

**Ethernet Over VDSL Converter**

**EV-401M / EV-401S**

**User's Manual**

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## **FCC Warning**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Instruction manual, may cause harmful interference to radio communications, however, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on.

## **CE Mark Warning**

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

## **Revision**

**Ethernet Over VDSL Converter User's Manual**  
**FOR MODELS: EV-401M / EV-401S**  
**Part No.: EM-EV401V1**

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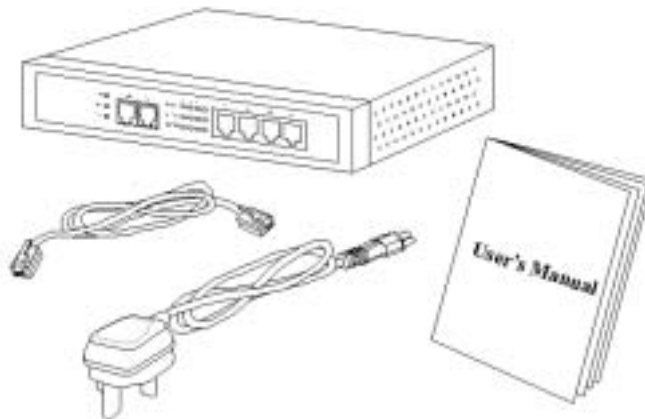
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# 1. INTRODUCTION

## 1.1 Checklist

**Check the contents of your package for following parts:**

- Ethernet over VDSL Converter
- User's manual
- Power cord
- Telephone line



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 VDSL Converter**

### **General Description**

The converter is a switching architecture with four RJ45 10/100Mbps Fast Ethernet switching ports and one 10Mbps RJ11 symmetric Ethernet over VDSL port (symmetry means 10Mbps upstream and 10Mbps downstream data rate). it is ideal for signal conversion by transmitting the Ethernet data from the standard twisted pair cable to the telephone cable and extending the distance.

The Ethernet over VDSL combines the well proven Ethernet and VDSL technology to transmit the Ethernet format data by using VDSL signaling over the most widespread telephone wires and has no impact to current voice service. Therefore, it is very good for Internet building phone line network because every room or house could use the existing phone line to transmit data to the Internet and the whole building could share the Internet line to the wide area network with minimum cost.

With much enough bandwidth, the 10Mbps symmetric capability enables many multi-media services on local Internet come true, like VOD (Video On Demand), Internet caching server, distance education, ... and so on.

In one community or hotel, we just need to install one local server then the multi-media services will be localized that is people do not need to access the services through Internet but using local area network with better bandwidth and efficiency. Meanwhile, this kind of infrastructure will minimize the burden on the Internet.

The converter is plug-n-play without any software to configure and also fully compliant with all kinds of network protocols. Moreover, the rich diagnostic LEDs on the front-panel provide the operating status of individual port and the whole system. There are two models of the converters, one is used for client side and the other is

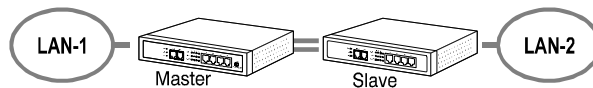
central side. If you want to setup one pair of converters for point-to-point connection then one set must be client mode and the other one is master mode.

The cable specifications of the connection are listed as following:

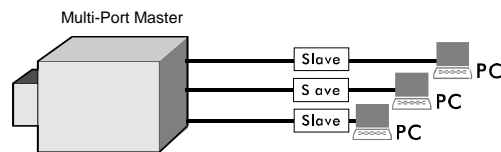
- 10BASE-T, Category 3, 4 or 5 UTP
- 100BASE-TX, Category 5 UTP
- Ethernet over VDSL, Twisted-pair telephone wires

The two drawings listed below are typical application for the Ethernet over VDSL converter.

Drawing 1: LAN to LAN connection



Drawing 2: Multi-port Master Connection



**Note: Slave device must connect to Master device through the telephone wire. Slave cannot connect to Slave and Master cannot connect to Master. EV-401M works as Master device and EV-401S works as Slave device.**

### 1.3 Key Features

**The converter provides the following key features:**

- Complies with IEEE802.3 10BASE-T standard
- Complies with IEEE802.3u 100BASE-TX standard
- Supports Ethernet over VDSL
- Two RJ11 connectors for Ethernet over VDSL port, one for LAN connection and one for voice connection.
- Supports one 10Mbps symmetric Ethernet over VDSL port
- Based on different phone line quality, the distance could extend up to 1.2km (4000 ft)
- Supports four 10/100Mbps Fast Ethernet switching ports
- Store-and-forward architecture filters fragment & CRC errors packets
- Supports extensive LED indicators for network diagnostics
- Internal universal power supply
- FCC, CE Class B



