



Ethernet over VDSL2 Converter DCE 2178HSEE / HSEE4

User's Manual

FCC Warning

This equipment has been tested and found to comply with the regulations for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user's guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

CE Mark Warning

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

WEEE Warning



To avoid the potential effects on the environment and human health as a result of the presence of hazardous substances in electrical and electronic equipment, end users of electrical and electronic equipment should understand the meaning of the crossed-out wheeled bin symbol. Do not dispose of WEEE as unsorted municipal waste and have to collect such WEEE separately.

Revision

Ethernet over VDSL2 Converter User's Manual

For Models: DCE 2178HSEE

Rev 1.0 (October, 2009)

Part No.: DCE 2178HSEE

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1. Introduction

1.1 Checklist

Check the contents of your package for following parts:

- DCE 2178HSEE / DCE 2178HSEE4
- Splitter (2178HSEE only)
- Power Adapter
- RJ-11 Telephone line
- User's Manual

If any of these pieces are missing or damaged, please contact your dealer immediately, if possible, retain the carton including the original packing material, and use them against to repack the product in case there is a need to return it to us for repair.

1.2 Introduction to Ethernet over VDSL2 Bridge

Data Connect's state-of-the-art ethernet-over-VDSL2 products are based on two core networking technologies: Ethernet and VDSL2 (Very-high-data-rate Digital Subscriber Line 2). This technology offers the absolute fastest possible data transmission speeds over existing copper telephone lines without the need for rewiring.

The 2178HSEE & HSEE4 Ethernet over VDSL2 Converter / Bridge has switching architecture with RJ-45 10/100Mbps Ethernet port and one symmetric Ethernet over VDSL port (symmetry means upstream and downstream rate are the same or similar) – the VDSL port can be RJ-11 connectors. The 2178HSEE & HSEE4 can be set to CO mode or CPE mode via a DIP switch, when the 2178HSEE / HSEE4-CO is used to connect to the other 2178HSEE / HSEE4 CPE as a standalone pair, up to 100/100Mbps symmetric data rate within 300m and up to 50/2Mbps asymmetric data

rate at 1.4km. This capability is ideal for use as an Ethernet extender for your existing Ethernet network.

Data Connect's VDSL2 Converter solution provides a much cheaper replacement and smooth migration for existing Long Reach Ethernet (LRE) networks.

The cable specifications of the connection are listed as following:

- 10Base-T, Category 3, 4 or 5 UTP
- 100Base-TX, Category 5 UTP
- Ethernet over VDSL, Twisted-pair telephone wires

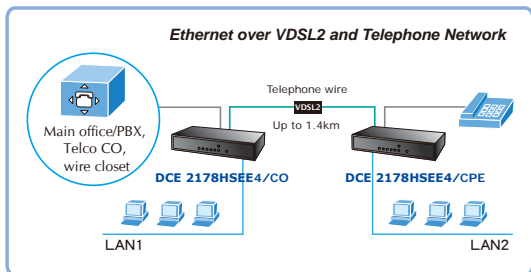
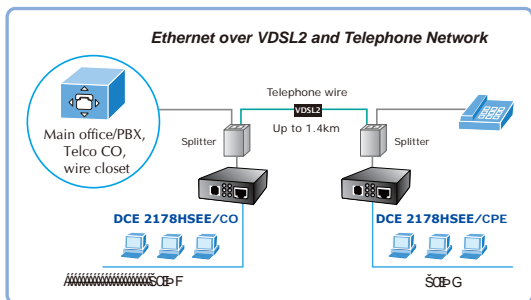
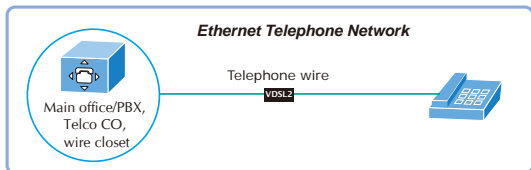
The two drawings listed below are typical application for the Ethernet over VDSL2 Converter.



