Industrial Ethernet Extender

IVC-2002

User's Manual

Trademarks

Disclaimer

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

Industrial Ethernet Extender User's Manual

For Model: IVC-2002

Rev 1.0 (Nov., 2010)

Part No.: 2350-AH0340-000

Table Of Contents

1. Introduction

1.1 Checklist

Check the contents of your package for following parts:

- IVC-2002 Industrial Ethernet Extender x 1

- DIN Rail Kit

- Wall Mount Kit

- User's Manual x 1

If any of these items 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 Ethernet over VDSL2 Bridge Description

PLANET'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 or coaxial cables without the need for rewiring.

The IVC-2002 Industrial Ethernet Extender has a switching architecture with 4 RJ-45 10/100Mbps Ethernet port and one asymmetric or symmetric Ethernet over VDSL port (Asymmetric means upstream and downstream rate are not the same and Symmetric means upstream and downstream rate are similar) – the VDSL port can be RJ-11 or BNC Connector. The IVC-2002 can set to **Master** or **Slave** mode via a DIP switch. When IVC-2002 (RJ-11) is connected with other IVC-2002 device, the performance will up to 99/63Mbps for asymmetric data rate within 200m and up to 28/2Mbps for asymmetric data rate at 1.4km. The IVC-2002 (BNC) performance is up to 99/65Mbps for asymmetric data rate within 200m and up to 31/4Mbps for asymmetric data rate at 2.4km. This capability is ideal for use as an Ethernet extender for your existing Ethernet network.

The IVC-2002 Industrial Ethernet Extender with slim type and IP-30 metal shape for easily deployment in Heavy Industrial demanding environments.

PLANET Industrial Ethernet Extender provides a lower cost 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, 5e or 6 UTP

● Ethernet over VDSL2, Twisted-pair Telephone Wires

● Ethernet over VDSL2, Coaxial Cable

Note	Slave device (CPE) must connect to Master device (CO) through the telephone wire or coaxial cable. It is not allow connecting like Master to Master or Slave to Slave. To define the IVC-2002 to Master or Slave, please refer to section 2.1.2 for more detail.

1.3 Key Features

The Industrial Ethernet Extender provides the following key features:

- Cost-effective VDSL2 Master / Slave bridge solution

- -40 to 75°C operating temperature

- Redundant Power Design: 12~48V DC, redundant power with polarity reverse protect function

- IP-30 metal case / Protection

- One box design, Master / Slave selectable via DIP Switch

- Defines Asymmetric (Band Plan 998) and Symmetric band plans for the 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

- Support up to 1536 bytes packet size, 802.1Q VLAN tag transparent

- Integrated address look-up engine, support 2K absolute MAC addresses

- VDSL2 Stand-Alone transceiver for simple bridge modem application

- Selectable Target Band Plan and Target SNR Margin

- Support extensive LED indicators for network diagnostics

- DIN Rail and Wall Mount Design

1.4 Specifications

Product		IVC-2002
Hardware Specification		
Ports	10/100 Base-TX	4 x RJ-45, Auto-Negotiation and Auto-MDI/MDI-X
	VDSL	1 x RJ-11, female Phone Jack 1 x BNC, female connector
DIP Switch		4 position DIP switch
Functionality		**Master / Slave** mode select Selectable **fast** and **interleaved** mode Selectable target **Band Plan** Selectable target **SNR mode**

Encoding		VDSL-DMT
		  - ITU-T G.997.1
		  - ITU-T G.993.1 VDSL
		  - ITU-T G.993.2 VDSL2 (Profile 17a Support)

LED Indicators		P1 (Green) P2 (Green) Fault (Green) Master (Green) and Slave (Green) ACT (Green) Sync. (Green)
Cabling	Ethernet	• 10Base-T: 2-pair UTP Cat.3, 4, 5 up to 100m (328ft) • 100Base-TX: 2-pair UTP Cat.5, 5e, 6 up to 100m (328ft)
	VDSL (RJ-11)	Twisted-pair telephone wires (AWG24 or better) up to 1.4km
	BNC	50 ohm, RG58A/U, RG58C/U, RG58/U or 75 ohm, RG6 (Distance 2.4km)

