test is running and powering the PD, the menu presents measurements of load current (mA) and PD power draw (watts). These are presented as Minimum, Average, and Maximum values accumulated over the course of the test. Users may at any time reset (or re-initialize) these statistics while the testing is running. Testing runs indefinitely until either there is a powering violation (OVERLOAD, INRUSH, or MPS, *see Figure 5*) or the user terminates the testing manually.

Build Your Own PD Test Applications with PowerShell MPD

The MPD-600 software includes an interactive programming environment built on Tcl/Tk. Customized test applications for volume QA and manufacturing test are readily produced and debugged using intuitive Tcl command extensions for managing the MPD-600. MPD software including **MPD Interactive** and **PowerShell MPD** will run on Microsoft Windows and Linux PC hosts.

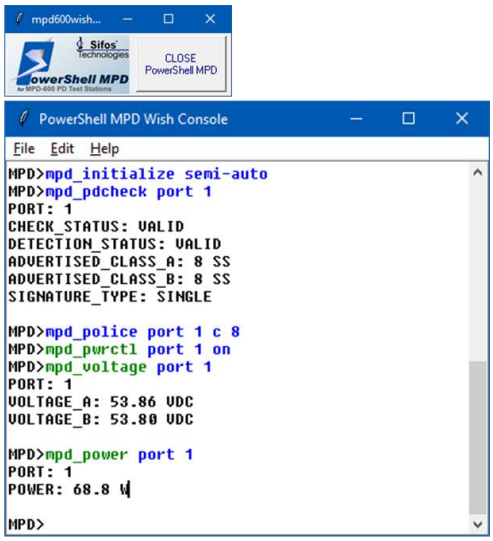


Figure 6. PowerShell MPD – Wish Shell

The PowerShell MPD Wish Shell (*see Figure 6*) is a command-knowledgeable interactive shell with typical Microsoft Windows features for cut-copy-paste actions and text editing.

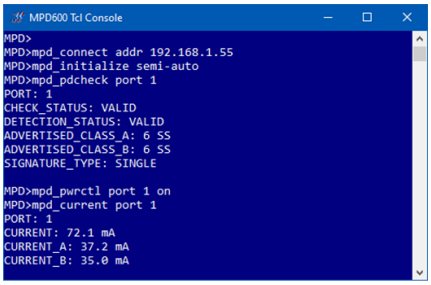


Figure 7. PowerShell MDP – Tcl Shell

PowerShell MPD is also supported on the traditional command shell (e.g. Windows cmd) as shown in Figure 7.

MPD-600 host software also provides a customized Tcl/Tk and MPD smart program editing environment for Microsoft Windows built into Notepad++ (*see Figure 8*). Productive authoring and debugging of more complex programs is readily enabled with this feature.

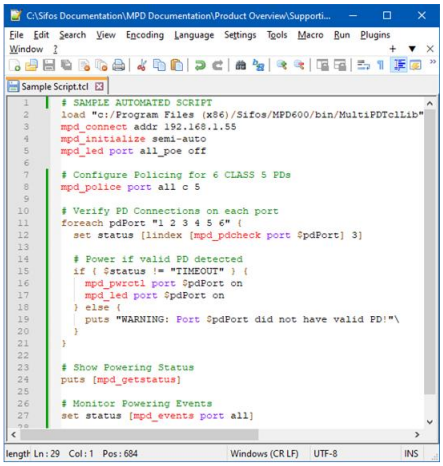


Figure 8. PowerShell MPD Script Editor

PowerShell MPD commands cover a full range of PoE operations as well as ordinary Ethernet switching operations including 10/100/1000Base-T port configurations, link status checking, MAC address recovery, and IP address lookups.

Alternative Programming Languages

MPD-600 software is designed to support any programming environment under Microsoft Windows or Linux that can import binary libraries such as Windows (.dll) or Linux (.so) binaries. Equivalent command sets available to PowerShell MPD are accessible using these binary libraries to other programming languages including C, C++, Visual Basic, etc. PowerShell MPD commands are also available to Python using the tkinter tool.

Technical Specifications: MPD-600

Interfaces

Port(s)	Type	Parameter	Specification
Mgmt	Ethernet	Connections	RJ45
		Data Rates and Signaling	10/100/1000Base-T
		Purpose	Host PC Connection (via network)
Ntwk	Ethernet	Connections	RJ45
		Data Rates and Signaling	10/100/1000Base-T
		Purpose	Network Interaction with PDs under test
PD1 – PD6	Ethernet	Connections	RJ45
		Data Rates and Signaling	10/100/1000Base-T
		Purpose	PD Evaluation Ports
		PoE Output Voltage	43V, 49V, or 55V selectable
		Maximum Power Capacity	80W per port, 480W combined
		PoE Standard	802.3bt, 802.3at
Console	RS232	Connections	RJ45
		Baud Rate	38,400
		Configuration	8-N-1, no flow control
		Purpose	IP Address Config

