

User Manual

850 MHZ/1 GHZ PHOTORECEIVERS

MODELS 1601 & 1611



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1 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 first occurs.

1.1 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.

CAUTION

These photodetectors and photoreceivers are sensitive to electrostatic discharges and could be permanently damaged if subjected to any discharges. Ground yourself adequately prior to handling these detectors or making connections. A ground strip provides the most effective grounding and minimizes the likelihood of electrostatic damage.

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.

2 Safety Information

2.1 Safety Procedures and Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of intended use of the instrument and may impair the protection provided by the equipment. MKS Instruments, Inc. assumes no liability for the customer’s failure to comply with these requirements.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an MKS Calibration and Service Center for service and repair to ensure that all safety features are maintained.

SERVICE BY QUALIFIED PERSONNEL ONLY

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

2.2 Symbols Used in This Instruction Manual

Definitions of, NOTE, CAUTION, WARNING and DANGER messages used throughout the manual.

NOTE The NOTE sign denotes important information. It calls attention to a procedure, practice, condition, or the like, which is essential to highlight.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of all or part of the product.

WARNING The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition, on the like, which, if not correctly performed or adhered to, could result in injury to personnel.

DANGER The DANGER sign Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

3 Operation

3.1 Introduction

The Newport Models 1601 1 GHz and 1611 850 MHz, low-noise photoreceivers address the needs of the photodetector community in the area of low-noise, high-gain, RF photoreception. These photoreceivers are AC coupled and are capable of driving up to 1 V peak to peak into a 50- Ω load, with a current gain of 700 V/A.

The performance of these units is achieved through the use of solid RF design together with the implementation of some of the latest advances in commercially available amplifier chips. The detector is shielded to avoid RF pickup. New Focus offers two models to match your different wave-length requirements.

These photoreceivers have very large gain \times band-width products, low noise performance, high drive capability and a large dynamic range. They will enable wide bandwidth lownoise detection of signals distributed over fiber-optic cables or found in high resolution spectroscopy, fiber-optic sensors, optical metrology, and many other applications.

NOTE

Do not discard any packing materials unless you have completed your inspection and are sure the unit arrived safely.

CAUTION

Only qualified individuals should perform the installation and any adjustments. They must comply with all the necessary ESD and handling precautions while installing and adjusting the instrument. Proper handling is essential when working with all highly sensitive precision electronic instruments.

4 Theory

The Model 1601 photoreceiver consists of a silicon PIN photodiode followed by a lownoise amplifier. The Model 1611 photoreceiver consists of an InGaAs PIN photodiode with the same amplifier.

The 1601 photodetector has a maximum current of 5 mA and the 1611 photodetector has a maximum current of 10 mA. Therefore, the maximum input optical power is 10 mW for both detectors. The responsivity of the photodiode is shown in Figs. 2 and 3. Power is delivered through a connector on the back of the unit, and the entire package is shielded to eliminate RF pickup. Typical frequency responses for the Models 1601 and 1611 are shown in Figs. 4 and 5.

The amplifier is a low-noise, silicon amplifier having a voltage gain of 15 and an input impedance of 50 Ω . This unit can be cascaded with other 50- Ω amplifiers.

Transmission lines connect the photodiode to the amplifier and the amplifier to the output. Microstrip transmission lines are used to preserve speed and eliminate parasitic inductance and capacitance that can cause ringing. Rise time of the diode/amplifier combination is less than 400 ps.

The AC-coupled 1601 and 1611 incorporate blocking capacitors and a DC bias monitor circuit as shown in Fig. 1. The corner frequency of the high-pass filter on the AC-coupled output is approx. 30 kHz; the corner frequency of the low-pass filter on the DC bias monitor output is approx. 20 kHz. The DC bias monitor gain is 10 V/mA.