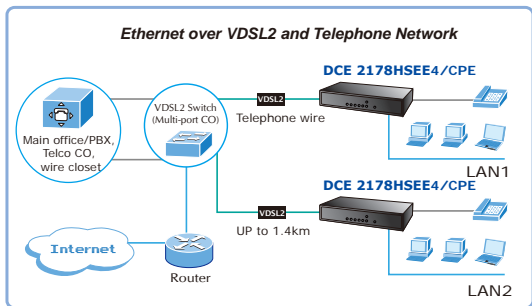
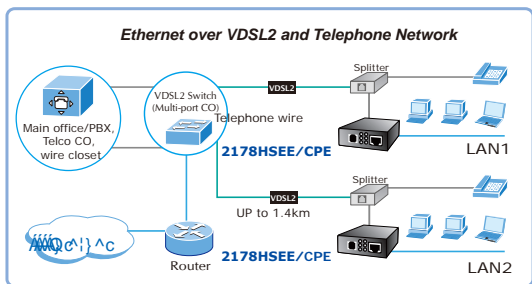
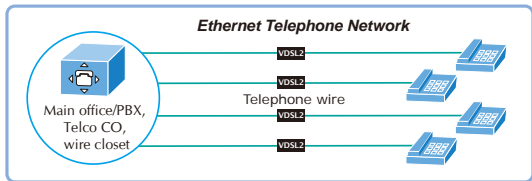
Note

Slave device (CPE) must connect to Master device (CO) through the telephone wire. Slave cannot connect to Slave and Master cannot connect to Master. To define the 2178HSEE / HSEE4 to CO or CPE, please refer to section 2.2.1 for more detail.

LAN to LAN Connection



Multi-LAN Connection



1.3 Key Features

The Ethernet over VDSL2 Converter provides the following key features:

- Cost-effective VDSL2 CO/CPE bridge solution
- One box design, CO/CPE selectable via DIP Switch
- Defines profile 17a band plan for the long distance transmission of upstream and downstream signals
- Defines profile 30a band plan for the short distance transmission of upstream and downstream signals
- Complies with IEEE 802.3, IEEE 802.3u and IEEE 802.3x standards
- DMT (Discrete Multi-Tone) line coding
- Half duplex Back pressure and IEEE 802.3x Full Duplex Pause frame flow control
- Built-in POTS splitter to share voice and data (HSEE4 only)
- Voice and data communication can be shared on the existing telephone wire simultaneously
- Hardware IGMP Snooping for Multimedia service (HSEE4 ONLY)
- Support up to 1536 bytes packet size, 802.1Q VLAN tag transparent
- VDSL2 stand-alone transceiver for simple bridge modem application
- Selectable target profile and target SNR margin
- Support extensive LED indicators for network diagnostics

1.4 Specifications

Product		2178HSEE	2178HSEE4
Hardware Specification			
Ports	10/100Base-TX	1 RJ-45, Auto-negotiation and Auto-MDI/MDI-X	4 RJ-45, Auto-negotiation and Auto-MDI/MDI-X
	VDSL	1 RJ-11, female Phone Jack	
	PHONE	Additional Splitter for POTS connection	1 RJ-11, Built-in splitters for POTS connection
DIP Switch & Functionality		4 position DIP switch <ul style="list-style-type: none"> • CO / CPE mode select • Selectable fast and interleaved mode • Selectable target 17a / 30a profiles • Selectable target SNR mode 	
Encoding		<ul style="list-style-type: none"> • VDSL-DMT <ul style="list-style-type: none"> - ITU-T G.993.1 VDSL - ITU-T G.997.1 - ITU-T G.993.2 VDSL2 (Profile 17a/30a Support) 	
LED Indicators		<ul style="list-style-type: none"> • One Power • 3 for RJ-11/VDSL2: • 2 for per RJ-45 10/100Base-TX port 	<ul style="list-style-type: none"> • One Power • 3 for RJ-11/VDSL2: • 1 for per RJ-45 10/100Base-TX port
Cabling	Ethernet	<ul style="list-style-type: none"> • 10Base-T: 2-pair UTP Cat.3,4,5 up to 100m (328ft) • 100Base-TX: 2-pair UTP Cat.5, up to 100m (328ft) 	
	VDSL	Twisted-pair telephone wires (AWG24 or better) up to 1.4km	
Performance* (Down Stream / Up Stream)		17a profile 300m -> 86/65Mbps 400m -> 86/52Mbps 600m -> 81/36Mbps 800m -> 72/19Mbps 1000m -> 60/9Mbps 1200m -> 59/6Mbps 1400m -> 50/2Mbps	300m -> 99/70Mbps 400m -> 99/60Mbps 600m -> 90/45Mbps 800m -> 50/28Mbps 1000m -> 40/12Mbps 1200m -> 20/7Mbps 1400m -> 20/4Mbps

