HUBER+SUHNER

POLATIS® 16 TO 48 Port Optical Switch Module Installation and Commissioning Guide

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7001-005-05

Revision history

Date	Version	Description	Author(s)
	7001-005-01	Initial Release	
May-2018	7001-005-02	Updated	
Nov-2021	7001-005-03	Added ribbon fiber exits and numbering. Amended boot up time.	MU
Aug-2022	7001-005-04	Reformatted in new template.	EA
June-2023	7001-005-05	Weights of the modules added into Section 5.3	EA

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Document conventions

Admonitions

Tip: A useful suggestion to help the user get the most out of the product.

Note: Something a user should be aware of and take into account.

Warning: Something that risks physical injury, damage to the switch, or irretrievable loss of data.

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2 Overview

The POLATIS Optical Switch Module (OSM) products are fiber optic switches. In this context, a fiber optic switch is like an electrically controlled fiber optic patch panel. Optical fibers are connected to input and output ports and the switch internally connects the optical paths as requested by external commands.

This manual covers the installation and commissioning of the POLATIS optical switch modules with a maximum of 48 ports. These are:

- The POLATIS Series 6000 48 Port Optical Switch Module
- The POLATIS Series 6000 Ultra 32 Port Optical Switch Module
- The POLATIS Series 6000 Ultra 16 Port Optical Switch Module

There are a total number of up to 16 or 48 optical ports that can be configured in many ways depending on customer requirements.

A standard configuration is with an equal number of input and output ports, e.g. 24 input ports and 24 output ports.

There are also 16xCC-Ultra, 32xCC-Ultra and 48xCC configurations where “CC” implies it is “Customer Configurable.” This means there are not pre-defined input and output ports, but that any port can be connected to any other port. A 48xCC OSM can be used as a 48xCC switch, a 24x24 switch with 24 inputs and 24 outputs, or any configuration where the sum of the total number of input and output ports equals 48. The separate SCPI Operations Manual details the operation and control interface.

2.1 Features

Suitable for a wide range of applications, the POLATIS optical switch modules offer ultra-low optical loss on all paths. Electrical connectivity to the module is provided through a male DB15 connector or a 20-way edge connector. Fiber pigtails, terminated with high performance connectors are used for fiber interfacing.

The switch module is controlled using a text-based Command Line Interface (CLI) based on the SCPI protocol. The operation of the switch is based on piezo-electric actuation and capacitive sensing. It is a passive optical component in the sense that it does not generate or amplify laser radiation.

2.2 Key features

- The industry's smallest 16-fiber to 48-fiber optical switching modules.
- Non-blocking single-sided 16 to 48 port "any-to-any" switches.
- Compact designs – three sizes from 27 x 110 x 237 mm to 41 x 122 x 266 mm.
- Energy efficient using < 5 Watts.
- Best in class optical performance.
- Typical insertion loss of less than 1.0 dB.
- Back reflection of less than -50dB.

- Simple robust command interface.
- Ideal for OEM applications - module can be mounted onto pluggable circuit packs.
- Designed specifically for integration with network equipment, fiber management systems and test and measurement tools.

2.3 Description

The 3 variants of the POLATIS Optical Switch Module (OSM) family are shown below.

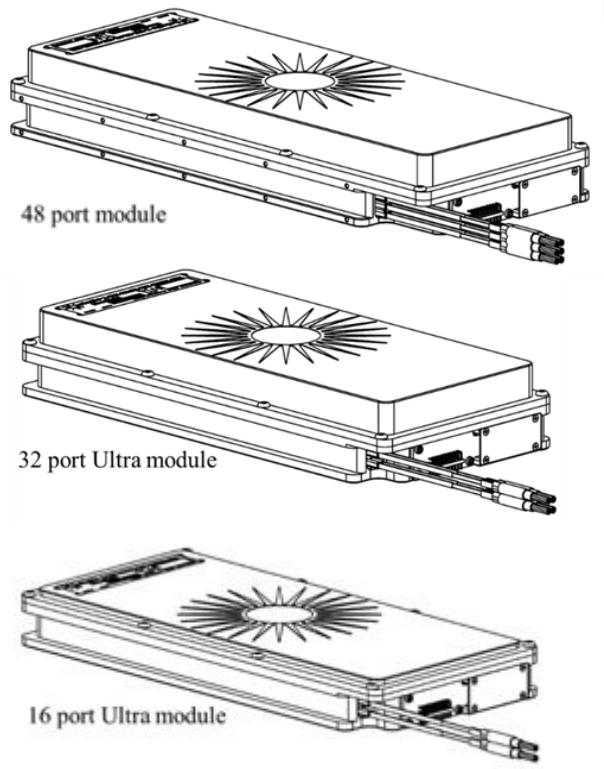


Figure 1 The 3 variants of the optical switch module (OSM) family

Optical connections are made via pigtails terminated with high performance connectors. There are a total number of up to 48 optical ports that can be configured in many ways depending on customer requirements. A standard configuration is with 24 input ports and 24 output ports. On standard NxM switches, we usually number the Input ports (1 through N) and Output ports (N+1 through N+M).

If ordered as a 48xCC Customer Configurable switch, there are not specifically defined input and output ports. However, even on standard NxM switches, the labels Input and Output to the module are arbitrary, since the optical connections between port-pairs are bi-directional.

