

# EOS-6000 Series Optical A/B Switch User Manual – DC Version



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## Safety Information

### Power Requirements

The system operates from a DC power source that supplies -36 to -60 V DC.

### Safety Instructions

The following safety instructions must be observed whenever the unit is operated, serviced, or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the user's manual is in direct violation of the standards of design, manufacture, and intended use of the unit. Emcore assumes no liability for the customer's failure to comply with any of these safety requirements.






#### Before Initializing and Operating the Unit

- Inspect the unit for any signs of damage, and read the user's manual thoroughly.
- Install the unit as specified in the **Getting Started** section.
- Ensure that the unit and any devices or cords connected to it are properly grounded.

### Safety Symbols

The following symbols and messages can be marked on the unit (Table 1). Observe all safety instructions that are associated with a symbol.

**Table 1: Safety Symbols**

Symbol	Description
	Laser safety. See the user's manual for instructions on handling and operating the unit safely.
	See the user's manual for instructions on handling and operating the unit safely.
	Electrostatic discharge (ESD). See the user's manual for instructions on handling and operating the unit safely.
	Frame or chassis terminal for electrical grounding within the unit.
	Protective conductor terminal for electrical grounding to the earth.
<b>WARNING</b>	<b>The procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding.</b>
<b>CAUTION</b>	The procedure can result in serious damage to or destruction of the unit if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding.

## Getting Started

### Before Initializing and Operating the Unit

1. Inspect the optical switch for any signs of damage, and read the User's Manual thoroughly.
2. Install the optical switch as specified in the *Getting Started* section.
3. Ensure that the optical switch and any devices or cords connected to it are properly grounded.
4. Become familiar with all safety symbols and instructions to ensure that the optical switch is operated and maintained safely.

### Initial Inspection



**WARNING:** To avoid electrical shock, do not initialize or operate the unit if it bears any sign of damage to any portion of its exterior surface, such as the outer cover or panels.

Check that the unit and contents are complete:

1. Wear an anti-static wrist strap and work in an electrostatic discharge (ESD) controlled area.
2. Inspect the shipping container for any indication of excessive shock to the contents, and inspect the contents to ensure that the shipment is complete.
3. Inspect the unit for structural damage that can have occurred during shipping.

**Note:** Keep the packaging.

Immediately inform Emcore and, if necessary, the carrier if the contents of the shipment are incomplete, if the unit or any of its components are damaged or defective, or if the unit does not pass the initial inspection.

## Storing and Shipping

To maintain optimum operating reliability, do not store the unit in locations where the temperature falls below  $-25^{\circ}\text{C}$  or rises above  $65^{\circ}\text{C}$ . Avoid any environmental condition that can result in internal condensation. Ensure that these temperature and humidity requirements can also be met whenever the unit is shipped.

## Claims and Repackaging

Immediately inform Emcore and, if necessary, the carrier, if

- The contents of the shipment are incomplete
- The unit or any of its components are damaged or defective
- The unit does not pass the initial inspection

In the event of carrier responsibility, Emcore will allow for the repair or replacement of the unit while a claim against the carrier is being processed.

## Returning Shipments to Emcore

Emcore will only accept returns for which an approved Return Material Authorization (RMA) has been issued. This number must be obtained prior to shipping any material to Emcore. The owner's name and address, the model number and full serial number of the unit, the RMA number, and an itemized statement of claimed defects must be included with the return material.

Ship the return material in the original shipping container and packing material. If these are not available, typical packaging guidelines are as follows:

1. Wear an anti-static wrist strap and work in an ESD controlled area.
2. Wrap the unit in anti-static packaging. Use anti-static connector covers, as applicable.
3. Pack the unit in a reliable shipping container.
4. Use enough shock-absorbing material (10 to 15 cm or 4 to 6 in on all sides) to cushion the unit and prevent it from moving inside the container. Pink poly anti-static foam is recommended.
5. Seal the shipping container securely.
6. Clearly mark FRAGILE on its surface.
7. Always provide the model and serial number of the unit and, if necessary, the RMA number on any accompanying documentation.
8. Please contact the RMA department, using the contact information at the beginning of this document, to provide an RMA number and a shipping address.