## 1.4 Specifications

Protocols and Standards	IEEE 802.3 (Ethernet)IEEE 802.3u (Fast Ethernet) IEEE 802.3x (flow control)Ethernet over VDSL
Maximum Speed	Full Duplex: 200Mbps (for 100Base-TX), 20Mbps (for 10Base-T) Half Duplex: 100Mbps (for 100Base-TX), 10Mbps (for 10Base-T)
Cabling	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 (AWG26 or better) to 1.2km(4000 ft)
Modes	Half and Full Duplex, auto-negotiation
MAC address	4K entries
Buffer memory	128K bytes
Forwarding Mode	Store and forward
Packet Forwarding Rate (64bytes)	14880pps @ 10Mbps and VDSL 148800pps @ 100Mbps
Maximum throughput (64bytes)	610Kpps
MDI/MDI-X	Auto-sensing on each Ethernet ports
Dimensions	200 x 130 x 30 mm (W x D x H)
Weight	0.6 kg
Operation temperature and Humidity	0 ~ 50 degree C, 10~90% (non-condensing)
Input Voltage	100~240V AC, 50/60Hz auto-sensing, 1.0A maximum
Power Consumption	6.6 WATT./ 22.5 BTU per hour.
Regulatory Compliance	FCC Part 15 CE EN55081, EN55022, EN55024, EN60950

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## 2. HARDWARE DESCRIPTION

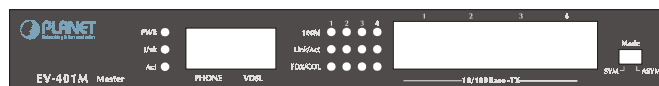
This product series provide 2 RJ-11 ports for voice connection (like telephone) and for network line connection.

This product series also provide 4 RJ-45 ports for two different running speed –10Mbps, 100Mbps, in the same converter and automatically distinguish the speed of incoming connection.

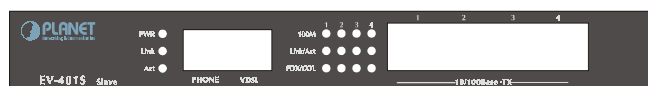
This section describes the hardware features of these Converters. For easier control of the converter, familiarize yourself with its display indicators, and ports. Front panel illustrations in this chapter display the unit LED indicators. Before connecting any network device to the converter, read this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

### 2.1 Front Panel

The units' front panel provides a simple interface monitoring the converter. It includes a power and port indicator for each port.



**EV-401M front panel**



**EV-401S front panel**

### LED indicators

<i>SYSTEM LED</i>		
PWR	Steady Green	This indicator lights green when the converter is receiving power.
	Off	Not receiving power
<i>VDSL LED</i>		
Link	Steady Green	If both ends of the VDSL devices are connected then the LED will blink for a while (in 10 seconds), this is the stage of speed auto-negotiation, after the negotiation process, the Link LED will stay green.
	Blink Green	The link process is fail.
ACT	Blinking Green	If there is any traffic transverses the port then the LED will blink green.
	Off	No traffic on the network.
<i>Fast Ethernet LED</i>		
100M/10M	Steady Green	The 100M LED indicates the link speed of each port. If the LED light green then the connection speed is 100Mbps
	Off	Link speed is 10Mbps
Link /Act	Steady Green	Every port has a Link/Activity LED. Steady green (link state) indicated that the port has good linkage to its associated device.
	Blinking Green	The port is receiving or transmitting data from/to its associated partner.
	Off	<ol style="list-style-type: none"> <li>1. The connected device's power are off</li> <li>2. The port's cable is not firmly seated in its connectors in the switch and in the associated device.</li> <li>3. The connecting cable is not good or is not with correct type</li> <li>4. The connecting device, including any network adapter is not functional.</li> </ol>
FDX/ COL	Steady Amber	The port works on Full Duplex mode
	Off	The port works on Half Duplex mode

	Blinking Amber	A collision occurs when two stations within a collision domain attempt to transmit data at the same time. Intermittent flashing amber of the collision LED is normal; the contending adapters resolve each collision by means of a wait-then-retransmit algorithm. Frequency of collisions is an indicator of heavy traffic on the network.
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<i>Mode slide switch* (for EV-401M only)</i>	
SYM	It provides 10M upstream and 10M downstream. It will extend up to 1.2km (4000ft) with AWG 26(0.4mm) telephone wire. The distance will change by the quality of cable. (default mode)
ASYM*	It provides 3M upstream and 10M downstream. It will extend up to 1.35km (4500ft) with AWG 26(0.4mm) telephone wire. The distance will change by the quality of cable.

