

ViaLiteHD **Optical Switch**

Handbook

HRS-5/6-xx-xx-xx-xxxx-HB

CR5301

03/04/2023



Instrument Care and Safety Information

*Please read the whole of this section before using your **ViaLiteHD** product. It contains important safety information and will enable you to get the most out of your Fibre Optic Link.*

Electrical Safety



The **ViaLiteHD** chassis is a Safety Class 1 product (having metal case directly connected to earth via the power supply cable).

When operating the equipment note the following precautions:

- Hazardous voltages exist within the equipment. There are no user serviceable parts inside; the covers should only be removed by a qualified technician.
- There are no user replaceable fuses in the chassis mounted equipment. Replacement should only be carried out by a **ViaLite Communications** technician.
- The Optical Switch does not have safety earth stud connection. A 3 pin power lead with Earth MUST be used for supplying power to the Optical Switch.

ESD Precautions



The **ViaLiteHD** RF Fibre Optic Link is equipped with high frequency active electronics, without the correct handling, they will be susceptible to damage.

Precautions for handling electro-static sensitive devices should be observed when handling all **ViaLiteHD** modules.

- Technicians should ensure that they use effective personal grounding (i.e. ESD wrist strap etc.) when servicing the equipment.
- Any equipment or tools used should be grounded to prevent static charge build-up.

Good practice should be observed at all times, for reference see relevant standards: EN 61340-5-1, "Protection of Electronic Devices from Electrostatic Phenomena – General Requirements."

Optical Safety



The **ViaLiteHD** RF Fibre Optic Switch may be connected to devices that contain optical sources operating at C-Band (DWDM) 1530 to 1565nm.

These devices can be rated up to EN60825-1 as CLASS 3B radiation emitting devices. A class 3B laser is hazardous for eye exposure. They can heat skin and materials but are not considered a burn hazard. Use of laser protective eyewear is recommended. Avoid all eye exposure to beams from class 3B lasers.

When operating the equipment note the following precautions:

- Never look into the end of an optical fibre directly or by reflection either with the naked eye or through an optical instrument.
- Never leave equipment with radiating bare fibres – always cap the connectors.
- Do not remove equipment external covers when operating.

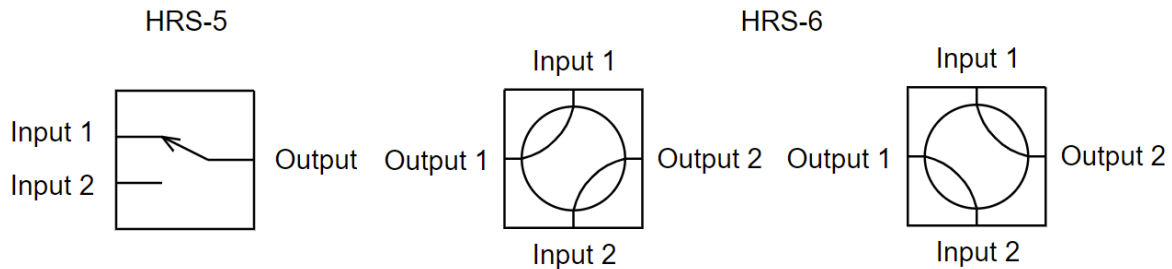
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1 Introduction

The **ViaLiteHD** RF Fibre Optic Links (FOLs) are a family of fibre optically coupled link systems designed for the transmission of RF analogue signals over long distances for the communications market. **ViaLite Communications** is a division of Pulse Power and Measurement Ltd (PPM).

The Optical Switch is available as two main variants, the HRS-5 2 Input to 1 Output or the HRS-6 2 Input to 2 Output. The HRS-5 is a standard SPDT optical switch, whereas the HRS-6 is commonly termed as a baseball switch, where in one state Input A is connected to Output 1 and Input B is connected to Output 2, and in the other state Input A is connected to Output 2 and Input B is connected to Output 1.



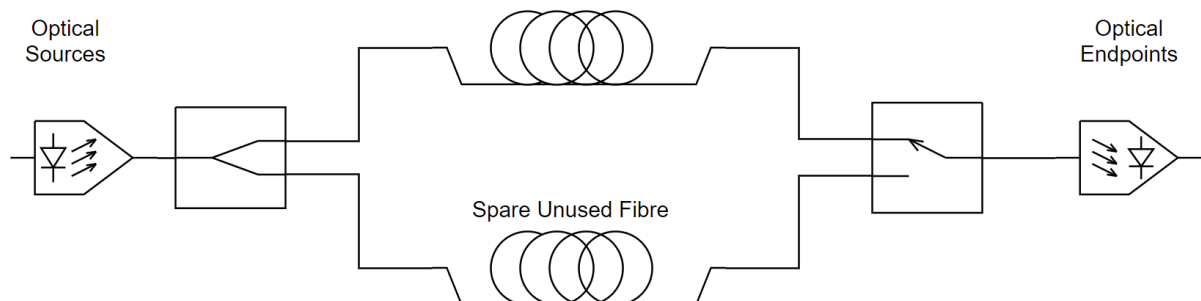
ViaLite offers several variants of the Optical Switches to suit application-specific requirements such as input power range, fibre connector type.

