

Broadband Optical Switch Module

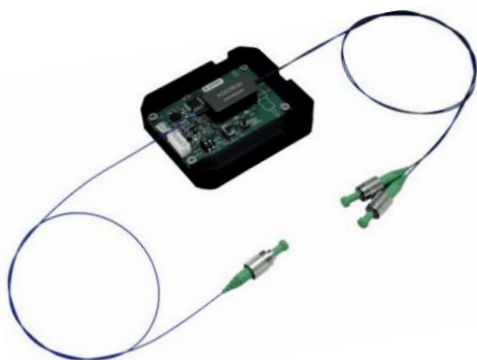
1x1, Dual 1x1, 1x2, 2x2, USB/GUI, TTL, Manual Push Button

(350 to 2400nm, SM, PM, MM, Bidirectional)



DATASHEET

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Features

- Convenient control: USB, TTL, Manual Button
- Ultrabroadband: 350 to 2400nm
- All fiber types, SM, PM, MM
- Low insertion loss
- Continuous transmission without gap

Applications

- Laser Systems
- Reconfigurable Optics
- Instrumentations



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Rev 05/05/26

The FFSM Series fiber optic switch module is designed for ease of use and exceptional optical performance, offering ultra-broadband wavelength transmission limited only by the fiber itself and near-lossless operation. It is available with single-mode, multimode, polarization-maintaining, double-clad, and specialty fibers, and supports fully bidirectional light propagation. The module integrates multiple control options, including manual push-button control, TTL, and USB operation via a user-friendly Windows™ GUI. It features a mini-USB connector and a 5-pin control connector and can be powered either through the USB port or an included 5 V wall-plug power supply (100–240 VAC). Latching operation preserves the selected optical path after power is removed. Command codes are provided for customer customization, and optional code-development services are available. Superior optical performance is achieved using patented MEMS technology in which light propagates through a continuous medium without interruption, resulting in extremely low insertion loss, minimal wavelength dependence, and no optical coatings. The switch employs a specially formulated, non-fluorescent index-matching liquid that fills a gap of less than 5 μm. For single-mode configurations, users should note that performance depends on the fiber cutoff wavelength below which single-mode operation is no longer maintained. PM fiber versions preserve both polarization states consistent with the fiber characteristics. The switches have 3 types of MEMS chips to select: PM 1Hz, regular SM 5Hz, fast SM 50Hz.

For switch component without driver, please go to <https://agiltron.com/category/optical-switches/fiberfiber/>

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength	350		2500	nm
Insertion Loss ^[1]	0.01	0.2	0.4	dB
Wavelength Dependent Loss			0.01	dB
Polarization Dependent Loss			0.05	dB
Polarization Extinction Ratio ^[2]	22		30	dB
Return Loss	50 (SM)			dB
	35 (MM) ^[3]			dB
Cross Talk On/Off Ratio	50		75	dB
Optical Rise/Fall Time (PM)	5		20	ms
Optical Rise/Fall Time (SM, MM)	0.4		1	ms
Repetition Rate (PM)			5	Hz
Repetition Rate (SM,MM)	5		50	Hz
Repeatability			± 0.02	dB
Durability	10 ⁸			cycles
Operating Optical Power ^[6]		0.5	0.7	W
Operating Voltage	4.3		4.5	VDC
Operating Current		30	60	mA
Switching Type		Latching		
Operating Temperature	-40		80	°C
Storage Temperature	-50		90	°C

Notes:

[1]. For 1x2, 1x2, Dual 1x1, Dual 1x2, SMF-28 fiber, Typical loss is 0.3dB.

Ultra-low loss version is special order. Excluding Connectors.

For Small core fibers, the specs are reduced.

For Full 2x2, 2x2 bypass, SMF-28 fiber, Typical loss is 1dB.

Ultra-low loss version is special order. Excluding Connectors.

For Small core fibers, the specs are reduced

[2]. For PM fiber only

[3]. For MM fiber with laser CPR<14

[4]. For PM type mainly

[5]. For SM, MM type, 15ms including the electrical delay as shown in the testing data

[6]. For SM 28 and MM fibers, other wavelength SM fiber see the chart at the end.