## Unpacking

1. Inspect the shipping boxes for any obvious damage.
2. Unpack the unit from all packaging boxes.

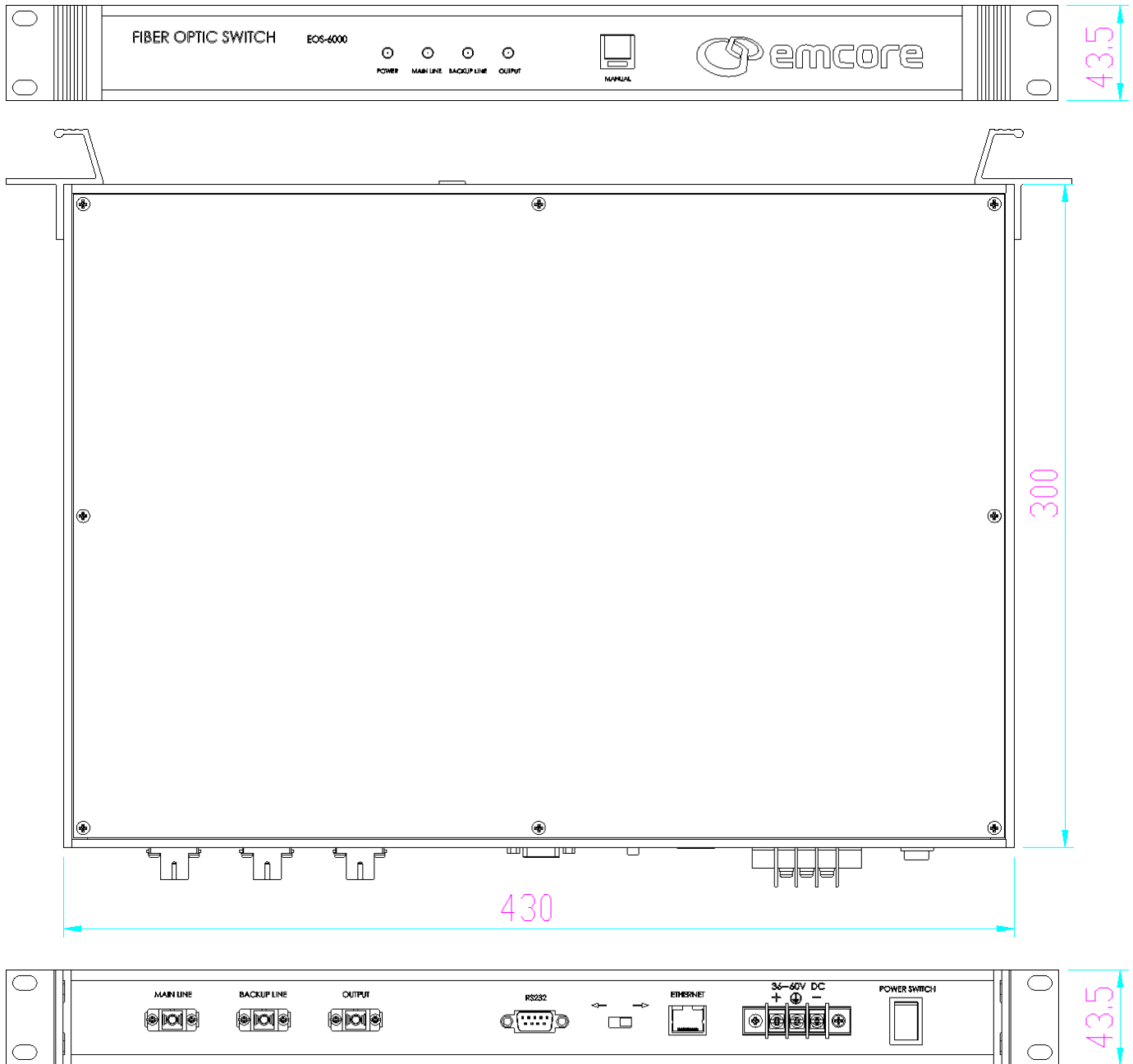
3. Inspect the appearance of the unit for any shipping damage.
4. In case of damage, document and inform the shipping company and your local representative.
5. Save the shipping boxes and their inserts for any future reshipment for upgrade or repair.