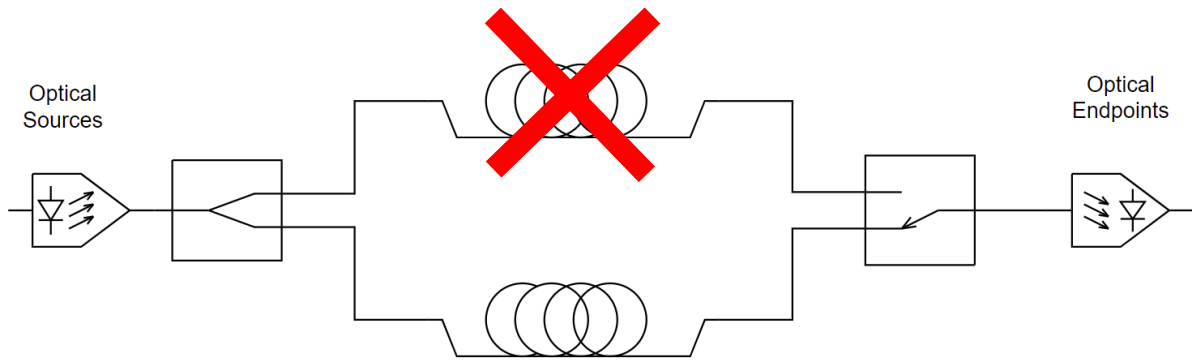


1.1 Typical Deployment

1.1.1 2 : 1 Redundancy

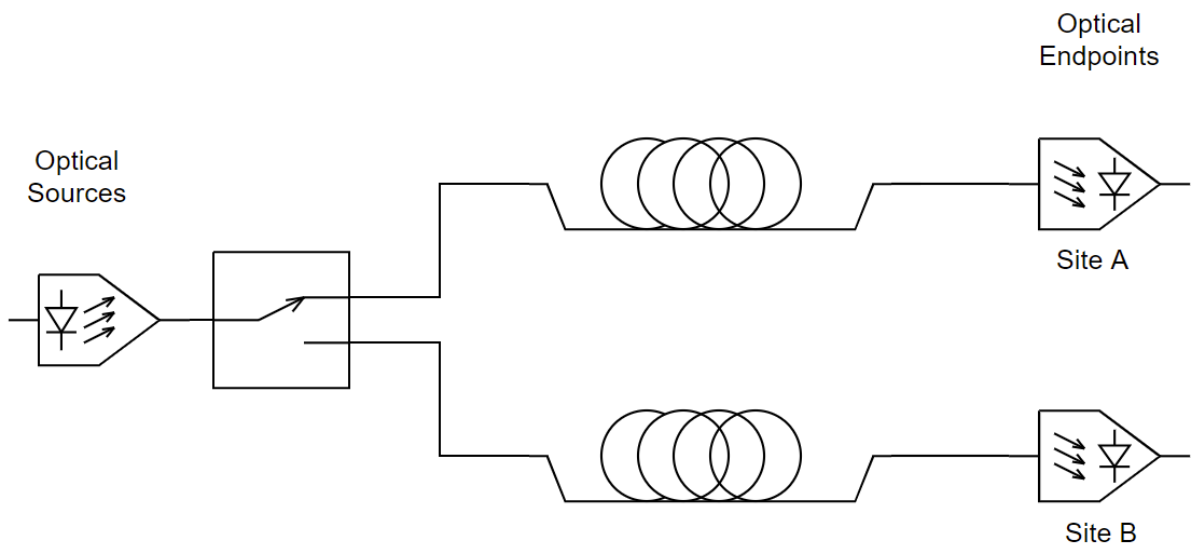
One use for a 2x1 optical switch is 2:1 optical link redundancy. An optical splitter is used to send the optical signal down both the primary and the spare fibres. At the receiving end, an optical switch can be used to pick which of the two fibres it should route through the receiver. With the built in power monitoring of a **ViaLiteHD** 2x1 Optical Switch, the switch can detect if there is no light present on one of the fibres, and then automatically switch to the backup fibre if required.





