

125-MHz Photoreceivers

Models 1801 and 1811



These 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 strap provides the most effective grounding and minimizes the likelihood of electrostatic damage.

 **Newport**[™]

phone: (877) 835-9620

e-mail: tech@newport.com

www.newport.com

Warranty

Newport Corporation guarantees its products to be free of defects for one year from the date of shipment. This is in lieu of all other guarantees, expressed or implied, and does not cover incidental or consequential loss.

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Operation

Introduction

The Newport Models 1801 and 1811 125-MHz, low-noise photoreceivers address the needs of the photodetector community in the area of low-noise, high-gain, RF photoreception. These photoreceivers are available either DC or AC coupled. Their typical bandwidth is 125 MHz with a current gain of 40 V/mA.

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. Newport offers two models to match your different wavelength needs. The specifications at the rear of the manual list each model's characteristics.

These units address nearly all of the general purpose needs of the RF photoreception community. They all have a very large gain-bandwidth product, low noise, high drive capability and a large dynamic range. These receivers will enable wide bandwidth low-noise detection of signals distributed over fiber-optic cables or found in high resolution spectroscopy, fiber-optic sensors, optical metrology, and many other applications.

Handling Precautions

Whenever handling the photoreceiver, make sure to follow these precautions:

- Prior to handling the unit or making connections, be sure to ground yourself adequately—even small electrostatic discharges could permanently damage the device. A ground strap provides the most effective grounding and minimizes the likelihood of electrostatic damage.
- Make sure the optical connector is clean and undamaged before connecting it to the detector module.

Using the Photodetector

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 $\pm 15\text{-V}$ power supply. (We recommend the Newport Model 0901 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. If you have a New Focus Model 0901 power supply, use the Model 0923 cable on one of the supply's 0.3-A Pico (m8) outputs. Do not use the Model 0924 on the Model 0901 power supply's 0.1-A banana outputs since they do not provide enough current for the receiver. Use the Model 0924 cable only with a power supply other than the 0901 providing a minimum of 0.25 A of

current on ± 15 V. 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 free-space beam input, align the module so that the beam is incident on the detector surface. For fiber-optic input, connect the fiber-optic cable from your optical source to the FC input connector on the front of the module. The detector is designed to receive an FC/PC connectorized fiber.

Note:

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

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 AC-coupled units) on the back of the module.
2. If your instrument has a female connector, connect with the appropriate cable.
3. On AC-coupled units, monitor the DC bias on the output labeled "DC" with the provided SMB-to-BNC cable.

Theory

The Model 1801 photoreceiver contains a Silicon/PIN photodiode. The Model 1811 contains an InGaAs/PIN photodiode. In both models, the photodiode is followed by a low-noise transimpedance amplifier. A functional block diagram of the DC-coupled version is shown in Figure 1.

The AC-coupled versions incorporate blocking capacitors and a DC bias monitor circuit. The corner frequency of the high-pass filter on the AC-coupled output is approximately 25 kHz. The corner frequency of the low-pass filter on the DC bias monitor output is approximately 50 kHz. Refer to Figure 2 for a functional block diagram.

Figure 3 and Figure 4 show the responsivity of the photodiodes. Power is delivered through a connector on the back of the unit and the entire package is shielded to eliminate RF pickup.

The 3-dB bandwidth is typically in excess of 125 MHz for the Model 18x1 photoreceivers. See the typical frequency response plot in Figure 5.

The output noise for the 18x1 family is 5 mVrms when measured on a >250-MHz, 50-ohm oscilloscope. For additional information on 18x1 noise performance, see the typical Input Referred Noise and typical Output Noise plots in Figure 6 and 7.

Figure 1:
Functional
block diagram
of Models 1801
& 1811
(DC Versions).

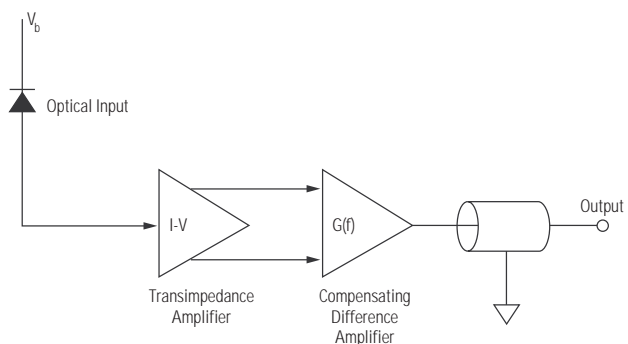


Figure 2:
Functional
block diagram
of Models 1801
& 1811
(AC Versions).