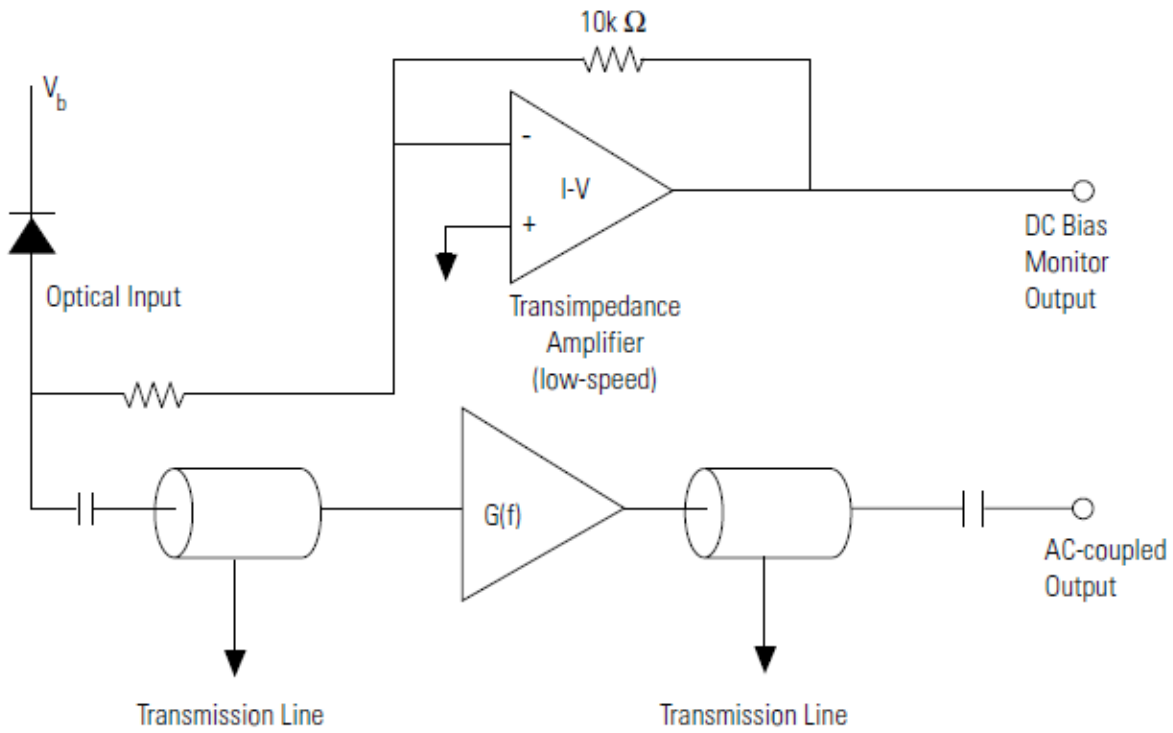


Figure 1: Functional block diagram of the Models 1601 and 1611.

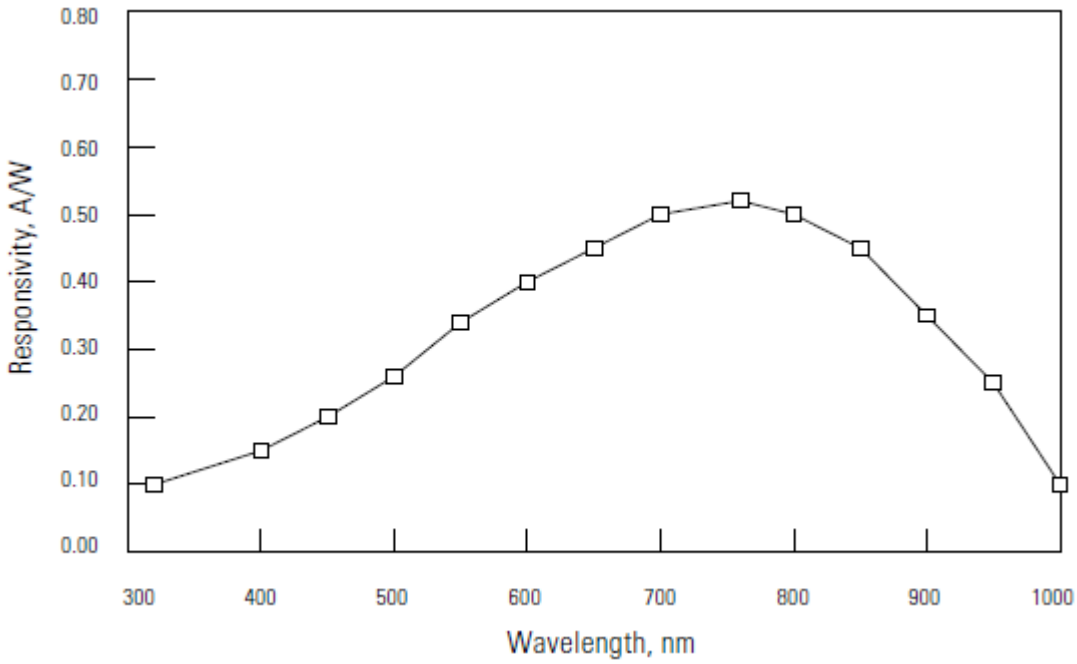


Figure 2: Responsivity of the photodiode used in the Model 1601.