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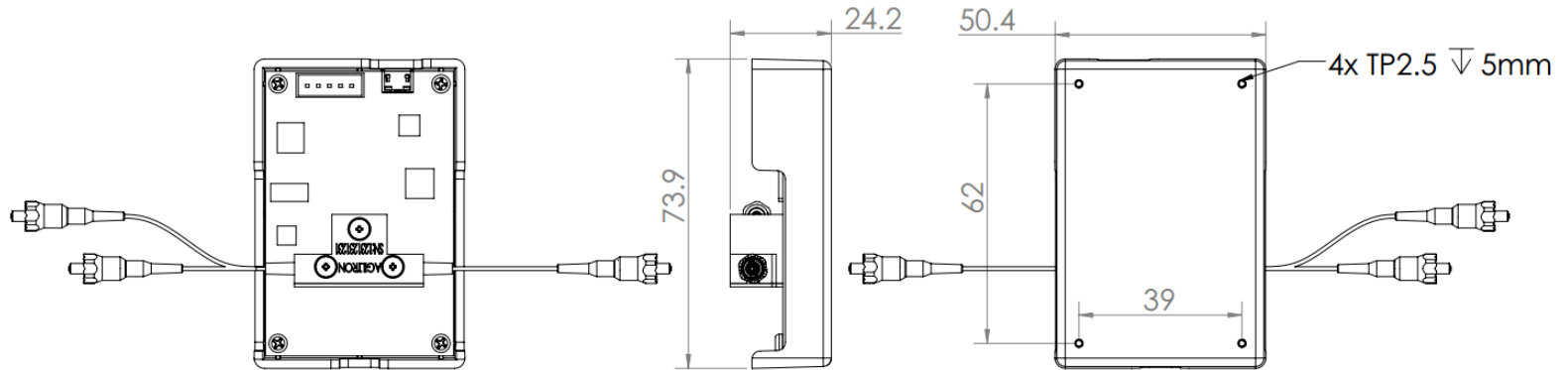
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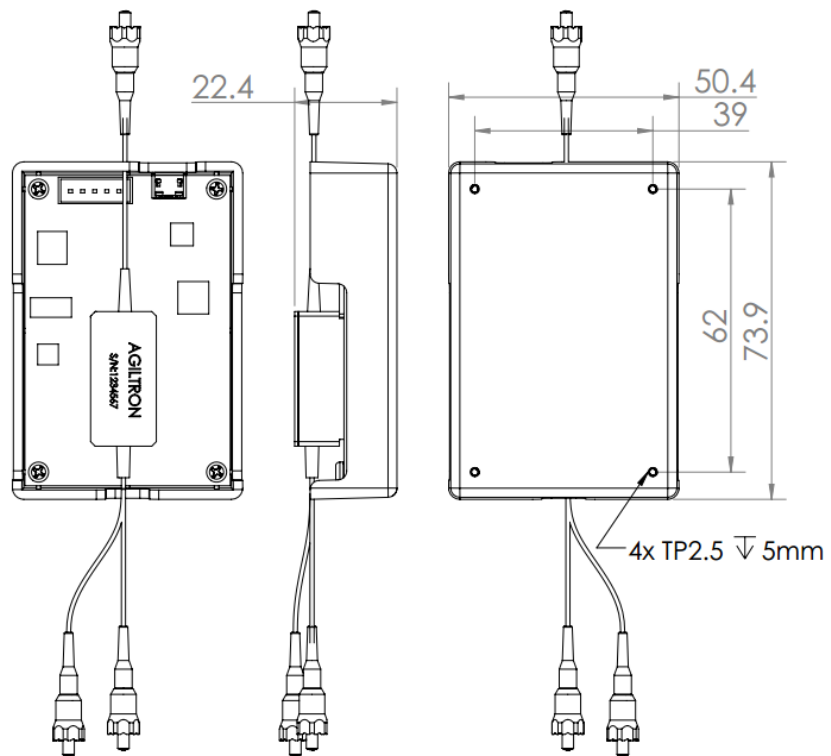
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Mechanical Dimensions (Unit: mm)

