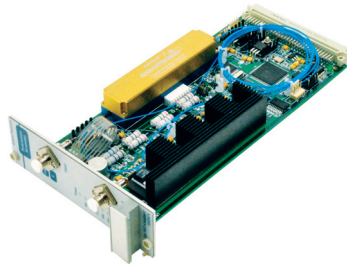


Polarization Scrambler Module with Microprocessor Controller



General Photonics' Polarization Scrambler module uses a breakthrough all-fiber technology to effectively randomize polarization states. This module is designed to be easily plugged into sensor equipment or measurement instruments with minimal development effort. Its advanced digital circuitry delivers uniform SOP distribution over a wide operation temperature range, making it a good choice for sensor field applications. The PCD-005 can be remote controlled via RS-232 to set the operation wavelength or enable/disable the scrambling operation. The PCD-005 delivers superior performance with extremely low insertion loss, back reflection, and residual phase and amplitude modulation.

Specifications:

Insertion Loss ¹	< 0.05 dB (without connectors) < 0.6 dB (with connectors)
Center Operating Wavelength ²	λ range 1: 1310, 1480, 1550, 1600nm λ range 2: 980, 1060, 1310nm
Operating Wavelength Range ³	> 100 nm
Output Degree of Polarization ^{4,5}	< 5%
Average PMD	< 0.05 ps
Intrinsic PDL	< 0.05 dB, 0.01dB typical
Return Loss	> 65 dB (without connectors)
Optical Power Handling	> 1000 mW
Residual Amplitude Modulation	< ± 0.01 dB
Residual Phase Modulation	< 0.1π
Power Supply	± 12 VDC / 1A to ± 15 VDC / 1A, +5 VDC / 0.2A
Power Consumption	12 W typical
Scrambling Frequencies	Factory set 4 fixed frequencies, distributed between DC to > 700 kHz
Operating Temperature	Standard: 10 to 45°C Extended: -5 to 65°C
Storage Temperature	-20 to 75 °C
Board Dimensions	220 × 100 × 30 mm (L × W × H)

Notes:

1. For SMF-28 compatible fiber. Other fibers may have higher loss, especially with connectors.
2. Please note that the fiber used determines the operating wavelength range. The standard fiber covers wavelengths in the 1260-1620nm range. The PCD-005 can also be configured to cover the 980-1310nm range using a different fiber. This fiber can handle wavelengths up to 1650nm, but if it is coupled to SMF-28 fiber, the performance may not be quite as good as normal due to mode mismatch. Please contact General Photonics for details.
3. Center Wavelength ± 50 nm
4. At 500 Hz detection bandwidth
5. Measured from a photodetector at PCD-005 output using a spectrum analyzer. A polarizer is placed in front of the photodetector to convert polarization modulation to amplitude modulation.

Features:

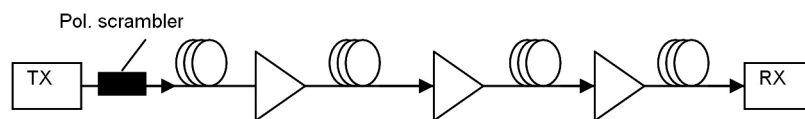
- Minimal insertion loss and back reflection
- Low residual phase and amplitude modulation
- RS-232 control option
- Remote operation wavelength control

Tech Info: pp. 104, 223
FAQ: p. 229

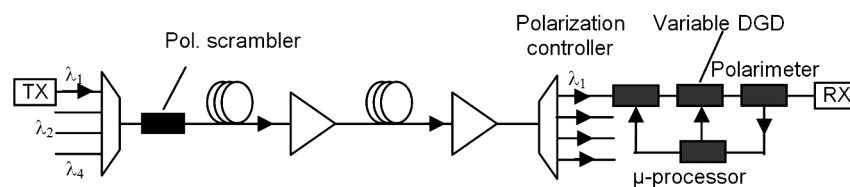


Polarization Scrambler Module with Microprocessor Controller

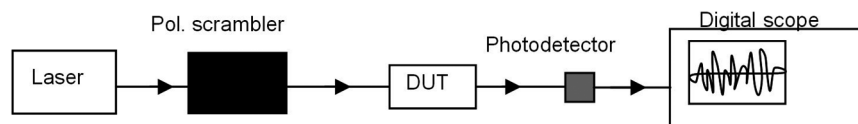
Applications:



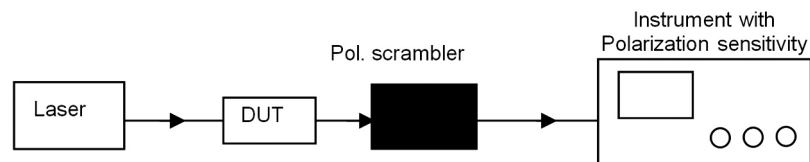
PDG (polarization dependent gain) mitigation