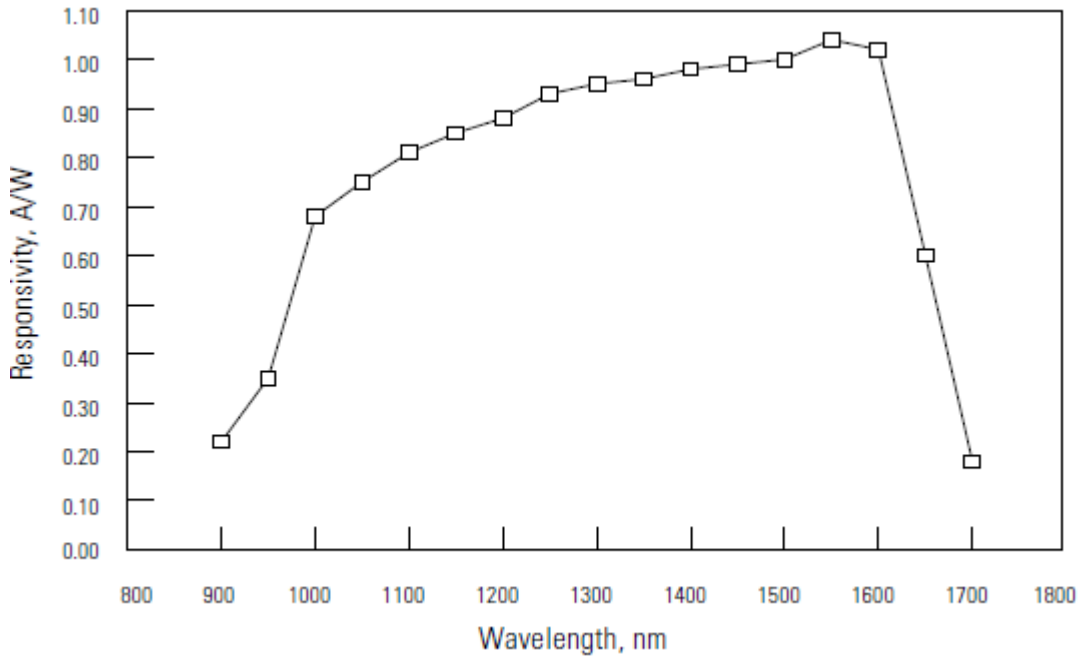


Figure 3: Responsivity of the photodiode used in the Model 1611.