Modules can be supplied with either a 3 pin RS-232 connector and 4 pin power connector or a 20-way edge connector to provide all required electrical connections.

3 Hazards and cautions

3.1 Electrical

⚠ **Warning: System contains high voltages of up to 70 V DC.**

⚠ **Do not attempt to disassemble – no user-serviceable parts inside.**

3.2 Laser eye safety

This equipment does not generate any laser signals internally, but is capable of passing through high optical intensities with minimal optical loss. Within the limits of the maximum optical input power specified for the optical switch module unit (see the Optical subsection within Absolute maximum ratings), the equipment connected to it determines the level of safety hazard. It is the responsibility of the user to assess what level of optical intensity may exist at input and output connectors and to label the system with the appropriate laser safety classification.

4 Absolute maximum ratings

4.1 Electrical

The absolute maximum electrical ratings of the POLATIS optical switch module are specified in the table below.

Table 1 Absolute maximum electrical ratings

Rating	Value
Power Required	12 VDC (single or redundant supplies: the A and B inputs can be connected together to a single supply, or to 2 independent supplies.)
Input Voltage range.	Minimum 11 VDC to maximum 24 VDC
Maximum ripple	50mV
Peak inrush current Nominal current draw	2.5A at 12 VDC 0.42A at 12 VDC
GND	Power Supply must be earthed or grounded
Nominal Electrical Power dissipation	5W

The voltage values referred to in the table above represent the minimum and maximum values that should be maintained **at the module** at all times, including during inrush current.

The mechanical mounting for the optical switch module should be electrically connected to **GND** (see the also Electrical connections section).

4.2 Optical

The maximum optical input power is common across the POLATIS optical switch module product family[1].

Table 2 Max optical input power

Max optical input power	+24 dBm per input

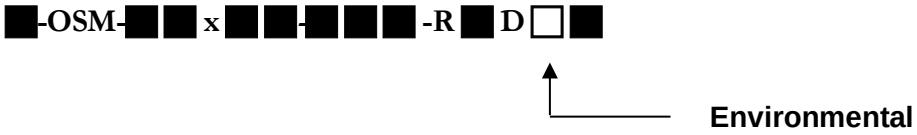
Refer also to the Connecting and disconnecting, Fiber connection subsection in the Maintenance and operation chapter.

4.3 Environmental

The environmental ratings of POLATIS optical switch modules for both storage and operation can be either Normal or Extended depending on the product variant.

The environmental rating is specified in the part code.

[1] For some product variants within the Polatis Optical Switch Module product family higher maximum optical powers may be available upon request.



For both Normal or Extended rated units, the surface that the optical switch module is mounted on must maintain the temperature ranges specified.

The installer should also ensure there is sufficient airflow around the unit and that the ambient temperature is appropriate for the unit's temperature ranges.

4.4 Normal operating range

Table 3 Normal operating range

Operating	+5 C to +45 C 85% RH non-condensing
Storage and Transport	-40 C to +70 C non-condensing 40% RH non-condensing

4.5 Extended operating range

Table 4 Extended operating range

Operating	- 5 C to +55 C 85% RH non-condensing
Storage and Transport	-40 C to +70 C non-condensing 95% RH non-condensing

5 Installation

5.1 Package contents

The POLATIS optical switch module is supplied as follows:

Primary pack: contains OSM Optical Switch Module unit as shown below:

The outer packaging contains the module with ATR, cables and optional manual.

5.2 Additional equipment required

The optical switch module unit requires some equipment additional to that supplied as part of the standard pack to operate.

- Fiber optic bulkhead adapters for connection to the switch module's optical connectors of the appropriate type for the optical switch module variant. (Refer to the Optical Interface Specifications subsection for a complete list.)
- A PC with an RS-232 interface and associated free DB-9 COM port together with a terminal program will also be required for switch operation.
- An appropriate interface board if the switch is supplied with a 20-way edge connector.

5.3 Sizes and weights

The modules are the following sizes:

Table 5 Module dimensions and weight

Size	Length	Width	Height	Weight up to
16 Port	237.0 mm (9.33 ")	109.5 mm (4.31 ")	27.05 mm (1.06 ")	1.0 kg (2.20 lbs.)
32 Port	237.0 mm (9.33 ")	109.5 mm (4.31 ")	40.30 mm (1.57 ")	1.15 kg (2.54 lbs.)
48 Port	269.0 mm (10.59 ")	109.5 mm (4.31 ")	40.30 mm (1.57 ")	1.45 kg (3.20 lbs.)

Shipping dimensions and weight (in its shipping packaging)

Table 6 Module dimensions and weight

Size	Length	Width	Height	Weight up to
16 Port	600 mm (23.6 ")	300 mm (11.8 ")	185 mm (7.3 ")	4.60 kg (10.1 lbs.)
32 Port	600 mm (23.6 ")	300 mm (11.8 ")	185 mm (7.3 ")	4.75 kg (10.5 lbs.)
48 Port	600 mm (23.6 ")	300 mm (11.8 ")	185 mm (7.3 ")	5.05kg (11.1 lbs.)

6 Mechanical

The mechanical details are specified in the following pages.

