

# Free Space Variable Optical Delay Lines

(Femtosecond Resolution, up to 4000ps delay, USB/RS232 GUI)



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The Motor-Driven Free Space Variable Optical Time Delay is an all-in-one module integrated controller with USB/RS232 computer interface and user-friendly GUI. It uses a highly stable moving stage with a novel backlash prevention mechanism and incorporates proprietary optical encoders, offering submicron repeatability, long delay range, and variable high speed. It features submicron-level high resolution at unmatched low cost, a covered dust-free moving track, compatibility with various mirrors, all-degree light path adjustments, and ease of use.

In operation, connecting the wall-pluggable power supply (included) and a computer via a USB cable (included) or a RS232 cable to the unit, the graphic control software (downloadable) will perform step scan in both forward and reverse direction. The module come with a standard one-year manufacturer warranty

## Features

- Low Cost
- fs Resolution
- Fast
- 4000ps Delay
- High Reliability
- Dust Cover
- Easy to Use

## Specifications

Parameter		Min	Typical	Max	Unit
Maximum Time Delay/Resolution (Accuracy)	1466ps			± 2	µm
	1800ps			± 7	
	4000ps			± 9	
Max Speed <sup>[2]</sup>	1466ps		20		mm/s
	1800ps		20		
	4000ps		20		
Durability (Life cycle)		10 <sup>7</sup>			
Operating Temperature		0		70	°C
Storage Temperature		-40		85	°C
Mirror Size			1"		

Equation to convert delay time to free space length:

$$T = L/C = L (m)/(2.9996 \times 10^8 \text{m/s})$$

## Applications

- Instrumentation
- Lab use

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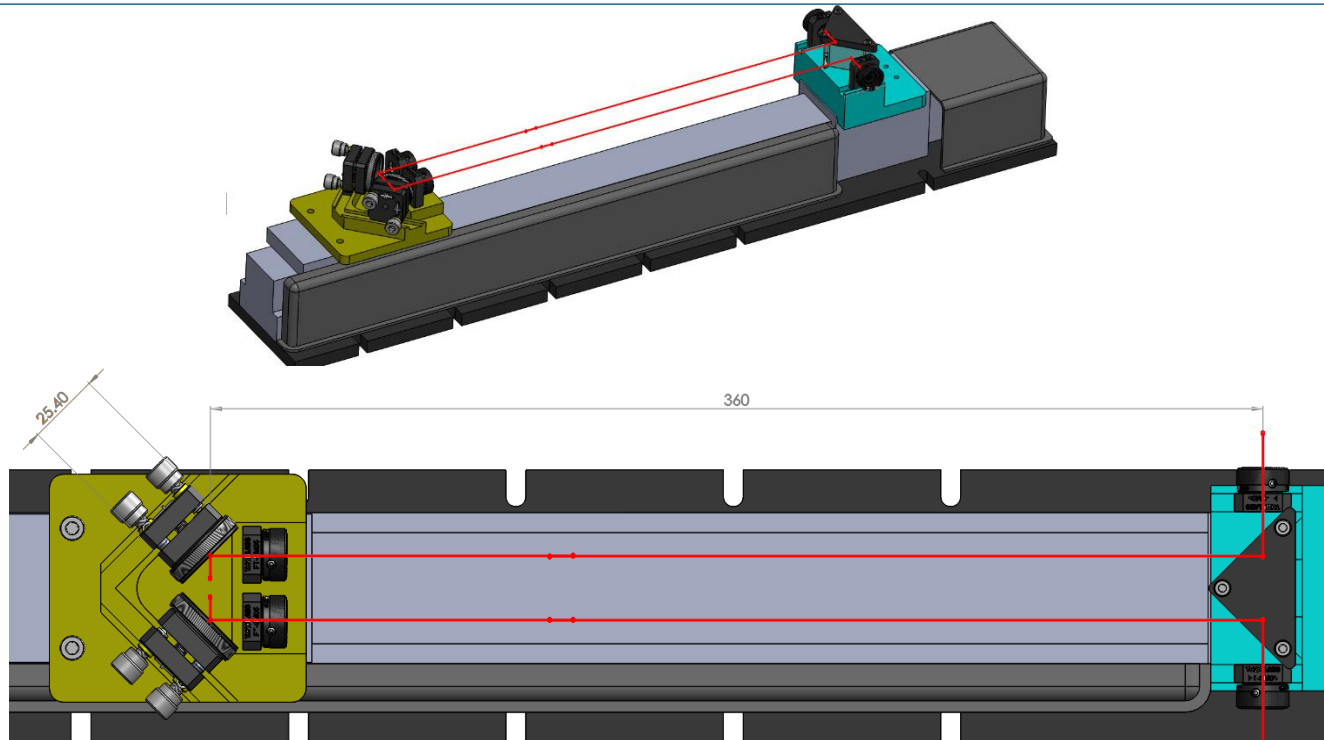
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## Mechanical Dimensions (mm)