**NOTE:** *In the event of a reshipment back to the manufacturer, any additional damage caused by not using the original boxes will be considered the responsibility of the customer.*

### Optical Switch Mounting and Power Connection

1. Mount the unit into a 19-inch wide rack or cabinet.
2. Turn the unit power supply switch located on the rear panel off.
3. Connect wires DC+, DC-, and GND to the pluggable terminal block that is connected to the DC input of the power supply. The DC power source must be 36 – 60VDC and wires used must handle at least 10VA.
4. Turn the unit power switch to the ON position.

Optical Switch Outline Drawing (Units in mm)



## Operating the Optical Switch

### WARNING

To avoid the risk of injury or death, always observe the following precautions before initializing the optical switch.

- If using a voltage-reducing autotransformer to power the optical switch, ensure that the common terminal connects to the earthed pole of the power source.
- Use only the type of power cord supplied with the optical switch.
- Connect the power cord only to a power electrical outlet equipped with a protective earth contact. Never connect to an extension cord that is not equipped with this feature.
- Willfully interrupting the protective earth connection is prohibited.
- Never look into the end of an optical cable connected to an optical output device that is operating. Laser radiation is invisible, and direct exposure can severely injure the human eye. For more information, see the User's Manual of the laser source in use.
- Turning off the power to the optical switch does not block the externally supplied radiation to the input of the optical switch, or the output of the optical switch.
- Do not use the optical switch outdoors.
- To prevent potential fire or shock hazard, do not expose the optical switch to any source of excessive moisture.
- Do not operate the optical switch when its covers or panels have been removed.
- Do not interrupt the protective earth grounding. Any such action can lead to a potential shock hazard that can result in serious personal injury.
- Do not operate the optical switch if an interruption to the protective grounding is suspected. In this case, ensure that the optical switch remains inoperative.
- Unless absolutely necessary, do not attempt to adjust or perform any maintenance or repair procedure when the unit is opened and connected to a power source.
- Repairs are to be carried out only by a qualified professional.
- Do not attempt any adjustment, maintenance, or repair procedure to the optical switch's internal mechanism.
- Disconnect the power cord from the unit before adding or removing any components.
- Operating the unit in the presence of flammable gases or fumes is extremely hazardous.
- Do not perform any operating or maintenance procedure that is not described in the User's Manual.
- Some of the optical switch's capacitors can be charged even when the unit is not connected to the power source.



## Operating Environment

In order for the optical switch to meet the warranted specifications, the operating environment must meet the following conditions for temperature and humidity.

### WARNING

1. Do not use the optical switch outdoors.
2. To prevent potential fire or shock hazard, do not expose the optical switch to any source of excessive moisture.

### Temperature

The optical switch can be operated in the temperature range of 0°C to 50°C.

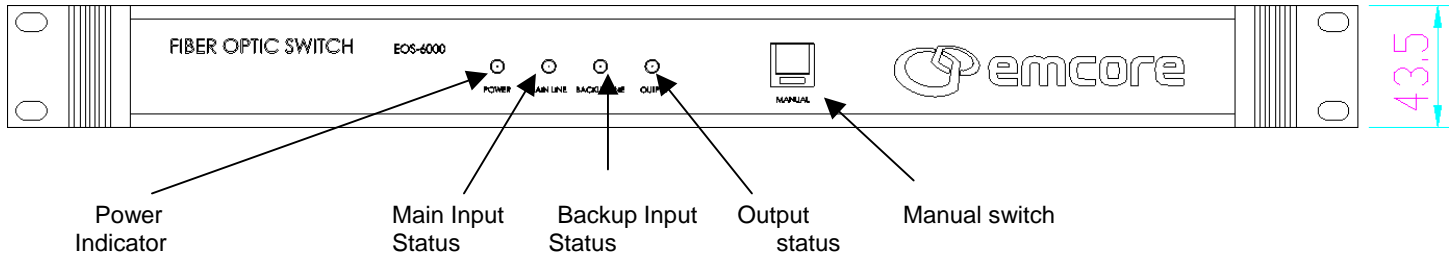
### Humidity

The optical switch can be operated in environments with up to 85% humidity, non-condensing (0°C to 50 °C). Do not expose it to any environmental conditions or changes to environmental conditions that can cause condensation to form inside the optical switch.