SM version package



PM version package



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

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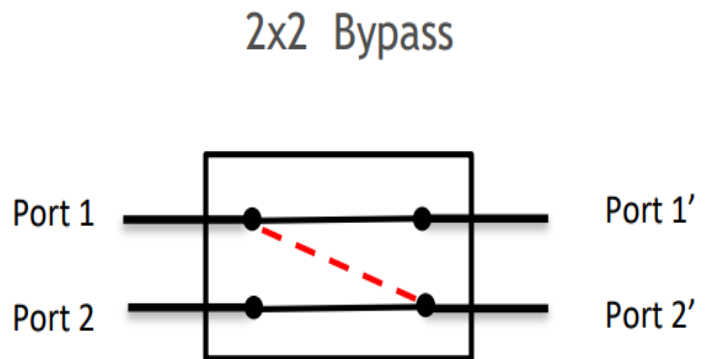
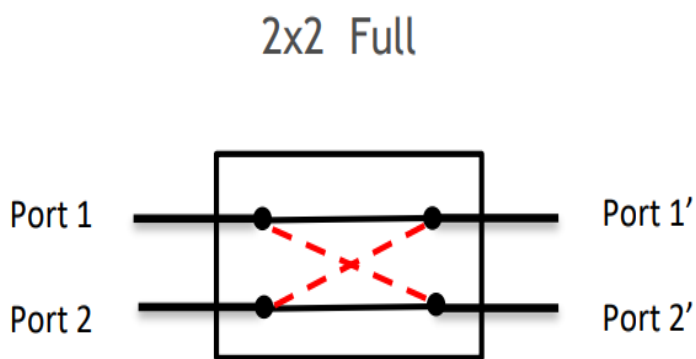
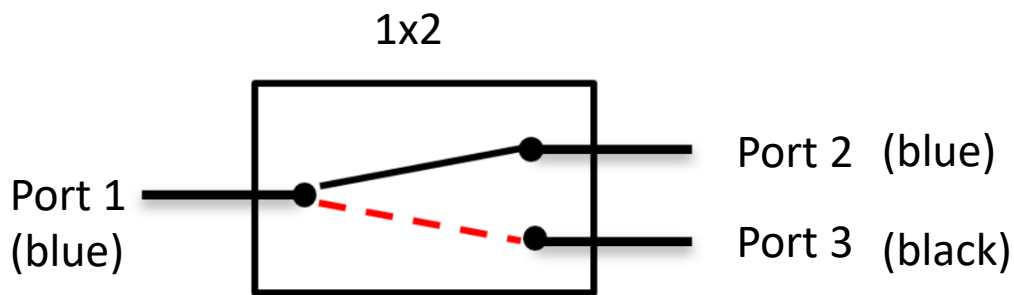
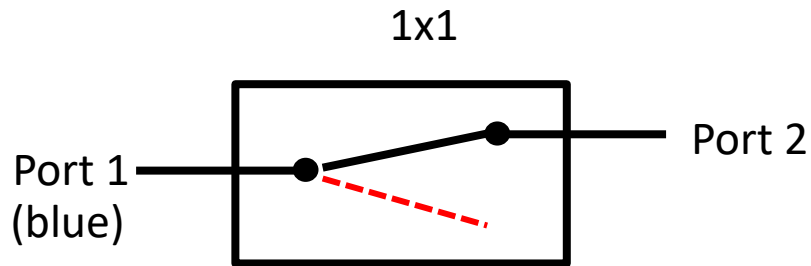
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Optical Path Diagram