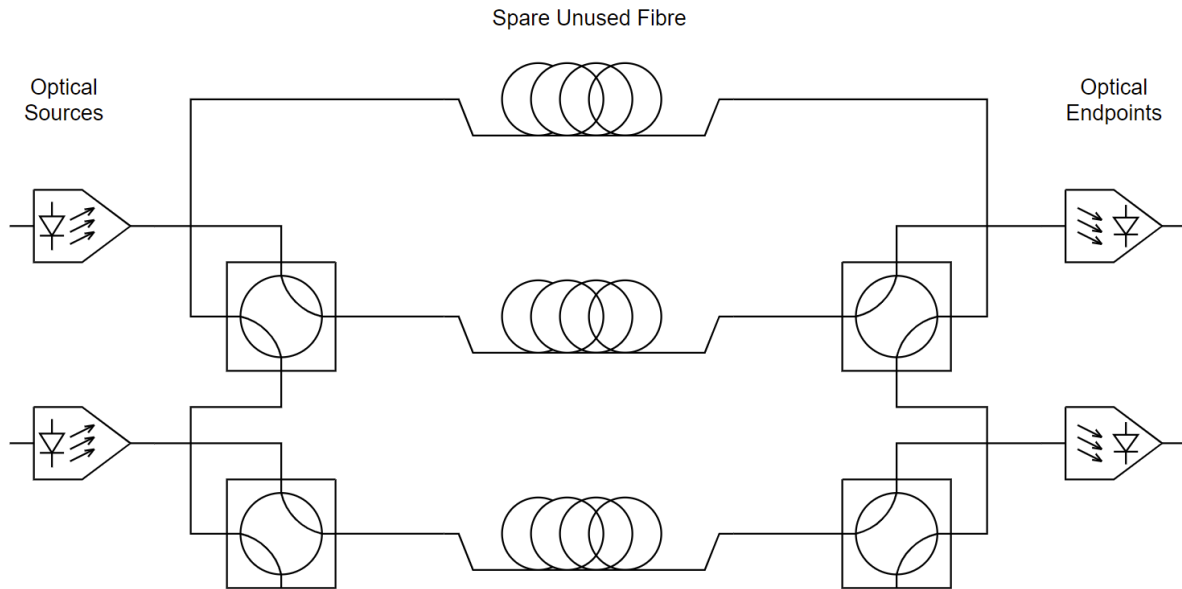
1.1.2 Site Diversity

To improve the reliability of satellite communications, it is common to have multiple ground stations in different locations where if Site A's communication link is heavily impaired by rain attenuation, the communication link can be transferred to Site B which will be sufficiently far away from Site A that it should not be affected by the same weather conditions. After receiving a remote switch command, a **ViaLiteHD** Optical Switch can switch an RF over fibre (RFOF) signal from one site to another with minimal delay, ensuring minimal disruption to the satellite communications.