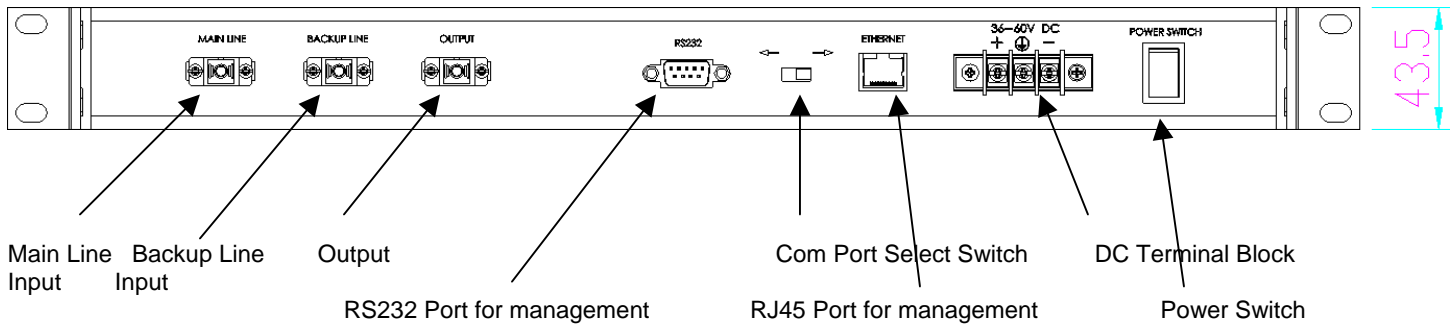
## Introduction

The Model EOS-6000 Optical A/B Switch series product line is a high performance solution for network protection and optical redundancy. Packaged in a convenient 1RU housing, this line of optical switches provides an automatic or manual fiber switching function to protect the network from inadvertent service outages due to up-stream optical signal degradation. Each fiber's optical signal power level is continuously monitored, as is an adjustable optical trip threshold for each channel. If the primary fiber's optical signal power level falls below the desired optical trip threshold, the unit automatically switches to the secondary fiber, thus eliminating the need for intervention of a system operator. The EOS-6000 is capable of manual switching or can be switched remotely via SNMP adding optical protection to many system applications.

### Front Panel View

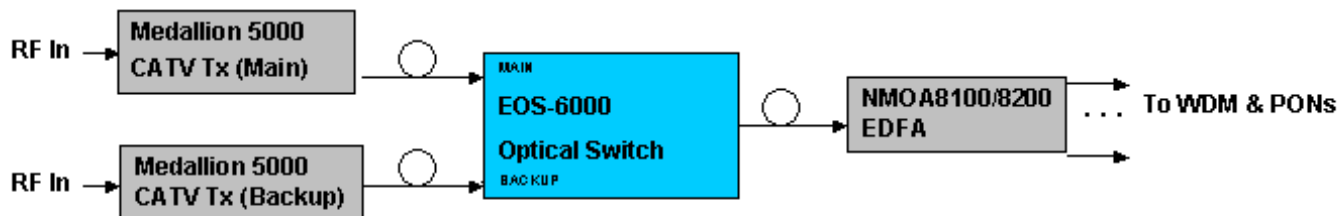


### Rear Panel View (DC)



## Sample Application

The diagram below shows a typical CATV application that allows fully redundant transmitters and fiber paths, with automatic protection to the network via the EOS-6000 switch. Contact your Emcore sales representative for more information on Emcore's complementary product lines.



## Functionality

### Network management

The EOS-6000 supports SNMP1.0 protocol for remote network management. In addition to SNMP, the EOS-6000 also supports web browser, telnet and remote firmware upgrade.

EOS-6000 supports the following Network Management functions.

- 1) Monitoring the main and backup channel's optical power;
- 2) Obtaining the output status;
- 3) Switching between the main line and the backup line
- 4) Setting up the following parameters:

Parameters	Description
Switching Threshold	Power value for auto-switch
Pre-alarm dB value	The Pre-alarm power value (dBm) (for warning) = Switching Threshold + Pre-alarm dB value
Operating mode	Mode 0: Switch remains on the backup line even if the power of the main line returns to normal. Mode 1: Switches to the main line when the power of the main line rises above the Pre-alarm power value (dBm).

