



## DM4610

OLT – OPTICAL LINE TERMINATION

INSTALLATION GUIDE

## LEGAL NOTICE

Although every precaution has been taken in the preparation of this document, DATACOM takes no responsibility for possible errors or omissions, and it will accept no obligation for damages resulting from the use of the information contained in this manual. The specifications provided in this manual are subject to changes without notice, and they will not be recognized as any kind of contract.

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## WARRANTY

This product is warranted against material and workmanship defects for the period specified in the sales invoice.

The warranty only includes the repair and replacement of defective components and parts without any resulting burden to the customer. Defects resulting from the following are not covered: improper use of device, faulty electrical power network, nature-related events (lightning discharges, for instance), failure in devices connected to this product, installations with improper grounding or repairs made by personnel not authorized by DATACOM.

This warranty does not cover repairs at the customer's facilities. Equipment must be forwarded for repairs to DATACOM.



# CONTACTS

## TECHNICAL SUPPORT

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## GENERAL INFORMATION

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# EQUIPMENT DOCUMENTATION

This manual is part of a set of documents prepared to provide all the necessary information about Datacom equipment.

- **Description** – Presents equipment information and characteristics.
- **DmOS Command Reference** – Lists all commands relevant to the equipment.
- **Installation Manual** – Provides instructions about equipment installation procedures.
- **Quick Reference Guide** – Provides summarized instructions about equipment installation and configuration procedures (shipped with the equipment).
- **Release Notes** – Informs users about new features, known bugs and hardware compatibility.

The availability of certain documents may vary depending on the type of equipment.

Visit the Datacom website to find related documentation or contact Technical Support for more information (see [Contacts](#)).

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# 1. INTRODUCTION

## 1. INTRODUCTION

### 1.1. ABOUT THIS GUIDE

This manual provides information about hardware specification and installation procedures from DM4610. This document also covers initial configuration, those normally needed after hardware installation.

It is assumed that the individual or individuals managing any aspect of this product have basic understanding of Ethernet and Telecommunications networks.








### 1.2. INTENDED AUDIENCE

The DM4610 Hardware Installation Guide is intended for Network Administrators, technicians and other qualified service personnel responsible for installing, configuring, planning and maintaining this product.

### 1.3. CONVENTIONS

In order to facilitate understanding throughout this manual, the following conventions have been adopted:

#### 1.3.1. ICONS

Icon	Category	Description
	Note	Notes further explain certain details presented in the text.
	Warning	This formatting indicates that the text contained herein is of great importance and there is a risk of damage.
	Hazardous	Indicates that, if the procedures are not followed correctly, there is a risk of electric shock.
	Hazardous	Indicates the presence of laser radiation. If instructions are not followed and if direct exposure to the skin and eyes is not avoided, it may cause damage to the skin or eyes.
	Warning	Indicates equipment or a part that is sensitive to static electricity. It shouldn't be handled without using an antistatic bracelet or equivalent.
	Warning	Indicates the emission of non-ionizing radiation.
	Note	Symbol of the WEEE directive (Applicable for the European Union and other countries with a selective collection system). This symbol on the equipment or packaging indicates that the equipment cannot be

Icon	Category	Description
		disposed of with household waste. However, it is your responsibility to take the equipment to be discarded at a collection point assigned for the recycling of electro-electronic equipment. Separate collection and the recycling of equipment at the time of disposal help in the conservation of natural resources and ensure that the equipment will be recycled so as to protect people's health and the environment. For further information on where to discard equipment for recycling, contact your local dealer where the equipment was purchased.

*Table 1 - Icon Conventions*



A warning icon calls attention to conditions that, if not avoided, may cause physical damage to the equipment.



A text of the Notice type calls the attention for the conditions that, if not avoided, may result in death or serious injury.

### 1.3.2. TEXTS

Convention	Description
HYPERLINK	Indicates an internet or email address. It can also be used to indicate a link within the document itself.
Terminal	System commands and terminal outputs
<b>Object</b>	Indicates a reference to something. Used to emphasize a referenced object.
[Key]	Keyboard keys

*Table 2 - Text Conventions*



The conventions used in this document are not necessarily the same as those in the Command Reference document. Observe the conventions established for each document.

## 2. GETTING STARTED

### 2.1. SAFETY WARNINGS

Before to continue, read carefully the following safety warnings:



Prior to installation carefully read the whole manual.

---



Pay attention to the safety instructions during installation, operation or maintenance of this product. Installation, adjustments or maintenance must be performed only by qualified, trained and authorized personnel.

---



To prevent the risk of electrical shocks, before turning the equipment on or connecting an interface card or cable, install the protective grounding system.

---



All unoccupied slots must be closed with a blind panel. This way, the live parts inside the equipment are not exposed. This procedure must be performed only by trained and authorized personnel.

---



Before connecting any cable to the equipment, make sure that the grounding system is functional.

---



The *hot swap* procedure must be performed only by qualified technicians with specific training on this equipment. Failure to comply with this requirement may expose the person that performs this procedure to electric shocks.

---



The hot swap procedure can, when executed improperly, cause damage to the equipment and the people that are handling it. Therefore, in case of doubt, consult DATACOM technical support for explanations.

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Some pieces of equipment in this guide have optical modules of laser-emitting. Avoid exposure to eyes and skin.

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The optical interface modules use transmitters with invisible laser radiation. Never look directly at the laser terminals or the optical fiber. Exposure to laser emission may cause partial or total vision loss.

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## 2.2. PRODUCT OVERVIEW

The DM4610 GPON (Gigabit Passive Optical Networks) OLT is a compact and cost-effective solution to provide FTTx services. It supports up to 1024 GPON subscribers.



Figure 1 - DM4610 OLT

DM4610 OLT 8GPON+8GX+4GT+2XS
<ul style="list-style-type: none"><li>• 1U chassis for 19-inch rack installation</li><li>• 8 GPON ports (SFP – SC/PC)</li><li>• 8 1GbE Base-X ports (optical SFP)</li><li>• 4 1GbE Base-X ports (electrical RJ45)</li><li>• 2 10GbE Base-X ports (SFP+)</li><li>• 2 slots for power supply, DC or AC (full range, redundancy and support for hot swap)</li><li>• Field replaceable fan and power supply modules</li></ul>


Table 1.- DM4610 Hardware Features

### 2.2.1. MAIN DM4610 FAMILY MODULES

The following items fulfill the solution:

- DM4610 OLT 8GPON+8GX+4GT+2XS - (DATACOM part number 800.5081.xx)
  - DM4610 OLT 8GPON+8GX+4GT+2XS (HW2) - (DATACOM part number 800.5165.xx)
- The DM4610 is designed for different operating environments, ideal for indoor and outdoor installations, with a compact 1U height chassis for 19-inch racks. Its power supply flexibility allows DC or AC source *full range* with redundancy and support for *hot swap*.

The DM4610 and DM4610 (HW2) are equivalent product.



Both DM4610 and DM4610 (HW2) products use DmOS software. However, the firmware (file) for installing DmOS on these devices is different between the two platforms.

- DM4610 FAN - (DATACOM part number 800.5096.xx)
- The DM4610 FAN module also is part of the DM4610 chassis basic unit. The DM4610 - FAN module is removable, allowing its easy maintenance in failure events. The fan module is formed by 3 fans. See more details on [FAN module](#) into the [Hardware Description](#) section.

- **PSU 120 AC - (DATACOM part number 800.5079.xx)**  
Power source module for DM4610 chassis, with type AC input voltage. Up to 2 PSU 120 AC may be equipped allowing a redundant solution for power supply. See more details on PSU 120 AC Module into the Hardware Description section.
- **PSU 120 DC - (DATACOM part number 800.5080.xx)**  
Power source module for DM4610 chassis, with type DC input voltage. Up to 2 PSU 120 DC may be equipped allowing a redundant solution for power supply. See more details on [PSU 120 DC Module](#) into the [Hardware Description](#) section.

## 2.3. PREPARING THE SITE

Before to install the equipment, some cares must be taken to guarantee a successfully equipment deployment. The site planning process should consider the following requirements:

- Building;
- Environment;
- Equipment;
- Cabling.

### 2.3.1. BUILDING REQUIREMENTS

Verify that building and electrical installation are in according to all code specifications (set of rules for building constructions) defined by governamental authority.

Buildings must be prepared to support additional mechanical and electrical loading from new equipment. See [Technical Specification](#) chapter for DM4610 weight and energy consumption.



Be sure that the power supply circuit to the rack assembly is not overloaded.

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### 2.3.2. ENVIRONMENT REQUIREMENTS

Electrical equipment generates a significant amount of heat. Therefore, it is essential to provide a temperature-controlled environment for assure performance and safety.