	30a profile	
	300m -> 100/100Mbps 400m -> 90/90Mbps 600m -> 61/40Mbps 800m -> 54/8Mbps	300m -> 100/100Mbps 400m -> 90/90Mbps 600m -> 69/55Mbps 800m -> 48/9Mbps
Power Requirement	5V DC, 2A	
Dimension (W x D x H)	97 x 70 x 26 mm	155 x 86 x 26 mm
Weight	199g	368g
Operating Temperature	0~50°C	
Storage Temperature	-25~70°C	
Operating Humidity	10% to 90%, relative humidity, non-condensing	
Storage Humidity	10% to 90%, relative humidity, non-condensing	
Switch Specification		
Switch Processing Scheme	Store-and-Forward	
Address Table	1K entries	2K entries
Flow Control	Back pressure for half duplex IEEE 802.3x Pause Frame for full duplex	
Switch fabric	0.2Gbps	0.8Gbps
Throughput (packet per second)	0.14Mpps	0.59Mpps
Network cables	10/100Base-TX: 2-Pair UTP Cat. 3, 4, 5 (100meters, max.) EIA / TIA-568 100-ohm STP (100meters, max.)	
Standard Conformance		
Regulation Compliance	FCC Part 15 Class A, CE	
Standards Compliance	IEEE 802.3 10Base-T IEEE 802.3u 100Base-TX ITU-T <ul style="list-style-type: none"> ● G.993.1 (VDSL) ● G.997.1 ● G.993.2 VDSL2 (Profile 17a/30a) 	

* The performance data above is for reference only, the actual data rate will vary on the quality of the copper wire and environment factors.

2. Hardware Description

The 2178HSEE provides 1 RJ-11 port for VDSL2 connection, for both VDSL2 connection and voice connection service operate at the same time. The additional splitter from package of 2178HSEE can help 2178HSEE work in this way easily.

The 2178HSEE4 provides 2 RJ-11 ports for voice connection (like telephone) and for network line connection.

The 2178HSEE provide 1 RJ-45 port and 2178 HSEE4 provide 4 RJ-45 ports for two different running speed –10Mbps, 100Mbps, in the same converter / bridge and automatically distinguish the speed of incoming connection.

This section describes the hardware features of the Ethernet over VDSL2 Converter / Bridge. For easier control of the converter / Bridge, familiarize yourself with its display indicators, and ports. Front panel illustrations in this chapter display the unit LED indicators. Before connecting any network device to the converter / Bridge, read this chapter carefully.

2.1 Front Panel

The units' front panel provides a simple interface monitoring the Ethernet over VDSL2 Converter.

■ DCE 2178HSEE Front Panel

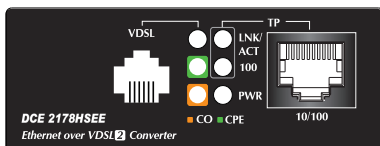


Figure 2-1: DCE 2178HSEE front panel

■ DCE 2178HSEE4 Front Panel



Figure 2-2: DCE 2178HSEE4 front panel

2.1.1 LED indicators for DCE 2178HSEE

The rich diagnostic LEDs on the front panel can provide the operating status of individual port and whole system.

■ System

LED	Color	Function	
PWR	Green	Lit	Lights to indicate that the VDSL Converter has power.
		Off	Indicate that the VDSL Converter has no power.

■ VDSL

LED	Color	Function	
VDSL	Green	Lit	Indicate that the VDSL link is established.
		Fast Blink	Indicate that the VDSL link is at training status (about 10 seconds).
		Slow Blink	Indicate that the VDSL link is at idle status.
CO	Green	Lit	Indicate the VDSL Converter is running at CO mode.
CPE	Green	Lit	Indicate the VDSL Converter is running at CPE mode.

■ 10/100Base-TX Port

LED	Color	Function	
LNK/ ACT	Green	Lit	Indicate that the port is link up.
		Blink	Indicate that the VDSL Converter is actively sending or receiving data over that port.
		Off	Indicate that the port is link down .
100	Green	Lit	Indicate that the port is operating at 100Mbps .
		Off	Indicate that the port is link down or 10Mbps .