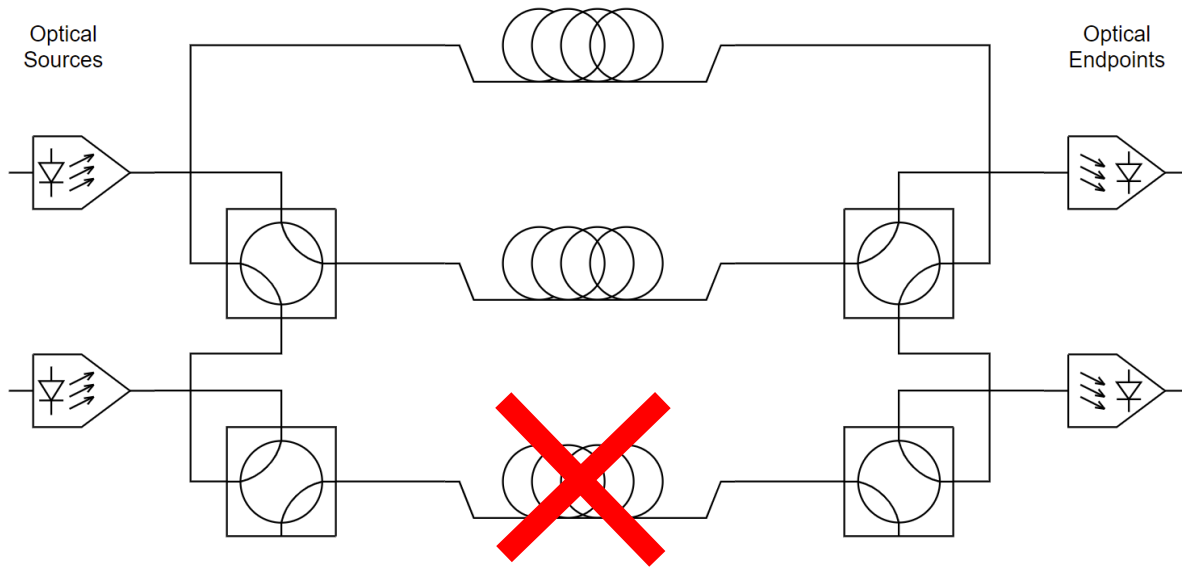


1.1.3 N+1 : N Redundancy

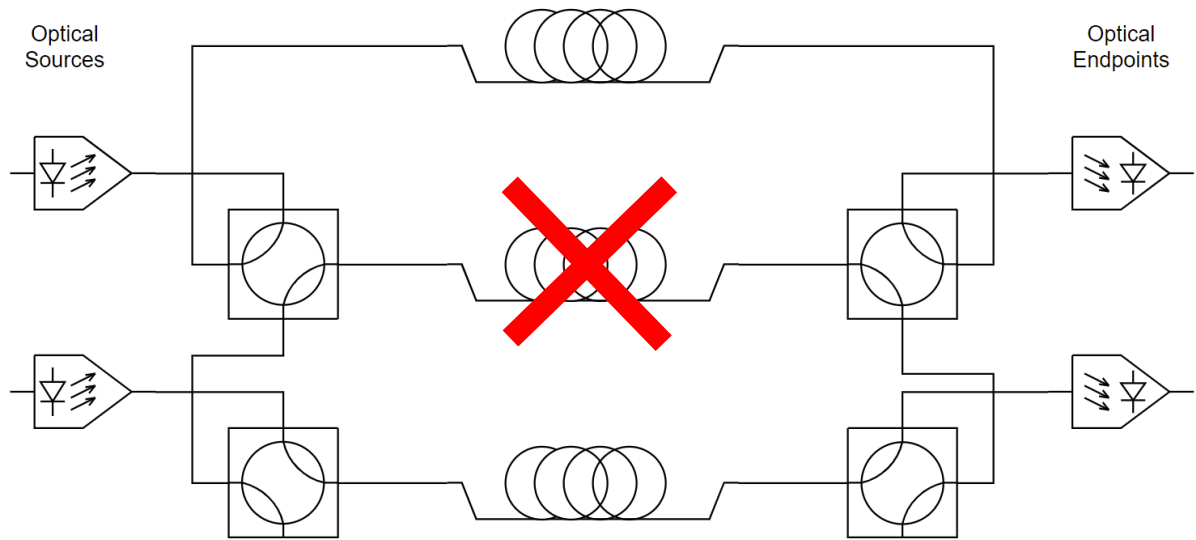
The primary use of the 2x2 Optical Switch is to provide link and equipment redundancy. One example is a 3:2 redundancy where one spare fibre is available for use in the event that one of the other fibres are damaged. The below image shows that equipment and link set up.



The below image shows the first case where the bottom fibre is damaged. The optical path can be switched through the spare fibre by switching the bottom two optical switches.



The below image shows the second case where the bottom fibre is damaged. The optical path can be switched through the spare fibre by switching the top two optical switches.



2 Care of fibre optic connectors

When the fibre optic cables are not connected, it is essential that the cable and equipment connectors are protected by the dust caps provided with the system. Failure to do so may result in damage to the fibre ends, which are critical to the system performance. Please refer to section 2.2 for fibre optic cable handling details.

2.1 Fibre optic cable & connectors

All **ViaLiteHD** RF modules use single-mode (9µm/125µm) cable terminated in a range of optical connectors detailed below. Cross-site fibre optic cables are available from **ViaLite Communications** as either standard patch leads or heavy-duty multicore cables.



Warning!

Angle polished (APC) and standard (PC) connector must not be confused.

The two connector types are not interchangeable and mating one with the other will damage both the cable and the module connectors.

The specification of optical connector is critical to the performance of the complete fibre optic link. System performance can only be guaranteed with fibre optic cables and connectors supplied by **ViaLite Communications**.

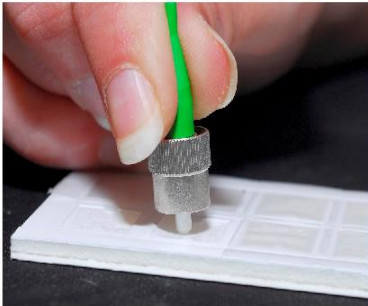
When FC/APC connectors are specified they must be “narrow key width.”

2.1.1 **Connecting and disconnecting**

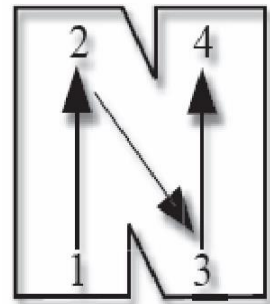
Before connecting optical fibres to the module or to each other, ensure that the mating connectors are clean (see below).

2.1.2 **Cleaning optical connectors, cleaning before every use**

Optical connectors **MUST** be cleaned before use, even where they have been protected with dust caps. A large percentage of performance issues can be attributed to dirty fibres.



- Peel the plastic cover from an unused 'N' cleaning pad.
- Hold the connector between your thumb and forefinger
- Clean the connector using firm pressure by swiping in a pendulum motion through each segment of the 'N' shape, following the diagram
- Do not swipe over the same space twice.



For more details please read the cleaning instruction which accompanies the connector cleaning kit. Further details can also be found on the **ViaLiteHD** website at www.vialite.com.

2.1.3 **Cleaning optical connectors, high levels of contamination**

If there are performance issues that are not resolved by basic cleaning, then the following procedure should be used. If the level of contamination is high it will be necessary to repeat this procedure.

Cleaning items required:

- Lint free fibre cleaning tissues and/or cleaning sticks (normal cosmetic tissues produce dust and are not acceptable).
- Reagent grade Isopropyl Alcohol (IPA).
- Air duster or filtered compressed air line.

Cable Connector Cleaning

- Dampen a patch of cleaning tissue with IPA and clean all surfaces of the plug ferrule.
- Using a dry cleaning tissue, dry the ferrule and clean the end face.
- Using the air duster, blow away any residue from the end of the connector.

Module Female Receptacle Cleaning (only recommended if problems are being experienced)

- Either use an optical cleaning stick or twist a cleaning tissue to form a stiff probe, moisten either with IPA. Gently push the probe into the receptacle and twist around several times to dislodge any dirt.
- Repeat the above process with a dry tissue.
- Using the air duster, blow away any residue from the receptacle.