Additionally to temperature control, it is also necessary to install the equipment only in a humidity-controlled area that is free of airborne materials that can conduct electricity. Remember that too much humidity can cause a fire and too little humidity can produce electrical shock and fire.

### 2.3.3. EQUIPMENT REQUIREMENTS

To ensure the correct operation of the equipment, when inspecting or installing the DM4610, follow [Operating Conditions](#) on [Technical Specification](#) chapter of this guide to know DM4610 operating humidity and temperature ranges.

See [Power](#) chapter on [Technical Specification](#) for DM4610 to consult power requirements.

### 2.3.4. CABLING REQUIREMENTS

After a site survey and verifying that all environment requirements are met, evaluate and compare already installed cable plant with the requirements of the DM4610 equipment to determine if it is needed to install new cables.

The cabling is solution-dependent and it should be planned together to network design phase. For example, a GPON solution has different cabling requirements than an ADSL solution.

## 2.4. RECEIVING A DM4610 CHASSIS AND MODULES

The DM4610 chassis is packed in a box, suitably protected by polystyrene sheets and a plastic cover, the function of which is to protect it from damage during transport. The modules and remaining accessories are placed in smaller boxes, protected by foam and antistatic plastic bags.

### 2.4.1. VISUAL INSPECTION

The box containing the chassis or any of the units must be sealed, dry and contain no apparent damage. If these conditions are not met, the box must not be opened and the user should contact the DATACOM service center.

### 2.4.2. PACKAGE CHECKING

Prior to opening the packaging, check the data on its identification label with the information on the receipt. Any divergence must be reported to DATACOM prior to opening the packaging.

### 2.4.3. UNPACKING DM4610 CHASSIS

Once the packaging data has been checked, the user can open it. However, we recommend this only be done at the moment that the unit is ready to be installed, as while packed it is protected from accidents.

The packaging includes the following items:

- 1 x Mechanical structure (Standalone Chassis)
- 1 x Fan Module
- 1 x Power Supply Module (at least)
- 1 x Power cable per power supply module
- 2 x Lateral brackets
- 12x Screws (6 for each lateral bracket)
- 1 x Set of accessories, comprised of a serial cable and an antistatic wristband

See more details about DM4610 packaging on [Packaged Dimensions](#).

### 2.4.4. UNPACKING DM4610 MODULES

Each module is packaged into an individual box and antistatic bag that protect it during transportation and handling. See more details about DM4610 packaging on [Packaged Dimensions](#).



During all opening package process, use the antistatic wristband. This care avoids damage to the modules.

---

### 3. INSTALLING THE DM4610 OLT

This chapter explains procedures, recommendations and cautions regarding to DM4610 installation.

#### 3.1. INSTALLING THE CURRENT DISTRIBUTOR

The DM4610 may operate with one power supply or two power supplies.

On the redundant mode, there is a protection as to possible faults and power drops on the main power supply, in this case is important connect them in diferent electrical circuits to avoid that two energy sources do not turn off simultaneously.

Electrical connections must consider the model of power supply acquired, as shown below.

Model	Description
PSU 120 AC	Only AC input voltage
PSU 120 DC	Only DC input voltage

Table 2.- Power Supply models

For more technical information about PSU models, see the chapters [PSU 120 AC Module](#) and [PSU 120 DC Module](#).

In some electrical connections, it may need to cut the cable next to the male connector to make calls directly from bus bar or circuit breakers, in this case it is mandatory to connect the green wire to the protective ground bar the other wires do not require polarization.

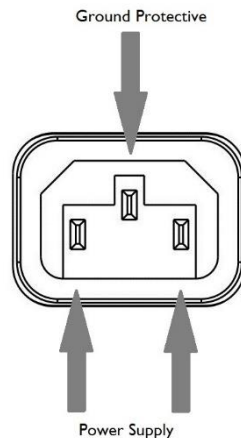


Figure 2 - IEC-320 connector

According to the NBR 14136 standard, the ground pin should be connected to the ground of the installation protection, since the other pin no need to polarity.

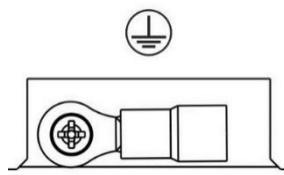


Figure 3 - Chassis Ground Connector



This product depends on the previous installations against short-circuit and circuit overload.



Linking both cables to a single circuit break is not recommended, as this will affect the power redundancy schematics.

---

### 3.2. INSTALLING THE DM4610 CHASSIS

The DM4610 chassis has lateral brackets with depth adjustment, facilitating installation in different 19-inch rack configuration, the space required is 1U. It is possible to adjust the lateral brackets to two depths (0 or 73 mm). The standard factory configuration is 0 mm. The following figure shows the assembly of the lateral brackets in the two possible positions.

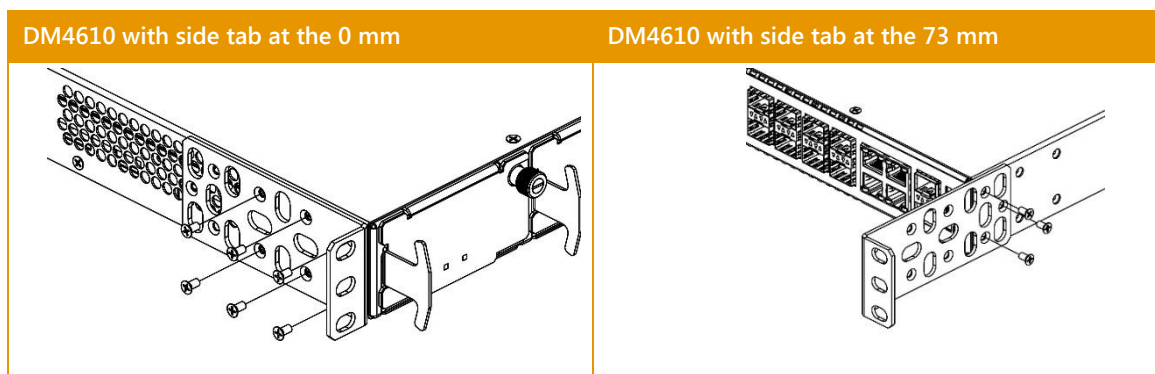


Figure 4 - *DM4610 with and without side tab*

If necessary, the installer must remove the lateral screws, adjusting the brackets to a depth of 73 mm. This mounting brackets configuration positions the chassis deeper inside the rack.

Each bracket is fixed to the chassis by a set of six screws. In the case of changing the position (0 or 73 mm), the screws will be fixed in the same position they were, and the lateral brackets will advance to the second attachment position.

Once the position of the lateral brackets has been determined, choose the position inside the rack where the DM4610 should be placed.

Leave at least 1U height empty at the top and bottom of the DM4610, to facilitate the passage of cables and see the lights indicators of interfaces.



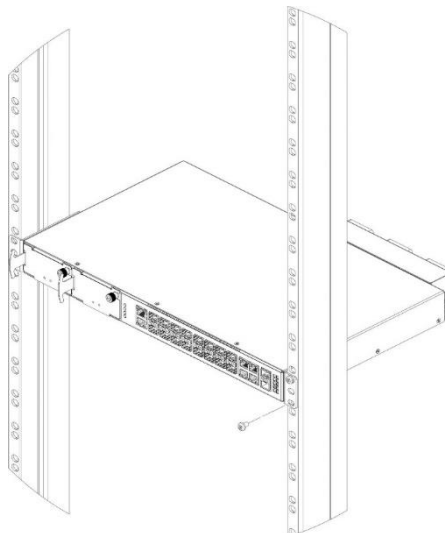


Figure 5 - Installing the DM4610

Details about the laying and placement of cables are defined in the chapter [Cabling for DM4610](#) in this manual.

### 3.3. INSTALLING THE FAN MODULE

The FAN module is a mechanical structure that contains three fans and a connection card. This card has one connector that must be attached to the equivalent connector in DM4610 chassis, which effects control of FAN module.

It can generate a maximum 66 CFM (*Cubic Feet Minute*), when the fans are in full rotation, which is also the equipment's maximum noise condition.



Despite there are fan protection shields, take some care to manipulate the ventilation module. It must be pulled through the structure metal from the frontal part only. Besides, it requires attention regarding chains, bracelets and other objects small enough to pass through the ventilation rails

The following figure shows all components used on cooling system of the DM4610. On the next items will be explained how to handling these parts.

