918D-IS Series

Photodiode Detectors

918D-IS Series User's Manual

Newport®
Experience | Solutions

Model 918D-IS Series Photodiode Detectors

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 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 2007

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 90002246 Rev. B

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Service Information

This section contains information regarding factory service for the source. The user should not attempt any maintenance or service of the system or optional equipment beyond the procedures outlined in this manual. Any problem that cannot be resolved should be referred to Newport Corporation.

Technical Support Contacts

North America & Asia
Newport Corporation Service Dept.
1791 Deere Ave. Irvine, CA 92606
Telephone: (949) 253-1694
Telephone: (800) 222-6440 x31694

Europe
Newport/MICRO-CONTROLE S.A.
Zone Industrielle
45340 Beaune la Rolande, FRANCE
Telephone: (33) 02 38 40 51 56

Asia

Newport Opto-Electronics Technologies (Wuxi) Co., Ltd
No 36, 38 Xikun Road, WSIP, Wuxi, Jiangsu, China
214028
Telephone: +86 510 8018 3000
Fax: +86 510 8018 3289

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 our Technical Support Representatives diagnose your problem, please note the following conditions:

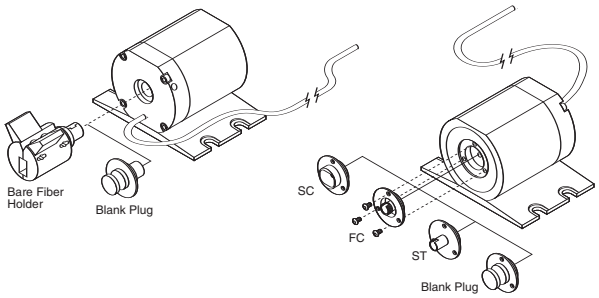
- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Have you seen this problem before? If so, how often?
- Can the system continue to operate with this problem?
  Or is the system non-operational?
- Can you identify anything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

Table of Contents

1 General Information.

1.1 Introduction

Newport's new Model 918D-IS-1 universal fiber optic detector is an integrating sphere based detector designed for accurate measurements from all types of fiber optic sources. The detector uses a dual port, dual detector design to provide maximum versatility over a broad range of wavelengths and sources. A variety of adapters are available for the front port to facilitate measurements from connectorized fibers. The rear port is designed to measure light from bare fibers, using the P3-FH1 bare fiber holder. A complete kit of adapters is included with each detector, together with a rugged case for storage and transportation. The 918D Series uses a symmetrical integrating sphere design to ensure accurate calibration, regardless of the fiber type or port used. The detector uses a novel dual detector design, with special optics that improve temperature sensitivity markedly from ordinary detectors. The sphere is constructed from a highly reflective thermoplastic which gives much better calibration stability under varying conditions of temperature, humidity, and long term usage than conventional coated spheres. The 918D-IS-1 is fully calibrated over the wavelength range of 400-1650 nm, The 918D-IS-IG has a single InGaAs detector and is calibrated from 800-1650nm. The 918D-IS-SL has a single silicon detector and is calibrated from 400-1100nm. Calibration data is stored in read-only memory integral to the electrical connector, and provided in a calibration data and certification is provided with the detector. 918D-IS Series Spheres are compatible with all of Newport's new power meters that accept DB15 based detectors. The drawing on the next page shows how the supplied adapters can be connected to the detector to make power measurements.



1.2 Installation

The 918D-IS Series includes the following items, in addition to this manual. Please make sure that all items are present and are in good condition.

- Carrying case
- Detector body with two blank plugs and baseplate installed
- Adapters for ST, FC, and SC connectors
- Adapter for bare fibers
- Two Allen keys
- Extra bolts for connectorized fiber adapters and the baseplate
- Dust caps for the connector adapters
- Calibration data sheet

The 918D-IS Series has a DB15 connector integrated to the end of the cable. This connector is intended only to be plugged into Newport power meters that have DB15 detector connections. If you would like to use the 918D-IS Series with CAL-Module based Newport Power Meters, you can use the optional 818P-DIN adapter.

