

# Integrated PolaRITE™ III with Miniature Piezo Driver Card

## PCD-M02

This module integrates a General Photonics all-fiber dynamic polarization controller with miniature piezo driver card, so that the SOP of the signal can be directly controlled either by a 0-5V analog control signal or a 12-bit TTL digital control signal. Because there is an on-board HV DC/DC converter, no external high voltage power supply is required. The card can be configured to accept either a  $\pm 12$  volt power supply or an external 160-volt power supply. As a polarization controller, the PCD-M02 can convert any input polarization state to any desired output polarization state. As a scrambler, it can randomize the output polarization state. This module offers the low insertion loss, low back reflection, and low activation loss needed for test and measurement applications, combined with the compact size needed for system integration or handheld devices.



### Specifications<sup>1</sup>

Operating Wavelength	1260-1650nm or 980-1310nm standard Others available
Insertion Loss <sup>2</sup>	< 0.05 dB (without connectors) < 0.6 dB (with connectors)
Return Loss	>65 dB
Activation Loss	0.01 dB (P grade), 0.05 dB (A grade)
Polarization Mode Dispersion	0.05 ps
Polarization Dependent Loss	0.05 dB
Optical Power Handling	1000 mW
Polarization Control Range	0-4 $\pi$ each channel (Optical head $V_{\pi}$ per channel $\leq 35V$ )
Number of Channels	3 or 4
Power Supply	+12VDC/1.2A, -12VDC/0.1A (standard) or +12VDC/1.2A, -12VDC/ 0.1A, +160V/100 mA (ext)
External Analog Input	10 pin
Analog Control Voltage	0-5V
Input Impedance (Analog)	$\geq 20$ k $\Omega$
Analog Input Gain	30V/V $\pm 1$ %
External Digital Input	20 pin
Digital Control	TTL, 12-bit data, 4-bit control
Output Voltage Range	0-140V
Max. Output Current	20 mA / channel all channels (continuous) 60 mA single channel (continuous) 60 mA per channel (peak)
Output Impedance	50 $\Omega$
140V Output Rise/Fall Time	<30 $\mu$ s (MPD-001, no load), <400 $\mu$ s (PCD-M02)
15V Output Rise/Fall Time	10 $\mu$ s (MPD-001, no load), 65 $\mu$ s (PCD-M02)
Noise <sup>3</sup>	<40 mV (RMS)
Operating Temperature	0° to 40° C
Storage Temperature	-20° to 60°C
Board Dimensions	3.94" (L) $\times$ 3.94"(W) $\times$ 0.69" (H)

### Applications:

- Polarization control
- Polarization scrambling
- PDL measurement
- PMD compensation/emulation
- Fiber sensor

### Features:

- Minimal insertion loss
- Low activation loss
- Fast response
- Digital and analog control
- Compact

### Ordering Information:

PCD - M02 - XX - X - XXX

# Channels:  
3X = 3 Channel  
4X = 4 Channel

Operation Wavelength:

1=480 nm  
2=633 nm  
3=780 nm  
4=820 nm  
6=980-1310nm  
7=1260-1650nm

Connector Type:  
FC/PC, FC/APC or  
NC = no connectors  
Others specify

1. Optical specifications are referenced without connectors.  
2. For SMF-29 compatible fibers. Other fibers may have higher loss, especially with connectors.  
3. The noise is measured with the output set to 140V and an output capacitance of 0.18 $\mu$ F (capacitance of piezoelectric actuator used in PolaRITE II/III). It may decrease with higher output capacitance and increase with no output capacitance.