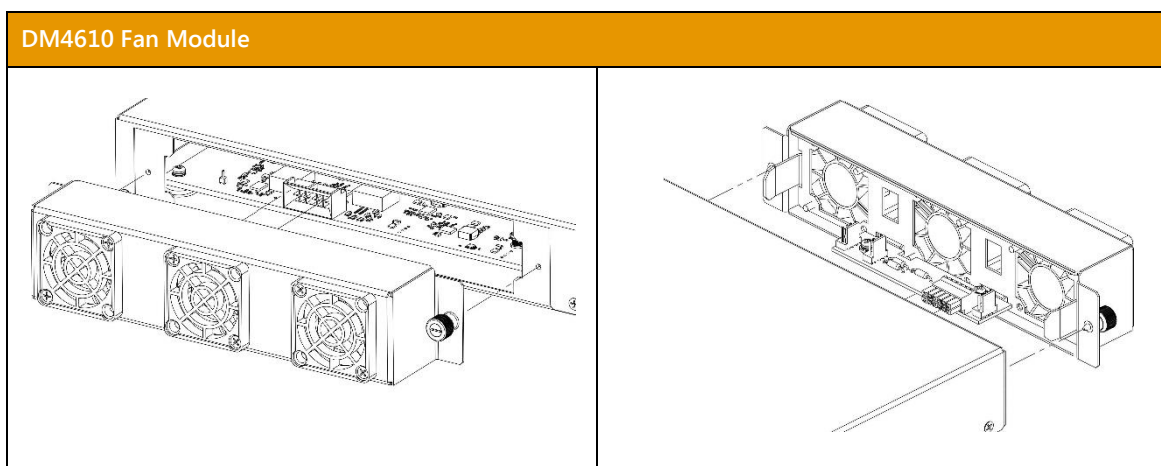


Figure 6 - DM4610 Fan Module

### 3.3.1. INSERTING THE FAN MODULE

The FAN module occupies your respective position localized in the rear of DM4610 chassis and is fixed with two side screws included with the module.

The process for insertion must follow the steps below.

Step 1	<ul style="list-style-type: none"><li>Position fan module guide between DM4610 chassis guide.</li></ul>
Step 2	<ul style="list-style-type: none"><li>Make sure that the backplane connectors are aligned for fitting.</li></ul>
Step 3	<ul style="list-style-type: none"><li>Push the module until it touches the DM4610 chassis.</li></ul>
Step 4	<ul style="list-style-type: none"><li>Tighten the side screws that attach the module to the DM4610 chassis.</li></ul>

### 3.3.2. REMOVING THE FAN MODULE

Follow the step below to remove the fan:

Step 1	<ul style="list-style-type: none"><li>Loosen the side screws that attach the module to the DM4610 chassis.</li></ul>
Step 2	<ul style="list-style-type: none"><li>Pull the module until release the backplane connectors.</li></ul>

### 3.3.3. CHECKING FAN OPERATION

By powering the system, the fans begin to rotate at the maximum speed.

### 3.3.4. INSTALLING OR REMOVING THE AIR FILTER

The air filter fits into the plastic support fixed in the fan module rear, thus all the air captured by the FAN module from the external environment passes mandatorily through the air filter.

Air Filter specification: 30 to 40 PP1 (*Pores Per Inch*).

The process for insertion must follow the steps below.

Step 1	<ul style="list-style-type: none"><li>Using a needle-nose pliers or tweezers remove the plastic grid fixing the air filter.</li></ul>
Step 2	<ul style="list-style-type: none"><li>Remove or replace the air filter</li></ul>
Step 3	<ul style="list-style-type: none"><li>Position the grid back in place and press to fit.</li></ul>

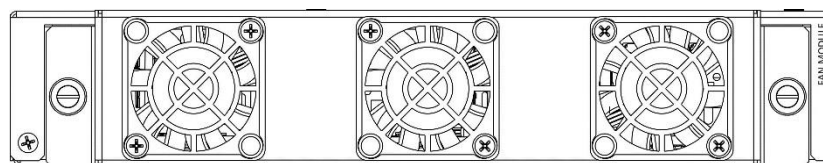


Figure 7 - FAN module without air filter

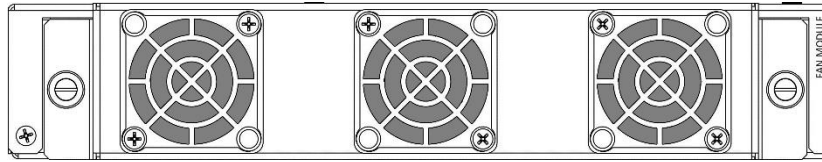


Figure 8 - FAN module with air filter



Only using FAN module without filter, if using SFP modules extended temperature and the environment is extremely clean of impurities in the air. In all other cases it should be used the air filter.



Periodically check the condition of air filters and replace if necessary.  
This procedure increases the lifetime of the DM4610, FAN, PSU and SFP modules and if necessary.

### 3.4. INSTALLING THE PSU MODULE

The PSU120 module is a power supply used to power the whole DM4610. This unit is also involved in the control of the fans. For power redundancy operation, two of them must be installed.

Available models are: PSU 120 AC and PSU 120 DC.



It is possible to use the two available PSU models operating in redundant way.



When using two different models at the same time careful not to reverse the connectors of the power supply circuit (PSU1 and PSU2), located at the rear of the equipment.

#### 3.4.1. INSERTING THE PSU MODULE

The PSU 120 module is responsible for powering the DM4610, as such, must be the first to be installed in the equipment. These modules must be installed in the position of the DM4610 used exclusively for the power supply, as shown below.

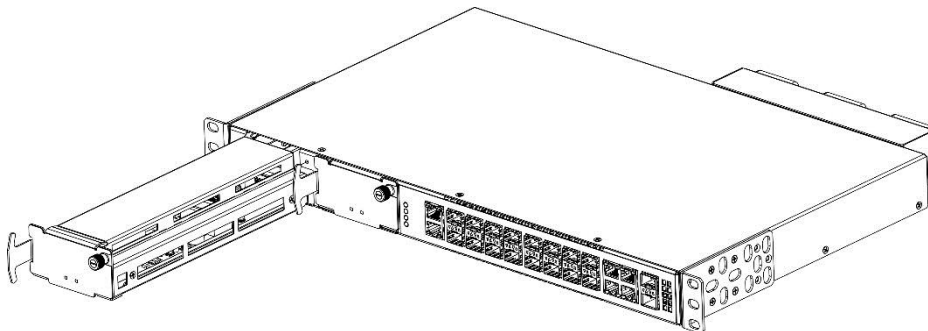


Figure 9 - Installing the DM4610 – PSU 120

The process for insertion must follow the steps below, in this order:

Step 1	<ul style="list-style-type: none"> <li>Loosen the screw and remove cover of slot.</li> </ul>
Step 2	<ul style="list-style-type: none"> <li>Position the PSU module in the first position of the DM4610.</li> </ul>
Step 3	<ul style="list-style-type: none"> <li>Push the module until it reaches the backplane connectors.</li> </ul>
Step 4	<ul style="list-style-type: none"> <li>Tighten the screw that attach the PSU module to the DM4610.</li> </ul>

### 3.4.2. CHECKING PSU OPERATION

Once powered, the PSU 120 module can activate two LEDs on its panel. The table below shows the possible states of the LEDs:

Indicator	Color	State	Description
POWER	Green	Off	Failure in powering the module
		On	Unit correctly powered
ACT	Green	Off	PSU in stand by
		On	PSU in operation

Table 3.- *DM4610 PSU 120 Light Indicators*

### 3.4.3. REMOVING THE PSU MODULE

The PSU 120 module is responsible for powering the entire DM4610. The process for removal must follow the steps below, in this order:

Step 1	<ul style="list-style-type: none"> <li>Loosen the screw that attach the unit to the DM4610.</li> </ul>
Step 2	<ul style="list-style-type: none"> <li>Pull the module extractor to disconnect it from the backplane.</li> </ul>
Step 3	<ul style="list-style-type: none"> <li>Extract the module with the help of the guides, removing it from the DM4610.</li> </ul>

## 3.5. CABLING FOR DM4610

Wires and cables supply electric power and communication services, becoming vital components on networks. Therefore, the planning, installation and maintenance regarding to cabling is a point to be careful.

There are three basic types of cabling that are used in the DM4610:

- Power cables.
- Copper cables.
  - Management Cables (Console and Ethernet).
  - Electrical cables in 1 Gb (RJ45).
- Optical Cables
  - Optical cables in GPON (SFP).
  - Optical cables in 1 Gb (SFP).

- Optical cables in 10 Gb (SFP+).

The cabling of the DM4610 varies according to the types of installed interfaces.