Facilitating PMD compensation



Facilitating PDL measurement



Polarization sensitivity elimination
in fiber sensor systems and in measurement systems

Polarization Scrambler Module with Microprocessor Controller

Typical Performance Data:

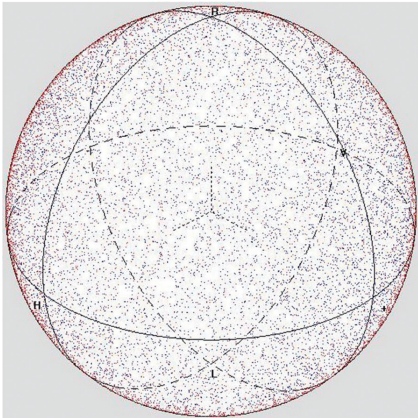


Figure 1. PCD-005 SOP distribution measured by a POD-101D polarimeter using a sampling rate of 625 kS/s over a measurement period of 1 second.

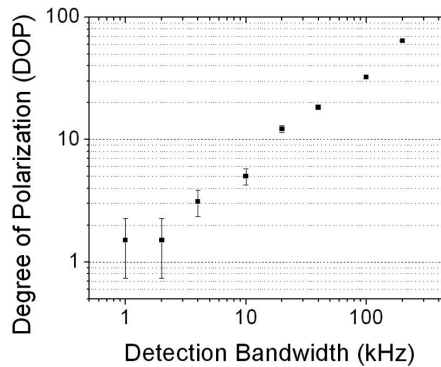


Figure 2. Degree of Polarization (DOP) as a function of detection bandwidth.

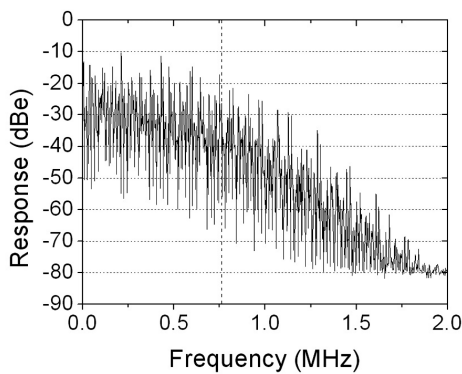
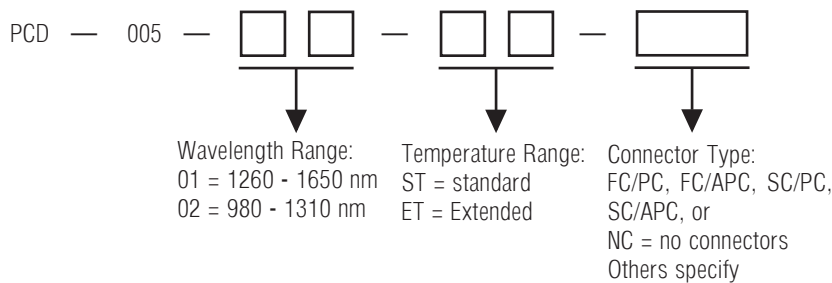


Figure 3. Effective scrambling bandwidth.

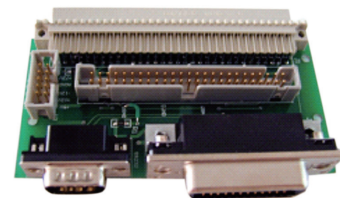
Ordering Information:



See pages 44, 46 for miniature scrambler, page 77 for passive depolarizer

Accessories:

ADB — 001 (RS-232 adapter board)



Miniature Polarization Scrambler Module

PSM-002

General Photonics' miniature polarization scrambler module, the PSM-002, is specially designed for integration into sensor and communication systems that need to work in extreme environmental conditions. The module uses General Photonics' patented fiber squeezer technology to effectively randomize polarization states. Unlike that of the PCD-005, the scrambling rate of this miniature scrambler is user selectable via an RS-232 command. Another attractive feature is that the scrambling function can also be enabled and disabled by a TTL trigger signal. The PSM-002 is available either as a standard board for lab applications or fully enclosed in a water-tight enclosure for applications in high humidity environments. It also comes in either standard or extended temperature versions.