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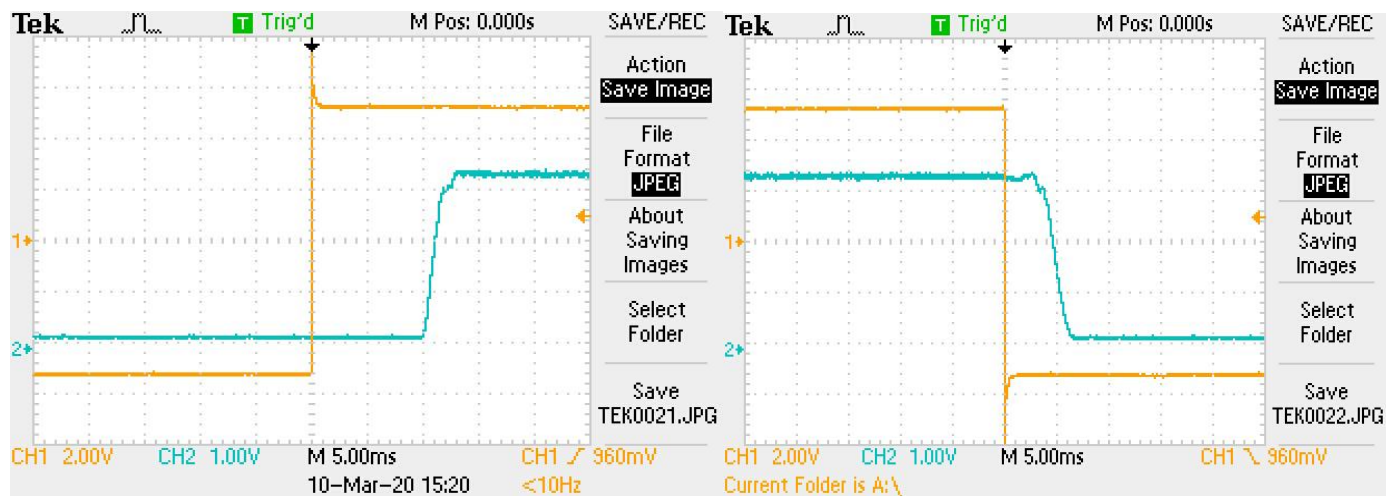
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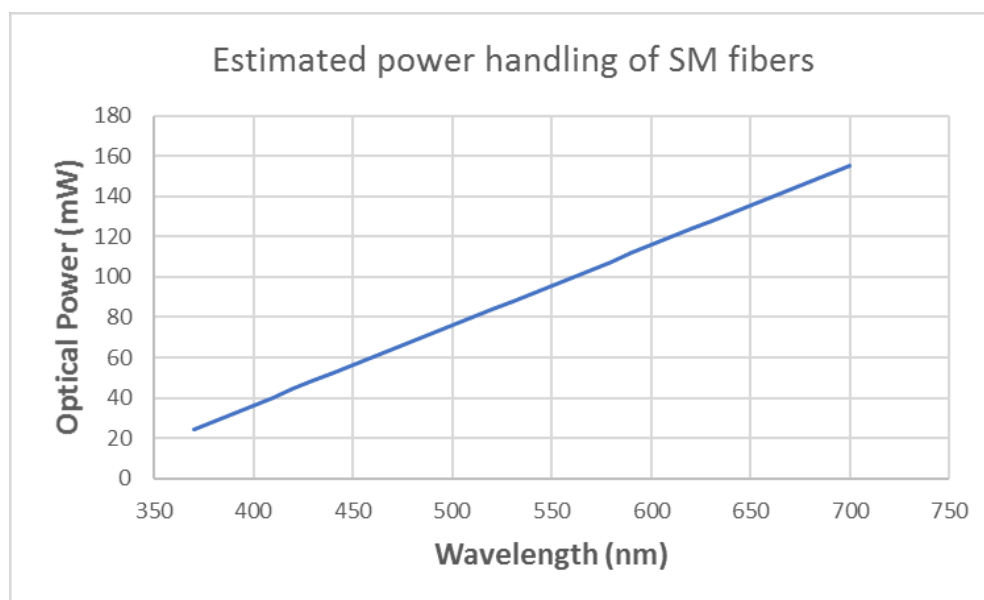
Response Speed (SM/MM)



Rise

Fall

Optical Power Handling vs Wavelength For Single-Mode Fibers



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Ordering Information (Part Number)