### 3.5.1. INSTALLING POWER CABLES

These electric cables make the initial operation of the system possible.

As shown in following figure, one cable passage possibility is suggested.

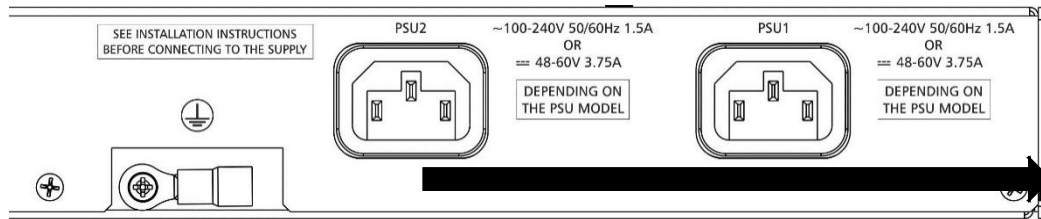


Figure 10 - Position of the cables to be followed



The non-fulfillment of this recommendation during the installation process will result in difficulties in the replacement of the FAN module or maintenance of the filter.



In power modules polarity issues are not required. Only mandatory is the position of ground pin.

#### 3.5.1.1. INSTALLING THE CABLES

The PSU 120 powers the system. One 3-Pins power cable must be connected to the rear of the DM4610. See [PSU 120 Cabling](#), into the [Cabling for DM4610](#) section for more details regarding power cabling.

#### 3.5.1.2. ATTACHING THE POWER CABLES

For this activity it is necessary that the PSU 120 modules are already inserted in their slots.

The DM4610 has redundant power. The power cables have a fixed length that is enough to link them to any rack position. To attach the power cables, the following procedure is recommended:

Step 1	<ul style="list-style-type: none"> <li>• Ensure that the protective ground cable is connected.</li> </ul>
Step 2	<ul style="list-style-type: none"> <li>• Connect the cable with female connector on the connector (PSU1 or PSU2).</li> </ul>



See [Installing the PSU Module](#) for more details about power cables installing.

### 3.5.1.3. *INSTALLING THE POWER CABLE IN THE PSU 120*

There are two cables (DATACOM code 408.0391.xx) that come out of the PSU1 and PSU2 connectors in direction of the current distributor. The cable must be positioned a for installation in the current distributor.

For detailed information about PSU 120 cable and connector pinout, consult [Power Supply Modules](#) into the chapter [Hardware Description](#).

Each cable corresponds to a power supply and if using the redundancy mode must be connected an entirely independent circuit.



To prevent the risk of electrical shocks, before turning the equipment on or connecting an interface or cable, install the protective grounding system.

---

### 3.5.2. *CHECKING OPERATION THE DM4610 CHASSIS*

Considering that the DM4610 was installed as described, the following steps may be used to check the unit operation:

Step 1	<ul style="list-style-type: none"><li>Just after the power up DM4610, the FAIL LED (red) will remain lit indicating software load (booting) and POWER LED (green) on.</li></ul>
Step 2	<ul style="list-style-type: none"><li>Wait until the end of the unit's start up process and check the condition of the front LEDs:</li><li>POWER LED (green) on: The unit is correctly powered.</li><li>FAIL LED (red) off: The unit did not detect hardware failures.</li><li>SYS LED (green) on, indicating that this unit of the system is working.</li><li>ALARM LED (red) off: The unit did not receive any alarm.</li></ul>
Step 3	<ul style="list-style-type: none"><li>The system is operating correctly, whether the following conditions are satisfied:</li><li>POWER LED (green) on;</li><li>FAIL LED (red) off;</li><li>SYS (green) on;</li><li>ALARM LED, does not matter.</li></ul>

When successfully ending the start up process, the operator must configure the management IP address as described on [Logging in for First Time](#).

### 3.5.3. *INSTALLING MANAGEMENT CABLES*

These management cables make the initial configuration of the system possible.

#### 3.5.3.1. *CONSOLE SERIAL CABLE*

The DM4610 has a RS232 serial port provided on the RJ45 connector located on the right of the unit. DATACOM provides a cable with the function of interlinking the DM4610 to a PC. This connection is only necessary one single occasion, when starting up the product, when it is necessary to record the IP address in the DM4610.

Only one adaptor cable for sporadic use is defined in the DM4610. The console serial cable, DATACOM code 710.0137.xx.

Check in [Console Interface](#) chapter for cable assembly and pinout.



Always try to access the equipment using notebooks. The RS232 interfaces are very sensitive to the voltage differences between grounding systems, which happens when a computer connected to an AC network is linked to the DM4610. If the voltage difference between the AC grounding and the grounding available for the DM4610 is too much, both the DM4610 serial port and the computer's serial port may be damaged.

### 3.5.3.2. *MGMT ETHERNET CABLE*

A standard Fast Ethernet cable, with wiring and distribution of standard signals, interlinks the DM4610 to the management network.

For detailed information about the interface configuration, consult [Configuring Management Access](#) into the chapter [Logging in for First Time](#).

### 3.5.4. *INSTALLING OPTICAL CABLES*

The DM4610 uses SFP+ and SFP (Small Form-factor Pluggable) modules to provide optical accesses. According to the defined modules, the units that initially have optical interfaces will only operate with optical fibers with LC connectors.



See [Installing and Removing SFP Modules](#), for details regarding how to handle SFP modules.

Due to the excess of cable on the left of the rack, there is always a risk of damaging the fibers. To prevent this effect and considering that the optical fibers are very thin, the installer must always, do passage of cables in side upper or below the chassis, using the lower cable guide.



During the installation of the fibers, it is highly recommended to use corrugated tubes or plastic troughs to hold the fibers linked to the equipment, thereby protecting them from possible breakages or damage and, consequentially, interruptions in service.



The curvature radius of the optical cables cannot be too small. Fibers with a small radius present micro cracks that drastically reduce the reach of the optical signal. Fibers from different manufacturers have different characteristics. To verify the curvature radius is adequate, please check the characteristics of the cable used in the manufacturing manual.



The optical interface modules use transmitters with invisible laser radiation. Never look directly at the laser terminals or the optical fiber. Exposure to laser emission may cause partial or total vision loss.

### 3.5.4.1. *OPTICAL CABLES IN GPON INTERFACES*

The DM4610 Chassis has 8 front connectors for the optical GPON SFP interfaces.

To not harm the removal of the other units, the fiber must be directed to the upper or down side of the chassis, depending on the interface position.

### **3.5.4.2.    *OPTICAL AND ELECTRICAL CABLES IN 1GB INTERFACES***

The DM4610 has 8 front connectors for the optical Gigabit Ethernet SFP interfaces and 4 front connectors for de Gigabit Ethernet RJ45.

To not harm the removal of the other units, the fiber or electrical cables must be directed to the upper or down side of the chassis, depending on the interface position.

### **3.5.4.3.    *OPTICAL CABLES IN 10GB INTERFACES***

The DM4610 has 2 front connectors for the optical 10 Gigabit Ethernet SFP+ interfaces.


To not harm the removal of the other units, the fiber must be directed to the upper or down side of the chassis, depending on the interface position.




# 4. INSTALLING AND REMOVING SFP MODULES

This chapter describes how to install and remove SFP modules.

The SFP (Small Form-Factor Pluggable) modules are used in the equipment's SFP ports, serving as transceivers between the card and the chosen means of communication (CAT-5 optic fiber or electric).



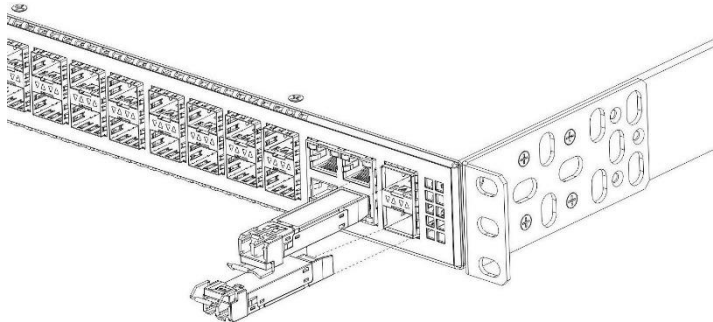
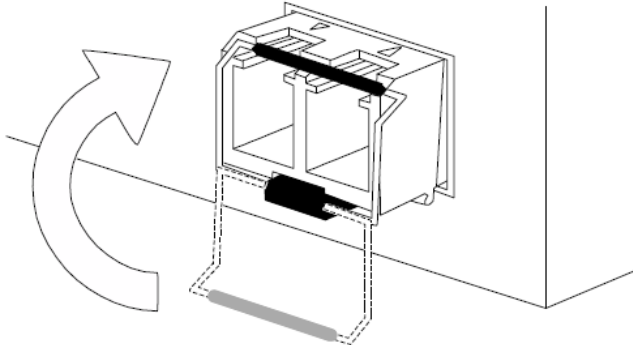
Whenever some form of work is conducted on the equipment, it is necessary for the technician implementing the alteration to check beforehand that suitable protection is present. Grounding (and the use of an antistatic wrist strap) prevents damage to the equipment and risks to technician's health.