Note:

There are no user serviceable components inside the 918D-IS Series. Disassembly of the detector will most likely damage delicate internal components, and will result in a loss of certified calibration, as well as voiding of all warranties.

Note:

The photodiodes used in the 918D-IS Series are designed for high performance when used with an amplifier that provides a virtual ground, such as Newport's power meters. These detectors are not designed to tolerate bias voltages of any kind. Exposure to reverse voltages in excess of that given in the specifications, or to forward voltages of any magnitude, can damage the photodiodes. Also, as explained below, the detector will not give accurate or linear measurements when biased or when driving a resistive load, such as an oscilloscope input

1.3 Calibration

The 918D-IS Series comes with its calibration data individually encoded on a programmable read only device built into the connector. In order to make use of this feature to obtain accurate power measurements, however, you must make sure that the power meter is using the correct data. Please note that Newport's power meters read the entire data set from the read only memory in the connector only on power up. If you change detectors, you must reboot the power meter in order to ensure that the meter is using the correct calibration constants. This can be accomplished by means of the reset button on the rear of the instrument (see the owner's manual for your power meter for details), or by cycling the power switch off, then on. Also, be sure that the wavelength is set correctly for the source you are measuring, or inaccurate readings will result.

Statement of Calibration:

The accuracy and calibration of this photodetector are traceable to NIST or NPL through equipment which is calibrated at planned intervals to certified standards maintained at Newport Corporation.

Note:

The performance and calibration of the integrating sphere based measurement system depends on the reflectance of the material from which the sphere walls are made. It is imperative that these walls be protected from contamination that could lower their reflectance. Dust caps and port plugs are provided to keep dust out of the detector. These should be used whenever possible, particularly if the detector is to be used in a dirty environment.

Excessive oil contamination in the air can cause long term calibration shifts and should thus be avoided.

Note:

The 918D-IS Series is designed to be a rugged assembly for use in production and laboratory environments. However, it is a calibrated optical instrument, and is thus vulnerable to mechanical shock. If your detector is dropped, it may have to be inspected and recalibrated at the factory. Exposure to temperatures beyond those specified for storage can also create mechanical stresses which may also affect the performance of the calibration and detector.

All semiconductor detectors display temperature sensitivity which affects their responsivity. This sensitivity is usually more pronounced in a specific range of wavelengths particular to the material used for the detector. The dual detector balanced design used in the 918D-IS-1 largely eliminates these temperature sensitivities to give very accurate measurements over a very broad range. However, the inherent temperature sensitivity is not entirely removed. Therefore it is wise to use the detector at or near the calibration temperature whenever possible. The calibration temperature is given on the individual calibration report that ships with every detector.

1.4 Fiber Preparation

The 918D-IS-1 detector uses a dual port design to allow measurement from a variety of fiber sources. The rear port (the end the blue cable exits from) is designed to be used with Newport's FP3-FH1 bare fiber holder, included with every 918D-IS Series detector sold. This port should not be used with other adapters, such as the FP3 and FP4 series, since the fiber tip will be in the wrong position relative to the port entrance. The natural spreading of the light as it exits the fiber will cause much of the light to strike the area around the port, where it cannot be measured. When using the FP3-FH1, the position of the fiber in the chuck is not very critical. The fiber tip can be exactly flush to the tip of the holder, or can protrude as much as 0.25" (6 mm) without affecting the measurement accuracy. If the fiber protrudes more than this, damage to the fiber or the interior of the sphere becomes possible. The port receptacle is designed so that if the fiber protrudes less than .25", the adapter will align itself as you insert it to prevent damage to the fiber tip.

You may use angled cleaves or angle polished ferrules to reduce back reflection without affecting measurement accuracy. The detector is also fairly insensitive to cleave quality since the light is fully integrated before being measured. However, for best results, cleave quality should be reasonably good. The front port of the 918D-IS Series is designed to be used with any of the other adapters that come with the detector. FP3 and FP4 series adapters should not be used on this port since they do not position the ferrule tip properly for accurate measurement.

The 918D-IS Series is designed for fibers with numerical apertures of 0.29 or less. Higher numerical apertures can result in part of the beam striking the interior of the port before entering the sphere. This can cause a modest degradation in measurement accuracy.