Important Notes

- IPA is flammable. Follow appropriate precautions / local guidelines when handling and storing.
- IPA can be harmful if spilled on skin. Use appropriate protection when handling.
- It should only be necessary to clean the female receptacles on the modules if problems are being experienced.



Warning!

Never inspect an optical fibre or connector with the naked eye or an instrument unless you are convinced that there is no optical radiation being emitted by the fibre. Remove all power sources to all modules and completely disconnect the optical fibres.

2.1.4 FC/APC Connectors

To connect FC/APC optical connectors follow these steps:

- Remove the dust caps and align the white ceramic center ferrule on the cable connector with the mating receptacle.
- There is a key (lug) on the side of the ferrule, which must match the keyway (gap) in the receptacle shroud.
- When they are aligned, gently push the plug home.
- Finger tighten the knurled collet nut onto the threaded receptacle.

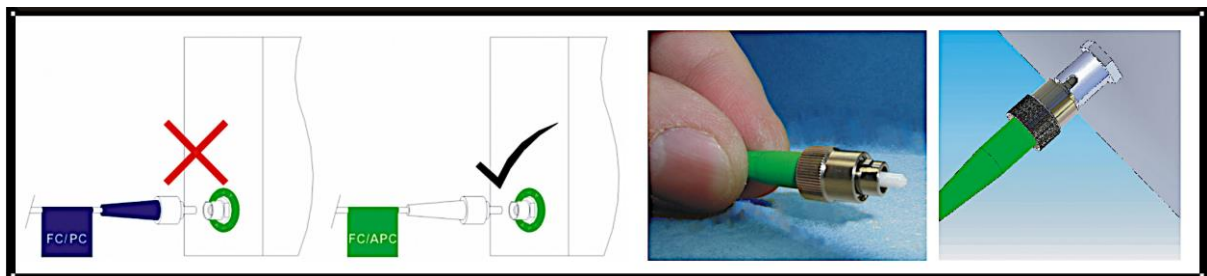
To disconnect follow these steps:

- Using fingers fully unscrew the knurled collet nut, gently withdraw the connector.
- Replace the dust caps on both the receptacle and the cable plug.



Warning!

It is possible to tighten the knurled collet without aligning the lug and gap. This will result in poor light transmission. Check that the lug and gap are aligned before tightening the knurled collet.



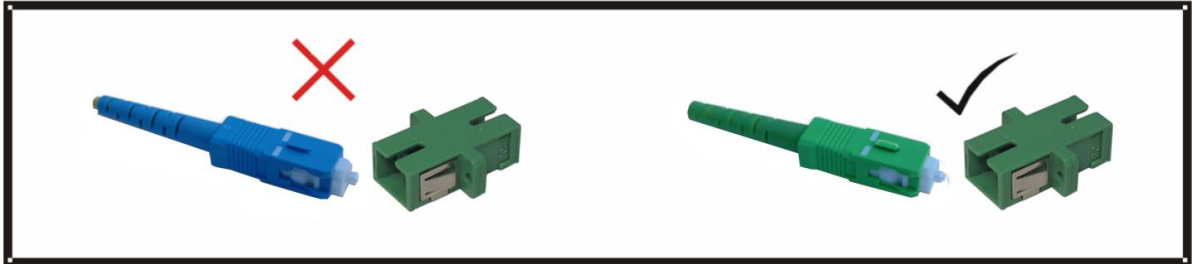
2.1.5 SC/APC Connectors

To connect SC/APC optical connectors follow these steps:

- Remove the plug protective cover.
- Align the connector keyway slot in the adaptor to the key of the plug.
- Gently push the plug-into the adaptor until a click is heard and the connector locks.

To disconnect follow these steps:

- Grip the body of the plug and gently pull the plug from the adaptor, replace the protective cover.



Only connect SC/APC cable to SC/APC receptacles.

2.1.6 LC/APC Connectors

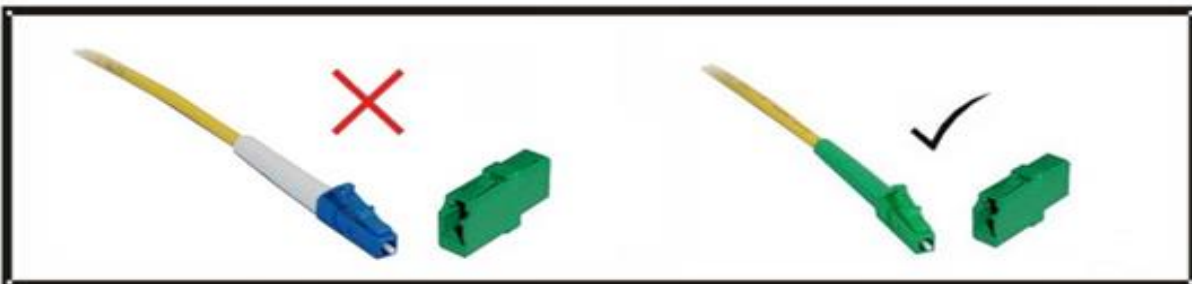
All **ViaLiteHD** LC connectorised modules use LC/APC. Clean the plug, before inserting see section 2.1.2.