Modules without approval do not guarantee correct operation of the equipment and may damage interface cards. Contact the technical support team about the risks of using not approved modules and the possibility of unblocking them.

## 4.1. INSTALLING THE SFP MODULES

The SFP installation is conducted as shown on following steps:

Step 1	<ul style="list-style-type: none"><li>Remove the plastic protector plug of the SFP receptacle.</li></ul>
Step 2	<ul style="list-style-type: none"><li>Insert the module into the SFP slot of the equipment and pushing it until it is firmly held. The correct position of the attachment can be seen in following figure.</li></ul> <div></div> <div>Figure 11 - Inserting a SFP module</div>
Step 3	<ul style="list-style-type: none"><li>After attaching the module, it is necessary to secure the securing handle as shown below, as it serves as a lock for the optical cables when these are connected.</li></ul> <div></div> <div>Figure 12 - Locking the SFP module</div>

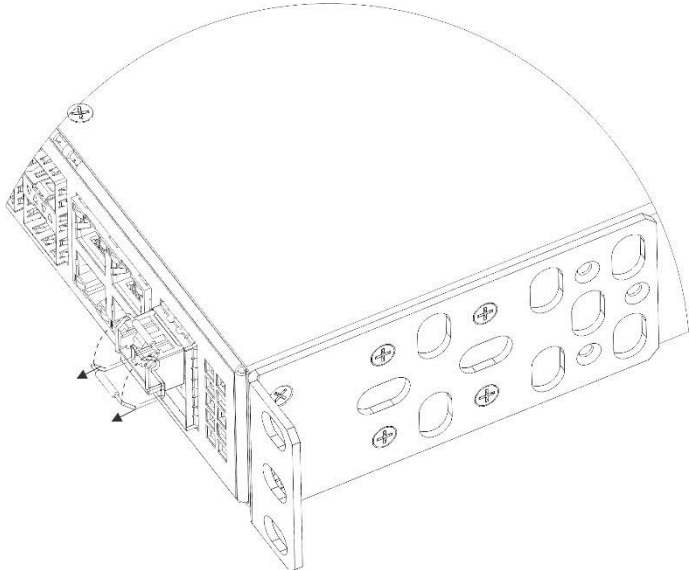
Step 4	<ul style="list-style-type: none"> <li>After positioning the handle simply connect the optical cables.</li> </ul>
--------	---

## 4.2. REMOVING SFP MODULES



Before removing the optical cables it is recommended to check if there are any markings indicating which cable should be connected to which module.

To remove the modules, simply follow the installation instructions in reverse:

Step 1	<ul style="list-style-type: none"> <li>Remove the optical cables.</li> </ul>
Step 2	<ul style="list-style-type: none"> <li>Lower the securing handle.</li> </ul>
Step 3	<ul style="list-style-type: none"> <li>Pull the module by the handle, as shown in the following figure.</li> </ul>  <p>Figure 13 - Removing a SFP module</p>
Step 4	<ul style="list-style-type: none"> <li>Insert the plastic protector plug of the SFP receptacle, thereby preventing the accumulation of dust and dirt in it.</li> </ul>

## 5. LOGGING IN FOR FIRST TIME

Considering the equipment correctly installed as described previously, the user can manage it through a Command Line Interface (CLI). The CLI is accessed by using a direct console connection or by using a SSH connection from a remote management terminal.



More information about how to use console and management ports is available [on Connecting by Console Interface](#) and [Connecting by MGMT Interface](#).

Step 1	<ul style="list-style-type: none"><li>On the PC or laptop, start the terminal emulation program. The initial login prompt for a username appears:</li></ul> DM4610 login:
Step 2	<ul style="list-style-type: none"><li>The default username and password are <b>admin</b>. Type the username followed by [Enter]:</li></ul> DM4610 login: <b>admin</b> [Enter]
Step 3	<ul style="list-style-type: none"><li>Type the password followed by [Enter]:</li></ul> Password: <b>admin</b> [Enter]
Result	<ul style="list-style-type: none"><li>The prompt as following will appear, indicating a successful login:</li></ul> DM4610#



Due the security reasons, it is strongly recommended to change the *admin* account password at the first time login. For change password, see [Changing admin User Passwords](#).

### 5.1. CONFIGURING MANAGEMENT ACCESS

#### 5.1.1. DEFAULT ACCOUNT

One account is configured by default on the DM4610: *admin*.

Account	Password	Description
<i>admin</i>	<i>admin</i>	<i>admin</i> is an account that has <b>admin</b> level privileges. So, it can view and change all device parameters. It is a complete read-and-write access to the entire device.

Table 4.- Default Account

#### 5.1.2. CHANGING ADMIN USER PASSWORDS

For security reasons it is highly recommended to modify the default admin password.

Step 1	<ul style="list-style-type: none"> <li>Entering the configuration mode:</li> </ul> <pre># configure</pre>
Step 2	<ul style="list-style-type: none"> <li>Entering the user mode:</li> </ul> <pre>(config)# <b>aaa user</b> admin</pre>
Step 3	<ul style="list-style-type: none"> <li>Changing the password:</li> </ul> <pre>(config-user-admin)# <b>password</b> new-password</pre>
Step 4	<ul style="list-style-type: none"> <li>Exiting the user mode:</li> </ul> <pre>(config-user-admin)# <b>exit</b></pre>
Step 5	<ul style="list-style-type: none"> <li>Applying and saving configuration changes:</li> </ul> <pre>(config)# <b>commit</b></pre>

### 5.1.3. CONFIGURING A MANAGEMENT INTERFACE

The configuration below will set up the device management according to the above diagram. If you are connected by MGMT interface, the session will be disconnected after the commit. To continue setting the device by MGMT interface, you must set an IP address on your PC within the same network or connect by Console:

Step 1	<ul style="list-style-type: none"> <li>Entering the configuration mode:</li> </ul> <pre># configure</pre>
Step 2	<ul style="list-style-type: none"> <li>Entering the configuration MGMT interface:</li> </ul> <pre>(config)# <b>interface mgmt 1/1/1</b></pre>
Step 3	<ul style="list-style-type: none"> <li>Configuring the IPv4 address on the MGMT interface:</li> </ul> <pre>(config-mgmt-1/1/1)# <b>ipv4 address</b> 172.2.22.1/24</pre>
Step 4	<ul style="list-style-type: none"> <li>Removing the default IP address (only one is supported) and exit:</li> </ul> <pre>(config-mgmt-1/1/1)# <b>no ipv4 address</b> 192.168.0.25/24 (config-mgmt-1/1/1)# <b>exit</b></pre>
Step 5	<ul style="list-style-type: none"> <li>Configuring the default gateway address and exit configure mode:</li> </ul> <pre>(config)# <b>router static</b> 0.0.0.0/0 <b>next-hop</b> 172.2.22.254</pre>
Step 6	<ul style="list-style-type: none"> <li>Applying and saving configuration changes:</li> </ul> <pre>(config)# <b>commit</b></pre>

### 5.1.4. VERIFYING BASIC CONNECTIVITY

The DM4610 provides a tool to perform checking of network connectivity. A successful network connection is established between any two devices when data flows from node to the other. Ping is a tool that is indispensable when testing TCP/IP network connectivity.

5.1.4.1. PING

The ping command is a very simple connectivity testing tool. Ping verifies connectivity by sending Internet Control Message Protocol (ICMP) echo packets to a host and listening for an echo reply.

In the command line session, perform the following tasks to check connectivity using **ping** command:

Step 1	<ul style="list-style-type: none"><li>Enter the ping command followed by destination address.</li></ul> <pre># ping destination_ip_address</pre> <p>Example:</p> <pre>DM4610# ping 192.168.0.1</pre> <pre>PING 192.168.0.1 (192.168.0.1) 56(84) bytes of data.</pre> <pre>64 bytes from 192.168.0.1: icmp_seq=1 ttl=64 time=15.0 ms</pre> <pre>64 bytes from 192.168.0.1: icmp_seq=2 ttl=64 time=5.28 ms</pre> <pre>64 bytes from 192.168.0.1: icmp_seq=3 ttl=64 time=3.65 ms</pre> <pre>64 bytes from 192.168.0.1: icmp_seq=4 ttl=64 time=2.86 ms</pre> <pre>64 bytes from 192.168.0.1: icmp_seq=5 ttl=64 time=2.86 ms</pre> <pre>--- 192.168.0.1 ping statistics</pre> <pre>5 packets transmitted, 5 received, 0% packet loss, time 4006ms</pre> <pre>rtt min/avg/max/mdev = 2.862/5.950/15.079/4.649 ms</pre>
--------	--

5.1.5. VERIFYING DEVICE INFORMATION

The command *show* shows details about firmware and hardware versions, configuration, serial numbers, power suppliers and fan module status and system temperature.