Please note the following:

1. The bend-radius of the optical fiber pigtails should be at least 35mm.
2. The installer should also ensure there is sufficient airflow around the unit and that the ambient temperature is appropriate for a unit's temperature range.
3. The surface that the optical switch module is mounted on must also maintain the temperature ranges specified in Environmental subsection under Absolute maximum ratings for the module variant. These are summarized earlier in this manual.
4. The 32 and 16 port modules should be mounted using 8 M3 screws.
5. The 48 port module should be mounted using 9 M3 screws.
6. In all cases the M3 screws should penetrate 6mm or less into the module body.

6.1 Mechanical drawing – 48 port module, I- and S- variants

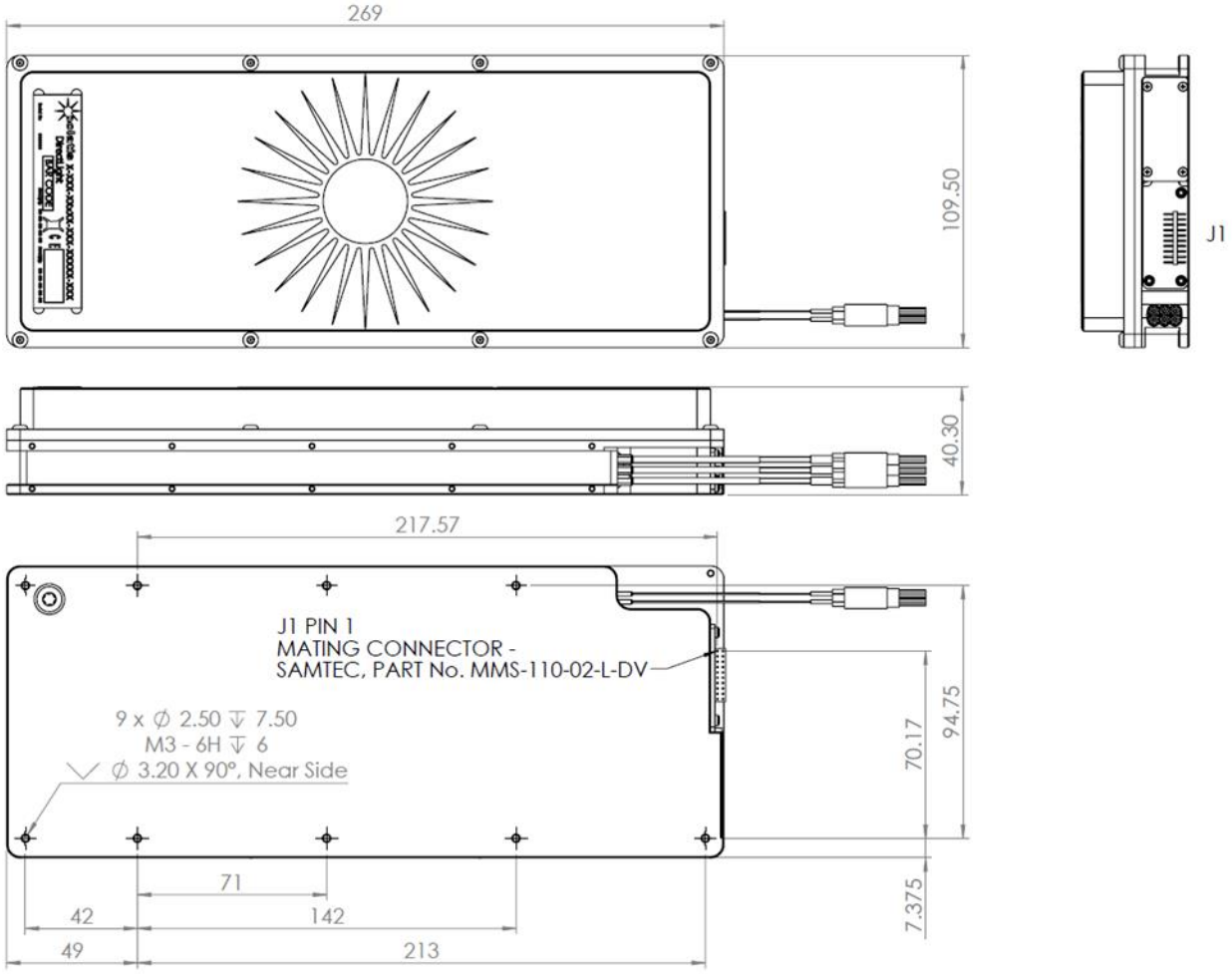
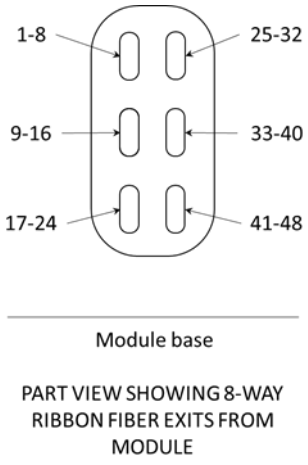
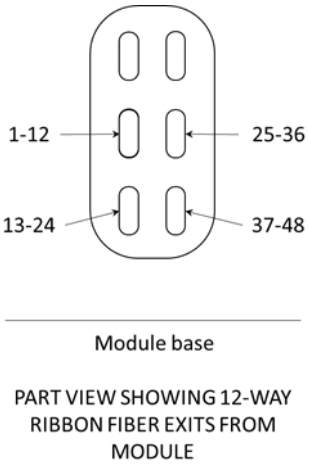


