818P Series
High Power Detector

User's Manual

Newport®
Experience | Solutions

Warranty

Newport Corporation warrants that this product will be free from defects in material and workmanship and will comply with Newport's published specifications at the time of sale for a period of one year from date of shipment. If it is found to be defective during the warranty period, the product will either be repaired or replaced at Newport's option.

To exercise this warranty, write or call your local Newport office or representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the product, freight prepaid, to the indicated service facility. Repairs will be made and the instrument returned freight prepaid. Repaired products are warranted for the remainder of the original warranty period or 90 days, whichever is longer.

Limitation of Warranty

The above warranties do not apply to products which have been repaired or modified without Newport's written approval, or products subjected to unusual physical, thermal or electrical stress, improper installation, misuse, abuse, accident or negligence in use, storage, transportation or handling. This warranty also does not apply to fuses, batteries, or damage from battery leakage.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE. NEWPORT CORPORATION SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE PURCHASE OR USE OF ITS PRODUCTS.

First printing 2004

This manual has been provided for information only and product specifications are subject to change without notice. Any change will be reflected in future printings.

Newport Corporation
1791 Deere Avenue

Irvine, CA, 92606

USA
P/N 41313-01 Rev. O

Declaration of Conformity

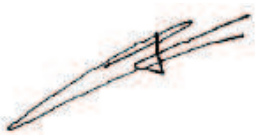
We declare that the accompanying product, the model 818P, identified with the CE mark, meets the intent of the Electromagnetic Compatibility Directive, 89/336/EEC and Low Voltage Directive 73/23/EEC.

Manufacturer's Name:	Newport Corporation
Manufacturer's Address:	1791 Deere Avenue Irvine, CA 92606 USA
Type of Equipment:	Laser Power Detector
Model No.:	818P
Year of test & manufacture:	2002

Standard(s) to which Conformity is declared:

Standard	Description	Performance Criteria
EN 61326 :1997	Limits and methods of measurement of radio interference characteristics of information technology equipment. Testing and measurements of conducted emission	Class A
EN 61326 : 1997	Limits and methods of measurement of radio interference characteristics of information technology equipment. Testing and measurements of radiated emission	Class A
EN 61000-4-2:1995	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4.2: Electrostatic discharge.	Class B
EN 61000-4-3:1996	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 3: Radiated, Radio Frequency immunity.	Class A
ENV 50204: 1995	Radiated Electromagnetic field from digital radio telephones- immunity test 900MHz pulsed	Class A
EN 61000-4-4:1995	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4: Electrical fast transient/burst immunity.	Class B
EN 61000-4-6:1996	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 6: Immunity to conducted Radio Frequency.	Class A

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).



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Newport Corporation Calling Procedure

If there are any defects in material or workmanship or a failure to meet specifications, promptly notify Newport's Returns Department by calling 1-800-222-6440 or by visiting our website at www.newport.com/returns within the warranty period to obtain a **Return Material Authorization Number (RMA#)**. Return the product to Newport Corporation, freight prepaid, clearly marked with the RMA# and we will either repair or replace it at our discretion. Newport is not responsible for damage occurring in transit and is not obligated to accept products returned without an RMA#.

E-mail: rma.service@newport.com

When calling Newport Corporation, please provide the customer care representative with the following information:

- Your Contact Information
- Serial number or original order number
- Description of problem (i.e., hardware or software)

To help us diagnose your problem, please note the following conditions:

- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Have you seen this problem before? If so, how often?
- Can the system continue to operate with this problem? Or is the system non-operational?
- Can you identify anything that was different before this problem occurred?

Safety Information

Do not use the 818P detector if it looks damaged, or if you suspect that the 818P is not operating properly.

Appropriate installation must be done for water-cooled and fan-cooled detectors. Refer to the specific instructions for more information. The user must wait for a while before handling these detectors after power is applied. Surfaces of the detectors get very hot and there is a risk of injury if they are not allowed to cool down.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, it is suggested to try to correct the interference by taking one or more of the following steps:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment to an outlet that is on a different circuit than the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

SYMBOLS

The following international symbols are used in this manual:

Refer to the manual for specific Warning or Caution information to avoid any damage to the product.

Table of Contents

List of Illustrations

UPDATE INFORMATION

Thank you for purchasing Newport optical detectors. Please check Newport's website periodically for firmware, software and manual updates. Go to www.newport.com and type for "818P" in the search box for the latest versions.

1 General Information

1.1 Introduction

Newport's 818P Series High Power Detector's are thermopile devices that are specifically designed to work with Newport's Optical Power and Energy Meters. They may also be used with other instruments by means of various adapter cables (see Sections 1.2 & 3.3 for more information).

The 818P Series Detectors may be grouped into distinct product families, based on dimensions and active area size:

- 818P-001-12 series: 73 x 73 mm with a 12 mm aperture,
- 818P-xx-12 series: 38 x 38 mm with a 12 mm aperture,
- 818P-xx-17 series: 50 x 50 mm with a 17 mm aperture,
- 818P-xx-18(HP) series: 50 x 50 mm with a 18 mm aperture,
- 818P-xx-19 series: 50 x 50 mm with a 19 mm aperture,
- 818P-xx-25 series: 89 x 89 mm with a 25 mm aperture,
- 818P-xx-50 series: 89 x 89 mm with a 50 mm aperture,
- 818P-xx-55 series: 89 x 89 mm with a 55 mm aperture,
- 818P-500-55 series: 120 x 120 mm with a 55 mm aperture.

Within each group are various individual detectors with different cooling options: stand alone, heat sink, fan or water.

The range of measurement for each 818P family is as follows:

- 818P-001-12 series: 1 µW and 3 W
- 818P-xx-12 series: 1 mW and 70 W,
- 818P-xx-17W series: 1 mW and 50 W,
- 818P-xx-18(HP) series: 2 mW and 30 W,
- 818P-xx-19 series: 1 mW and 150 W,
- 818P-xx-25 series: 3 mW and 300 W,
- 818P-xx-50W series: 5 mW and 50 W,
- 818P-xx-55 series: 5 mW and 400 W,
- 818P-500-55: 15 mW and 500 W.