Command	Description
# <i>show running-config</i>	Verifying the current configuration.
# <i>show environment</i>	Verifying the temperature of modules.
# <i>show firmware local</i>	Verifying firmware version.
# <i>show inventory</i>	Verifying hardware information.
# <i>show platform</i>	Verifying device modules.

Table 5.- *Example of show commands available*

## 5.2. CONNECTING BY CONSOLE INTERFACE

It is possible to access the CLI by the Console port located at the device front panel. For that, connect a console cable and run a terminal emulator as Hyper Terminal or similar on your PC. The terminal software must be set as 9600 8N1.



Check in [Console Interface](#) chapter for cable assembly and pinout or in [Console serial cable](#) chapter for further recommendations on the cable and console interface.

## 5.3. CONNECTING BY MGMT INTERFACE

Alternately, it is possible to access the CLI by the MGMT port also located at the device front panel. The MGMT port is an Ethernet interface dedicated to manage the device and it is unable to perform switching or routing. To access the CLI, connect a LAN cable to the MGMT port and set an IP address on the network adapter of your PC. The default IP address is **192.168.0.25/24**. Run a SSH application on a PC to start a terminal session with the device. Telnet session is not supported at the current version.



Check in [MGMT Interface](#) for the lights or in [MGMT ethernet cable](#) chapter for further recommendations on the cable.

# 6. HARDWARE DESCRIPTION

## 6.1. BASIC DM4610 HARDWARE

The basic hardware (minimum configuration) is a set of fundamental modules, without which no activity is possible. The figure below presents the basic DM4610 OLT module assembled.

It is comprised of:

- DM4610 Chassis
- FAN module
- Air filter
- PSU 120 (AC or DC) Module

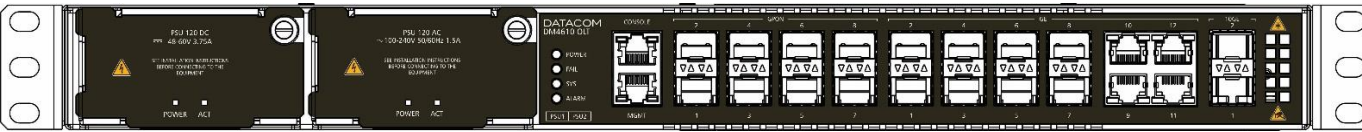


Figure 14 - Basic DM4610 OLT

### 6.1.1. LIGHT INDICATORS

The following table provides a description of the LEDs found on the DM4610 chassis.

Indicator	Color	State	Description
POWER	GREEN	Off	Failure in powering the module
		On	Unit correctly powered
FAIL	RED	Off	No failure present
SYS	GREEN	Off	Booting system
		On	Initialized system
		Flashing	0.5s – Applying configuration
		Flashing	1s – Firmware update
ALARM	RED	Off	No alarm present
		Flashing	2s – Minor alarm
		Flashing	0.25s – Critical alarm

Table 6.- DM4610 Light Indicators

## 6.2. FAN MODULE

The FAN module is composed of a mechanical structure that houses three fans.

The following figure presents the front panel of the FAN module and the module with details on the assembly of fans in the metal housing of DM4610 products.

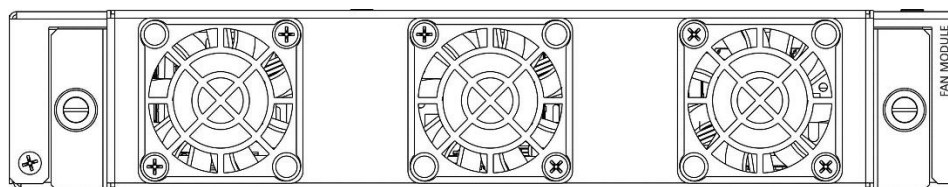


Figure 15 - DM4610 - FAN module with Air Filter.



Despite there are fan protection shields, take some care to manipulate the ventilation module. It must be pulled through the structure metal from the frontal part only. Besides, it requires attention regarding chains, bracelets and other objects small enough to pass through the ventilation rails.

### 6.2.1. DM4610 FAN MODULE

The DM4610 uses three fans. It is possible to operate at different speeds, depending on the environment's temperature, configuration and number of interfaces installed in the system, which also reduces the ambient noise and increases the service life of the fans.

When the system is active, the FAN module operates in maximum rotation, until the DM4610 software determines the initialization process. Once started, the DM4610 controls the speed of the fans according to the system temperature.

In failure case, an appropriate alarm is generated so that the operator can request the replacement.

### 6.2.2. AIR FILTER

Responsible for filtering the air used to cool the modules. To ensure a correct fit, the frame containing the filter is fixed with two screws in the module FAN.

In this position, all the air pumped by the FAN module from the external environmental passes mandatorily through the air filter.

For more details about the installation of the filter and cleaning, check on [Installing or Removing the Air Filter](#).

## 6.3. POWER SUPPLY MODULES

### 6.3.1. GENERAL INFORMATION

The DM4610 allows two power supply options for feed the basic chassis, PSU 120 AC and PSU 120 DC as described below.

It is possible to work with both models simultaneously and redundantly on the same chassis.

These power supply modules have exclusive slot positions on DM4610 chassis, called PSU1 and PSU2, with the feed inlets in the rear of the chassis.

### 6.3.2. PSU 120 AC MODULE

The PSU 120 AC module, accepts only AC input voltage, with full range of 100V to 240V and operation frequency 50/60Hz.

Other features presents are, support for hot swap, redundancy mode, interoperability with PSU 120 DC module and power good test.





In this module polarity issues are not required. Only mandatory is the position of ground pin.



Figure 16 - PSU 120 AC Module

### 6.3.3. PSU 120 DC MODULE

The PSU 120 DC module, accepts only DC input voltage, with full range of -48V to -60V.

Other features presents are support for hot swap, redundancy mode, interoperability with PSU 120 AC module and power good test.



In this module polarity issues are not required. Only mandatory is the position of ground pin.



Figure 17 - PSU 120 DC Module

### 6.3.4. LIGHT INDICATORS

Once powered, the PSU 120 module will can activate two LEDs on its panel. The table below shows the possible states of the LEDs:

Indicator	Color	State	Description
POWER	Green	Off	Failure in powering the module
		On	PSU correctly powered
ACT	Green	Off	PSU in stand by
		On	PSU is active

Table 7.- PSU 120 Module status light indicators

### 6.3.5. POWER INPUT AND CHASSIS GROUND CONNECTOR

Protection grounding. If used, must be attached to the common point of the union of the protection grounding systems of the current distributor.

According to the NBR 14136 standard, the ground pin should be connected to the ground of the installation protection, since the other pin no need to polarity.

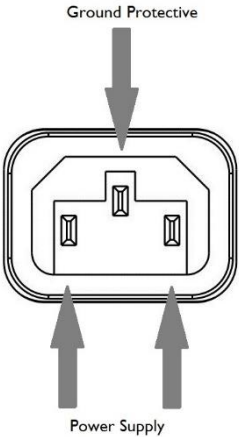


Figure 18 - IEC-320 connector

The distribution of signals in the IEC320/C14 connector seen from the rear is the following:

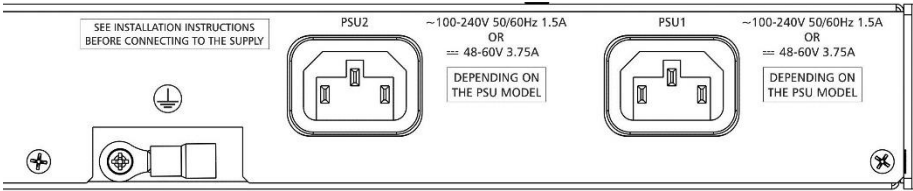


Figure 19 - IEC320/C14 and Ground Connector

6.4. DM4610 – INTERFACES CONNECTION

6.4.1. GENERAL

Overview of the front panel DM4610 interfaces is as follows:

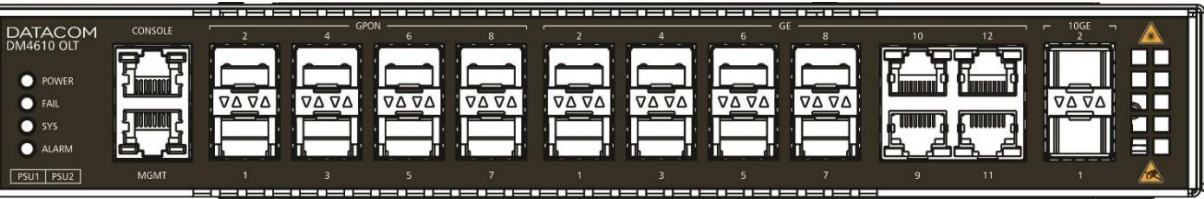


Figure 20 - DM4610 front view interfaces

6.4.2. GPON INTERFACES

The DM4610 has 8 front connectors for the optical GPON SFP interfaces, compatible with standards G.984.1, G.984.2, G.984.3 and G.984.4 (OMCI). This solution is TR-255 (GPON Interoperability Test Plan) compliance<sup>1</sup>.