Performance* (Down Stream / Up Stream)	Asymmetric Mode	
	VDSL (RJ-11)	BNC
	200m -> 99/63Mbps 400m -> 91/48Mbps 600m -> 71/32Mbps 800m -> 53/18Mbps 1000m -> 38/8Mbps 1200m -> 33/5Mbps 1400m -> 28/2Mbps	200m -> 99/65Mbps 400m -> 99/64Mbps 600m -> 97/59Mbps 800m -> 94/51Mbps 1000m -> 84/45Mbps 1200m -> 73/37Mbps 1400m -> 61/28Mbps 1600m -> 54/20Mbps 1800m -> 48/13Mbps 2000m -> 39/9Mbps 2200m -> 35/6Mbps 2400m -> 31/4Mbps
	Symmetric Mode	
	VDSL (RJ-11)	BNC
	200m -> 91/99Mbps 400m -> 74/79Mbps 600m -> 54/51Mbps 800m -> 38/34Mbps 1000m -> 27/21Mbps 1200m -> 24/15Mbps 1400m -> 21/10Mbps	200m -> 95/99Mbps 400m -> 92/97Mbps 600m -> 81/82Mbps 800m -> 71/70Mbps 1000m -> 60/57Mbps 1200m -> 50/44Mbps 1400m -> 42/33Mbps 1600m -> 37/27Mbps 1800m -> 29/22Mbps 2000m -> 23/21Mbps 2200m -> 19/17Mbps 2400m -> 19/13Mbps
Dimensions (W x D x H)	135mm x 87.8mm x 32mm	
Weight	495g	
Power Requirement	12~48V DC, Redundant power with polarity reverse protection function	

Power Consumption / Dissipation	5.64Watts / 19.24BTU
Installation	DIN Rail Kit and Wall Mount Ear
Standard Conformance	
Stability testing	IEC60068-2-32 (Free Fall) IEC60068-2-27 (Shock) IEC60068-2-6 (Vibration)
Operating Temperature	-40 ~ 75ºC
Storage Temperature	-40 ~ 80ºC
Operating Humidity	10% to 90%, relative humidity, non-condensing
Storage Humidity	10% to 90%, relative humidity, non-condensing
Regulation Compliance	FCC Part 15 Class A, CE
Standards Compliance	IEC 802.3 10Base-T IEEE 802.3u 100Base-TX IEEE 802.3x Full Duplex Pause frame Flow Control ITU-T • G.997.1 • G.993.1 VDSL • G.993.2 VDSL2 (Profile 17a)

* The actual data rate will vary on the quality of the copper wire and environment factors.

2. Hardware Description

■ **IVC-2002**

The IVC-2002 provides 4 RJ-45, 1 RJ-11 and 1 BNC port for network line connection. The 4 RJ-45 ports with two different running speeds – 10Mbps and 100Mbps. It will distinguish the speed of incoming connection automatically.

This section describes the hardware features of the Industrial Ethernet Extender. For easier control of the Industrial Ethernet Extender, 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 Industrial Ethernet Extender, read this chapter carefully.

2.1 Front Panel

The units' front panel provides a simple interface monitoring the Industrial Ethernet Extender.

■ **IVC-2002 Front Panel**

Figure 2-1: IVC-2002 front panel

2.1.1 LED indicators for IVC-2002

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

■ **System**

LED	Color	Function	
P1	Green	**Light**	indicate the power 1 has power
P2	Green	**Light**	indicate the power 2 has power
FAULT	Green	**Light**	indicate the either power 1 or power 2 has no power

■ **VDSL / BNC**

LED	Color	Function	
ACT	Green	**Light**	Indicate that the VDSL link is established
		Blink	Indicate that the VDSL link is actively sending or receiving data over that port
Sync	Green	**Light**	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.
Master	Green	**Light**	Indicate the VDSL Bridge is running at Master mode.
Slave	Green	**Light**	Indicate the VDSL Bridge is running at Slave mode.

■ **10/100Base-TX Port**

LED	Color	Function	
LNK/ACT	Green	**Light**	Indicate that the port is link up.
		Blink	Indicate that the Converter is actively sending or receiving data over that port.
		Off	Indicate that the port is link down.

2.1.2 MODE DIP Switch

The Industrial Ethernet Extender 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**	**Band Plan**	**SNR**
OFF	Master	Interleave	Symm	9dB
ON (default)	**Slave**	**Fast**	**Asymm**	**6dB**

- Master / Salve
  - ◆ Master (Central Office) – the Master device mode, usually the Master device will be located at the data center of ISP or enterprise to link to the backbone.

  - ◆ Slave (Customer Premises Equipment) – the Slave device mode, usually the Slave device will be located at branch office, home or remote side as the long reach data receiver. The Slave also can be connected to the PC, IP Camera or Wireless Access Point and etc network devices.

> Note
>
> When the Industrial Ethernet Extender operate at Slave mode, the DIP switch 2,3,4 is no function.

- Fast and Interleave mode
  - ◆ Fast mode guarantees a minimum end to end latency less than 1 ms.

  - ◆ Interleaved mode provides impulse noises protection with a duration less than 250 us. Interleaved mode has a maximum end to end latency of 10m sec.

- Band Plan
  - ♦ User can switch the Band Plan either Symmetric or Asymmetric by their own. When Symmetric is selected that provides better upstream performance, when Asymmetric is selected that provides better downstream performance. Refer to table above for details.