To connect LC/APC optical connectors

- Remove the plug protective cover.
- Align the connector latch to the adaptor.
- Gently push the plug-into the adaptor until a click is heard and the latch locks.

To disconnect:

- Grip the body of the plug and push down on the latch.
- While holding the latch down, gently pull the plug from the adaptor, replace the protective cover.



Only connect LC/APC cable to LC/APC.

2.1.7 Minimum bend radius

Because optical fibre is made of glass, it is important not to subject it to excessive stress. For this reason, each type of cable has a minimum bend radius (MBR) specification, beyond which the cable cannot be bent without permanent damage occurring. Systems using longer wavelength (i.e. 1550nm) are less tolerant to small bend radii.

The minimum bend radius of standard SMF28 fibre optic cable fitted to **ViaLiteHD** modules is 50mm. MBR specifications for **ViaLite Communications** supplied fibre optic cables are given in the **ViaLite Classic** and **ViaLiteHD** System Handbooks Lxx-HB and Hxx-HB respectively.

3 **Optical Switch Features**

This section describes the features of your Optical Switch; the available features may differ depending upon the Optical Switch selected.

Please read fully all relevant documents for information on installing your **ViaLiteHD** equipment before commissioning your system.

3.1.1 **Optical Connectors**

The **ViaLiteHD** Optical Switch is supplied with SC/APC input and output optical connectors as standard. FC/APC & LC/APC options are also available.

3.1.2 **Ethernet Communication (RJ45) Connections**

An RJ45 connection on the rear of the unit offers web and SNMP network management control (see section 5.1.1. for web interface access).

3.1.3 **Dual Redundant Power Supply**

The optical switch comes fitted with dual redundant power supplies. The power lead(s) are fed to the rear of the equipment. Each power supply is activated by a dedicated power switch also on the rear.

3.1.4 **Front Display Screen**

The display screen on the front of the module allows the user to scroll through all menu items in turn. This allows the user to set the IP configurations and to adjust operating settings where available.

3.1.5 **Modes of Operation**

- Manual

HRS-5 2x1 Switch

The available Options are:

- A to Out – Input A is routed to the Output, Input B is disconnected
- B to Out – Input B is routed to the Output, Input A is disconnected

HRS-6 2x2 Switch

The available Options are:

- A to 1; B to 2 – Input A is routed to the Output 1, Input B is routed to Output 2
- A to 2; B to 1 – Input A is routed to the Output 2, Input B is routed to Output 1

- Automatic

HRS-5 2x1 Switch

If optical power is detected at Input B when there is no optical power detected at Input A, then Input B will be routed to the Output

If the optical power detected at Input B is greater than the set Optical Switch Point while the optical power at Input A is below the Optical Switch Point, then Input B will be routed to the Output

In all other conditions, Input A will be routed to the Output

HRS-6 2x2 Switch

If optical power is detected at Input B when there is no optical power detected at Input A, then Input B will be routed to Output 1 and Input A will be routed to Output 2

If the optical power detected at Input B is greater than the set Optical Switch Point while the optical power at Input A is below the Optical Switch Point, then Input B will be routed to Output 1 and Input A will be routed to Output 2

In all other conditions, Input A will be routed to the Output 1 and Input B will be routed to Output 2

4 Using the Optical Switch. Control, Indicators and Alarms

4.1 Connecting the module

All instructions refer to the representation of the front panel shown in the diagram below. The user can scroll through the menus by using the push buttons located to the right of the LCD screen and scrolling to select all the menus of the optical switch.

4.2 Menu and Operation

These devices are fitted with four LED's to indicate the current routing through the switch.



4.2.1 Boot Sequence

- Plug in the power supply (to both ports if redundancy is required)
- Turn on the power switch on the rear panel
- Front Panel shows the part number
- IN(A)-OUT(1), IN(A)-OUT(2), IN(B)-OUT(1), IN(B)-OUT(2) will light up depending on the model and the current optical switching route

4.2.2 Startup main menu

Press Select button and the following menus will be displayed in sequence.

Menu #1 – Descriptor

Read only menu – Provides the device part number, and a description of the device

Menu #2 – Input A Wavelength

Read/write menu – Allows the wavelength of Input A to be changed between 1310nm and 1550nm

Menu #3 – Input B Wavelength

Read/write menu – Allows the wavelength of Input B to be changed between 1310nm and 1550nm

Menu #4 – Input A Power

Read only menu – Displays Input A's optical power in dBm

Menu #5 – Input B Power

Read only menu – Displays Input B's optical power in dBm

Menu #6 – Output Power

Read only menu – Displays the Output optical power in dBm

Menu #7 – Switch Type

Read only menu – Displays the Switch Type, either 2x1 or 2x2

Menu #8 – Switch Mode

Read/Write menu – Allows the switch mode of the device to be changed. The options available will depend on the switch type

