

## Timing/Delay Modules

## Motorized Variable Optical Delay Line – VariDelay™ II



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 delay resolution of less than  $0.3\mu\text{m}$  (1 fs), and an extremely low backlash of less than 8 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 pigtails.

### Specifications:

Operating Wavelength <sup>1</sup>	SM: 1260 to 1650 nm PM or double-pass: $1310 \pm 50$ or $1550 \pm 50$ nm
Optical Delay Range <sup>2</sup>	0 – 330 ps (single-pass model) 0 – 560 ps (single-pass model) 0 – 1120 ps (double-pass model)
Optical Delay Resolution	0.3 $\mu\text{m}$ or 1 fs per encoder count (single-pass) 0.6 $\mu\text{m}$ or 2 fs per encoder count (double-pass)
Optical Delay Accuracy	$\pm 0.01$ ps or $\pm 3$ $\mu\text{m}$ (single-pass) $\pm 0.02$ ps or $\pm 6$ $\mu\text{m}$ (double-pass)
Optical Delay Repeatability	$\pm 0.01$ ps or $\pm 3$ $\mu\text{m}$ (single-pass) $\pm 0.02$ ps or $\pm 6$ $\mu\text{m}$ (double-pass)
Insertion Loss	1.0 dB nominal (single-pass) 1.5 dB nominal (double-pass)
Insertion Loss Variation	$\pm 0.3$ dB over entire range for 330 ps models $\pm 0.5$ dB over entire range for 560 ps model $\pm 0.7$ dB over entire range for 1120 ps model
PDL	0.1 dB max for single-mode fiber
Return Loss	50 dB
Extinction Ratio	> 18 dB for PM model
Optical Damage Power Threshold	300 mW
Power Supply	12 VDC / 1A max.
Control Mode	Panel keypad and RS-232 interface
Display	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 fiber
Dimensions (Control Unit/Integrated Version)	330 ps model: 1.6" (H) x 4" (W) x 7" (L) 560 ps or 1120 ps models: 1.6" (H) x 4.4" (W) x 9" (L)
Dimensions (Mini Controller Board)	2.56" (L) x 2.56" (W) x 0.85" (H)
Dimensions (Optical Head)	330 ps model: 0.7" (H) x 1.46" (W) x 5.20" (L) 560 ps or 1120 ps models: 0.7" (H) x 1.46" (W) x 6.18" (L)

Notes: Values in table are valid over a  $1310 \pm 50$  or  $1550 \pm 50$ nm range for a device without connectors.

1. Other wavelengths, such as 1064nm, also available.

2. The 1120 ps model is a double-pass device. Since input and output signals travel on the same pigtail, a circulator or PBS may be necessary to separate input and output signals for some applications.

### Features:

- Compact
- High resolution
- Low backlash
- Low insertion loss
- High stability
- Highest delay to length ratio
- Long delay: more than 560 ps

### Applications:

- Optical Coherence Tomography (OCT)
- Optical Fourier spectrum analysis
- Optical interferometry
- Delay generation and measurement
- Optical time division multiplexing (OTDM)
- Fiber sensors

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Typical Performance Data:

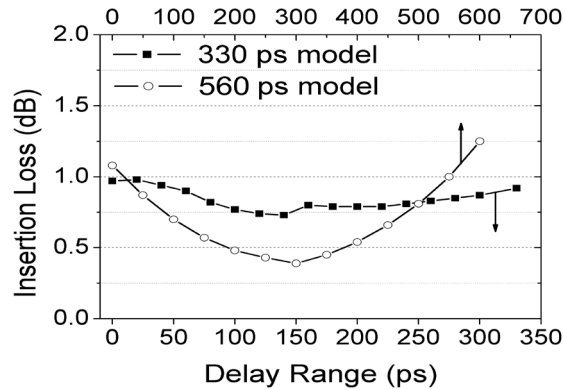
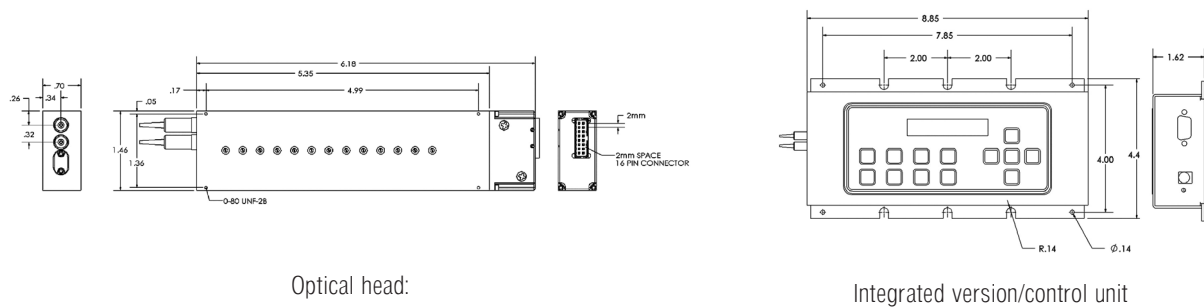


Figure 1. Insertion loss vs. optical delay.

Dimensions: (Representative drawings: 560 ps version)



Optical head:

Integrated version/control unit

Ordering Information:

MDL — 002 —  —   —   —    —    —

Configuration: I = integrated D = Remote head/ standard controller O = Remote head/ mini controller board	Wavelength: 13 = 1310 nm 15 = 1550 nm 35 = 1310 & 1550 nm	Delay Range: 33 = 330 ps 56 = 560 ps 11 = 1120 ps	Connector Type: FC/PC, FC/APC SC/PC, SC/APC or NC = no connectors Others specify	SS = SMF-28 PP = PM Panda
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Note:  
 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 (1310 or 1550nm) only.