2.1.2 LED indicators for DCE 2178HSEE4

The rich diagnostic LEDs on the front panel can provide the operating status of individual port and whole system.

■ System

LED	Color	Function	
PWR	Green	Lit	Lights to indicate that the VDSL Bridge has power.
		Off	Indicate that the VDSL Bridge has no power.

■ VDSL

LED	Color	Function	
VDSL	Green	Lit	Indicate that the VDSL link is established.
		Fast Blink	Indicate that the VDSL link is at training status (about 10 seconds).
		Slow Blink	Indicate that the VDSL link is at idle status.
CO	Green	Lit	Indicate the VDSL Bridge is running at CO mode.
CPE	Green	Lit	Indicate the VDSL Bridge is running at CPE mode.

■ 10/100Base-TX Port

LED	Color	Function	
LNK/ ACT	Green	Lit	Indicate that the port is link up at 10/100Mbps.
		Blink	Indicate that the VDSL Bridge is actively sending or receiving data over that port.
		Off	Indicate that the port is link down .

2.2 The Rear Panel

The rear panel of the Ethernet over VDSL2 Converter is shown as below.

■ DCE 2178HSEE Rear Panel

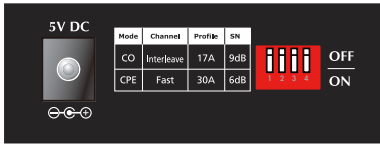


Figure 2-3: DCE 2178HSEE rear panel

■ DCE 2178HSEE4 Rear Panel

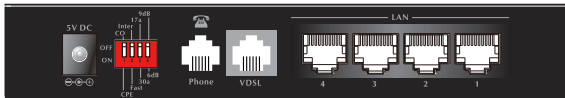


Figure 2-4: DCE 2178HSEE4 rear panel

2.2.1 MODE DIP Switch

The Ethernet over VDSL2 Converter provides 4 selective transmission modes. By switching the transmission modes, you can obtain a best transmission mode to suit with phone line quality or distance of connectivity. The following is the summary table of transmission setting, bandwidth and distance extensibility tested for AWG 24 (0.5mm) twisted-pair without noise and cross talk.

	DIP-1	DIP-2	DIP-3	DIP-4
	Mode	Channel	Profile	SNR
OFF	CO	Interleave	17A	9dB
ON (default)	CPE	Fast	30A	6dB

■ DIP-1: Mode (CO/CPE)

- CO (Central Office) – the Master device mode, usually the CO device will be located at the data center of ISP or enterprise to link to the backbone.
- CPE (Customer Premises Equipment) – the Slave device mode, usually the CPE device will be located at branch office, home or remote side as the long reach data receiver. The CPE can be connecting to the PC, IP Camera or Wireless Access Point or other network devices.



Note

When the Ethernet Over VDSL2 Converter operates at CPE mode, the DIP switch 2, 3, 4 is no function.

■ DIP-2: Channel (Fast and Interleave mode)

- Fast mode guarantees a minimum end-to-end latency less than 1 ms.
- Interleaved mode provides impulse noises protection for any impulse noise with a duration less than 250 us. Interleaved mode has a maximum end to end latency of 10m sec.

■ DIP-3: Profile (17A/30A)

- User has the ability to select profile. When 30a is selected that provides better downstream/upstream performance in short distance, when 17a is selected that provides longer distance link capability. Refer to section 1.4 specification for details.

■ DIP-4: SNR (9dB/6dB) Target SNR (Signal Noise Ratio) Margin

- When SNR margin is selected, the system provide 9dB/6dB SNR margin for across all usable loop length.



Note

1. By default, the four DIP switch are at **“ON”** position that will operate as **“CPE”**. For operate as **“CO”**, please adjust the DIP 1 switch at **“OFF”** position. Then adjust other DIP switch accordingly to fulfill different network application demand.
2. Please power off the Ethernet over VDSL2 Converter, before making any transmission mode adjustment.

2.2.2 DC power jack

2178HSEE / 2178HSEE4 require 5V DC 2A power input. It will conform to the bundled AC adapter. Should you have the issue to make the power connection, please contact your local sales representative.