This solution supports split ratio (SR), from 1:1 to 1:64.

<sup>1</sup> Please consult DATAKOM support for a test case list from the chapter 5.1 on TR255 (Broadband Forum GPON Interoperability Test Plan)

It supports:

- GPON SFP Classes B+ and C+;
- SBA (fixed) and DBA;
- Upstream and downstream FEC

The GPON interfaces are available from optical modules on the front side of the DM4610.

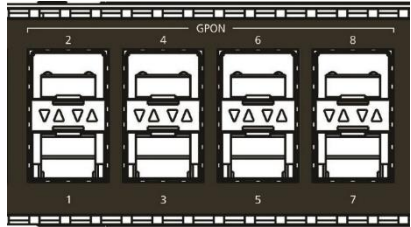


Figure 21 - GPON SFP interfaces front panel



The optical interface modules use transmitters with invisible laser radiation. Never look directly at the laser terminals or the optical fiber. Exposure to laser emission may cause partial or total vision loss.

### 6.4.2.1. LIGHT INDICATORS

The GPON interfaces have a status LED that indicates the plugged component status. The table below describes the meaning of those LEDs.

Indicator	Color	State	Description
STS	GREEN	Off	Administrative Status DOWN or without inserted SFP
		On	Administrative Status UP and inserted SFP.

Table 8.- GPON interfaces light indicators

### 6.4.3. GIGABIT ETHERNET INTERFACES (SFP AND RJ45)

There are eight SFP (Small Form-factor Pluggable) cages that permit the insertion of diverse types of optical SFP modules, in addition to electronic SFPs and four RJ45, as shown in the figure below.

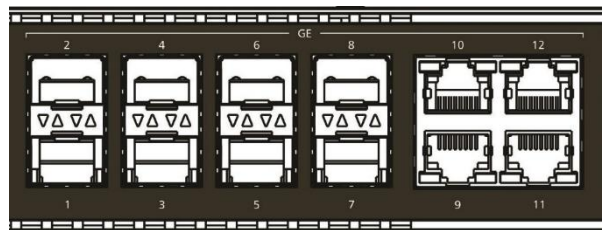


Figure 22 - Gigabit Ethernet SFP and RJ45 interfaces front panel



The optical interface modules use transmitters with invisible laser radiation. Never look directly at the laser terminals or the optical fiber. Exposure to laser emission may cause partial or total vision loss.

### 6.4.3.1. LIGHT INDICATORS

The Gigabit Ethernet interfaces have a status LED that indicates the plugged component status. The table below describes the meaning of those LEDs.

Indicator	Color	State	Description
LINK/ACT	GREEN	Off	Link Down (inactive).
		On	Link Up (active).
		Flashing	Sending and/or receiving data.
SPEED	YELLOW	Off	Operating at 1 Gbit/s
		On	Operating at 10 Mbit/s or 100 Mbit/s

Table 9.- Gigabit Ethernet interfaces light indicators

#### 6.4.4. 10 GIGABIT ETHERNET INTERFACES

There are two 10 Gigabit Ethernet SFP+ interfaces.

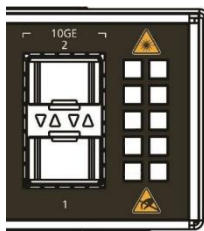


Figure 23 - 10 Gigabit Ethernet SFP+ interfaces front panel



The optical interface modules use transmitters with invisible laser radiation. Never look directly at the laser terminals or the optical fiber. Exposure to laser emission may cause partial or total vision loss.

##### 6.4.4.1. LIGHT INDICATORS

Each one of the four SFP+ ports has a pair of LEDs that indicate the port status. The following table describes their meanings.

Indicator	Color	State	Description
LINK/ACT	GREEN	Off	Link Down (inactive).
		On	Link Up (active).
		Flashing	Sending and/or receiving data.
SPEED	YELLOW	Off	Operating at 10 Gbit/s

Table 10.-10 Gigabit Ethernet interfaces light indicators

#### 6.4.5. CONSOLE INTERFACE

The DM4610 OLT has a console port for local management. The console port uses an RJ45 connector. A cable with a male RJ45 connector and a female DB9 connector must be used for the connection to a computer or laptop.

The serial console cable is an accessory included with the DM4610 OLT. Additional cables can be purchased separately via code 710.0137.xx or assembled as described in the figures below. The RJ45 connector pinout and its match with the DB9 connector is described in [Serial Console Connector Pinout](#).



Figure 24 - Console Cable



Figure 25 - Console Cable RJ45 Connector Pins

RJ45 Male	DB9 Female	Function	DM4610 OLT Input/Output
1	-	Reserved	-
2	-	Reserved	-
3	2	RS232_TX	Output
4	5	DGND	Ground
5	5	DGND	Ground
6	3	RS232_RX	Input
7	-	Reserved	-
8	-	Reserved	-

Table 11.- Serial Console Connector Pinout

### 6.4.6. MGMT INTERFACE

The Management (MGMT) Ethernet interface is used for local configuration, downloading codes and initial configuration of the equipment at the time of installation. This port is linked to the client's management network, when the in-band management option is not used via the uplink ports.

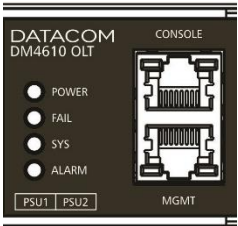


Figure 26 - Management interfaces front panel

DM4610 provides a 100Base-TX out band management Ethernet port and DM4610 (HW2) provides a 1000 Base-TX out band management Ethernet port.

6.4.6.1. LIGHT INDICATORS

For the Management Ethernet interface, two LEDs indicate the status of the port. Their meaning is presented in the table below.

Indicator	Color	State	Description
LINK/ACT	GREEN	Off	Link Down (inactive).
		On	Link Up (active).
		Flashing	Sending and/or receiving data.

Table 12.- Management Ethernet interface light indicators

## 7. TECHNICAL SPECIFICATION

### 7.1. PERFORMANCE

Capacity	DM4610 OLT
Switching	<ul style="list-style-type: none"><li>Up to 94 Gbits/s</li></ul>
Forwarding	<ul style="list-style-type: none"><li>Up to 70 Mpps</li></ul>
MAC Table	<ul style="list-style-type: none"><li>64k Addresses</li></ul>

Table 13.-DM4610 Performance

### 7.2. INTERFACES

The following table shows the maximum number of interfaces on DM4610 chassis.

Interfaces	DM4610 OLT
GPON (SFP – SC/PC)	<ul style="list-style-type: none"><li>8</li></ul>
10G Base-X ports (SFP+)	<ul style="list-style-type: none"><li>2</li></ul>
1000 Base-X (SFP)	<ul style="list-style-type: none"><li>8</li></ul>
10/100/1000Base-T ports (RJ45)	<ul style="list-style-type: none"><li>4</li></ul>

Table 14.-DM4610 Interfaces

### 7.3. POWER

#### 7.3.1. POWER SUPPLY

	PSU 120 AC	PSU 120 DC
Operational Voltage Range	<ul style="list-style-type: none"><li>100V to 240V (with 10% tolerance) 50/60Hz</li></ul>	<ul style="list-style-type: none"><li>-48V to -60V (with 10% tolerance)</li></ul>
Input Current Max.	<ul style="list-style-type: none"><li>1.5A</li></ul>	<ul style="list-style-type: none"><li>3.75A</li></ul>
Power Supply type	<ul style="list-style-type: none"><li>AC</li></ul>	<ul style="list-style-type: none"><li>DC</li></ul>
Power Supply input plug	<ul style="list-style-type: none"><li>IEC320/C14</li></ul>	<ul style="list-style-type: none"><li>IEC320/C14</li></ul>

Table 15.-DM4610 Power Supply Specifications

7.3.2. POWER CONSUMPTION

The consumption of DM4610 products varies with the type and quantity of the line interfaces installed in the chassis.