Figure 2 48 Port module, I- or S- variants



PART VIEW SHOWING 8-WAY RIBBON FIBER EXITS FROM MODULE



PART VIEW SHOWING 12-WAY RIBBON FIBER EXITS FROM MODULE

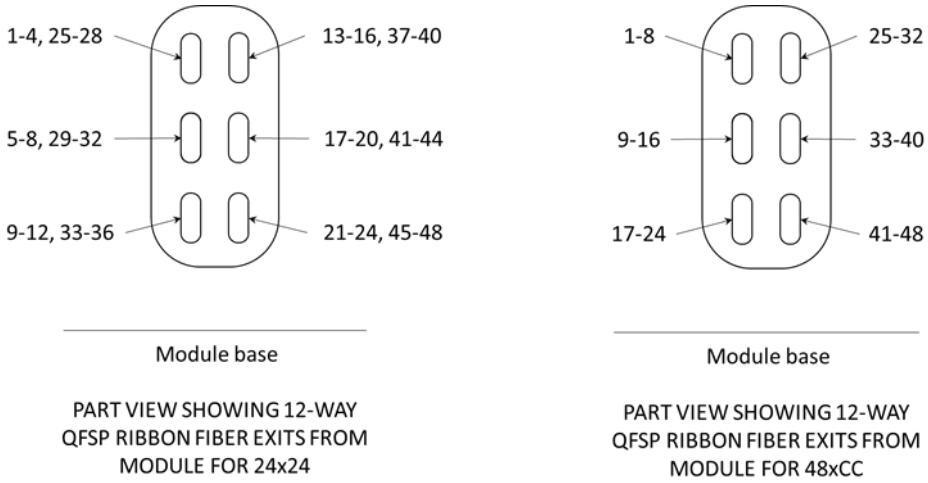


Figure 3 48 port ribbon fiber exits

All dimensions are shown in millimeters. The electrical connectors may differ from this drawing and are covered in the next section.

