

# Miniature Motorized Optical Variable Delay Line

## MDL-002

General Photonics' motorized variable optical delay line provides precision optical path length adjustment of up to 560 ps, single-pass. Driven by a DC motor with an integrated encoder, the MDL-002 has a resolution of less than 0.3µm (1 fs). In addition, its advanced motion design guarantees longevity for long-term continuous operation. Low insertion loss and high reliability make this device ideal for integration in optical coherence tomography (OCT) systems, network equipment and test instruments for precision optical path length control or timing alignment. The MDL-002 is available in three configurations: 1) an integrated unit for use as a bench-top instrument for laboratory applications, 2) with the optical head and control unit separated for easy incorporation into other equipment, and 3) an OEM version with a miniature controller board. All three versions can be remote controlled by a PC or a micro-processor through an RS-232 interface. The delay line is available with either single mode or PM fiber pigtailed.



### Specifications

Operating Wavelength <sup>2</sup>	SM: 1260-1650 nm PM: 1310 or 1550 nm ± 50 nm	840 ± 50nm or 1060 ± 50nm
Optical Delay Range <sup>3,4</sup>	0 ~ 330 ps (single pass model) 0 ~ 560 ps (single pass model) 0 ~ 1120 ps (double pass model)	0 ~ 330 ps (single pass model) 0 ~ 560 ps (single pass model)
Position Accuracy <sup>5</sup>	±3 µm (single pass) ±6 µm (double pass)	±3 µm (single pass)
Position Repeatability <sup>5</sup>	±3 µm (single pass) ±6 µm (double pass)	±3 µm (single pass)
Insertion Loss <sup>1</sup>	1.0 dB nominal (single pass) 1.5 dB nominal (double pass)	1.5 dB nominal (single pass)
Insertion Loss Variation <sup>1</sup>	±0.3dB entire range (330 ps) ±0.5dB entire range (560 ps) ±0.7dB entire range (1120 ps)	±0.3dB entire range (330 ps) ±0.5dB entire range (560 ps)
PDL <sup>1</sup>	0.1 dB (SM fiber)	0.2 dB (SM fiber)
Optical Delay Resolution	0.3 µm or 1 fs per encoder count (single pass) 0.6 µm or 2 fs per encoder count (double pass)	
Return Loss <sup>1</sup>	50 dB	
Extinction Ratio	> 18 dB for PM model	
Optical Damage Power Threshold	300 mW	
Power Supply	12VDC / 1A max.	
Control Mode <sup>6</sup>	Panel keypad and RS-232 interface	
Display <sup>6</sup>	2 x 16 character LCD	
Operating Temperature	0°C to 40°C	
Storage Temperature	-20°C to 60°C	
Fiber Type	SMF-28 or PM Panda	HI780 or PM Panda (840 nm) HI1060 or PM Panda (1060 nm)
Dimensions (Control unit/integrated version)	330 ps model: 7" (L) × 4" (W) × 1.6" (H) 560 ps or 1120 ps models: 9" (L) × 4.4" (W) × 1.6" (H)	
Dimensions (Optical head)	330 ps model: 5.20" (L) × 1.46" (W) × 0.7" (H) 560 ps or 1120 ps models: 6.18" (L) × 1.46" (W) × 0.7" (H)	
Dimensions (OEM board)	2.56" (L) × 2.56" (W) × 0.85" (H)	

#### Notes:

- Values in table are valid over an 840, 1060, 1310, or 1550 ± 50nm range for a device without connectors at 23±5°C.
- Other wavelengths available upon request. Contact General Photonics for details.
- The 1120 ps model is a double-pass device. Input and output signals travel on the same pigtail. A circulator or PBS can be used to separate input and output signals.
- Double-pass versions not available for 840 or 1060nm.
- Accuracy and repeatability specifications given for mechanical position of reflector at static position setting.
- For model with standard control unit. OEM board has no display and is controlled by RS-232 only.