All 818P series detectors are supplied with a 180 cm flexible cable having a DB-15 connector. More about this connector in the next section.

CAUTION

To eliminate possible damage, do not carry the detector using the connector cable.

When using a detector with a heat sink, the fins should always be oriented vertically. Call your nearest Newport distributor to replace the sensor disk and/or to recalibrate the detector.

1.2 818P Series DB-15 Connector

The DB-15 male connector found at the end of the cable contains an EEPROM (Electrically Erasable Programmable Read-Only Memory) programmed with calibration sensitivity and other data relating to the specific 818P detector in use.

Fast set-ups are attained because the Newport Optical Power and Energy Meter automatically adjusts to the characteristics of the detector after reading the EEPROM. The 818E EEPROM can also be read by Newport's legacy 1835-C and 2835-C meters when using the 818P-DIN adapter cable (sold separately).

The DB-15 connector pin-out is as follows:

1- USED BY OPTICAL POWER/ENERGY METER
2- " " "
3- " " "
4- " " "
5- " " "
6- "+" SIGNAL OUTPUT
7- USED BY OPTICAL POWER/ENERGY METER
8- " " "
9- " " "
10- " " "
11- " " "
12- " " "
13- "-" SIGNAL OUTPUT
14- USED BY OPTICAL POWER/ENERGY METER
15- " " "
SHELL- COAX SHIELD / BODY GRND

2 Specifications

2.1 Standard Operating Mode

The following tables contain specifications when operating in the standard power mode (i.e. when measuring average power, in Watts).

	818P-001-12		818P-001-12NIR	
Effective Aperture Diameter	12 mm			
Wavelength Range	190 nm – 20 µm[a]		280 nm – 2.1 µm[j]	
Power Noise Level [b, c]	± 0.5 µW			
Thermal Drift [d]	12 µW/°C		6 µW/°C	
Typical Rise Time (0-95%) [e]	27 s (2.5 s with anticipation)			
Typical Sensitivity [f]	200 mV/W[g]		180 mV/W	
Calibration Uncertainty [h]	± 2.5 %			
Linearity with Power	± 2 %			
Repeatability (Precision)	± 0.5 %			
Power Resolution	± 0.5 %			
Max. Average Power	3 W			
Max. Average Power (2 min) [i]	3 W			
Max. Average Power Density at 1064 µW	1 kW/cm^2			
Pulsed Laser Damage Thresholds 1.064 µm, 360 µs, 5 Hz 1.064 µm, 7 ns, 10 Hz 532 nm, 7 ns, 10 Hz 266 nm, 7 ns, 10 Hz	Max. Energy Density 5 J/cm^2 1 J/cm^2 0.6 J/cm^2 0.3 J/cm^2		Peak Power Density 14 kW/cm^2 143 MW/cm^2 86 MW/cm^2 43 MW/cm^2	
Dimensions (H x W x D in mm)	With isol. tube: 73 x 73 x 72	W/o isol. tube: 73 x 73 x 20	With isol. tube: 73 x 73 x 80	W/o isol. tube: 73 x 73 x 28
Weight	0.312 kg		0.324 kg	
Cooling	Heat sink			
Recommended Load Impedance	100 kΩ			
Linearity vs. Beam Dimension	± 0.7 %			

Specifications subject to change without notice

a With NIR Filter: 280 nm – 1.36 µm

b Nominal value. Actual value depends on electrical noise in the measurement system.

c Without anticipation. ± 5 µW with anticipation.

d At 150 µW.
12 µW/°C with 842-PE, 50 µW/°C with 841-P-USB.

f Maximum output voltage = sensitivity x maximum power.

g With 818P-IRF1 Filter: 180 mV/W

h Including linearity with power

i Cooling: minimum 3 min

e With Newport optical power/energy meter

j Except 1350 – 1450 nm

	818P-010 / 020 / 070-12	
Effective Aperture Diameter	**12 mm**	
Wavelength Range	**190 nm – 20 µm**	
Power Noise Level	**1 mW**	
Typical Rise Time (0 – 95 %)	**1.6 s (0.3 s with anticipation)**	
Typical Sensitivity	**0.53 mV/W**	
Calibration Uncertainty	**± 2.5 %**	
Linearity with Power	**± 2 %**	
Repeatability (Precision)	**± 0.5 %**	
Power Resolution	**± 0.5 %**	
Max. Average Power		
818P-010-12	**10 W**	
818P-020-12	**20 W**	
818P-070-12	**70 W**	
Max. Average Power (2 min)[a]		
818P-010-12	**15 W**	
818P-020-12	**30 W**	
818P-070-12	**90 W**	
Max. Average Power Density		
1.064 µm, 10W CW	**36 kW/cm^2**	
10.6 µm, 10W CW	**11 kW/cm^2**	
Pulsed Laser Damage Thresholds	**Max. Energy Density**	**Peak Power Density**
1.064 µm, 360 µs, 5 Hz	**5 J/cm^2**	**14 kW/cm^2**
1.064 µm, 7 ns, 10 Hz	**1.0 J/cm^2**	**143 MW/cm^2**
532 nm, 7 ns, 10 Hz	**0.6 J /cm^2**	**86 MW/cm^2**
266 nm, 7 ns, 10 Hz	**0.3 J /cm^2**	**43 MW/cm^2**
Dimensions (mm)		
818P-010-12	**38(H) x 38(W) x 14(D)**	
818P-020-12	**38(H) x 38(W) x 45(D)**	
818P-070-12	**38(H) x 38(W) x 32(D)**	
Weight		
818P-010-12	**0.13 kg**	
818P-020-12	**0.15 kg**	
818P-070-12	**0.19 kg**	
Minimum Cooling Flow[b]	**0.5 litre/min**	
Recommended Cooling Flow	**1.0 litre/min**	
Cooling	**Heat sink / water**	
Recommended Load Impedance	**100 kΩ**	
Linearity vs. Beam Dimension	**± 0.7 %**	

Specifications subject to change without notice

a Cooling: minimum 3 min
b Water temperature ≤ 22°C, ⅛ NPT compression fittings for ¼ inch semi-rigid tube