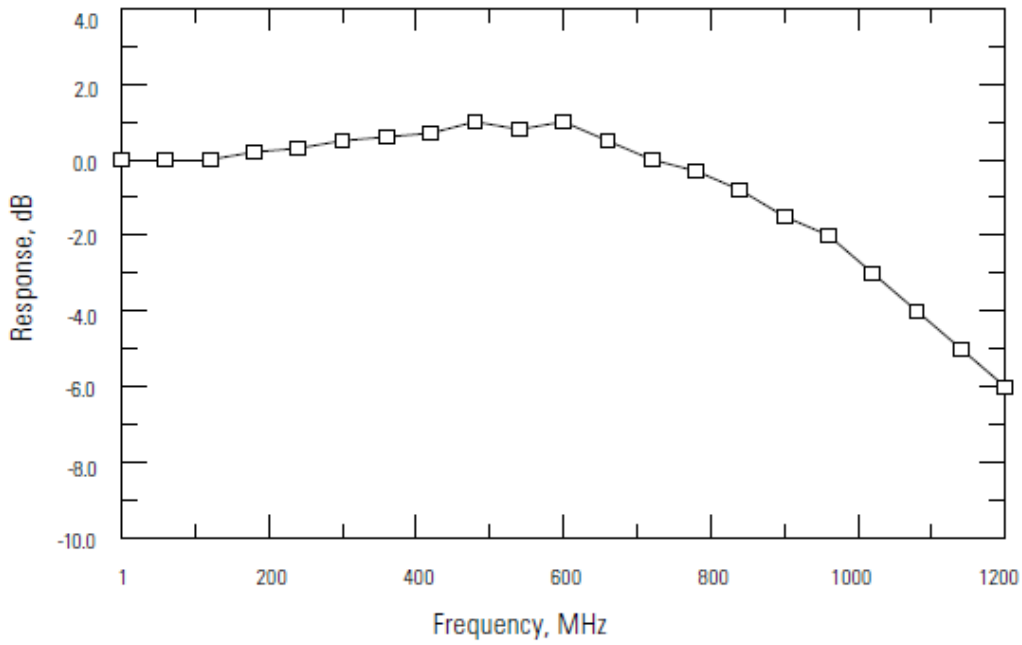


Figure 4: Typical frequency response of the Model 1601.

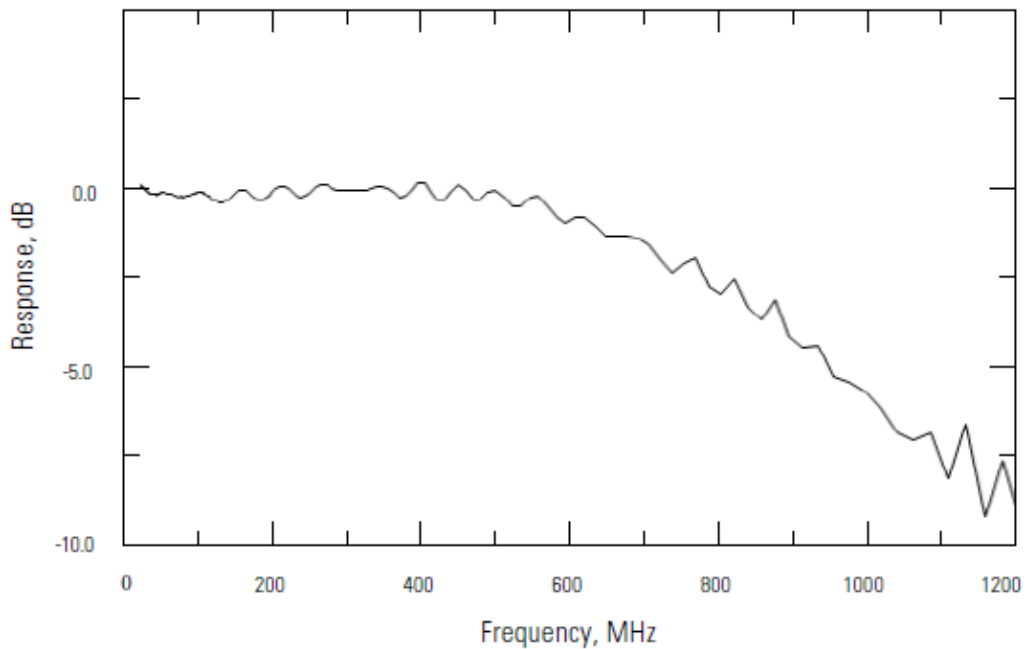


Figure 5: Typical frequency response of the Model 1611.

5 Operation

5.1 To obtain optical input:

1. Plug one end of the power cable to the connector on the back of the module and the other end into a ± 15 Volt power supply. Turn on the supply. Two different power cables have been shipped with your detector: a model 0924 banana plug to Pico (m8) cable and a Model 0923 Pico (m8) to Pico (m8) cable. The convention of the three banana plugs is:

Banana Plug	Voltage
Red	+15 V
Green	COM/GND
Black	-15 V

2. Turn on the optical beam.
3. For direct optical beam input, align the module in front of the optical beam. For fiber-optic cable input, connect the fiber optic input cable from your optical source to the FC-input connector port on the front of the module.

NOTE

to operate the receiver in the linear region, keep the input power levels well below The CW saturation power specification on page 12 period (the input power is wavelength dependent and is inversely proportional to the responsivity.)