Note

1. The device is a power-required device, it means, it will not work till it is powered. If your networks should active all the time, please consider using UPS (Uninterrupted Power Supply) for your device. It will prevent you from network data loss or network downtime.
2. In some area, installing a surge suppression device may also help to protect your Ethernet Over VDSL2 Converter / Bridge from being damaged by unregulated surge or current to the Ethernet Over VDSL2 Converter / Bridge or the power adapter.

3. Installing and Using VDSL Converter

3.1 Install the Ethernet Over VDSL2 Converter

The Ethernet over VDSL2 Converter / Bridge does not require any software configuration. Users can immediately use any feature of this product simply by attached the cables and plug power on. There is some key limitation on the Ethernet over VDSL2 Converter / Bridge. Please check the following items:

- The device is used for Point-to-Point connection only (Master device to Slave device) and allows data and voice work on the same telephone lines.
- 2178HSEE provides one RJ-11 connector for VDSL port and the port can build VDSL2 connection easily. For voice device connection, the additional splitter from 2178HSEE package is an idea choice.
- 2178 HSEE4 provides two RJ-11connectors for VDSL port. One for voice device connection (like telephone) and the other one for network link connection.
- Depending on the quality of telephone line, the maximum distance of one VDSL segment is 1.4km (4593ft) with AWG 24 telephone wires. The distance could vary by the quality of telephone wires or the installed environment.

3.1.1 2178HSEE / 2178HSEE4 LAN to LAN connection

Two sets of the Ethernet over VDSL2 Converters / Bridge could be used to link two local Area networks that are located in different place. Through the normal telephone line, it could setup a 100/100Mbps symmetric backbone, but one Ethernet over VDSL2 Converters / Bridge must be Master (CO mode) and the other one is Slave (CPE mode).

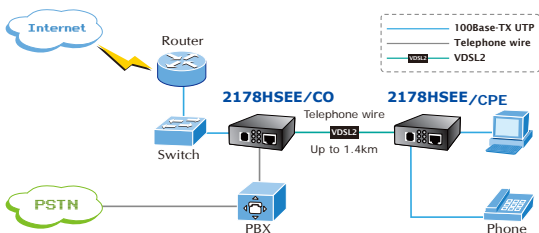


Figure 3-1: LAN to LAN connection

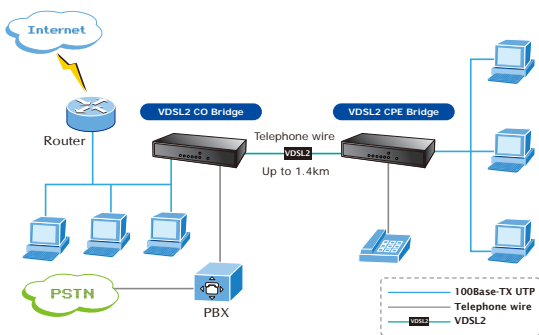


Figure 3-2: LAN to LAN connection

3.1.2 2178HSEE / 2178HSEE4 Connect to Multi-Port Master

In order, to built up a local Internet in apartment, hotel and campus and hospitality environment.

The Multi-port Master (for example, 5208-SW / 5224-SW VDSL2 Switch) need to be placed in the wiring center (MDF room) and connect to the telephone line system, on the other hand, need to install a Slave (2178HSEE / HSEE4) Converters / Bridge on the individual client side and connect to the Multi-port Master through the telephone lines.

When deciding where to put the converter then you must ensure:

- It is accessible and cables can be connected easily.
- Cabling is away from sources of electrical noise such as radios, transmitters and power lines and fluorescent lighting fixtures.
- Water or moisture can not enter the Converters / Bridge.
- Air flow around the unit and through the vents in the side of the case is not restricted (company recommend that you provide a minimum of 25mm inch clearance).

To prolong the operational life of your units:

- Do not place objects on top of any unit or stack.

3.2 Connecting 2178HSEE / 2178HSEE4

3.2.1 Connecting Standalone PC

Refer to the following procedures to setup the 2178HSEE to a standalone PC.