Prefix	Type	Switch ^[2]	Test Wavelength ^[3]	Speed ^[4]	Fiber Type	Fiber Cover	Fiber Length	Connector ^[5]	Control Interface
FFSM-	1x1(Transparent) ^[1] = 11 1x1 (Opaque) = 1D 1x2 = 12 2x2 = 22 Special = 00	Latching = L Non-Latching = N	488 = 4 360 = A 430 = B 532 = 5 630 = 6 780 = 7 850 = 8 980 = 9 1060 = 1 1310 = 3 1550 = C 2000 = 2 Special = 0	1ms/5Hz = 1 0.4ms/50Hz = 2	<i>Pick from below table</i>	Bare fiber = 1 0.9mm tube = 3 Special = 0	0.25m = 1 0.5m = 2 1.0m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 ST/PC = 6 LC/PC = 7 Duplex LC/PC = 8 LC/APC = A LC/UPC = U Special=0	GUI = 1 Labview = L Metlab = M Python = P Special = 0

[1]. Transparent means light passes without activation. Opaque means light is blocked at the nonactivation state.

[2]. Latching: Retains the last state/position when power is removed.

Non-Latching: Automatically returns to a default "home" position when power is disconnected.

[3]. The device is ultra-broadband limited by fiber transmission. However, we only test at one selected wavelength to save cost. If a customer needs to test at several wavelengths, the selection is special = 0 with added cost.

[4]. For SM and MM only. PM fiber is only available 20ms/1Hz speed.

[5]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

Note:

- **PM1550** fiber works well for **1310nm**

Fiber Type Selection Table:

01	SMF-28	34	PM1550	71	MM 50/125μm
02	SMF-28e	35	PM1950	72	MM 62.5μm
03	Corning XB	36	PM1310	73	105/125μm
04	SM450	37	PM400	74	FG105LCA
05	SM1950	38	PM480	75	FG50LGA
06	SM600	39	PM630	76	STP 50/125
07	780HP	40	PM850	77	
08	SM800	41	PM980	78	
09	SM980	42	PM780	79	
10	Hi1060	43	PM350	80	
11	SM400	44	PM405	81	UV180nm
12		45	PM460	82	LMA-PM-10
13		46			

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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.