Hardware Module	Maximum Consumption (W)
DM4610 OLT	120

Table 16.-DM4610 Power Consumption

7.4. PHYSICAL DIMENSIONS

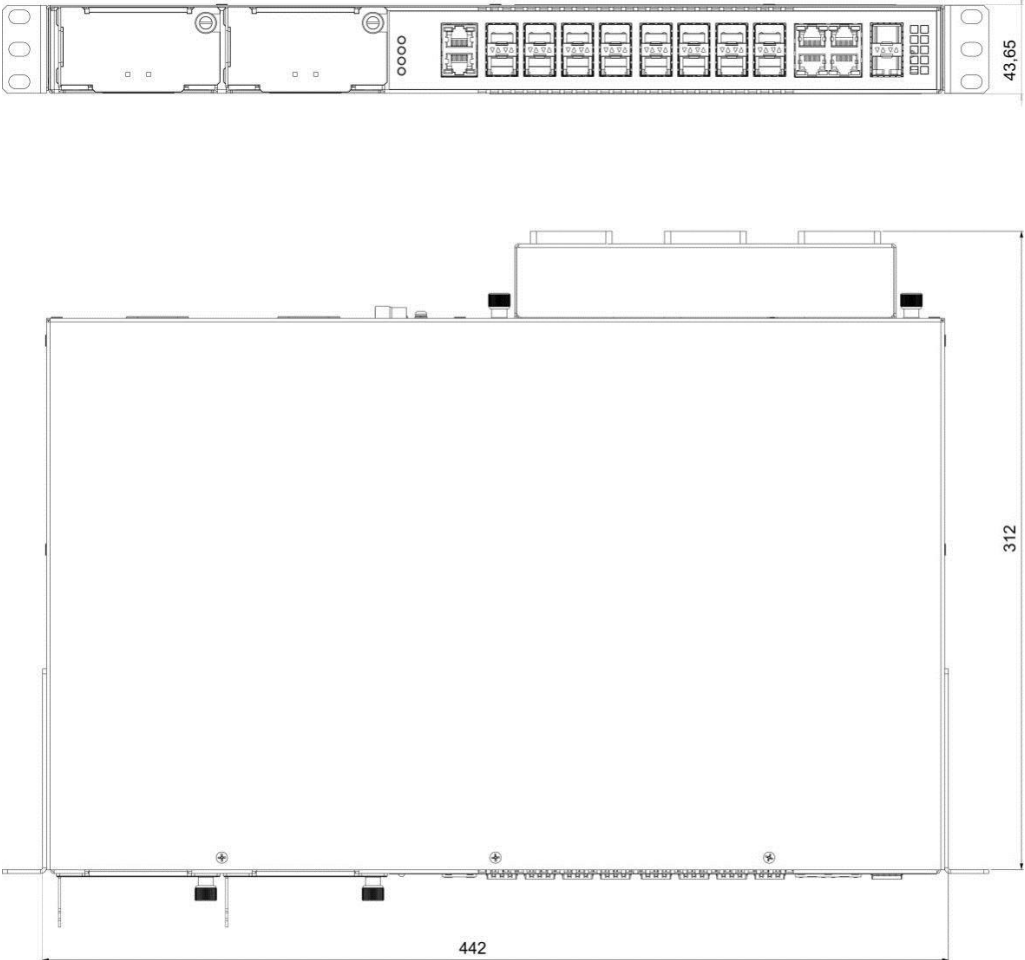
DM4610 OLT	
Height	<ul style="list-style-type: none"><li>44 mm (1U)</li></ul>
Width	<ul style="list-style-type: none"><li>442 mm (482.6 mm with mounting brackets)</li></ul>
Depth	<ul style="list-style-type: none"><li>312 mm (385 mm with long mounting brackets)</li></ul>
Default Factory Assembly	 <p>The technical drawing illustrates the physical dimensions of the DM4610 OLT chassis. It includes three views: a top view showing the front panel with 16 ports (8 SFP and 8 RJ45) and a height dimension of 43.65 mm; a side view showing the depth of the chassis with a dimension of 312 mm; and a front view showing the width of the chassis with a dimension of 442 mm. The text 'Default Factory Assembly' is positioned to the left of the side view.</p>

Table 17.-DM4610 Physical Dimensions



## 7.5. WEIGHT

Hardware	Weight (kg)
DM4610 OLT	3.440
DM4610 FAN	0.375 (with air filter)
PSU 120 AC	0.680
PSU 120 DC	0.500
Power Cable	0.240

Table 18.-DM4610 Weight

## 7.6. PACKAGED DIMENSIONS

Hardware	Dimension (H x W x D)
DM4610 OLT	223 x 557 x 407 mm
DM4610 FAN	72 x 295 x 124 mm
PSU 120 AC	127 x 295 x 124 mm
PSU 120 DC	127 x 295 x 124 mm

Table 19.-DM4610 Package Dimensions

## 7.7. PACKAGED WEIGHT

Hardware	Weight (kg)
DM4610 OLT	4.975
DM4610 FAN	0.515
PSU 120 AC	1.090
PSU 120 DC	0.910

Table 20.-DM4610 Packaged Weight

## 7.8. ENVIRONMENTAL DATA

### 7.8.1. OPERATING CONDITIONS

The DM4610 has over temperature protection, preventing the chassis to operate at elevated temperatures.

DM4610 OLT	
Temperature Range	<ul style="list-style-type: none"><li>0°C to 45°C (using SFPs commercial temperature and FAN module with filter)</li><li>0°C to 65°C (using SFPs extended temperature and FAN module without filter)</li></ul>
Relative Humidity	<ul style="list-style-type: none"><li>5% to 95%, non-condensing</li></ul>
Altitude	<ul style="list-style-type: none"><li>0m to 3000m</li></ul>

Table 21.-DM4610 Operating Conditions

### 7.8.2. STORAGE AND TRANSPORTATION CONDITIONS

DM4610 OLT	
Temperature Range	<ul style="list-style-type: none"><li>-40°C to 70°C for non-climatized transportation (packaged)</li><li>-10°C to 70°C for other cases</li></ul>
Relative Humidity	<ul style="list-style-type: none"><li>10% to 95%, non-condensing</li></ul>

Table 22.-DM4610 Storage and Transportation Conditions

## 8. SAFETY STANDARDS

Specification	Description
IEC 825	Safety of Laser Products

## 9. EMI/EMC STANDARDS

Specification	Description
EN 55022 – CISPR22	(2008) – Radio disturbance characteristics

## 10. COMPLIANCE

### 10.1. ITU-T

Specification	
G.984.1	GPON General Characteristics
G.984.2	Physical Media Dependent GPON (PDM) layer
G.984.3	GPON Transmission Convergence Layer
G.984.4	ONT Management and Control Interface
G.988	ONU Management and Control Interface (OMCI)

### 10.2. IETF

Specification	
RFC 783	The TFTP Protocol (Revision 2)
RFC 792	Internet Control Message Protocol (ICMP) (Ping IPv4)
RFC 1157	A Simple Network Management Protocol (SNMPv1)
RFC 1213	Management Information Base for Network Management of TCP/IP-based internets: MIB-II
RFC 1215	A Convention for Defining Traps for use with the SNMP - TRAPS MIB
RFC 1441	Introduction to version 2 of the Internet-standard Network Management Framework (SNMPv2)
RFC 2030	Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI
RFC 2236	Internet Group Management Protocol, Version 2 - IGMPv2 Snooping support
RFC 2348	TFTP Blocksize Option (obsoletes RFC1783)
RFC 2865	Remote Authentication Dial In User Service (RADIUS)
RFC 3376	Internet Group Management Protocol, Version 3 - IGMPv3 Snooping support

### 10.3. IEEE

Specification	
802.1D	Spanning Tree Protocol (STP)
802.1Q	Virtual LAN (VLAN)
802.1W	Rapid Spanning Tree Protocol (RSTP)
802.3I	10BASE-T 10 Mbit/s (1.25 MB/s) over twisted pair
802.3u	100BASE-TX Fast Ethernet at 100 Mbit/s (12.5 MB/s) auto negotiation
802.3x	Flow Control
802.3AB	1000BASE-T Gbit/s Ethernet over twisted pair at 1 Gbit/s
802.3AE	10GBase-X

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