6.2 Mechanical Drawing – 32 port Ultra module, I- or S-variants

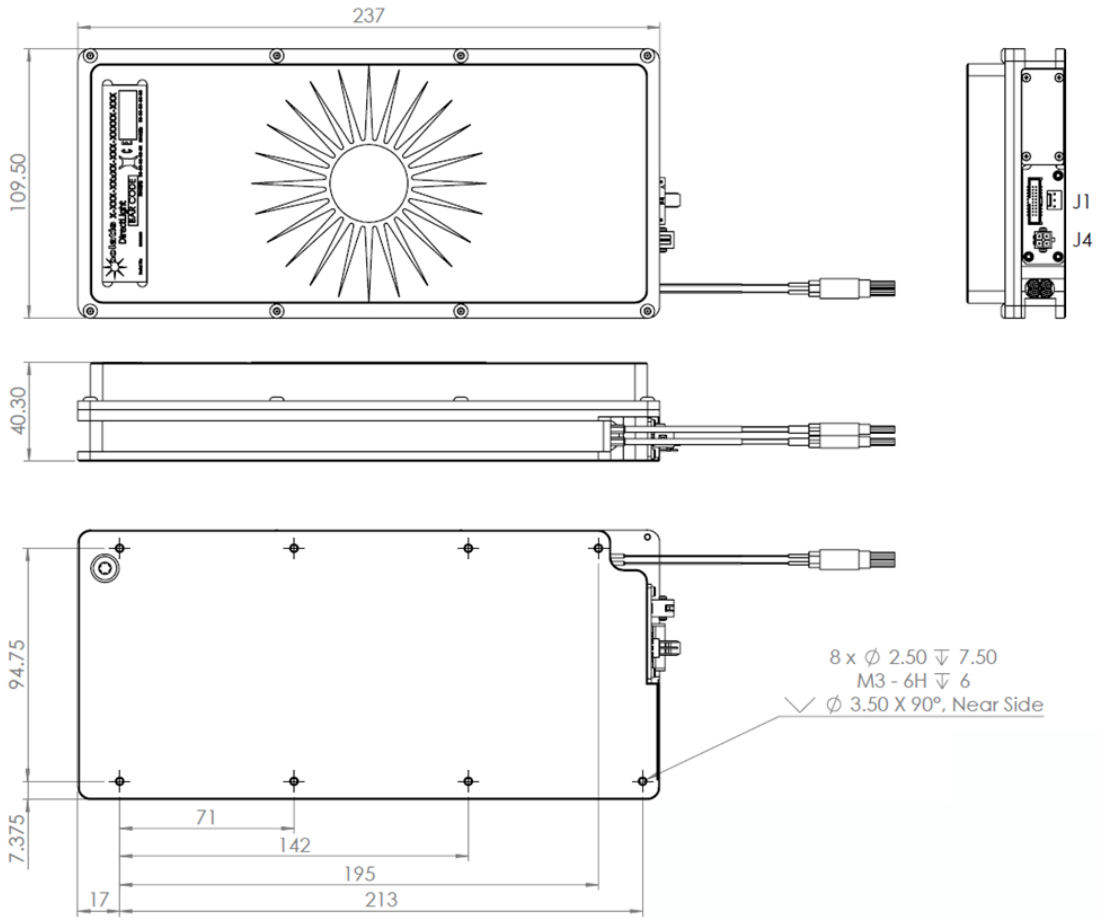


Figure 4 32 port Ultra module, I- or S-variants

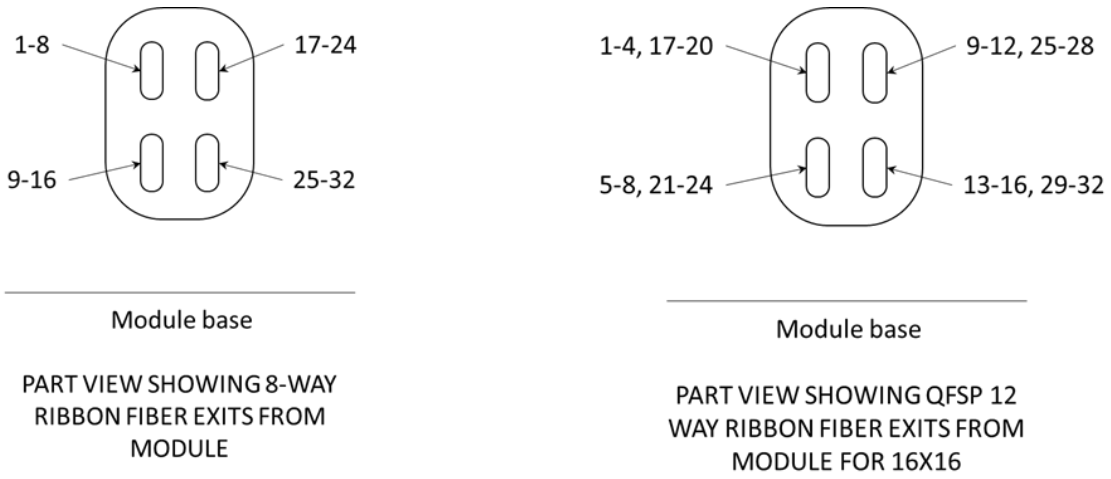


Figure 5 32 port Ultra ribbon fiber exits

All dimensions are shown in millimeters. The electrical connectors may differ from this drawing and are covered in the next section.