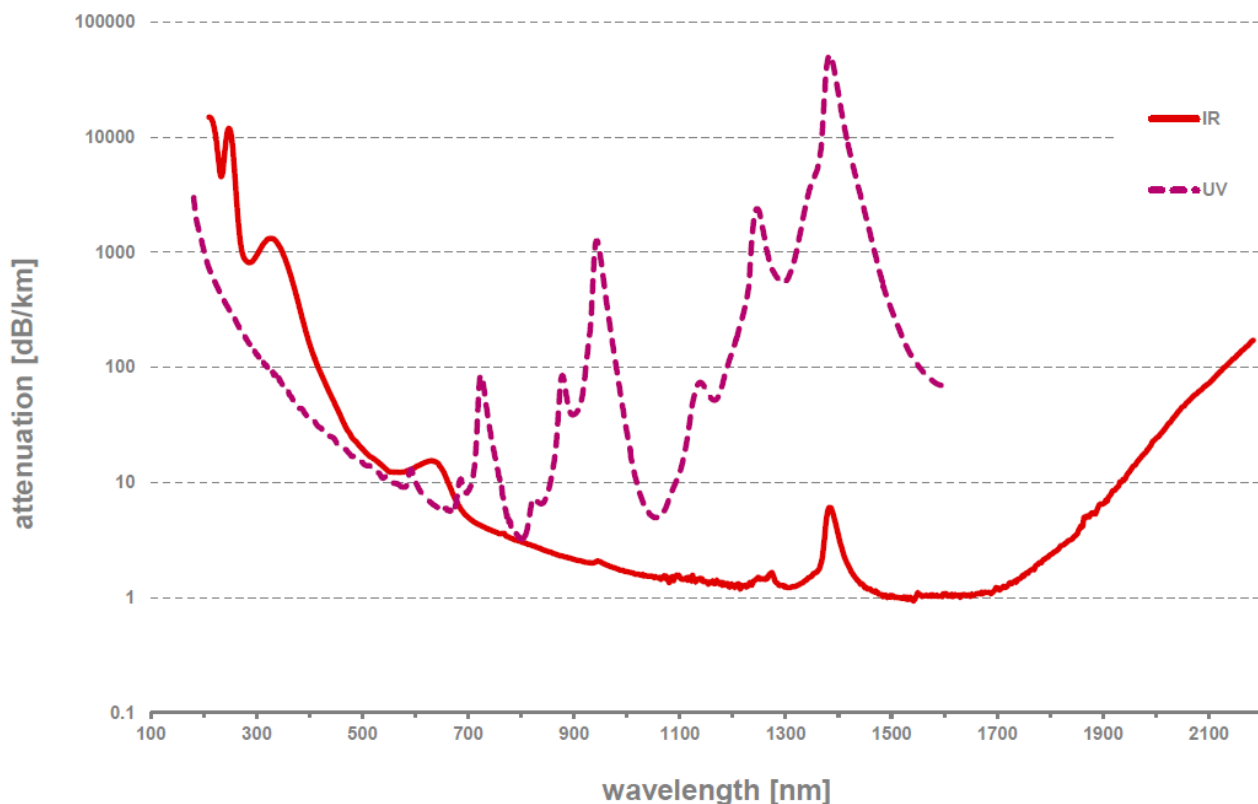
Fiber Cleanliness

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.

Typical Fiber Transmissions



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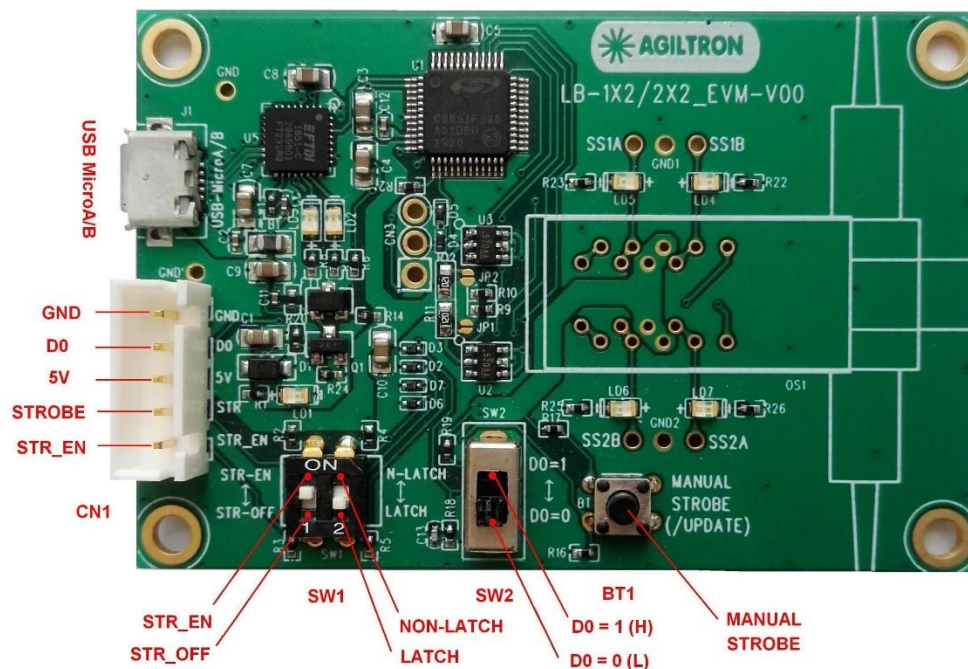
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Electrical Connector Configurations



Power Voltage Input DC	Mini 4.9V	Max 5.2V
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The two configuration switches S1 and S2 are preset to match the switch type. Do not change it.

Manual Operation Instruction

- Power the Board**

The unit can be powered up via the Micro USB port connecting to a computer or a cellphone wall plug power supply.

- Manual Push Button Control**

When using Manual Push Button Control, SW1-1 should be set to **STR_EN**.