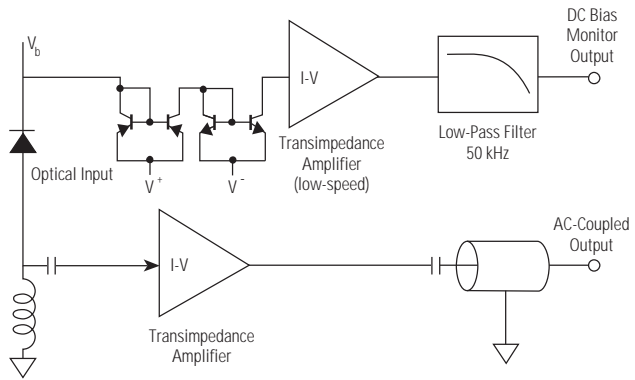


Figure 3:
Responsivity of
the
photodiode
used in the
Model 1801
(DC Version).

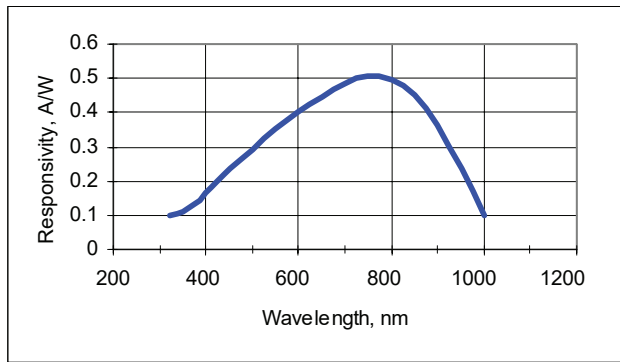


Figure 4:
Responsivity of
the
photodiode
used in the
Model 1811
(DC Version)