\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

## Electrical Connection/ Operation Instruction

1. Connect the power supply (included)
2. Connect to a computer with the USB cable (included) or a RS232 cable
3. Install Windows™ GUI software (download)
4. Click run

## Parts List To Be Included

The module come with integrated controller and all the mechanical parts shown in the picture including two Adjustable Mirror Mounts, one Angle Bracket. Optical mirror and reflection prism can also be purchased here or from other vendors.

Qty	Part Number	Description
2	<a href="#">RFSM</a>	Silver Mirror, 25.4 mm, $\lambda/10$ , 480-20,000 nm
3	<a href="#">IDAA</a>	Iris Diaphragm, 1 to 11 mm Aperture Range, 10 Leaves
1	<a href="#">RFGP</a>	Glass Reflection Prism

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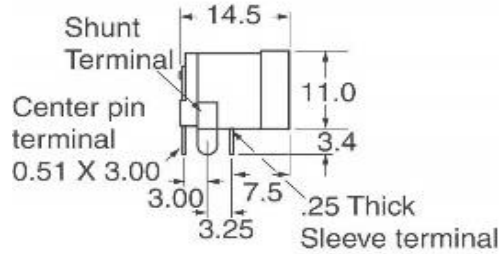
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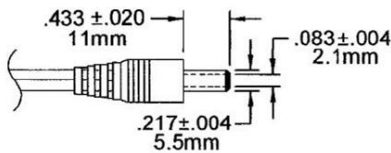
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### Power Connector

P/N:  
Power Barrel Connector Jack 2.00mm ID (0.079"),  
5.50mm OD (0.217") Through Hole, Right Angle



### 12V Wall Plug DC Power Supply Interface



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### GUI



### Ordering Information

Prefix	Type	Max Delay (ps) / Length (mm)	Minimum Step	Speed	Package	Mirror	Prism	Iris
FSDL-	Motorized = 01	670ps/100mm = 1 1770ps/220mm = 2 2000ps/300mm = 3 4000ps/600mm = 4	8fs = 1 Special = 0	Standard = 1 Special = 0	Standard = 1 Special = 0	Non = 1 1 = 2 2 = 3 3 = 4	Non = 1 1 = 2 2 = 3 3 = 4	Non = 1 1 = 2 2 = 3 3 = 4

1770ps is standard in stock item

#### Fiber Core Alignment

Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

#### Fiber Cleanliness

Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

#### Maximum Optical Input Power

Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the handling by expanding the core side at the fiber ends.