Once the board is powered (LED on), the unit can be easily controlled by pushing the **STROBE** button, the light path will be changed accordingly.

TTL Operation Instruction

- Power the Board**

The unit can be powered up via the Micro USB port connecting to a computer or a cellphone wall plug power supply.

- TTL Control**

When using TTL Control, SW1-1 should be set to **STR_OFF**.

The unit can be controlled by a standard TTL Signal. Sending a **HIGH** voltage ($>3.5V < 5V$) to the **D0** pin in the 5 pin connector, and the light path will change. Sending a **LOW** voltage ($0-0.8V$) to the **D0** pin in the 5 pin connector light path will change again.

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Computer Graphic Software User Guide

- **Install the Program**

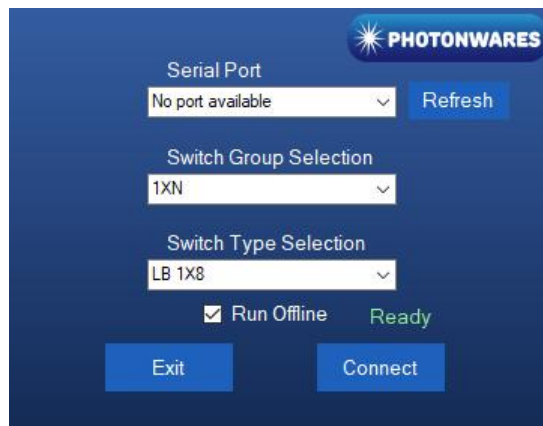
Click on setup.exe for the automatic installation, which should be provided with the product.

- **Power and Connect the Board**

Use the Micro-USB to USB cable to connect the board with the PC with software installed. Remember to set SW1-1 to STR_EN.

- **Run the Program**

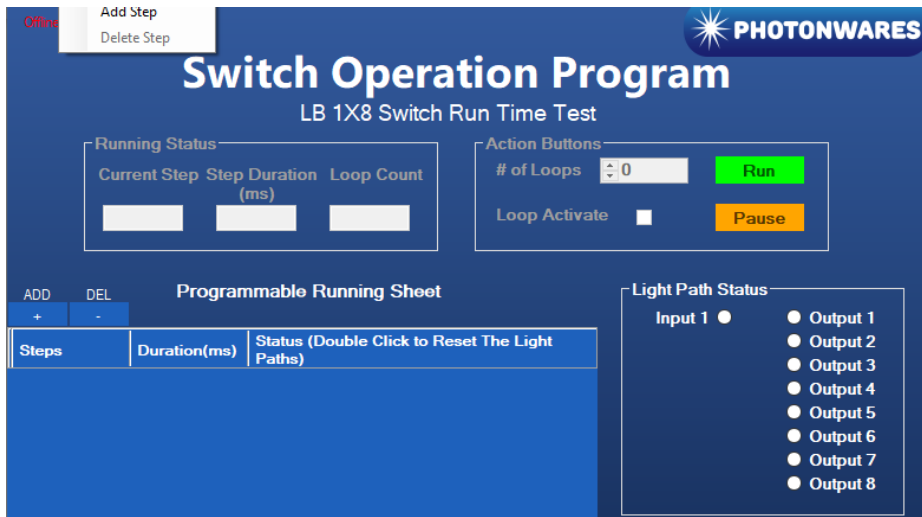
Run the "Switch Operation Program.exe" and the program will open the configuration window. Select the correct Switch Group and select the specific Switch Type. Then click the "Connect" button and the program will establish the connection between PC and board.



- **Create and edit testing time sequence**

Add step: Click the "Add Step" button in the menu strip or click the "+(ADD)" button would both add a step to the Programmable Running Sheet.

Delete step: Click the "Delete Step" button in the menu strip or click the "-(DEL)" button would both delete a step in the Programmable Running Sheet.