**\*Note 1: Power off and on the converter to make the mode take effect.**

**\*Note 2: When run on this mode, the VDSL connection can coexist with other HomePNA connections over the same telephone wire.**

## 2.2 Rear Panel

The rear panel of the Converter is shown as below



The rear panel of the Converter indicates a AC inlet power socket, which accepts input power from 100 to 240VAC, 50-60Hz 1.0A Max.

**Power Notice:**

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 converter from being damaged by unregulated surge or current to the converter or the power adapter.

## 3. INSTALLING AND USING ETHERNET OVER VDSL CONVERTER

### 3.1 Install the Ethernet Over VDSL Converter

The Converter 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 VDSL converter. Please check the following items:

The device is used for point-to-point connection only and allow data and voice work on the same telephone lines.

Two RJ-11 connectors 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 1.2km (4000ft) with AWG 26 telephone wires. The distance will change by the quality of telephone wires. We got some data as following table.

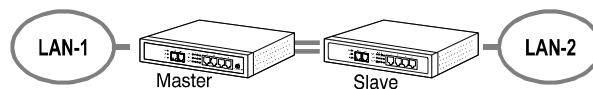
<b>Phone line wire (diameter)</b>	<b>Distance</b>
AWG 26 (0.40 mm)	1.2km
AWG 24 (0.51 mm)	1.3km
AWG 22 (0.64 mm)	1.5km

Therefore, this device is an ideal client access unit for the applications of apartment, hotel, campus and hospitality. Integration with the Internet access concentrator, the total infrastructure could be a perfect solution for multi-media local Internet. This structure could support many multi-media applications, like VOD (Video on Demand), Distant education, Internet caching server, ... and so on.

Therefore, most of the traffic will be limited on the local phone line network instead of flooding to the Internet. Another application for the converter is used for LAN to LAN extension through the normal telephone line.

### 3.2 LAN to LAN connection

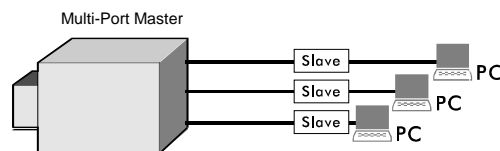
Two sets of the converters could be used to link two local Area networks that are located in different areas. Through the normal telephone line, it could setup a 10Mbps symmetric backbone, but one converter must be **Master** and the other one is **“Slave”**.



### 3.3 Connect to Multi-Port Master

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

The Internet Access Concentrators 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”** converter 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 unit
- 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
- Do not obstruct any vents at the sides of the case

### **3.4 Installing Network Cables**

After placing the converter on the desktop, then we need to know how to connect the device to network.

### **3.5 Station Connections with Telephone Wires**

Connect the network adapters in stations to the converter's 10/100Mbps switching ports through category 3, 4 or 5 UTP cables. There are two RJ11 phone jacks, one for telephone set connection and the other one is used for phone line network connection. If you have telephone wall jacks at home then all you need to do is connecting the RJ11 network port to the wall jack through telephone wires.

### **Warning !**

Connection of the RJ-45 connector from an RJ-11 to TNV circuits can cause permanent damage to the device.

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## **4. SWITCH OPERATION**

### **4.1 MAC Address Table and Learning**

The converter built in with a MAC address table that is composed of many entries. Each entry is used to store the address information of network nodes on the network, including MAC address, port ID, etc. The information is the most important base to do packet filtering and forwarding.

When one packet comes in from any port, the switch will learn the source address, port ID, and the other related information in address table. Therefore, the content of the MAC table will update dynamically.

### **4.2 Filtering and Forwarding**

When one packet comes in from any port of the switch, it will check the destination address besides the source address learning. The switch will look up the address table for the destination address. If not found, this packet will be forwarded to all the other ports except the source port. If found and the destination address is located at different port from this packet comes in, the packet will be forwarded to the port where this destination address is located according to the information of address table. But, if the destination address is located at the same port as this packet comes in then this packet will be filtered.

### **4.3 Store and Forward**

Store-and-forward is one kind of packet-forwarding methodology. As a store-and-forward switch, it will store the complete packet in the internal buffer and do the complete error checking before transmitting to the network. Therefore, no error packets will disturb the network. It is the best choice when a network needs efficiency and stability.

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## 5. TROUBLE SHOOTING

**SYMPTOM:** VDSL link LED not lit after wire is connected to the VDSL port.

**CHECKPOINT:**

- 1: Verify the length of the wire connected between EV-401M and EV-401S is not more than 1.5km.
- 2: Please note you must use 1 EV-401M and 1 EV-401S connect to each other to make it work.

**SYMPTOM:** Switch Link/Act LED not lit after cable is connected to the port.

**CHECKPOINT:**

- 1: Verify use the RJ-45 cable connected to the port.
- 2: If your device(like Lan card) support to Auto-Negotiation, please try to manual set at a fixed speed of your device to solve this problem.



**EM-EV401V1**

**CE ISO9002**

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