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# Micro Polarization Controller



This OEM micro polarization controller 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. The state of polarization (SOP) of the output signal can be controlled via three analog 0 to 5V control voltages. This device is ideal for integration into OCT or sensor systems to maximize signal output. It requires only  $\pm 12$ 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
Number of Control Waveplates	$\times 3$
Control Voltage	0 – 5V
Rise and Fall Time	$< 5$ ms/V (or $12.5$ ms / $V_{\pi}$ )
$V_{\pi}$	2.5 V (typical), 3 V (max) @1550 nm
Frequency of Input Sine Wave	10 Hz max.
Insertion Loss	Control grade: 0.1 dB, excluding connectors Measurement grade: 0.05 dB, excluding connectors
Return Loss	$> 65$ dB excluding connectors
Activation Loss	Control grade: 0.1 dB Measurement grade: 0.01 dB
PDL	Control grade: $< 0.1$ dB Measurement grade: $< 0.01$ dB
PMD	$< 0.05$ ps
Optical Power Handling	300 mW
Fiber Pigtail	9/125 $\mu$ m single mode fiber standard, others specify
Electrical Interface	8-wire flat cable
Power Supply	$\pm 12$ VDC/25 mA
Power Consumption <sup>1</sup>	$< 0.6$ W 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. 5 V input on all 3 axes at 25 °C.

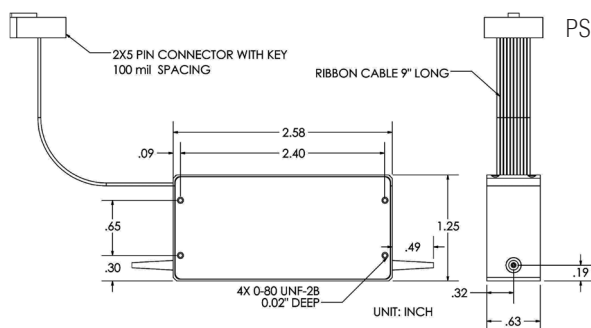
## Features:

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

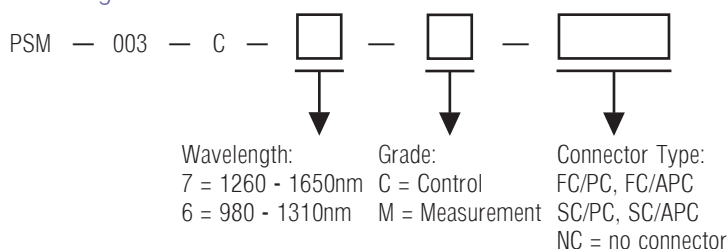
## Applications

- Polarization control in OCT systems
- Polarization control in sensor systems
- Polarization control in measurement systems

## Dimensions (in inches):



## Ordering Information:



# Pigttailed Polarization Controller – PolaRITE™



This version of the PolaRITE™ manual polarization controller is conveniently pigtailed with or without connectors. It can be spliced to other components with minimal loss, and is ideal for controlling the polarization state of light in any single mode fiber optic system. It is available in a regular (PLC-002) or miniature (PLC-M02) size for maximum flexibility.

## Specifications:

Intrinsic Insertion Loss	< 0.05 dB
Return Loss	> 65 dB
Operating Wavelength <sup>1</sup>	480 nm, 633 nm, 780 nm, 820 nm, 980 to 1310 nm, 1260 to 1650 nm
Extinction Ratio	> 40 dB
Operating Temperature	-40 to 85 °C
Storage Temperature	-40 to 85 °C
Dimensions	PLC - 002: 4.00" (L) x 1.00" (W) x 1.06" (H) PLC - M02: 3.00" (L) x 1.00" (W) x 1.09" (H)

Note: Values are referenced without connectors

1. 1260 to 1650nm and 980 to 1310 nm are the standard wavelength ranges for this product. Please contact General Photonics for information on other wavelength options.

## Features:

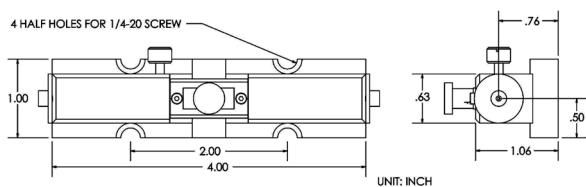
- Low Loss
- Low back reflection
- Compact
- Easy to connect
- Low cost
- Insensitive to wavelength variations