See the "EOS-6000 Network Management Manual" for more information.

### Output Indication

- 1) A blinking LED on either the main line or backup line indicates the current working channel.
- 2) If the working channel's optic power is:

- a. Above the Pre-alarm power value (dBm), the output indicator is green;
  - b. Above the Switching Threshold but below the Pre-alarm power value (dBm), the output indicator is yellow;
  - c. Below the Switching Threshold, the output indicator is red.
- 3) If the optic power of either the main line or backup line is higher than the Switching Threshold, the output indicator is green, otherwise red.

## Operation

1) If the working channel is on the main line currently, it will not switch to the backup line until the main line's optic power drops below the switching threshold and the backup line's optic power is higher than the switching threshold.

2) If the working channel is on the backup line currently,

a. For "mode 0", it will not switch to the main line until the backup line's optic power drops below the switching threshold and the main line's optic power is higher than the switching threshold.

b. For "mode 1", it will switch to the main line at once when the main line's optic power rises above the Pre-alarm power value (dBm).

## Manual Switch

The manual switch is enabled and will take effect only when the optic powers of two channels are both either above or below the switching threshold in mode 0 or below the switching threshold in mode 1.

## Normal Operating Condition

The normal operating condition is when the unit is powered on, receiving optical power on both its main and backup working channels with optical powers above the pre-alarm power values. The optical switch is positioned to passively direct the main optical power to the output port. In this case, the front panel LED indicators, "Power", "Main", and "Output" are steady green, and "Backup" is blinking green.

## Optical Characteristics

PROPERTY	UNITS	MIN.	TYP.	MAX.
Operating Wave Length	nm		1310 +/- 10 or 1550+/-20	
Insertion Loss	dB		1.0	1.3
Return Loss	dB	55	60	
Polarization Dependent Loss	dB		0.06	0.1
Repeatability	dB		+/-0.01	+/-0.02
Isolation	dB		-60	-50
Input Optical Power	dBm			24
Switching Time	ms			25

## General and Mechanical Specifications

PROPERTY	REQUIREMENT	COMMENTS
Switching Threshold	20 dB range – see datasheet	Settable within range
Switching Mode	Auto, Manual, remote	

Optical Connector	SC/APC	Other styles available
Monitoring Interfaces	100 Base-T Ethernet Rear Panel RS-232 interface LED Indicators	SNMP V1 Reserved for Factory Use Power, Main, Backup, and Output Indicators
Operating Temperature	0°C to 50°C	
Storage Temperature	-25°C to 65°C	
Power Consumption	5W	Maximum
Supply Range (VDC)	36 - 60 VDC	
Dimensions	430x300x44mm	

## Applicable Standards Compliance

### EMI/EMC

EN55022:2006 conducted emissions, information technology equipment  
 EN55022:2006 radiated emissions, information technology equipment  
 EN55024: 1998/A1:2000/A2: 2002  
 IEC 61000-4-2: 2001  
 IEC 61000-4-3:2008  
 IEC 61000-4-4:2004  
 IEC 61000-4-6:2006  
 FCC Part 15 (CFR 47), subpart B, Class B

## Packaging

### Packaging

- The module shall be sealed in an anti-static bag.
- The product manual will be installed in an anti-static bag and shipped with the unit
- MIB's and manuals will be provided on a CD-ROM supplied with unit

## Laser Safety

### Class 1 Device

This equipment is inherently classified as a Class I laser product, since the equipment contains no laser or light emitting diode (LED) of a higher class number.



- Although unit is classified as a Class 1 device, a hazard can exist due to laser radiation emitting from the output port of the optical switch, and thus eye safety precautions should be adhered to at all times. Never look into an uncovered optical bulkhead connector or the end of an optical cable connected to an optical output device that is operating. Laser radiation is invisible, and direct exposure can severely injure the human eye. For more information, see the User's Manual of the laser source in use.
- Turning off the power to the optical switch does not block the externally supplied radiation to the input of the optical switch, or the output of the optical switch.

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