6.3 Mechanical drawing – 16 port Ultra module, I- or S-variants

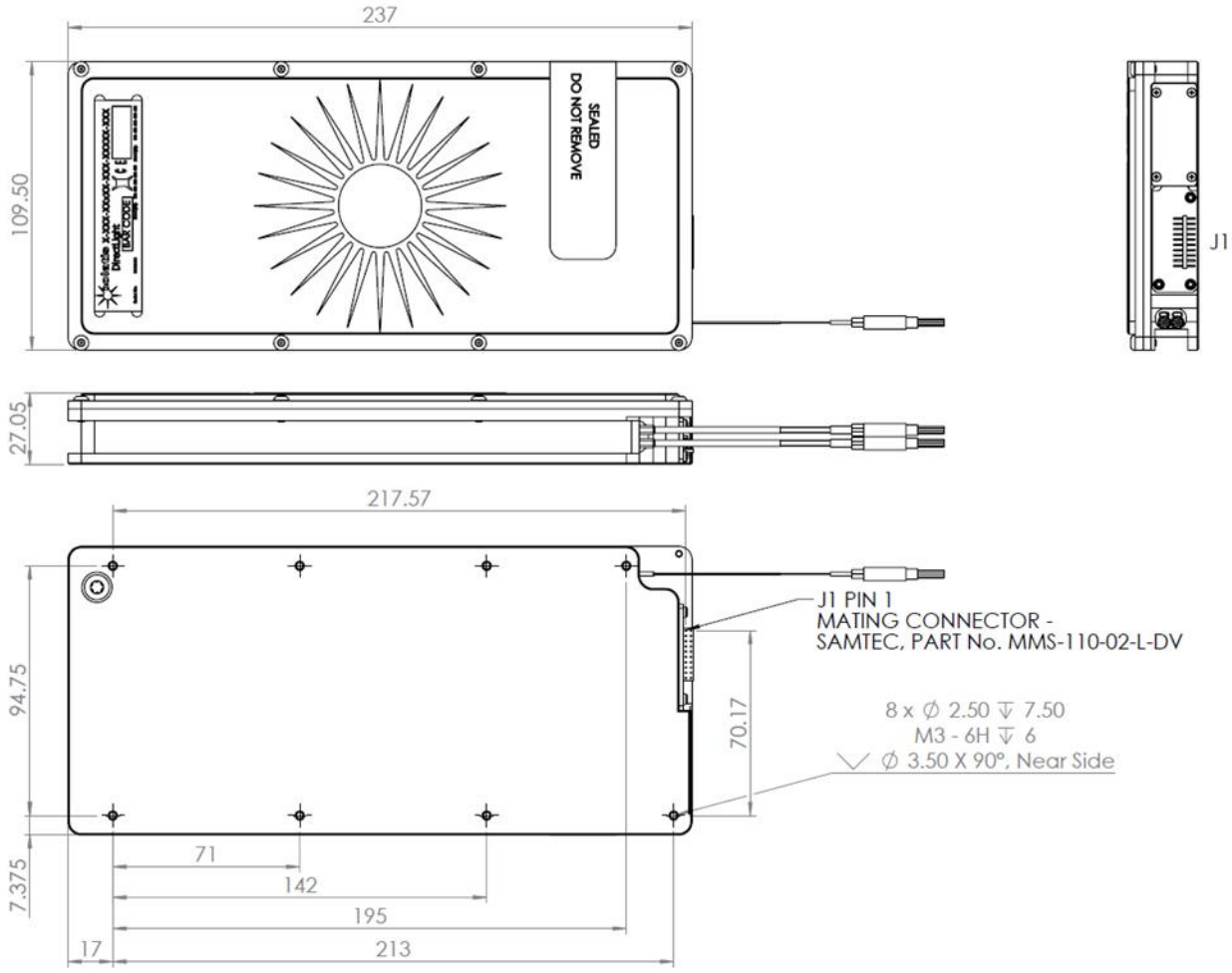


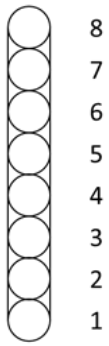
Figure 6 16 port Ultra module, I- or S-variant

Figure 7 16 port Ultra ribbon fiber exits

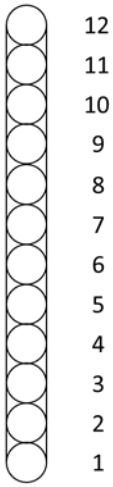
All dimensions are shown in millimeters. The electrical connectors may differ from this drawing and are covered in the next section.

6.4 Ribbon fiber numbering

Ribbon fibers are numbered as shown:

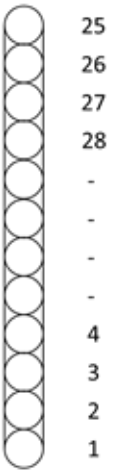


PART VIEW SHOWING
8-WAY RIBBON FIBER
NUMBERING



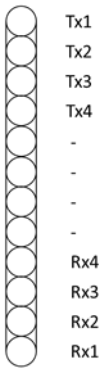
PART VIEW SHOWING
12-WAY RIBBON FIBER
NUMBERING

In the case of a 24x24 configuration in a 48 port module a QFSP format is available. This places 8 live fibers in a 12-way fiber ribbon.



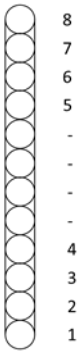
PART VIEW SHOWING FIRST
12-WAY QSFP FORMAT
RIBBON FIBER NUMBERING
FOR 24X24

In terms of duplex pairs the numbering is:



PART VIEW SHOWING FIRST
12-WAY QSFP FORMAT
RIBBON FIBER NUMBERING
FOR 24X24

In the case of a 48xCC configuration in a 48 port module a QFSP format is available but with a different fiber numbering as shown.



PART VIEW SHOWING FIRST
12-WAY QSFP FORMAT
RIBBON FIBER NUMBERING
FOR 48XCC

Figure 8 Ribbon fiber numbering

7 Electrical connections

7.1 Module connector option 1 – 3 pin serial connector, 4 pin power connector

The electrical interface is specified below for the 3 pin serial connector with 4 pin power connector.

Note: The control PC and the optical switch module should have a common electrical ground (GND).

To use the RS-232 SCPI interface the following module connections should be used. The Network Interface Card (NIC) that the customer has connected to the module and the module itself should be powered down and the NIC-OSM cable disconnected from the OSM before the connections are made to the module RS-232 port.

- J1. 3 pin Serial RS-232 connector.
  - Pin 1 (right pin): RXD
  - Pin 2 (center pin): TXD
  - Pin 3 (left pin): Ground
- J4. 4 way power cable.
  - Pins 1, 2 (top two pins): Ground
  - Pins 3, 4 (bottom 2 pins): +12 VDC
- J3. Not used

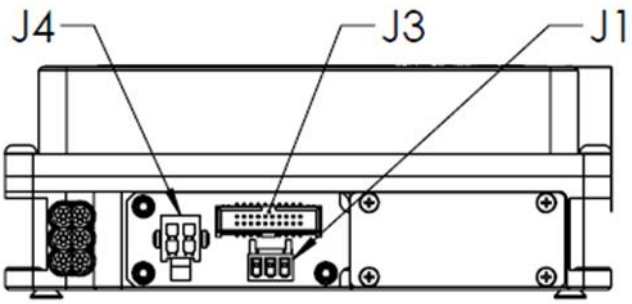


Figure 9 Electrical connections

The module J4 should be connected to +12 VDC with POLATIS power cable Part A-1000-10068-A shown below.