	818P-015 / 030 / 050-17W	
Effective Aperture Diameter	**17 mm**	
Wavelength Range	**190 nm – 10 µm**	
Min. Measurable Power	**20 mW**	
Power Noise Level	**1 mW**	
Typical Rise time (0 – 95 %)	**5 s (1.4 s with anticipation)**	
Typical Sensitivity	**0.65 mV/W**	
Calibration Uncertainty	**± 2.5 %**	
Linearity with Power	**± 2 %**	
Repeatability (Precision)	**± 0.5 %**	
Power Resolution	**± 0.5 %**	
Max. Average Power		
818P-15-17W	**15 W**	
818P-30-17W	**30 W**	
818P-50-17W	**50 W**	
Max. Average Power (2 min.)[a]		
818P-15-17W	**23 W**	
818P-30-17W	**45 W**	
818P-50-17W	**75 W**	
Max. Average Power Density		
1.064µm CW	**100 kW/cm^2**	
Pulsed Laser Damage Thresholds	**Max. Energy Density**	**Peak Power Density**
1.064 µm , 150 µs, 10 Hz	**100 J/cm^2**	**667 kW/cm^2**
1.064 µm , 7 ns, 10 Hz	**1.1 J/cm^2**	**157 MW/cm^2**
532 nm , 7 ns, 10 Hz	**1.1 J /cm^2**	**157 MW/cm^2**
248 nm , 26 ns, 10 Hz	**0.7J /cm^2**	**27 MW/cm^2**
Dimension (mm)		
818P-15-17W	**50(H) x 50(W) x 20.6(D)**	
818P-30-17W	**50(H) x 50(W) x 56.3(D)**	
818P-50-17W	**76.2(H) x 76.2(W) x 74.7(D)**	
Weight		
818P-15-17W	**0.16 kg**	
818P-30-17W	**0.21 kg**	
818P-50-17W	**0.48 kg**	
Cooling	**Heat sink**	
Recommended Load Impedance	**100 kΩ**	
Linearity vs. Beam Dimension	**± 0.5 %**	

Specifications subject to change without notice

a Cooling: minimum 3 min

	818P-015 / 030-18HP

Effective Aperture Diameter	**18 mm**	
Wavelength Range	**0.19 – 2.5 µm**	
Min. Measurable Power	**40 mW**	
Power Noise Level	**2 mW**	
Typical Rise time (0 – 95 %)	**36 s (2.5 s with anticipation)**	
Typical Sensitivity	**0.34 mV/W**	
Calibration Uncertainty	**± 2.5 %**	
Linearity with Power	**± 2 %**	
Repeatability (Precision)	**± 0.5 %**	
Power Resolution	**± 0.5 %**	
Max. Average Power **818P-15-18HP** **818P-30-18HP**	 **15 W** **30 W**	
Max. Average Power (2 min.)[a] **818P-15-18HP** **818P-30-18HP**	 **20 W** **35 W**	
Max. Average Power Density **1.064 µm CW**	 **700 W/cm^2**	
Pulsed Laser Damage Thresholds	**Max. Energy Density**	**Peak Power Density**
1.064 µm, 360 µs, 10 Hz	**40 J/cm^2**	**111 kW/cm^2**
1.064 µm, 7 ns, 10 Hz	**6 J/cm^2**	**860 MW/cm^2**
532 nm, 7 ns, 10 Hz	**4 J /cm^2**	**570 MW/cm^2**
266 nm, 7 ns, 10 Hz	**1J /cm^2**	**143 MW/cm^2**
Dimension (mm) **818P-15-18HP** **818P-30-18HP**	 **50(H) x 50(W) x 20.6(D)** **50(H) x 50(W) x 56.3(D)**	
Weight **818P-15-18HP** **818P-30-18HP**	 **0.16 kg** **0.21 kg**	
Cooling	**Heat sink**	
Recommended Load Impedance	**100 kΩ**	
Linearity vs. Beam Dimension	**± 0.5%**	

Specifications subject to change without notice

a Cooling: minimum 3 min

	818P-015 / 030 / 110 / 150-19	
Effective Aperture Diameter	19 mm	
Wavelength Range	190 nm – 20 µm	
Min. Measurable Power	20 mW	
Power Noise Level	110 model: 3 mW Others: 1 mW	
Typical Rise time (0 – 95 %)	4.5 s (1.5 s with anticipation) for 110 model 2.8 s (0.6 s with anticipation) for others	
Typical Sensitivity	0.23 mV/W for 110 model and 0.65 mV/W for others	
Calibration Uncertainty	± 2.5 %	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power 818P-15-19 818P-30-19 818P-110-19 818P-150-19	 15 W 30 W 110 W 150 W	
Max. Average Power (2 min)[a] 818P-15-19 818P-30-19 818P-110-19 818P-150-19	 23 W 45 W 135 W 170 W	
Max. Average Power Density 1.064 µm CW 10.6 µm CW	 45 kW/cm^2 for 110 model and 36 kW/cm^2 for others 14 kW/cm^2 for 110 model and 11 kW/cm^2 for others	
Pulsed Laser Damage Thresholds	**Max. Energy Density**	**Peak Power Density**
1.064 µm, 360 µs, 5 Hz	9 J/cm^2 for 110 model 5 J/cm^2 for others	25 kW/cm^2 for 110 model 14 kW/cm^2 for others
1.064 µm, 7 ns, 10 Hz	1.0 J/cm^2	143 MW/cm^2
532 nm, 7 ns, 10 Hz	0.6 J/cm^2	86 MW/cm^2
266 nm, 7 ns, 10 Hz	0.3 J/cm^2	43 MW/cm^2
Dimensions (mm) 818P-15-19 818P-30-19 818P-110-19 818P-150-19	 50(H) x 50(W) x 20.6(D) 50(H) x 50(W) x 56.3(D) 54.2(H) x 54.2(W) x 55.6(D) 50(H) x 50(W) x 33(D)	
Weight 818P-15-19 818P-30-19 818P-110-19 818P-150-19	 0.16 kg 0.21 kg 0.25 kg 0.24 kg	
Minimum Cooling Flow	0.5 liter/min	
Recommended Cooling Flow	1.0 liter/min	
Cooling	Heat sink / fan / water	
Recommended load Impedance	100 kΩ	
Linearity vs. Beam Dimension	± 0.5 %	