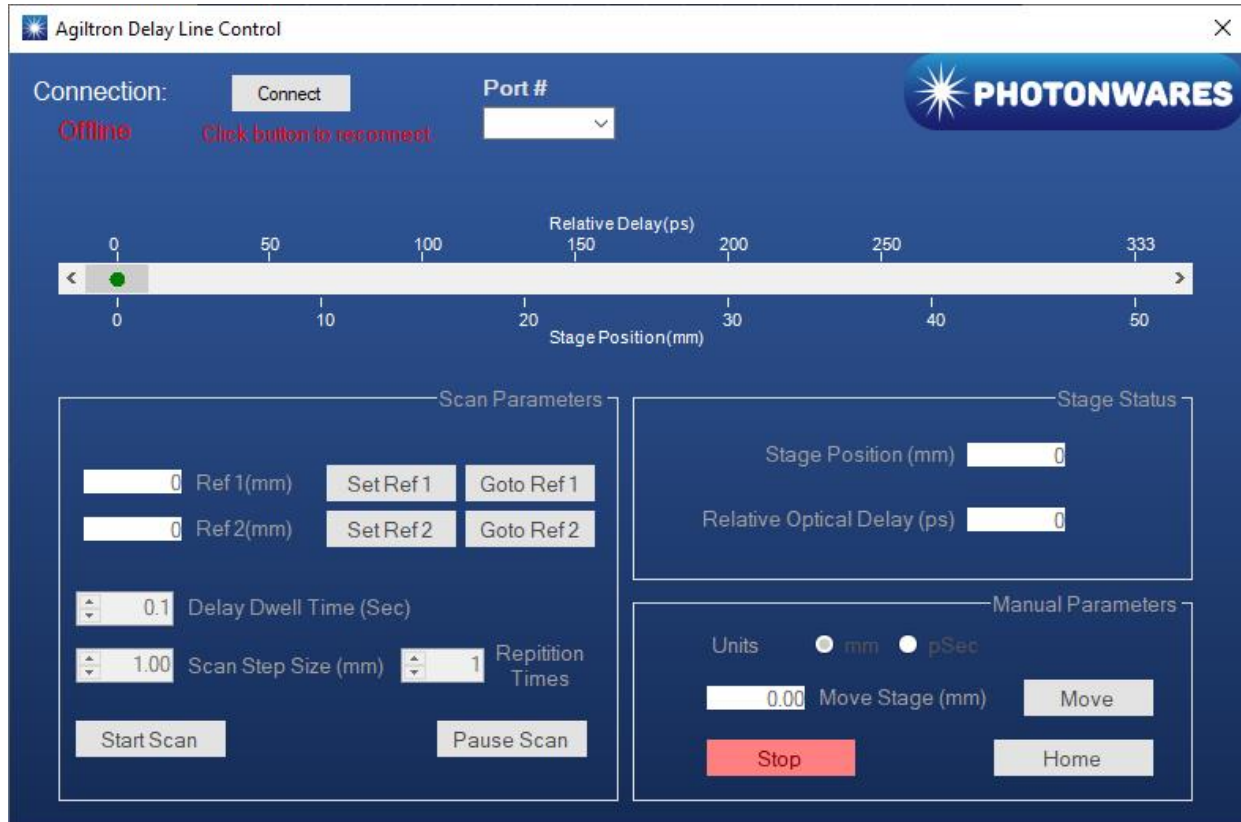
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## Delay Line Control (via Windows GUI):



### Control via Windows GUI:

1. Set Target Position(mm/pSec)  
Simply enter the exact number of position(mm) or delay time(pSec) in the text box or drag the slider. Then, click on "Move" button to move the device to target position.
2. Homing the device  
If the number is not correct, the device needs a homing calibration. Simply click on "Home" button.
3. Scan Function  
Drag the slider to the target position/delay time, then click on "Set Ref x"(x = 1,2). Ref x (x = 1,2) will be set.

"Goto Ref x" Button will allow you to move the device to Ref x.

You can decide the step length for this scan and delay dwell time for each step. Repetition times can also be set. Click on "Start Scan" will start current scan process. "Pause Scan" will pause current scan, and you can resume the scan after it being paused.

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## Delay Line Control (via UART command (in HEX))

### Control via UART command (in HEX):

The baud rate setting is 9600-N-8-1.

1. Set Motor Stage Target Position

CMD: 0x01 0x14 <Pos highest byte> <Pos higher byte> <Pos lower byte> <Pos lowest byte>

RTN: 0x01 0x14 <Pos highest byte> <Pos higher byte> <Pos lower byte> <Pos lowest byte>

Example: 0x01 0x14 0x00 0x01 0x38 0x80 -> set device to 80000 position

For 330 ps device, the position range is 0-80000. 0 means relative 0 psec. 80000 means relative 333 psec.

For 660 ps device, the position range is 0-160000. 0 means relative 0 psec, 160000 means relative 666 ps.

For 1200 ps device, the position range is 0- 288000. 0 means relative 0 psec, 288000 means relative 1200 ps.

2. Read Motor Stage Target Position

CMD: 0x01 0x15 0x00 0x00 0x00 0x00

RTN: 0x01 0x15 <Pos highest byte> <Pos higher byte> <Pos lower byte> <Pos lowest byte>

3. Check Motor Stage Current Position

CMD: 0x01 0x16 0x00 0x00 0x00 0x00

RTN: 0x01 0x16 <CurP highest byte> <CurP higher byte> <CurP lower byte> <CurP lowest byte>

4. Homing Calibration

CMD: 0x01 0x20 0x00 0x00 0x00 0x00

RTN: 0x01 0x20 0x00 0x00 0x00 0x00

5. Check Homing Status

CMD: 0x01 0x21 0x00 0x00 0x00 0x00

RTN: 0x01 0x21 0x00 0x00 0x00 <Status Byte>

<Status Byte>: 0 – Homing complete, 1 – Homing incomplete