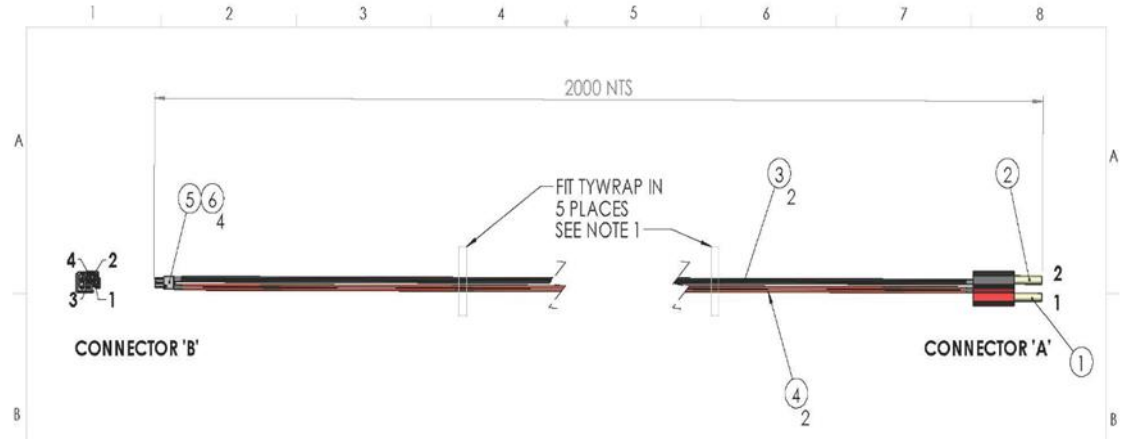


Figure 10 POLATIS power cable

The module J1 should be connected to the controller RS-232 serial port with POLATIS OSM serial cable Part A-1000-10071-B shown below. This provides a standard female DB-9 serial port connection.

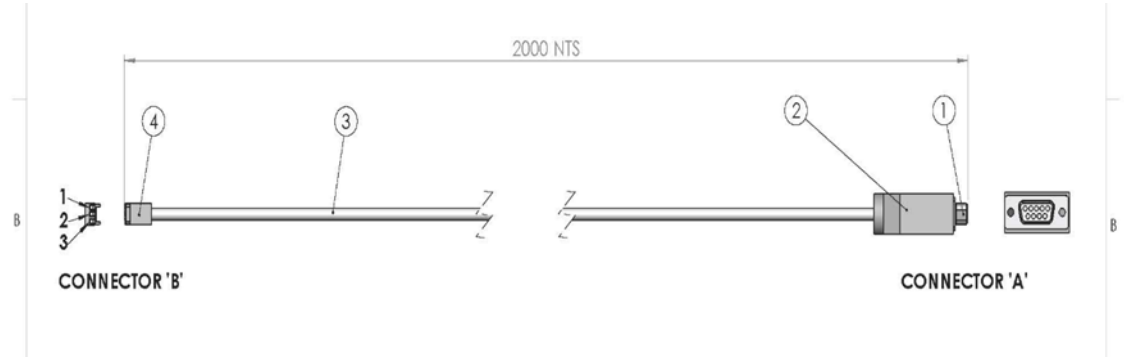


Figure 11 POLATIS OSM serial cable

7.2 Serial (female DB-9) port

Table 7 Serial (female DB-9) port

Serial RS-232 DB-9 Pin	OSM J1
2 RS-232 Tx	2 TXD
3 RS-232 Rx	1 RXD
5 GND	3 GND

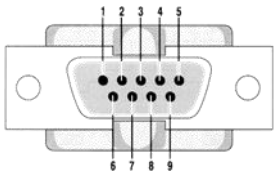


Figure 12 DB-9

Note: RS-232 3-wire interface is sufficient. (CTS/RTS are not used.)

7.3 Module connector option 2 - 20 way edge connector

Customer connector pinout (J1)

Table 8 Customer connector pinout (J1)

Pin no.	Description	Pin no.	Description
1	DO not use	2	DO not use
3	DO not use	4	DO not use
5	DO not use	6	DO not use
7	DO not use	8	DO not use
9	DO not use	10	DO not use
11	**GND**	12	**GND**
13	DO not use	14	DO not use
15	**RS232 RXD (IN)**	16	**RS232 TXD (OUT)**
17	**GND**	18	**GND**
19	**PWR IN, +12V**	20	**PWR IN, +12V**

Picture of the Module connector PCB (showing J1)

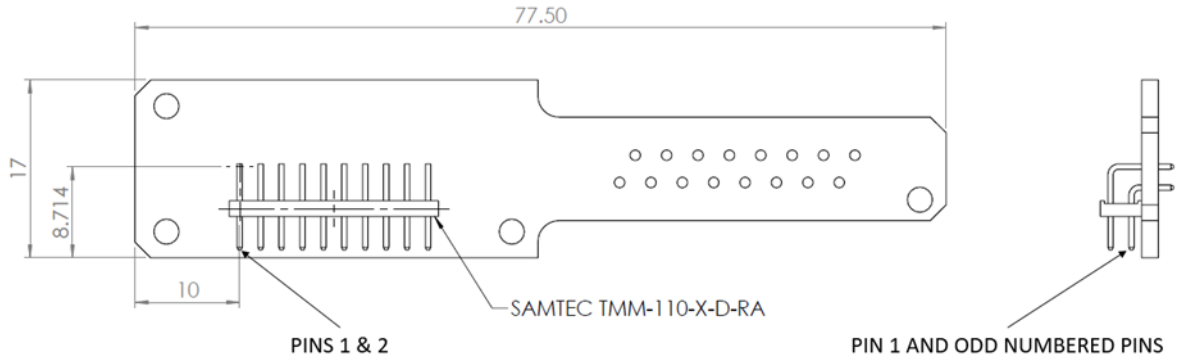


Figure 13 Module connector PCB (showing J1)

Mating connector: Samtec, part no. MMS-110-02-L-DV

7.4 RS-232 interface

The RS-232 set up is the same for both module electrical connections.