1. Set the 2178HSEE to be CO mode or CPE mode from the DIP switch at the rear panel.
2. Power on the 2178HSEE by connecting its power source.
3. Power LED will illuminate.
4. Use one RJ-11 wire and make a connection between 2178HSEE and “Line” port of splitter from 2178HSEE package.
5. Connect VDSL line from another VDSL device to DSL port of the splitter that connects to 2178HSEE VDSL port.
6. LNK LED will from blinking to illuminate.
7. Connect telephone to the PHONE port of the splitter that connects to 2178HSEE VDSL port.
8. Connect 2178HSEE Ethernet port to PC Network Interface Card (NIC) via regular Cat. 5 cables.

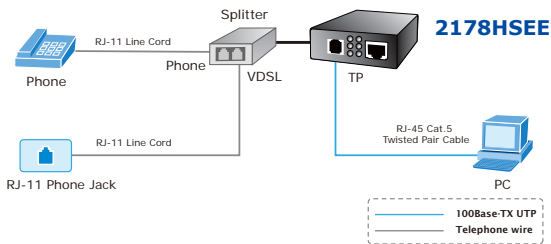


Figure 3-3: Connecting Standalone PC

3.2.2 Connecting Multiple PCs to an Ethernet LAN

Refer to the following procedures to setup the 2178HSEE / 2178HSEE4 to an Ethernet LAN.

1. Set the 2178HSEE / HSEE4 to be CO mode or CPE mode from the DIP switch at the rear panel.
2. Power on the 2178HSEE / HSEE4 by connecting its power source.
3. Power LED will illuminate.
4. Use one RJ-11 wire and make a connection between 2178HSEE and **"Line"** port of splitter from 2178HSEE package.
5. Connect VDSL line from another VDSL device to DSL port of the splitter that connects to 2178HSEE VDSL port.
6. Connect VDSL line from another VDSL device to VDSL port of the 2178HSEE4.
7. LNK LED will illuminate.
8. Connect telephone to the PHONE port.
9. 2178HSEE: Connect Ethernet port to Ethernet Switch (or Broadband Router) via regular Cat. 5 cable. 2178HSEE4: Connect per Ethernet port to each network device via regular Cat 5. cable

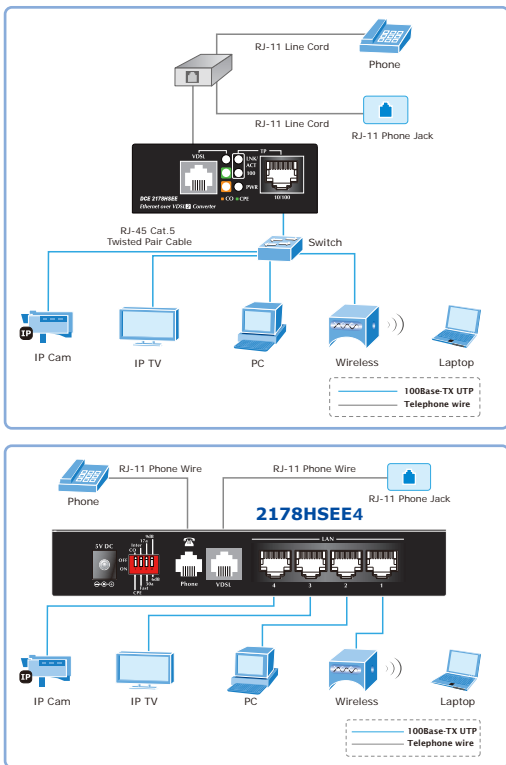


Figure 3-4: Connecting Multiple PCs to an Ethernet LAN



Please refer to your Ethernet device User's Manual for the device's set up information.

3.3 Chassis Installation & Rack Mounting (2178HSEE)

To install the Ethernet over VDSL2 Converter in a 10-inch or 19-inch Converter Chassis with standard rack, follow the instructions described below.

- Step 1:** Place your 2178HSEE on a hard flat surface, with the front panel positioned towards your front side.
- Step 2:** Carefully slide in the module until it is fully and firmly fitted into the slot of the converter chassis.

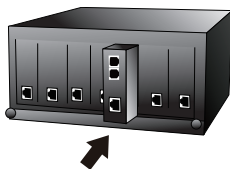


Figure 3-5: Insert a VDSL2 converter into an available slot

- Step 3:** Attach a rack-mount bracket to each side of the Converter Chassis with supplied screws attached to the package.
- Step 4:** After the brackets are attached to the Converter Chassis, use suitable screws to securely attach the brackets to the rack.
- Step 5:** Connect one end of the power cable to the 10-inch or 19-inch Converter Chassis.
- Step 6:** Connect the power plug of the power cable to a standard wall outlet then power on the 10-inch or 19-inch Converter Chassis, the PWR LED should light on.