DC Power to PDs

Resource	Setting	Parameter	Specification
DC Supply	43VDC	Actual PSE Output Voltage @ 1W	42.95 ± 0.2 VDC
		Actual PSE Output Voltage @ 71W	41.70 ± .25 VDC
	49VDC	Actual PSE Output Voltage @ 1W	48.9 ± 0.2 VDC
		Actual PSE Output Voltage @ 71W	47.9 ± 0. 25 VDC
	55VDC	Actual PSE Output Voltage @ 1W	54.9 ± 0.2 VDC
		Actual PSE Output Voltage @ 71W	54.0 ± 0. 25 VDC

PD Detection and Classification

Measurement	Parameter	Specification
PD Detection Signature	Metering & Powering Accept Range	17KΩ to 29KΩ
	Resolution	200Ω
	Non-**VALID** Meter Indications	**HIGH** (>26.6KΩ), **LOW** (<23.2KΩ), **OC** (no PD)
PD Classification Signature	Range	Class 0, 1, 2, 3, 4, 5, 6, 7, 8
	Event 1 Current Range (typical)	< 0.6mA to > 50mA per pairset
	Event 3+ Current Range (typical)	< 0.6mA to > 50mA per pairset
	Resolution	0.01 mA

PD Policing and Event Detection

Resource	Parameter	Specification
Default PD Power Policing (Maximum tolerated PD power draw)	Policed Power – Class 0, 3 PDs	13.25W
	Policed Power – Class 1 PDs	4W
	Policed Power – Class 2 PDs	7W
	Policed Power – Class 4 PDs	25.5W
	Policed Power – Class 5 PDs	40.0W
	Policed Power – Class 6 PDs	51.25W
	Policed Power – Class 7 PDs	62.25W
	Policed Power – Class 8 PDs	71.5W
	Maximum Overload Duration	60 msec (typical)
	Maximum Overload Duty Cycle	5% (typical)
Inrush (Start-up Overload) Event Detection	Inrush Current Violation – Class 0 – 6	> 420mA
	Inrush Current Violation – Class 7-8	> 840mA
	Maximum Inrush Duration	60 msec
DC MPS Event Detection	DC MPS Shutdown Threshold – Class 0-4	5 mA (typical)
	DC MPS Shutdown Threshold – Class 5-8	7 mA (typical)
	Maximum 0mA Duration Tolerance	364 msec (typical)

Technical Specifications: MPD-600 (con'd)

DC Voltage, Current, and Power Metering		
Measurement	**Parameter**	**Specification**
DC Voltage	Measurement Points	Alt-A Pairset, Alt-B Pairsets
	Range	40 VDC – 56 VDC (*meter reports 0V when port not powered*)
	Resolution	10 mV
	Accuracy @ 10mA Load	Reading ± 0.3 V
	Accuracy @ 1500mA Load	Reading – (0.67 ± 0.3) V
DC Current	Measurement Points	4-Pair, Alt-A Pairset, Alt-B Pairsets
	Range 4-Pair:	3.0 mA to 2000 mA
	Range per Pairset	1.5 mA to 1000 mA
	Resolution (4-Pair and Pairset)	0.1 mA
	4-Pair Accuracy (50mA – 350mA)	Reading ± 2.5mA
	4-Pair Accuracy (≥ 350mA)	Reading ± 5 mA
DC Power	Measurement Points	4-Pair
	Range 4-Pair:	0.3 W to 90 W (*meter reports 0W when port not powered*)
	Resolution	0.1 W
	Accuracy @ 10mA Load	Reading ± 0.1 W
	Accuracy @ 1500mA Load	Reading – (1.1W ± 0 5) W

Certifications & Physical Dimensions		
Description	**North America**	**Europe & International**
Safety	**CSA Listed** (CSA22.2 No. 61010)	EN61010-1 (Test & Measurement Equipment)
Emissions	FCC Part 15, Class A ICES-001	EN55011 (Class A Radiated Emissions) EN61326-1 (EMC) VCCI, AS/NZS 3548
European Commission		Low Voltage Directive (2014/35/EU) Electromagnetic Compatibility Directive (2014/30/EU) RoHS 2 Directive (2011/65/EU) **CE Marking** Directive (93/68/EEC)
FCC Statement: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.		
Physical Dimensions	17.5" W x 1.75" H (1 Rack Unit) x 12" D	

Ordering Information

MPD-600, Multi-PD Evaluating PSE including PowerShell MPD software.
MPD-600-GUI: MPD Interactive Software for the MPD-600 (1 license per MPD-600 instrument)
HCopy-Manual: Hardcopy of MPD-600 Technical Reference Manual

Accessories Included:

- MPD Software (CD, USB Stick) for Microsoft Windows and Linux PC's
- USB-Serial to RJ-45 Console Cable
- Power Cord
- Cat5e Patch Cable
- Rack Mounts

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