Specifications

Insertion Loss ¹	< 0.05 dB (without connectors) < 0.6 dB (with connectors)
Operating Wavelength ²	1260 to 1650 nm and 980 to 1310 nm standard
Output Degree of Polarization ³	< 5%; 2.5% typical
Average PMD	< 0.05 ps
Intrinsic PDL	< 0.05 dB (0.01 dB typical)
Return Loss	> 65 dB (without connectors)
Optical Power Handling	> 300 mW
Power Supply	5.0 to 5.5 VDC / 9W max.
Power Consumption	0.5 to 9 watts, depending on the scrambling rate
Scrambling Rate	User selectable from 0.01 to 20,000 points/s
Operating Temperature	Standard: 0 to 65°C Extended: -35°C to 70°C (case temperature)
Storage Temperature	-40°C to 85°C
Dimensions	96 (L) × 63.5 (W) × 18 (H) mm (board version) 115 (L) × 82.6 (W) × 19 (H) mm (enclosure)

Notes:

- For SMF-28 compatible fiber. Other fibers may have higher loss, especially with connectors.
- Standard calibrated wavelengths are 1550nm (1260-1650nm version) and 1310nm (980-1310nm version). Others available.
- DOP specification is <5% (to within 2σ) when averaged over 4000 or more points.

Wavelength Range:
01 = 1260 – 1650 nm
02 = 980 – 1310 nm

Enclosure:
0 = without enclosure
E = with enclosure

Ordering Information:

PSM - 002 - XX - X - XX - XXX

Temperature Range:
ST = standard
ET = extended

Connector Type:
FC/PC, FC/APC
SC/PC, SC/APC or
NC = No Connectors
Others specify

Temperature Range:
ST = standard
ET = extended

Connector Type:
FC/PC, FC/APC
SC/PC, SC/APC or
NC = No Connectors
Others specify



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Micro Polarization Scrambler



This OEM micro polarization scrambler integrates General Photonics' all-fiber dynamic polarization control technology with miniature electronic drive/control circuitry into a compact, self-contained device that provides full polarization control functionality while minimizing volume, power consumption, and cost. Two polarization scrambling options are available: random scrambling at a rate of up to 5 discrete points/s or smooth trace scrambling at a rate of up to 60π rad/s. Scrambling can be disabled with a 5-volt TTL high and enabled with a TTL low. This module is ideal for integration in a PDL measurement instrument or in a sensor system to minimize polarization related measurement uncertainties. It requires only ± 12 VDC power supplies, and its low power consumption enables use in battery-powered handheld devices.

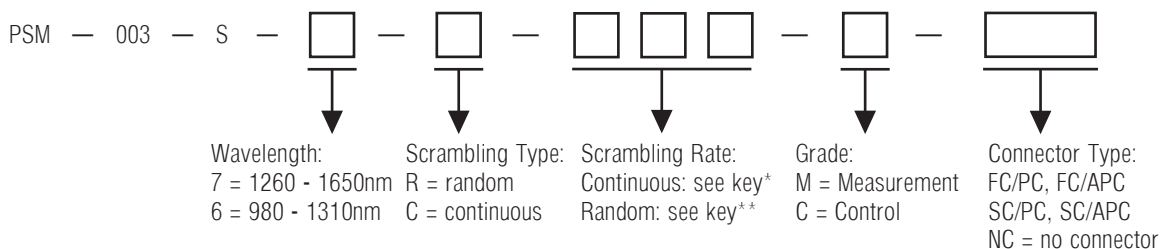
Specifications:

Operating Wavelength Range	1260 to 1650 nm standard, others specify
Smooth Trace Scrambling Rate	0.0192 π , 0.096 π , 0.48 π , 2.4 π , 12 π , 60 π rad/s, please specify when ordering.
Discrete Scrambling Rate	0.1, 0.2, 1, 5 points/s please specify when ordering.
Insertion Loss	Measurement grade: 0.05 dB, excluding connectors Control grade: 0.1 dB, excluding connectors
Return Loss	> 65 dB excluding connectors
Activation Loss	Measurement grade: 0.01 dB Control grade: 0.1 dB
PDL	Measurement grade: < 0.01 dB Control grade: < 0.1 dB
PMD	< 0.05 ps
Optical Power Handling	300 mW
Fiber Pigtail	9/125 μ m single mode fiber standard, others specify
Electrical Interface	8-wire flat cable
Power Supply	± 12 VDC/25 mA
Power Consumption ¹	< 0.6W typical
Operating Temperature	-10 to 70°C
Storage Temperature	-40 to 85 °C
Dimensions	2.58" (L) \times 1.25" (W) \times 0.63" (H)

Notes:

1. Continuous scrambling, 12 π rad/s, at 23°C.

Ordering Information:



*Continuous Scrambling Rate Key

000 = 0.0192 π rad/s
001 = 0.09 π rad/s
005 = 0.48 π rad/s
024 = 2.4 π rad/s
120 = 12 π rad/s
600 = 60 π rad/s

**Random Scrambling Rate Key

001 = 0.1 points/s
002 = 0.2 points/s
010 = 1 point/s
050 = 5 points/s

Features:

- Compact
- Low power consumption
- Low cost
- Plug and play

Applications:

- Minimize polarization related fluctuation in sensor systems
- Minimize polarization related fluctuation in measurement systems
- PDL or DOP measurement

Dimensions (in inches):