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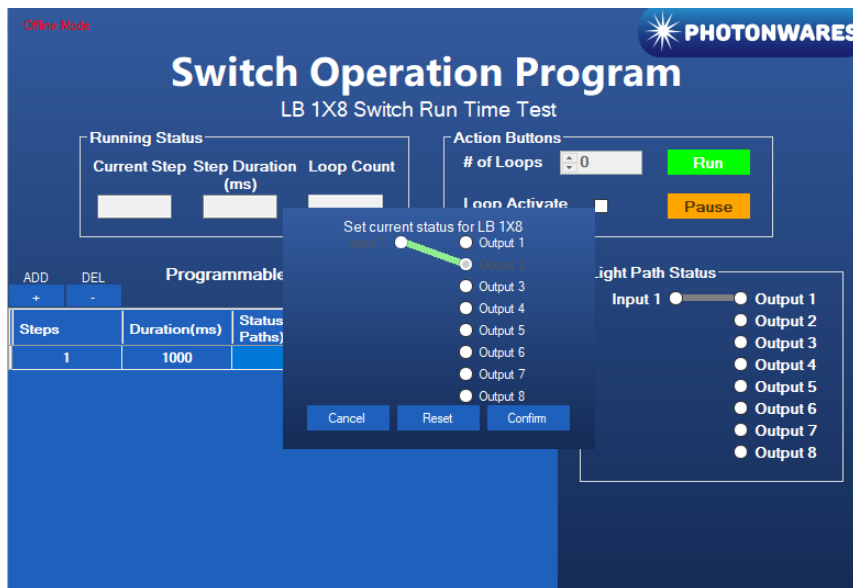
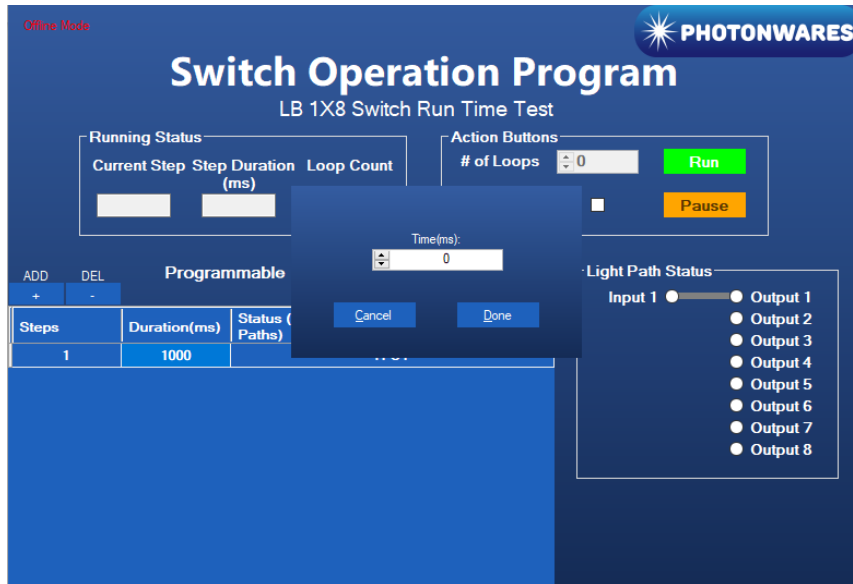
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Edit step: There are two things that you can modify for one step. One is the light path, and the other is the duration for each step. Double click the cell that you want to modify, and the program will allow you to modify the setting.



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Computer Interface Options

The USB interface working as a Virtual COM port which is compatible with LabView, Matlab. We provide **LabView** and **Matlab** interface software at extra cost.

A Windows GUI and UART command list will be provided for test and software development.

Command List

Command in Serial

The serial communication should be set in **9600 baud rate, none parity, 8 data bits, 1 stop bits.**

0x01 0x12 0x00 0x01 ---- Switch to status 1

0x01 0x12 0x00 0x02 ---- Switch to status 2

In **Matlab**,

Example code as below:

```
s=serialport("COM1", 9600, "Timeout", 5);
```

```
Write(s, [1, 18, 0, 1], "uint8");
```

for status 1

```
Write(s, [1, 18, 0, 2], "uint8");
```

for status 2

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