Specifications subject to change without notice

a Cooling: minimum 3 min

	818P-040 / 100 / 250 / 300-25	818P-040 / 100 / 300 / 400-55
Aperture Diameter	**25 mm**	**55 mm**
Spectral Range	**190 nm - 20 µm**	
Min. Measurable Power	**60 mW**	**100 mW**
Power Noise Level	-040-, -100-, -300- : **3 mW** -250- : **10 mW**	-040-, -100-: **5 mW** -300-, -400- : **15 mW**
Typical Rise Time (0 – 95 %)	-040-, -100-, -300- : **5 s** **(1.3 s w/anticipation)** -250- : **7.9 s** **(1.3 s w/anticipation)**	-040-, -100- : **11 s** **(2 s w/anticipation)** -300-, -400- : **18 s** **(2 s w/anticipation)**
Typical Sensitivity	-040-, -100-, -300- : **0.23 mV/W** -250- : **0.1 mV/W**	040-, -100- : **0.12 mV/W** -300-, -400- : **0.06 mV/W**
Calibration Uncertainty	**± 2.5 %**	
Linearity with Power	**± 2 %**	
Repeatability (Precision)	**± 0.5 %**	
Power Resolution	**± 0.5 %**	
Max. Average Power	40: **40 W** 100: **100 W** 250: **250 W** 300: **300 W**	40: **40 W** 100: **100 W** 300: **300 W** 400: **400 W**
Max. Average Power (2 min.)[a]	40: **60 W** 100: **150 W** 250: **300 W** 300: **300 W**	40: **60 W** 100: **150 W** 300: **300 W** 400: **400 W**
Max. Average Power Density **1.064 µm CW** **10.6 µm CW**	 **45 kW/cm²** **14 kW/cm²**	
Pulsed Laser Damage Thresholds **1.064 µm, 360 µs, 5 Hz** **1.064 µm, 7 ns, 10 Hz** **532 nm, 7 ns, 10 Hz** **266 nm, 7 ns, 10 Hz**	**Max. Energy Density** **9 J/cm²** **1.0 J/cm²** **0.6J /** **0.3J /cm²**	**Peak Power Density** **25 kW/cm²** **143 MW/cm²** **86 MW/cm²** **43 MW/cm²**
Dimensions (mm)	40**: 89(H) x 89(W) x 32(D)** 100**: 89(H) x 89(W) x 106(D)** 250**: 89(H) x 89(W) x 116(D)** 300**: 89(H) x 89(W) x 44(D)**	40**: 89(H) x 89(W) x 32(D)** 100**: 89(H) x 89(W) x 106(D)** 300**: 89(H) x 89(W) x 116(D)** 400**: 89(H) x 89(W) x 44(D)**
Weight (kg)	40**: 0.68** 100**: 0.99** 250**: 1.44** 300**: 0.90**	40**: 0.62** 100**: 0.93** 300**: 1.41** 400**: 0.84**
Minimum Cooling Flow[b]	**1 litre/min**	
Cooling	**Heat sink / Fan / Water**	
Recommended Load Impedance	**> 100 kΩ**	
Linearity vs. Beam Dimension	**± 0.5 %**	

Specifications subject to change without notice

a Cooling: minimum 3 min
b Water temperature ≤ 22°C, ⅛ NPT compression fittings for ¼ inch semi-rigid tube

	818P-040 / 050-50W	
Effective Aperture Diameter	**50 mm**	
Wavelength Range	**190 nm – 10 µm**	
Min. Measurable Power	**100 mW**	
Power Noise Level	**5 mW**	
Typical Rise time (0 – 95 %)	**16 s (3.5 s with anticipation)**	
Typical Sensitivity	**0.12 mV/W**	
Calibration Uncertainty	**± 2.5 %**	
Linearity with Power	**± 2 %**	
Repeatability (Precision)	**± 0.5 %**	
Power Resolution	**± 0.5 %**	
Max. Average Power **818P-040-50W** **818P-050-50W**	 **40 W** **50 W**	
Max. Average Power (2 min.)[a] **818P-040-50W** **818P-050-50W**	 **60 W** **75 W**	
Max. Average Power Density **1.064µm CW**	**100 kW/cm^2**	
Pulsed Laser Damage Thresholds	**Max. Energy Density**	**Peak Power Density**
1.064 µm, 150 µs, 10 Hz	**100 J/cm^2**	**667 kW/cm^2**
1.064 µm, 7 ns, 10 Hz	**1.1 J/cm^2**	**157 MW/cm^2**
532 nm, 7 ns, 10 Hz	**1.1 J /cm^2**	**157 MW/cm^2**
248 nm, 26 ns, 10 Hz	**0.7J /cm^2**	**27 MW/cm^2**
Dimension (mm) **818P-040-50W** **818P-050-50W**	 **89(H) x 89(W) x 32(D)** **89(H) x 89(W) x 106(D)**	
Weight **818P-040-50W** **818P-050-50W**	 **0.62 kg** **0.93 kg**	
Cooling	**Heat sink**	
Recommended Load Impedance	**100 kΩ**	
Linearity vs. Beam Dimension	**± 0.5 %**	