1.5 Saturation

The 918D-IS Series is designed to accurately measure photocurrents only up to the rated saturation current. Beyond this level, measured power will become nonlinear due to voltages generated by the photocurrent as it passes through the series resistances of the detectors. The saturation current is not a function of wavelength, but the maximum power measurable before saturation occurs is, since the responsivity (ratio of photocurrent generated to optical power applied) of the detector system is a function of wavelength. The maximum power specification given in the detector specifications table is a worst case value, and is guaranteed at any wavelength. The 918D-IS Series can be used to measure pulsed light sources, but precautions must be taken to ensure accurate results. The pulsed saturation level (see the specifications table on page 9) of the detector must not be exceeded. Also, since it is difficult to make accurate energy measurements of single pulses with semiconductor detectors, continuous pulse trains should be used. The average pulse energy may be obtained by dividing the power reading by the pulse repetition rate. See your power meter manual for details.

Note:

The 918D-IS Series is designed to provide calibrated attenuation of input light in order to accurately measure high light levels without using an attenuator. As indicated in the specifications, the maximum measurable light level of the detector is quite high. Please note, however, that the 918D-IS Series is designed to measure light from fiber sources, where the cone shaped beam emitted from the fiber tip ensures that the beam will be spread out before it strikes the reflective material of the sphere. This material is rated at 8 J/cm2, and this value should not be exceeded

1.6 Ambient Light and Electrical Offsets

Good measurement technique dictates that the effects of ambient light should be reduced as much as practical when using photodiodes. Although the photocurrent generated by ambient light can be easily zeroed out, the shot noise associated with the photocurrent will not be zeroed, nor will any changes in the ambient light levels, which might be caused by people moving around in the room. The 918D-IS Series is much less sensitive to ambient light than most detectors because of the small port size. However, when using the detector, we recommend that the port that is not in use be plugged with one of the blank plugs supplied with the detector. This also ensures that dirt and other contamination cannot enter the port. Ambient light will be blocked from the port in use by the adapter itself. A small electronic offset will always be present with semiconductor detectors, caused by an interaction of the detector shunt resistance with voltage offsets in the amplifier circuitry. Because the 918D-IS-1 uses very high quality detectors, this offset will be quite small (less than 250 fA of equivalent photocurrent is typical with Newport power meters). This offset can be removed by use of the power meter's zero function. Please note, however, that the offset is a function of the temperature of both the photodiode and the amplifier inside the power meter. So, when measuring very low light levels, it is best to rezero the meter whenever you think that the temperature of the detector or the power meter may have changed. For instance, it is good practice to rezero the meter after a warm-up period of about 30 minutes. Refer to your power meter manual for details regarding the zeroing procedure.

1.7 Specifications

Spectral range 918D-IS-1:	400-1650 nm
Spectral range 918D-IS-SL:	400-1100 nm
Spectral range 918D-IS-IG:	800-1650 nm
Saturation Power[(1)]:	≥ 200 mW
Saturation Energy[(1)]:	≥ 1 µJ (10-15 ns pulse)
Saturation current[(1)]:	≥ 2 mA
Max. Ave. Power (Bare Fiber):	250 mW
Max. Ave. Power (Connectorized):	1 W
Max. Pulse Energy:	100 µJ
Accuracy[(1)]:	± 2.5%
Responsivity 918D-IS-1[(1)]:	> 0.0025 (400-1600 nm)
	> 0.0040 (600-1600 nm)
Risetimev[(1)]:	< 2 µs
Shunt Resistance[(1)]:	≥ 20 M Ω
Die Capacitance[(1)]:	≤ 800 pF
Max. Reverse Bias:	2V
NEP[(1)]:	≤ 3 pW/ √Hz
Operating Temperature Range:	-10 to +55°C
Storage Temperature Range:	-10 to +55°C

(1) Specified at Calibration Temperature

2 Factory Service Information

2.1 Service Form

Newport Corporation
USA 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):

_____

_____

_____

_____

_____

_____

_____

_____

Notes: _____

_____

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_____

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ISO 9001
FM 27207

Newport Corporation, Irvine, California, has been certified compliant with ISO 9001 by the British Standards Institution.