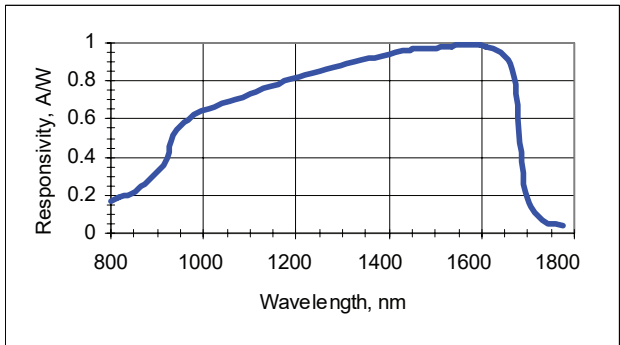


Figure 5:
Typical
frequency
response

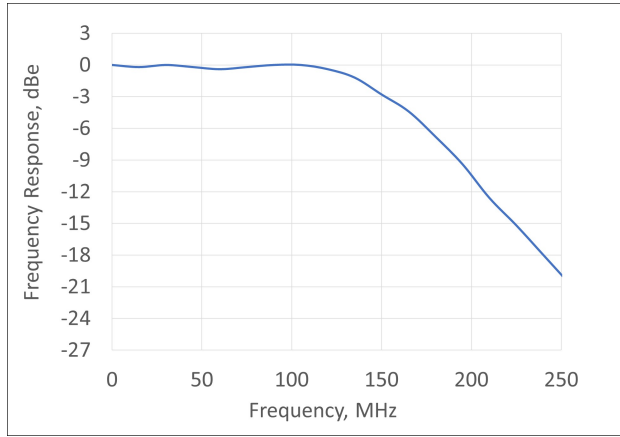


Figure 6: Typical
Input Referred
Noise of the
18x1 products

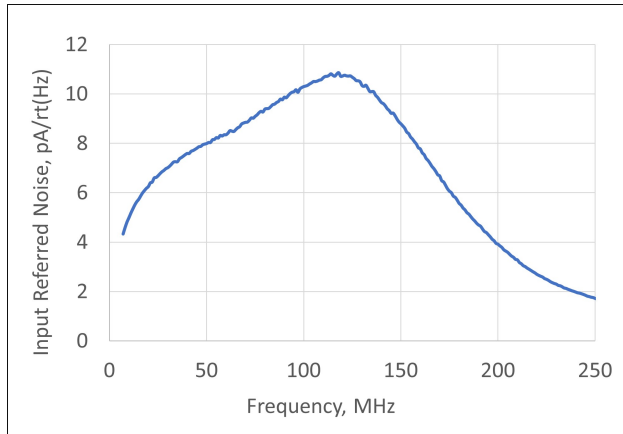
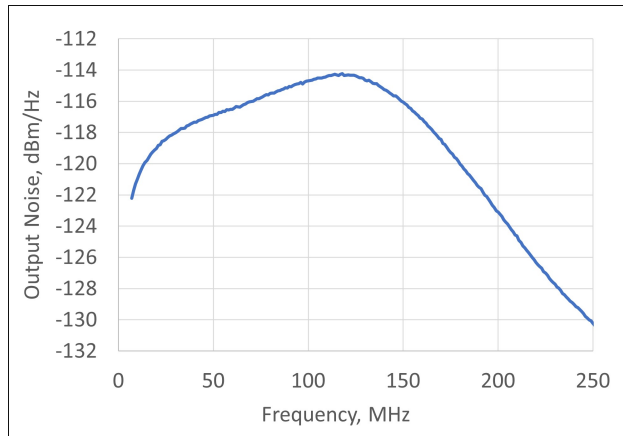


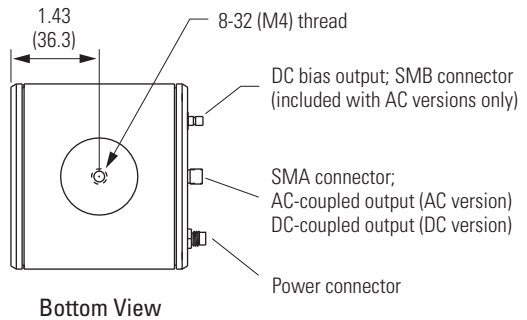
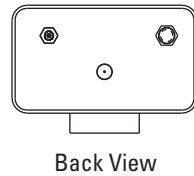
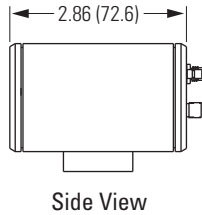
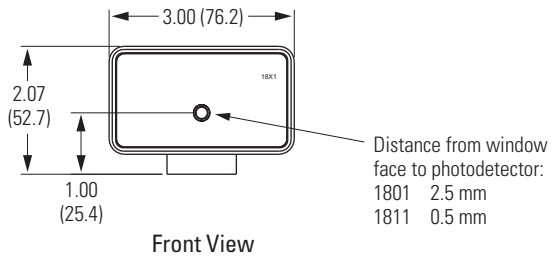
Figure 7: Typical
Output Noise of
the 18x1
products



Characteristics

Physical Specifications

Figure 6:
Mechanical
drawings of
the Model
18X1 casing



Photodetector Specifications

Model #	1801	1811
Wavelength Range	320–1000 nm	900–1700 nm
Coupling	DC or AC	DC or AC
3-dB Bandwidth (DC versions)	DC–125 MHz typical	DC–125 MHz typical
3-dB Bandwidth (AC versions)	25 kHz–125 MHz typical	25 kHz–125 MHz typical
DC Bias Monitor Bandwidth (AC versions only)	DC–50 kHz typical	DC–50 kHz typical
Risetime	3 ns (typical)	3 ns (typical)
Transimpedance Gain* (AC-coupled version)	40 V/mA (AC) 10 V/mA (DC)	40 V/mA (AC) 10 V/mA (DC)
Transimpedance Gain* (DC-coupled version)	40 V/mA	40 V/mA
Output Impedance	33 Ω	33 Ω
Integrated Noise	5 mVrms	5 mVrms
Conversion Gain*	2x10 ⁴ V/W @ 760 nm	4x10 ⁴ V/W @ 1550 nm
Saturation Power	110 μ W @ 760 nm	55 μ W @ 1550 nm
Maximum Optical Power	10 mW @ 760 nm	5 mW @ 1550 nm
Detector Material/Type	Silicon/PIN	InGaAs/PIN
Detector Diameter	0.4 mm	0.3 mm (FS) 0.15 mm (FC)
Power Requirements	\pm 15 V DC; <200 mA (0901 recommended)	\pm 15 V DC; <200 mA (0901 recommended)
Optical Input	FC or free space	FC or free space
RF Output	SMA	SMA
DC Bias Monitor output (AC-coupled units only)	SMB	SMB

* When driving a 50 Ω load

Customer Service

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

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.