Specifications subject to change without notice

a Cooling: minimum 3 min

	818P-500-55	
Effective Aperture Diameter	**55 mm**	
Wavelength Range	**190 nm – 20 µm**	
Min. Measurable Power	**100 mW**	
Power Noise Level	**15 mW**	
Typical Rise time (0 – 95 %)	**16.6 s (2.8 with anticipation)**	
Typical Sensitivity	**0.06 mV/W**	
Calibration Uncertainty	**± 2.5 %**	
Linearity with Power	**± 2 %**	
Repeatability (Precision)	**± 0.5 %**	
Power Resolution	**± 0.5 %**	
Max. Average Power	**500 W**	
Max. Average Power (2 min.)[a]	**500 W**	
Max. Average Power Density **1.064µm CW**	**8 kW/cm²**	
Pulsed Laser Damage Thresholds	**Max. Energy Density**	**Peak Power Density**
1.064 µm , 150 µs, 10 Hz	**9 J/cm²**	**25 kW/cm²**
1.064 µm , 7 ns, 10 Hz	**1.0 J/cm²**	**143 MW/cm²**
532 nm , 7 ns, 10 Hz	**0.6 J/cm²**	**86 MW/cm²**
248 nm , 26 ns, 10 Hz	**0.3 J/cm²**	**43 MW/cm²**
Dimensions (mm)	**120(H) x 120(W) x 135(D)**	
Weight	**2.75 kg**	
Cooling	**Fan**	
Recommended Load Impedance	**> 100 kΩ**	
Linearity vs. Beam Dimension	**± 0.5 %**	

Specifications subject to change without notice

a Cooling: minimum 3 min

2.2 Calorimeter Mode

The 818P Series High Power Detectors have an optional mode that is called Calorimeter Mode. It allows you to measure single shot pulse energy. This mode is accessible when you use a Newport Optical Power/Energy Meter, or with your own data acquisition system. The following specifications apply specifically to this mode. Also refer to Newport Optical Power/Energy Meter instruction manuals.

818P-	001-12	001-2NIR	010-12 020-12 070-12	015-17W 030-17W 050-17W	015-18HP 030-18HP	015-19 030-19 110-19 150-19
Typical Sensitivity	25 mV/J	22.5 mV/J	0.84 mV/J	0.33 mV/J	0.10 mV/J	0.65 mV/J
Power Sensitivity / Energy Sensitivity	8 J/W	8 J/W	0.63 J/W	2 J/W	3.4 J/W	0.99 J/W
Typical Rise Time	1000 ms	1000 ms	150 ms	400 ms	270 ms	264 ms
Min. Repetition Period	16 s	16 s	1.5 s	5 s	4.5 s	4 s
Max. Pulse Width	300 ms	300 ms	50 ms	133 ms	90 ms	88 ms
Max. Measurable Energy[a]	5 J	5 J	5 J	200 J	40 J	15 J
Noise Equivalent Energy	12 µJ	12 µJ	20 mJ	23 mJ	20 mJ	20 mJ
Accuracy	± 5 %	± 5 %	± 5 %	± 5 %	± 5 %	± 5 %

818P-	40-25 100-25 300-25	250-25	40-50W 50-50W	40-55 100-55	300-55 400-55	500-55
Typical Sensitivity	0.14 mV/J	0.05 mV/J	0.020 mV/J	0.028 mV/J	0.015 mV/J	0.013 mV/J
Power Sensitivity / Energy Sensitivity	1.67 J/W	2.19 J/W	5.28 J/W	4.25 J/W	4.46 J/W	4.62 J/W
Typical Rise Time	370 ms	1300 ms	1400 ms	1300 ms	1600 ms	1800 ms
Min. Repetition Period	4.6 s	11.5 s	11.1 s	11.1 s	12 s	14.3 s
Max. Pulse Width	123 ms	390 ms	467 ms	433 ms	430 ms	433 ms
Max. Measurable Energy[a]	40 J	40 J	500 J	200 J	200 J	200 J
Noise Equivalent Energy	200 mJ	200 mJ	250 mJ	250 mJ	250 mJ	250 mJ
Accuracy	± 5 %	± 5 %	± 5 %	± 5 %	± 5 %	± 5 %

Specifications subject to change without notice

a For 1.064 µm; 360 pulses

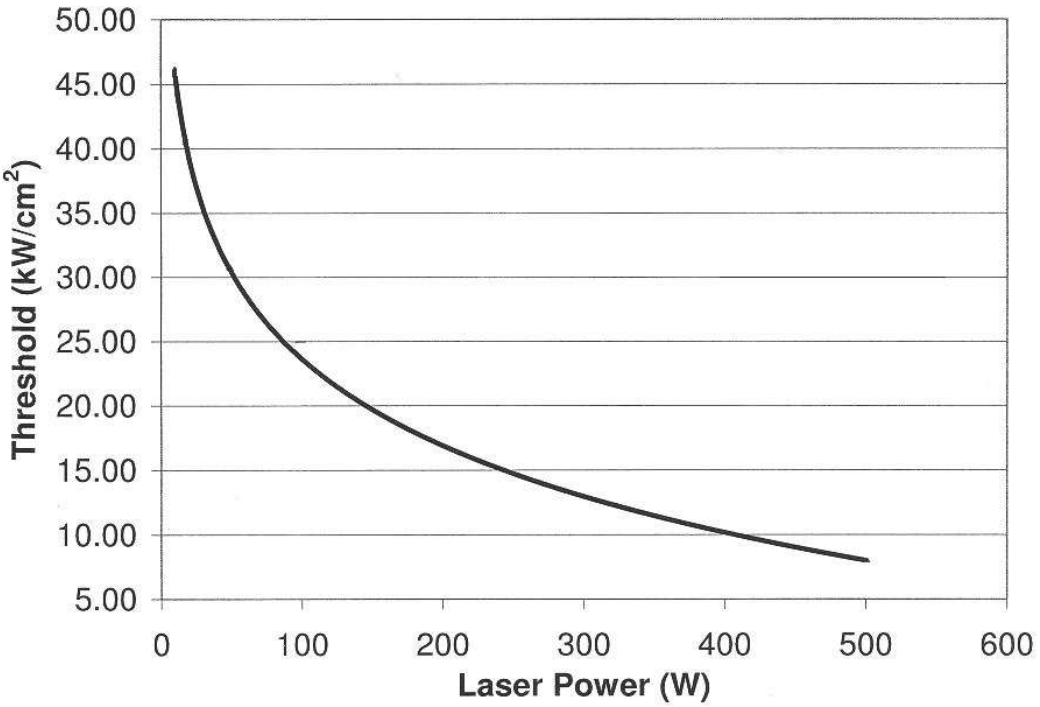

Figure 1 Power density thresholds at 1.064 µm (excluding W and HP types)

3 Operating Instructions

3.1 Detector Preparation

In order to ensure a long lifetime of accurate measurements, it is recommended that 818P Thermopile Detectors be held within the following ambient conditions:

Storage environment temperature: 10 to 65°C, RH < 90%
Operating environment temperature: 15 to 28ºC, RH < 80%.