## Applications:

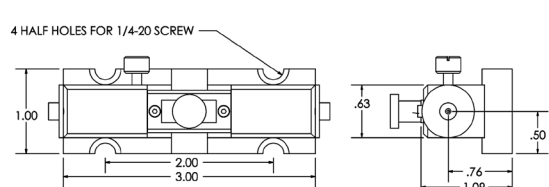
- High speed telecommunication systems
- WDM systems
- CATV systems
- Fiber laser
- Fiber sensor systems
- PM fiber systems
- Antenna remoting systems

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App Note: p. 210

## Dimensions (in inches):

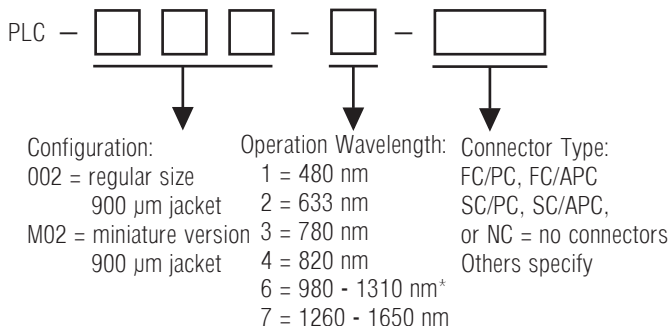


PLC-002



PLC-M02

## Ordering Information:

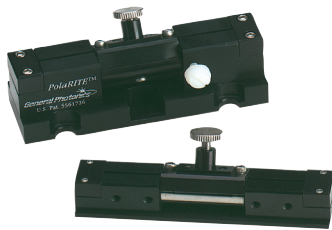


\*This fiber can handle wavelengths up to 1650nm, but if it is coupled to SMF-28 fiber, the performance may not be quite as good as normal due to mode mismatch.

See page 57 for fully connectorized polarization controller, page 56 for drop-in polarization controller

## Polarization Submodules

## Drop-in Polarization Controller – PolaRITE™



This is the in-line version of the PolaRITE™ polarization controller. It can be inserted into a fiber optic system to control the polarization state of light without having to disconnect any part of the system. It can be used by simply inserting a length of fiber into the slot located on top of the device. The miniature version can be inserted in even tighter spaces in a fiber optic module.

## Specifications:

Intrinsic Insertion Loss	< 0.05 dB
Return Loss	> 65 dB
Operating Wavelength	480 nm, 633 nm, 780 nm, 820 nm, 980 nm, 1064 nm, 1260 to 1650 nm
Extinction Ratio	> 40 dB
Operating Temperature	-40 to 85 °C
Storage Temperature	-40 to 85 °C
Dimensions	PLC - 003: 3.00" (L) x 1.00" (W) x 1.09" (H) PLC - 006: 3.00" (L) x 0.63" (W) x 0.67" (H)

## Features:

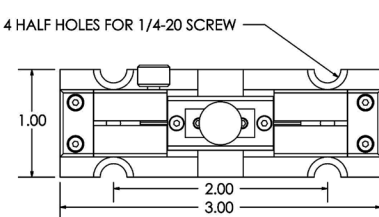
- Low Loss
- Low back reflection
- Compact
- Easy to connect
- Low cost
- Insensitive to wavelength variations
- Works with fibers of any size

## Applications:

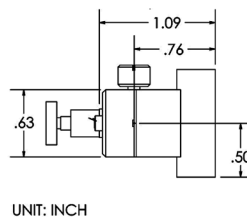
- High speed telecommunication systems
- WDM systems
- CATV systems
- Fiber laser
- Fiber sensor systems
- PM fiber systems
- Antenna remoting systems

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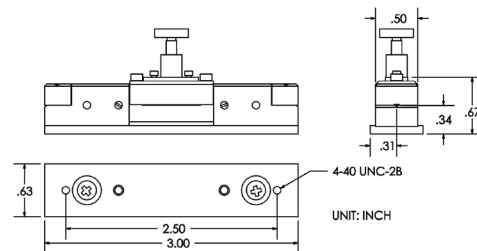
## Dimensions (in inches):