Menu #9 – Unit Temp

Read only menu – Displays the unit temperature in °C

Menu #10 – +5V Monitor

Read only menu – Displays the voltage of the +5V rail

Menu #11 – -5V Monitor

Read only menu – Displays the voltage of the -5V rail

Menu #12 – Optical Switch Point

Read/write menu – Allows the optical power threshold to be set, at which point the device switches from one path to the other

Menu #13 – IP Address

Read/Write menu – Allows the IP address of the device to be changed

Menu #14 – Subnet

Read/Write menu – Allows the subnet of the device to be changed

Menu #15 – Gateway

Read/Write menu – Allows the gateway of the device to be changed

Menu #16 – TRAP1

Read/Write menu – Allows the SNMP TRAP1 address to be changed

Menu #17 – TRAP2

Read/Write menu – Allows the SNMP TRAP2 address to be changed

Menu #18 – Serial Number

Read only menu – Displays the units serial number

4.2.3 Menu Operation

1. Setting the Automatic/Manual Optical Switching Mode (Menu #8)

Press Select until the Switch Mode Menu is visible. Press ▲ to edit then press ▼ until you have selected the required mode, then press Select to save.

2. Setting the Optical Switching Threshold (Menu #12)

Press Select until the Optic Switch Mode is visible. Press ▲ to edit then, use ▼ to increment the value or change the sign then use ▲ to shift to the next digit. Press Select to Save.

3. Setting the Network/SNMP Settings

Press Select until the required menu is visible (IP/Subnet/Gateway/Trap Addr1/Trap Addr2), press ▲ to edit, use ▼ to increment the value then use ▲ to shift to the next digit. Press Select to Save.

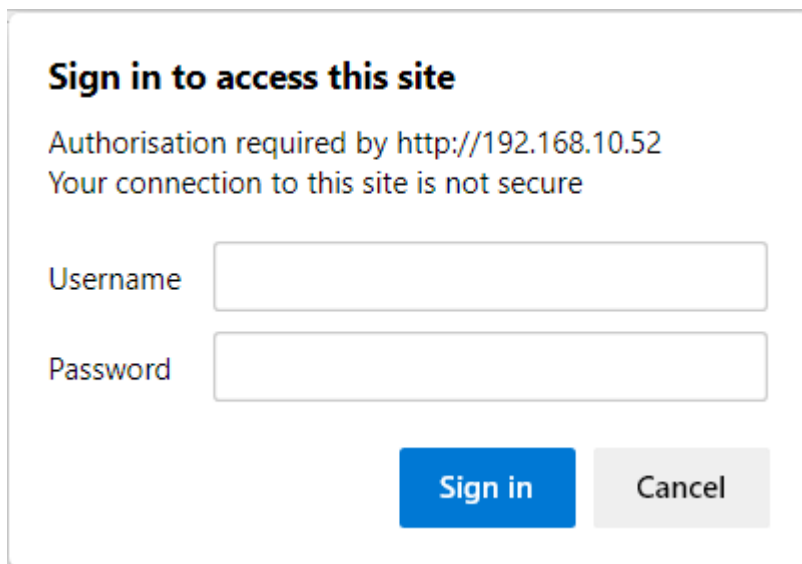
5 Installation of the Optical Switch

When installing the optical switch, ensure all fibre ports and connectors remain capped and fibres are cleaned before connection. Whilst the optical switch does not contain any optical sources, it is likely to be connected to a device with high power optical sources. Any optical sources in the system should be switched off before connecting the optical switch.

The unit can be programmed with the IP settings for serial connection to access via Web Browser as detailed here.

5.1.1 Web Interface Access:

Connect the LAN port of the computer and the optical switch, then turn on the power switch of the device. Scroll through the menus to check the IP address. Open a web browser and enter the IP address of the device (see section 3.1.2), then press “Enter” to bring up the following dialog box. Enter both the username and password as “admin” and then click Sign In/OK. Ensure your laptop settings are updated to match the device.



The image shows a web browser security warning dialog box. At the top, it says "Sign in to access this site". Below that, it states "Authorisation required by http://192.168.10.52" and "Your connection to this site is not secure". There are two input fields: "Username" and "Password". At the bottom, there are two buttons: "Sign in" (in blue) and "Cancel" (in grey).

Web access dialog box username & password “admin”

5.1.2 Menus

Once connected to the optical switch, the following menus will be available.

- IP Configuration menu (view and setup Network Settings)
- Analog Property Menu (signal and alarm thresholds)
- Discrete Property Menu (power status and control)
- Device Configuration (set switch mode and switch point)
- Device Status Menu (reporting of properties)
- System Information
- Event log
- User Configuration Menu (setup password access)

HRS-5-0B-8T-P1

IP Configuration	
IP Configuration	
Analog Property	
Discrete Property	
Device Configuration	
Device Status	
System Info	
Event Log	
User Configuration	

Static IP Address:	192	.	168	.	10	.	52
Subnet Mask:	255	.	255	.	255	.	0
Default Gateway:	192	.	168	.	10	.	1
Trap Address 1:	192	.	168	.	1	.	11
Trap Address 2:	192	.	168	.	1	.	12
Trap Address 3:	0	.	0	.	0	.	0
Trap Address 4:	0	.	0	.	0	.	0
Trap Address 5:	0	.	0	.	0	.	0
Save							