It is possible to store and operate your Newport 818P Detector beyond this range. For any specific requirement, please contact your local Newport representative.

Depending upon whether your particular detector is air-, fan-, or water-cooled, some preliminary steps may be required, as follows:

3.1.1 Fan-Cooled Detectors

Simply connect the fan to a power supply.

3.1.2 Water-cooled detectors

Connect the detector head to a cooling water supply. Use with ¼'' outer diameter plastic tubing.

NOTE:

The end of the tube must be cut perpendicular to the tubing; the portion of the outer tubing wall that slips into the fitting must not be deformed or damaged, otherwise the connection will not be water-tight.

To connect the detector head fittings to the water supply tubing, unscrew the two parts of the fitting, push the tubing into the part not connected to the detector until it comes to the end of the fitting; then screw in the two parts of the fitting.

The direction of flow through the head is unimportant. Once you have connected the fittings, check them for leaks. If you find a leak, check to see if the tubes are pushed in far enough and that the tubing has not been damaged.

To disconnect the detector head fittings, remove the water pressure and drain the water from the tubing. Unscrew the two parts of the fitting and pull out the tubing.

NOTE:

Water will usually remain in the detector head after it is disconnected. It is possible to remove it by blowing it out, but be careful not to blow the water on yourself or on the detector aperture. Dry the detector body off before storing it.

Be sure that flow rates satisfy the minimum values, as indicated on the specifications pages (see Section 2). Time variations of water flow rates or water temperature will cause corresponding oscillations in measurements.

3.2 Using with the Newport Power/Energy Meter

Connect the DB15 connector at the end of the cable to the input connector on the Newport Optical Power Meter (see the instruction manuals of the meters for more details).

Before performing the measurements, shield the detector head to prevent it from sensing heat from random sources. To obtain an accurate reading the Power Meters must also be zero adjusted.

Allow the detector head to thermally stabilize before making any measurements. Let the signal stabilize for a few seconds before adjusting the offset. Refer to the Optical Power Meter operating instructions for further details.

For the most accurate measurements, center the beam on the sensor face. The beam diameter on the sensor should ideally be the same size as the beam diameter of the original calibration, which is 86.5%, encircled power (>98% encircled power at full aperture) of a TEM 01 beam (at $1/e^2$) over 50% of the sensor's surface (this complies with the International Electrotechnical Commission standard #1040: "Power and Energy Measuring Detector...").

3.3 Using without the Newport Power/Energy Meter

The 818P Series High Power Detectors can be used with a voltmeter or oscilloscope. Usually these devices have a BNC input connector. For this reason, an adapter cable (Newport part number 818P-BNC) is available. This cable is sold separately.

To make a measurement, follow these steps:

1. Let the detector head thermally stabilize for at least 10 minutes.
2. Connect the power head to a precision microvoltmeter, oscilloscope, or data acquisition system, with a load impedance that is greater than 100 kΩ. Because of the very low voltages at lower power levels for some of these detectors, analog or digital filters may be required to remove ambient electrical noise.
3. Remove the detector cover.

NOTE:

For the most accurate measurements, center the beam on the sensor face. The beam diameter on the sensor should ideally be the same size as the beam diameter of the original calibration, which is 86.5%, encircled power (>98% encircled power at full aperture) of a TEM 01 beam (at $1/e^2$) over 50% of the sensor's surface (this complies with the International Electrotechnical Commission standard #1040: "Power and Energy Measuring Detector...").

WARNING:

Be careful not to exceed the maximum levels and densities stated in the specifications.

4 Place the detector head into the laser beam path (the laser beam must be contained within the sensor area) for about a minute.

5. Block off any laser radiation to the detector.
6. Switch on the microvoltmeter and adjust its voltage range to the range required for the measurement. To determine the voltage range to be measured, refer to the detector head specifications (see Section 2):

   V_{out} = (expected power) x (calibration sensitivity of power detector)

7. Wait until the signal has stabilized (fluctuations representing less than 1% of the voltage level being measured are negligible), then measure the zero level voltage offset from the detector. Strong fluctuations in the zero level are usually caused by one of the following:

- Rapid fluctuations in the rate of water flow,
- Rapid fluctuations in water temperature,
- Strong drafts or stray radiation (especially visible when you are taking low power measurements),

- Ambient electrical noise (should be filtered out).

8. Apply the laser beam to the detector head.
9. Wait until the signal has stabilized (between one to three minutes for optimum measurements), then measure the voltage output from the detector (see Section 2 for individual detector 0-95% non anticipated response times).
10. The measured power is calculated as follows:

$$\text{Measured power}[\text{W}] = \frac{\text{output voltage}[\text{mV}] - \text{zero level voltage}[\text{mV}]}{\text{calibration sensitivity}[\text{mV/W}]}$$

3.4 Safety Notes

3.4.1 Diffusive surfaces

When using the 818P, be aware of the ~ 5-15% diffused back reflection. Exception: the 818P-015/030-18HP have a 40-45% diffusive reflection.

As on any diffusive surface, the light on the sensor coating is scattered more or less uniformly as a Lambertian diffuser. It is recommended to use the detector with a black protective sleeve. This will limit wide-angled diffused reflections.

3.4.2 Detector temperature

Detectors can become hot enough during usage and can cause burns.

3.5 Damage to the Optical Absorber Material

Damage to the optical absorber material is usually caused by exceeding the manufacturer's specified maximum incident:

- Average Power Density
- Pulse Energy Density

Refer to the specifications pages (Section 2) for the 818P Series High Power Detector specifications.

Damage may also be caused by using a detector with a contaminated absorber surface.

Slight discoloration of the coating may occur, but this usually does not affect the calibration.

In any case, the beam's incident area should not be less than 10% of the detector's aperture. Please contact Newport to make measurements with such smaller beams.