PLC-003



UNIT: INCH



PLC-006

UNIT: INCH

## Ordering Information:

PLC - 00  -  -

3 = Lab. version      S = Fiber clamp with screws      25 = 250 μm jacket  
6 = Miniature version      M = Fiber clamp with magnets      90 = 900 μm jacket

See page 57 for fully connectorized polarization controller, page 55 for pigtailed polarization controller

Notes:  
PLC-006 has no 900 μm jacket option  
Magnet clamp available only for PLC-003 for 250μm fiber

# Fully Connectorized Polarization Controller – PolaRITE™



This is a fully connectorized polarization controller that comes with either male (PLC-005) or female (PLC-004) connectors, thus eliminating the headaches of fiber pigtailed. Customers can use the bulkhead connectors of their choice. Although the unit comes with FC type connectors, it can interface with ST and SC type connectors with industry standard FC/ST or FC/SC adapters. The device is especially suitable for interconnecting polarization maintaining (PM) fibers using standard connectors without having to align the birefringent axes of the PM fibers. Optional scales allow easy replication of earlier settings, a feature highly desirable in laboratories for repeating polarization adjustments.

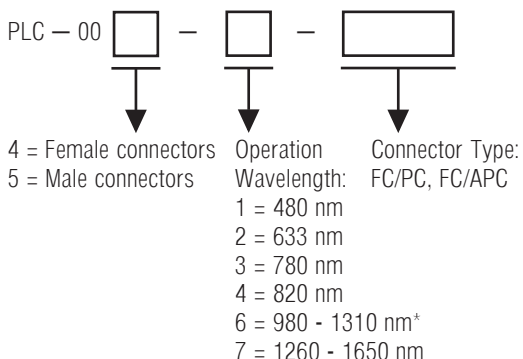
## Specifications:

Insertion Loss	< 0.5 dB with connectors
Return Loss	> 55 dB for APC connectors, > 45 dB for PC connectors
Operating Wavelength <sup>1</sup>	480 nm, 633 nm, 780 nm, 820 nm, 980 to 1310 nm, 1260 to 1650 nm
Extinction Ratio	> 40 dB
Operating Temperature	-40 to 85 °C
Storage Temperature	-40 to 85 °C
Dimensions	4.00" (L) x 1.00" (W) x 1.09" (H)

Notes:

1. 1260 to 1650nm and 980 to 1310 nm are the standard wavelength ranges for this product. Please contact General Photonics for information on other wavelength options.

## Ordering Information:



## Features:

- Low loss
- Low back reflection
- Compact
- Easy to connect
- Low cost
- Insensitive to wavelength variations

## Applications:

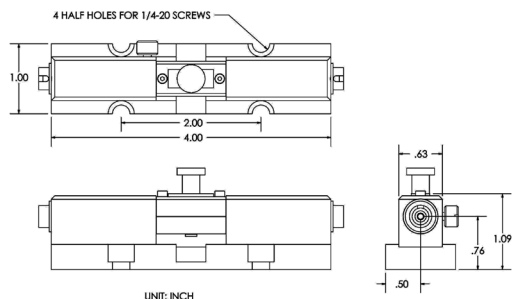
- High speed telecommunication systems
- WDM systems
- CATV systems
- Fiber laser
- Fiber sensor systems
- PM fiber systems
- Antenna remoting systems

Tech Info: p. 95  
App Note: p. 210

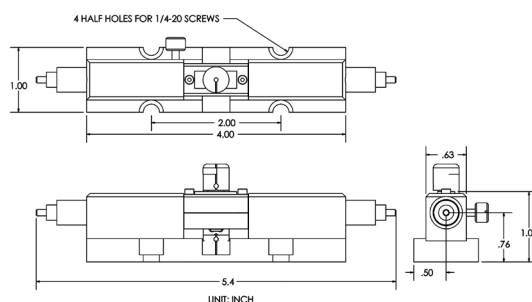
See page 56 for drop-in polarization controller, page 55 for pigtailed polarization controller

\*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.

## Dimensions (in inches):



PLC-004



PLC-005