The RS-232 interface requires connection to a PC with a terminal emulator with the following settings:

Table 9 RS-232 interface

Setting	Value

Port	Specify the COM port on the PC used to connect to the OSM.
Baud rate	115200
Data	8 bit
Parity	none
Stop	1 bit
Flow control	none

Local echo must be set in the terminal emulator.
CTS/RTS are not used. A 3-wire RS-232 interface is sufficient.

Note: All equipment should always be powered off before connecting or disconnecting any cables.

8 Initializing an optical switch module

This chapter describes how to start-up a POLATIS optical switch module after it has been installed.

8.1 Power-up

All electrical connections to the module must be made before power is applied.

The electrical power specified in the previous chapter shall be turned on to power-up a switch module.

Important: After powering up the Module, wait for up to 120 seconds for the Module to complete its initialization before attempting to communicate with it via external control interfaces. The initialization time varies according to module size. The serial port will respond with “SCPI READY” when it has completed initialization.

8.2 Module communications

Refer to the POLATIS SCPI Operations Manual for the Command Line Interface commands to control the OSM with the SCPI control language.

Note: Local echo must be enabled to see the SCPI commands sent to the OSM.

The basic SCPI switch identification command *idn? can be used to identify the switch and verify the serial port communications. After seeing “SCPI READY” enter *idn? (with no spaces). If you do not see the command you entered, please verify local echo is turned on.

If the serial port is configured correctly, the switch will respond something similar to:

Polatis, I-OSM-24x24-CA1-RSDNS,00001901,8.6.6

where “Polatis” is followed by the OSM Model Number (I-OSM-24x24-CA1-RSDNS), then the Serial Number (00001901) and finally the OSM Software Revision (8.6.6), all comma separated.

9 Maintenance and operation

9.1 Fiber connection

All optical switch module pigtails are terminated with high performance connectors. To connect the module to other equipment bulkhead adapters should be used.

The optical switch is a very high performance fiber optic switch. To maintain this performance, it is important to observe the following fiber handling precautions.

9.2 Connecting and disconnecting

Connectors should not carry significant optical powers when mating and de-mating with the optical connector bulkhead adapters, as this could damage the connectors or the switch core.

It is recommended that Class 1 laser limits be adhered to when connecting or disconnecting optical equipment to or from the optical switch module.

9.3 Fiber cleaning

All connectors to be used should be cleaned using a Cletop type A dry cleaning tape and inspected with an eye-safe fiber optic viewing scope prior to connection to the optical switch module. If there are any visible defects or contamination on a connector, the connector should be re-cleaned and inspected prior to reconnecting. More stubborn contamination may be cleaned using isopropyl alcohol and lint free cotton tissue.

It is strongly advised that there should be no optical power passing through the switch when cleaning fibers. It is possible to burn debris onto the end of the fiber when attempting to clean when optical power is present.

9.4 Switch connectivity check

The switch connectivity should be checked using either a visible fault locator or an appropriate loss measurement system, using the SCPI control interface, to exercise the switch connection map. This will verify the optical path continuity through the switch and correct communication to the switch module.

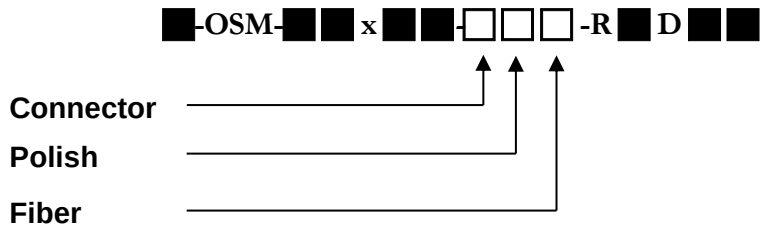
Please refer to the relevant interface manual for details of controlling the optical switch module.

9.5 Software upgrade

If the software of the unit needs to be upgraded the user should contact HUBER+SUHNER Polatis customer service for assistance.

10 Optical interface specifications

Variants within the POLATIS optical switch module product family are available with a number of alternative optical interfaces. The three characters following the switch size in the part number, indicated by the three boxes in the example below specify the variant of connector type and polish, as well as the type fiber, as shown in the tables below.



Note: For specification of the optical interface performance, please refer to the Optical subsection within Absolute maximum ratings.

10.1 Connector

Table 10 Connector – subject to variant type

Type	Description
L	LC
F	FC
C	SC
M	MTP 8-way
N	MTP 12-way

10.2 Polish

Table 11 Polish

Polish	Description
U	Ultra
A	Angled
Q	QFSP

Q is used exclusively with 12 way MTP single mode connectors. NQ1 defines single mode MTP-12 female connectors in QSFP format.

10.3 Fiber

Table 12 Fiber

Fiber Type	Description
1	Single-mode (SMF28) 900 micron diameter

11 HUBER+SUHNER Polatis customer support

Please have available the model and serial number of your POLATIS switch before you contact us:

Americas:

HUBER+SUHNER Polatis
213 Burlington Road
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