In the event of major damage to the coating, the 818P Series sensors can be recoated. Contact your local Newport representative for information on repair and recalibration. See page iii: "Technical Support Contacts."

4 Service Information

The Model 818P High Power Detector contains no user serviceable parts. To obtain information regarding factory service, contact Newport Corporation or your Newport representative. Please have the following information available:

1. Detector model number (818P-xx)
2. Detector serial number (on rear panel)
3. Description of the problem.

If the detector is to be returned to Newport Corporation, you will be given a Return Number, which you should reference in your shipping documents. Please fill out a copy of the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

To obtain warranty service, contact your nearest Newport agent or send the product, with a description of the problem, transportation and insurance prepaid, to the nearest Newport agent. Newport Corporation assumes no risk for the damage in transit. Newport Corporation will, at its option, repair or replace the defective product free of charge. However, if Newport Corporation determines that the failure is caused by misuse, alterations, accident or abnormal condition of operation or handling, you will be billed for the repair and the repaired product will be returned to you, transportation prepaid.

4.1 Service Form

Newport Corporation
U.S.A.
Office: 800-222-6440
FAX: 949/253-1479

Name _____ **Return Authorization #**_____

(Please obtain RA# prior to return of item)

Company _____

Address _____ Date _____

Country _____ Phone Number _____

P.O. Number_____ FAX Number_____

Item(s) Being Returned:

Model # _____ Serial #_____

Description _____

_____

_____

_____

_____

_____

Reason for return of goods (please list any specific problems):

_____

_____

_____

_____

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Notes:

Appendix A: Custom Heat Sink

Usually, the detector is calibrated and shipped with its final back panel. But the 818P can also be installed onto a heat sink supplied by the customer or onto another back panel. If this is the case, follow the instructions listed below.

1. Instructions:

1. Remove the four front screws of the detector, being sure to hold together the front cover and the central housing.

2. Discard the back panel.

3. Apply thermal paste (for example *Wakefield Engineering Inc. thermal paste part no. 120-2*) to the back of the central housing to assure good thermal contact with the new back panel.

4. Recommended: Apply removable thread locker (for example *Loctite removable thread locker 242*) to the ends of the four original screws and into the four holes on back panel.

5. Use the four original screws to install the new back panel onto the detector. Be sure to apply the same torque to all four screws.