### Applications:

- Optical coherence tomography (OCT)
- Optical Fourier spectrum analysis
- Optical interferometry
- Delay generation & measurement
- Optical time division multiplexing (OTDM)
- Fiber sensors

### Unique Features:

- Compact
- High resolution
- Low backlash
- Low insertion loss
- High stability
- Long delay range



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## Typical Performance Data

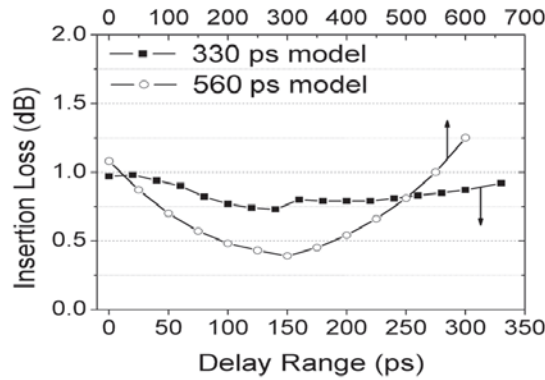
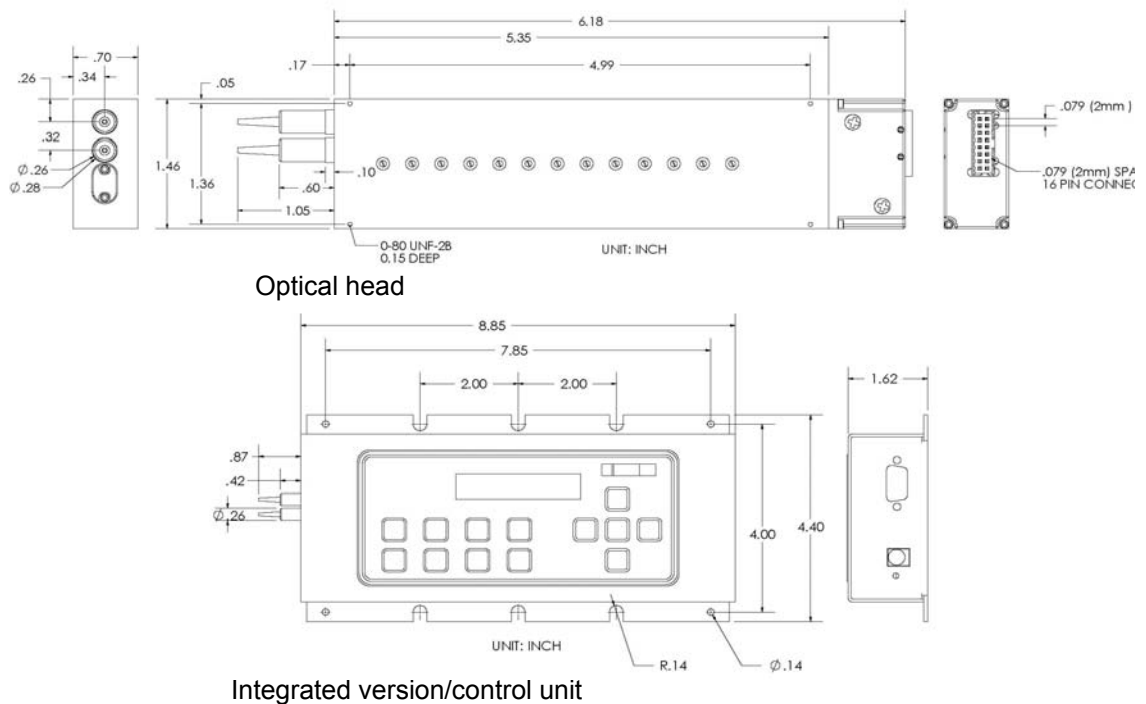


Figure 1: Insertion Loss vs. Optical Delay

## Dimensions: (Representative drawings: 560 ps version, in inches)



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## Ordering Information:

MDL- 002 - X - XX - XX - XX - XXX

Configuration:

I = Integrated  
D = Remote head/  
standard controller  
O = Remote head/  
OEM board

Wavelength:

84 = 840 nm  
10 = 1060 nm  
13 = 1310 nm  
15 = 1550 nm  
35 = 1310 & 1550 nm

Delay Range:  
33 = 330ps  
56 = 560ps  
11 = 1120 ps

Connector Type:  
FC/PC, FC/APC,  
SC/PC, SC/APC or  
NC = co connectors  
Others specify

Fiber Type:

SS = SM  
PP = PM

### Configuration Notes:

1. For SM pigtails, the default configuration is 3mm jacketed. For PM pigtails, the default configuration is 900µm loose tube jacketed.
2. Wavelength: 35 option (dual window 1310/1550nm) is available only for SM single-pass devices (330 and 560 ps). PM or double pass devices are single-window (e.g. 1310 or 1550nm) only.
3. Double-pass only available with SM fiber.
4. Double-pass not available for 840 or 1060nm.