5.2 To set up the output connection:

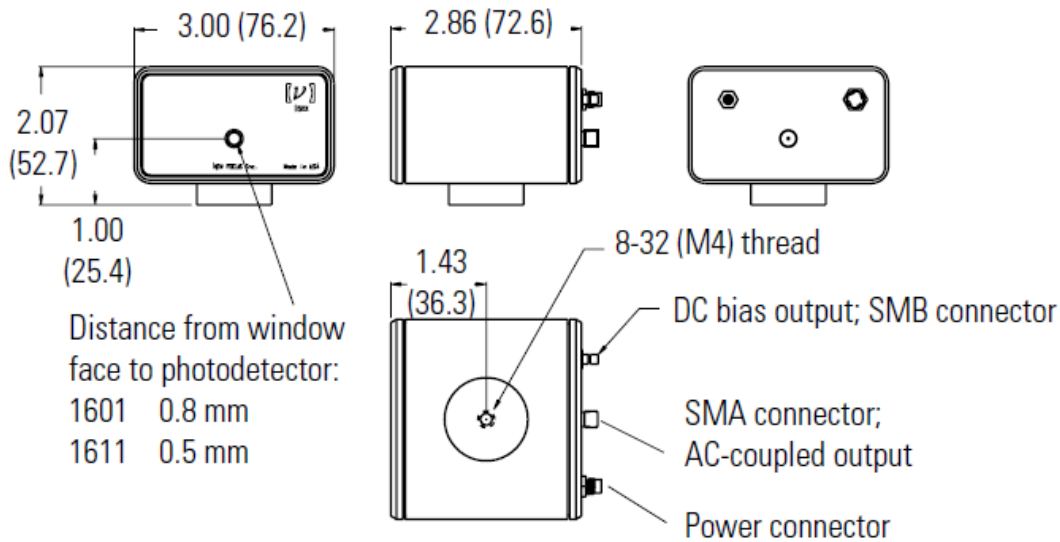
1. If your RF measurement instrument has a male connector, connect it directly to the SMA female output connector (labeled "AC") on the back of the module or connect with the appropriate cable.

If your instrument has a female connector, connect with the appropriate cable.

2. Monitor the DC bias on the output labeled "DC" with the provided SMB-to-BNC cable.

6 Model 1601 and 1611 Specifications

6.1 Dimensional



6.2 Performance

Table 1: 1601 and 1611 series specifications.

Model	1601	1611
Coupling	AC	AC
Bandwidth (3-dB)	30 kHz–1 GHz	30 kHz–850 MHz
Wavelength Range	320–1000 nm	900–1700 nm
Photodiode Material	Silicon PIN	InGaAs PIN
Photodiode Size	400- μ m diameter	100- μ m diameter
Power Requirements	\pm 15 V DC; 300 mA	\pm 15 V DC; 300 mA
Risetime	400 ps (est.)	400 ps (est.)
Current Gain	700 V/A	700 V/A

Input Noise Current	16 pA/ $\sqrt{\text{Hz}}$	16 pA/ $\sqrt{\text{Hz}}$
N.E.P	31 pW/ $\sqrt{\text{Hz}}$ (@ 760 nm)	20 pW/ $\sqrt{\text{Hz}}$ (@ 1.3 μm)
Output Current	10 mA (max into 50 Ω)	10 mA (max into 50 Ω)
Input Power (Linear Operation)	2 mW (max @ 760 nm)	1 mW (max @ 1.3 μm)
Input Power (CW)	10 mW (max w/o damage)	10 mW (max w/o damage)
Dynamic Range	>60 dB (typ)	>60 dB (typ)
Operating Temperature	10 - 35 $^{\circ}\text{C}$, < 70% RH	10 - 35 $^{\circ}\text{C}$, < 70% RH
Connectors		
Optical Input	FC or free space	FC or free space
RF Output	SMA	SMA
DC Bias Monitor	SMB	SMB

7 Customer Service

7.1 Technical Support

Information and advice about the operation of any Newport product is available from our technical support engineers. For quickest response, ask for “Technical Support” and know the model number and serial number of your photoreceiver.

Hours: 8:00-5:00 PST, Monday through Friday (excluding holidays)

Phone: 1-877-835-9620

Support is also available by email and chat

Chat: Connect with us at www.Newport.com

Email: tech@newport.com

We typically respond to email within one business day.

7.2 Service

In the event that your photoreceiver malfunctions or becomes damaged, please contact Newport for a return merchant authorization (RMA) number and instructions on shipping the unit back for evaluation and repair.

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