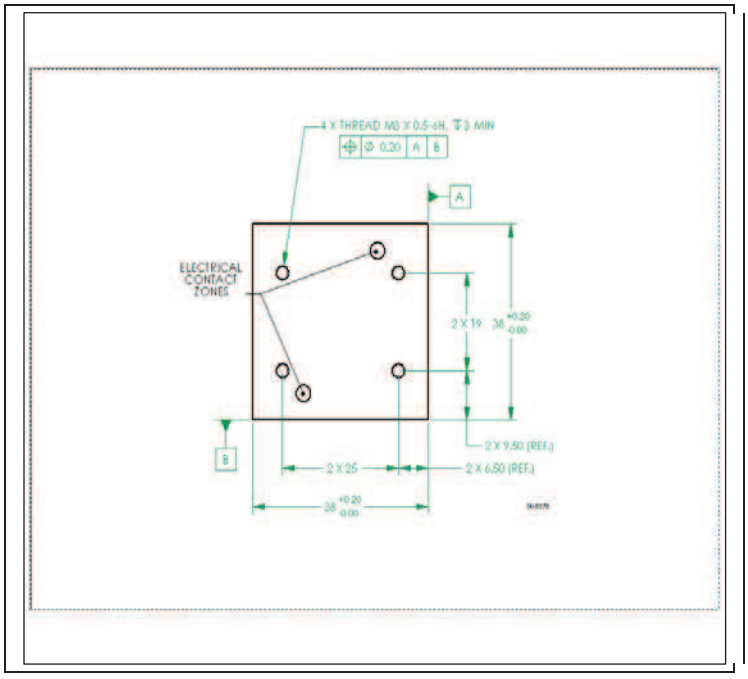

Figure 2 Tapped hole positions - 818P-xx-12

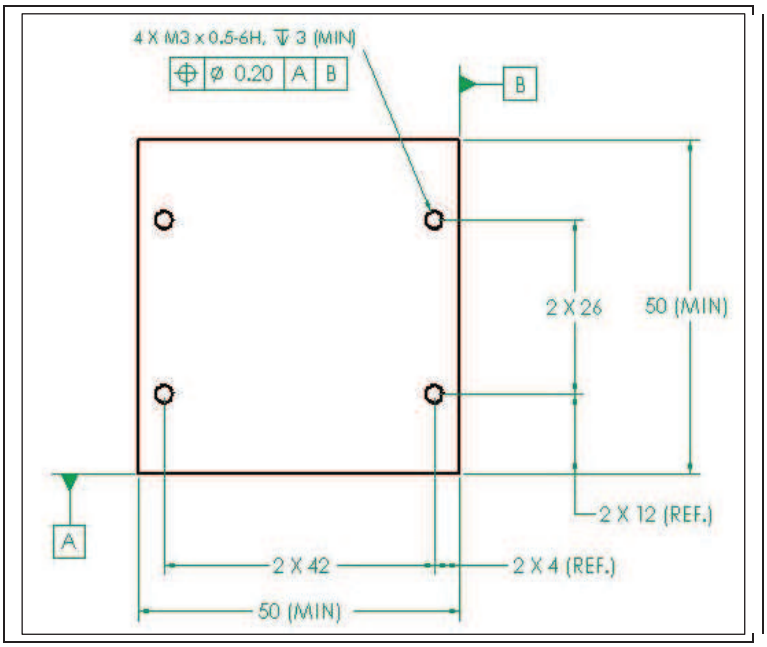

Figure 3 Tapped hole positions - 818P-xx-17W, 818P-xx-18xx and 818P-xx-19

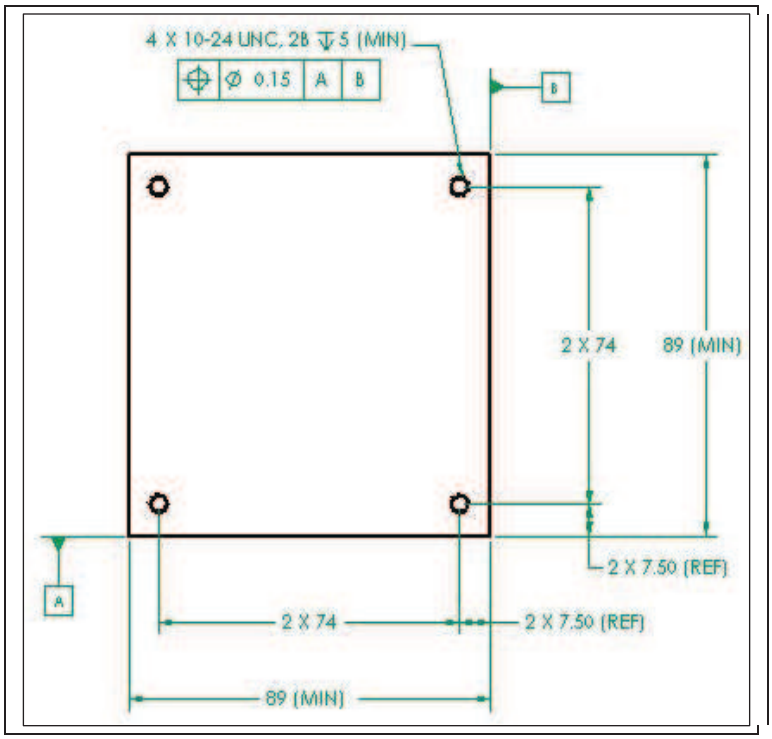

Figure 4 Tapped hole positions - 818P-xx-25, 818P-xx-50W and 818P-xx-55

Appendix B: WEEE directive

1.1 Recycling and separation procedure for WEEE directive 2002/96/EC:

This section is used by the recycling center when the detector reaches its end of life. Breaking the calibration seal or opening the monitor will void the detector warranty.

The complete Detector contains

1 Detector with wires or DB-15,

1 instruction manual,

1 calibration certificate.

1.2 Separation:

Paper : Manual and certificate,

Wires: Cable Detector,

Printed circuit board: inside DB-15, no need to separate (less then 10 cm^2),

Aluminum: Detector casing.

Appendix C: Using the 818P-001-12 wattmeter with an optical fiber adapter

When fitted with an appropriate adaptor, such as the 818P-001-12 FC, SC, or SMA optical fiber adaptor, the detector can be used to measure the output of an optical fiber. When using an optical fiber adaptor, it is the user's responsibility to ensure that the entire output of the fiber is incident upon the detector's absorbing surface. Figure 4 and the following inequation are provided as a guide to verify this.

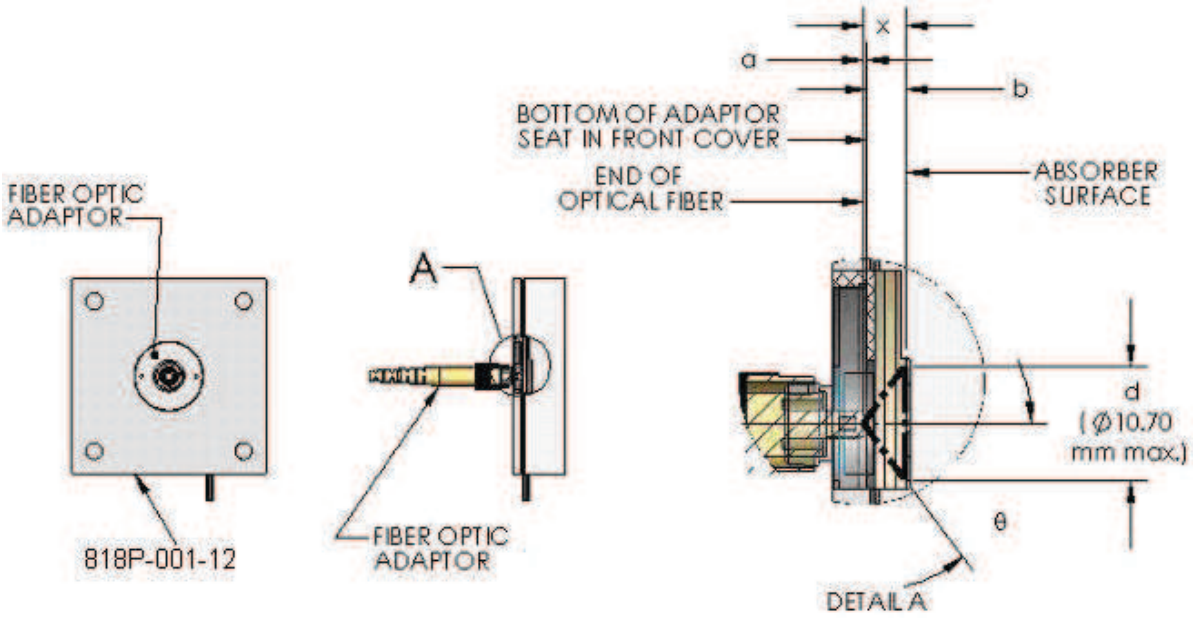

Figure 5 Using an optical fiber adaptor

For the 818P-001-12, the distance in mm between the absorbing surface and the adaptor seat is $b = 3.75 \pm 0.5$. The diameter in mm corresponding to 80% of the absorbing surface (80% is a common maximum value for allowing sufficient margin to avoid edge effects) is $d = 10.7$. The acceptance angle θ of the fiber is specific to the user's fiber, as is the value of a, the distance in mm between the end of the fiber and the interface between the adaptor and its seat on the detector. This value can be measured once the user's fiber is connected to the fiber adaptor (a typical value may be $a = 0.2$ mm). Once known, the values θ and a can be entered in the following inequation:

$$(a+4)\tan\theta < 5.35,$$

Where, 5.35 is $d/2$. If the inequation is verified, then it is safe to consider that the light cone having a height $x = a + b$ and a maximum diameter d, exiting the fiber is entirely incident on 80% of the measuring surface of the detector.

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