You must use the screws supplied with the mounting brackets. Damage caused to the parts by using incorrect screws would invalidate your warranty.

4. Power Information

The power jack of 2178HSEE / HSEE4 is with 2.5mm in the central post and required +5VDC power input. It will conform to the bundled AC-DC adapter and Planet's Media Chassis. Should you have the issue to make the power connection, please contact your local sales representative.

Please keep the AC-DC adapter as spare parts when your 2178HSEE is installed to a Media Chassis.



2.5mm
DC Receptacle 2.5mm
+5V for each slot



DC receptacle is 2.5mm wide that conforms to and matches the VDSL2 Converter 2.5mm DC jack's central post. Do not install any improper unit, model of the Ethernet Over VDSL2 Converter.

5. Troubleshooting

SYMPTOM:

VDSL LNK LED does not light after wire is connected to the VDSL port.

CHECKPOINT:

1. Verify the length of the wire connected between two 2178HSEE and 2178HSEE4 is not more than 1.4km. Please also try to adjust the DIP switch or 2178HSEE / 2178HSEE4 to other SNR mode.
2. Please note you must use one 2178HSEE / HSEE4 with CO mode and the other 2178HSEE / HSEE4 with CPE mode, connect to each other to make it work.

SYMPTOM:

TP LED does not light after cable is connected to the port.

CHECKPOINT:

1. Verify you are using the Cat.5 or better cable with RJ-45 connector to connect to the port.
2. If your device (like LAN card) supports to Auto-Negotiation, please try to manual set at a fixed speed of your device to solve this issue.
3. The Converter / Bridge and the connected device's power are on or not.
4. The port's cable is firmly seated in its connectors in the switch and in the associated device.
5. The connecting cable is good and with correct type.
6. The connecting device, including any network adapter is functional.

6. FAQ

Q1: What voltage that 2178HSEE / HSEE4 used?

A1: 5V DC, 2A

Q2: What is VDSL2?

A2: VDSL2 (Very High-Bit-Rate Digital Subscriber Line 2), G.993.2 is the newest and most advanced standard of xDSL broadband wire line communications.

Designed to support the wide deployment of Triple Play services such as voice, data, high definition television (HDTV) and interactive gaming, VDSL2 enable operators and carrier to gradually, flexibly, and cost efficiently upgrade exiting xDSL-infrastructure.

Q3: What is the best distance for 2178HSEE / HSEE4?

A3: In order to guarantee the stability and better quality of network, so we would suggest the distance in 1.4 kilometer is the best for 2178HSEE / HSEE4.

Q4: What is the best data rate for 2178HSEE / HSEE4?

A4: We provide the data rate of the 2178HSEE / HSEE4 is up to 100Mbps/100Mbps (downstream / upstream) in 200 meters.

Q5: Are VDSL1 modems compatible with 2178HSEE / HSEE4?

A5: Currently NO. Although 2178HSEE / HSEE4 (Profile 17a/30a) are base on ITU-T G.993.2 VDSL2, but with different Profiles, so far they are not compatible with each other.

Q6: What is SNR and what's the effect?

A6: In analog and digital communications, Signal-to-Noise

Ratio, often written SNR, is a measure of signal strength relative to background noise. The ratio is usually measured in decibels (dB).

In digital communications, the SNR will probably cause a reduction in data speed because of frequent errors that require the source (transmitting) computer or terminal to resend some packets of data. SNR measures the quality of a transmission channel over a network channel. The greater the ratio, the easier it is to identify and subsequently isolate and eliminate the source of noise.

Generally speaking, the higher SNR value gets better line quality, but lower performance.

Q7: What is profile and what's the benefit?

A7: VDSL2 defines multiple band plans and configuration modes (profiles) to allow asymmetric and symmetric services in the same binder (by designated frequency bands) for the transmission of upstream and downstream signals. User has the ability to select fixed band plan. When 17a profile is selected that provides long distance transmit with similar performance, when 30a profile is selected that provides short distance transmit with wire speed performance.

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