IP Configuration Menu

HRS-5-0B-8T-P1

Analog Property	
IP Configuration	
Analog Property	
Discrete Property	
Device Configuration	
Device Status	
System Info	
Event Log	
User Configuration	

Item	HIHI	HI	LO	LOLO	Unit
Input A	300	0	-20	-90	dBm
Input B	300	0	-20	-90	dBm
Output	300	0	-20	-90	dBm
Unit Temp.	80	65	-5	-45	C
+5V	8	6	4	2	V
-5V	-2	-4	-6	-8	V

Analog Property Menu

HRS-5-0B-8T-P1

	Discrete Property		
IP Configuration	Item	State	Control
Analog Property	SYSTEM POWER	offline	Minor ▾
Discrete Property	Save		
Device Configuration			
Device Status			
System Info			
Event Log			
User Configuration			

Discrete Property Menu

HRS-5-0B-8T-P1

	Device Configuration	
IP Configuration	Switch Mode:	B to OUT ▾
Analog Property	Switch Point:	-20 dBm
Discrete Property	Save	
Device Configuration		
Device Status		
System Info		
Event Log		
User Configuration		

Device Configuration

HRS-5-0B-8T-P1

IP Configuration	Device Status
Analog Property	
Discrete Property	
Device Configuration	
Device Status	
System Info	
Event Log	
User Configuration	

Input A	-40	dBm
Input B	-40	dBm
Output	-40	dBm
+5V	4.9	V
-5V	-5.1	V
Temperature	27	°C

Device Status Menu

HRS-5-0B-8T-P1

IP Configuration	System Info
Analog Property	
Discrete Property	
Device Configuration	
Device Status	
System Info	
Event Log	
User Configuration	

Model:	HRS-5-0B-8T-P1
S/N:	220516001
Version:	V1.2410
Name:	
Location:	
Contact:	
	Save

System Information

HRS-5-0B-8T-P1

IP Configuration	Event Log
Analog Property	☐ 3 21s HRS-5-0B-8T-P1 220516001 Output LOW -40.0dBm
Discrete Property	☐ 2 21s HRS-5-0B-8T-P1 220516001 Input B LOW -40.0dBm
Device Configuration	☐ 1 21s HRS-5-0B-8T-P1 220516001 Input A LOW -40.0dBm
Device Status	Check
System Info	
Event Log	
User Configuration	

Event Log

HRS-5-0B-8T-P1

IP Configuration	User Configuration
Analog Property	UserName:
Discrete Property	Password:
Device Configuration	NewName:
Device Status	NewPass:
System Info	ConfirmPass:
Event Log	submit reset
User Configuration	

User Configuration Menu

5.2 MiB Files

The Optical Switch may be controlled and monitored via SNMP over the Ethernet interface. For the latest Optical Switch MIB files, please contact your local **ViaLiteHD** distributor.

6 **Part numbering**

For part numbering, please contact your local ***ViaLiteHD*** distributor.

7 Maintenance and fault finding guide

Refer to the following table that gives a list of commonly encountered problems and suggested solutions.

Fault	Possible Causes	Solution
Power LED does not illuminate	Power is not connected to the PSU	Connect mains power to the rear of the PSU. Check fuses of power leads.
	Power switch is not enabled	Check the power switch is set to "1"
Optical Switch shows "NO INPUT" when fibre connected	Input level out of range	Check Optical Switch input level is within specified input range
	Poor fibre connection	Clean the fibre connectors and ports
	Low optical output level	Check optical link for breaks/kinks Check all optical connectors are clean
	Incorrect Wavelength Selected	Ensure that the correct wavelength is selected for each input
Signal not routed to the correct output	Unknown Cause	Contact your local ViaLite Communications office for Customer Support.
	Incorrect Switch Mode Set	Ensure that the correct manual or automatic switching mode has been set
	Incorrect Optical Switching Point Set	Ensure that the correct optical switching point has been set for your system and input signal levels
Low signal level	Unknown Cause	Contact your local ViaLite Communications office for Customer Support.
	Input level too low	Check optical input levels
	Optical loss too high	Clean and check optical connections
	Incorrect optical connectors	Ensure that optical cable matches the type of connectors on your ViaLiteHD module, singlemode fibre and APC connectors.
	Input power too high	Check EDFA input level is within specified input range

The **ViaLiteHD** range of optical conditioning modules are precision-engineered and calibrated for optimum performance and accuracy before dispatch.

In the event of any problems or queries arising with the equipment, please contact **ViaLite Communications** or your local agent.

8 **Product warranty**

The guarantee / warranty period, unless otherwise agreed in writing, shall be as stated in document F292 - PPM Manufactured Product – Warranty, which is available at: <https://ppm.co.uk/warranty-periods/>. Extended warranty options are available at the time of purchase.

Prior to returning any goods for warranty or non-warranty repairs please contact PPM / **ViaLite Communications** for a returns reference.

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