- Target SNR (Signal Noise Ratio) Margin
  - ♦ When fixed SNR margin is selected, the system will maintain the SNR margin at 9 dB across all usable loop length.

Note	By default setting, the four DIP switch at **"ON"** position and operate as **"Slave"**. For operate as **"Master"**, please adjust the DIP 1 switch to **"OFF"** position. Adjust other DIP switch setting to fill different network application demand.

Please power off the Industrial Ethernet Extender before making any transmission mode adjustment.

2.2 The Upper Panel

The upper panel of the Industrial Ethernet Extender consist one terminal block connector within two DC power inputs. Figure 2-2 shows the upper panel of the Industrial Ethernet Extender.
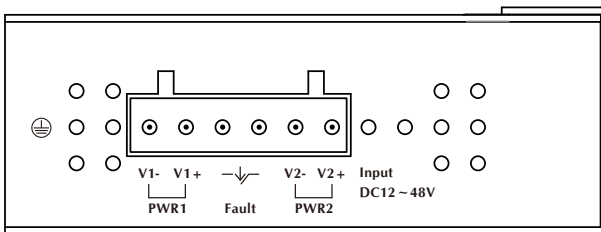

Figure 2-2 Industrial Ethernet Extender upper Panel.

3. Installation

3.1 Install Industrial Ethernet Extender – IVC-2002

The Industrial Ethernet Extender 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 Industrial Ethernet Extender. Please check the following items:

IVC-2002: The device is used for **Point-to-Point** connection only (Master device to Slave device) and has equipped with one RJ-11 and one BNC connectors for VDSL2 port for network link connection.

Phone wire: Depending on the quality of telephone line, the maximum distance of one VDSL segment is 1.4km (5249ft) with AWG 24 telephone wires.

Coaxial: Depending on the quality of coaxial cable, the maximum distance of one VDSL segment is 2.4km (9842ft) with 5C coaxial cable.

The distances will be changed by the quality of telephone wires and coaxial cables.

3.2 IVC-2002 BNC / RJ-11 Proper Connection

PLANET Industrial Ethernet Extender has a DIP switch which can adjust to be Master or Slave mode. Connection of two PLANET Industrial Ethernet Extenders, one must be Master (CO) mode and the other one must be Slave (CPE) mode. Please refer to the following Figure 3-1 chart.

Note

Industrial Ethernet Extender does not allow to connect BNC and RJ-11 at the same time.

Figure 3-1: Industrial Ethernet Extender BNC and RJ-11 connection chart

3.3 IVC-2002 Application Connection

Two sets of the Industrial Ethernet Extenders could be used to link two local Area networks that are located in different place. Through the normal telephone line or coaxial cable, it could setup a 99/63Mbps (RJ-11) or 99/65Mbps (BNC) asymmetric backbone.

Figure 3-2: IVC-2002 BNC and RJ-11 connection
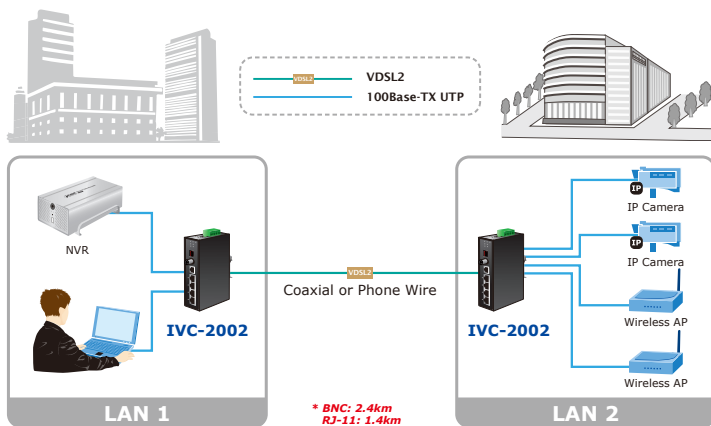
Advantage of IVC-2002 which it compatibles with PLANET VC-201A and VC-202A. Without spend extra cost to deploy a new local Internet in apartment, hotel, campus and hospitality environment. It can use the original network structure to re-deploy with our latest product PLANET IVC-2002. For example, MC-700, MC-1500, MC-1500R chassis with VC-201A and VC-202A inside and set it as **CPE (Customer Premises Equipment)** which need to be placed in the wiring center (MDF room) and connect it to the telephone line system or coaxial cable system. On the other hand, need to connect an **IVC-2002 converter** with **Master mode** and connect it to the PLANET Chassis through the telephone lines or coaxial cables.

Switch

2.4km

IVC-2002 Master
IP Camera

1.4km
IVC-2002 Master
IP Camera

75℃

VC-202A/VC-201A CPE+
MC-700 Chassis

Control Center

-40℃

IP Camera

Harbor

2.4km

IVC-2002 Master
IP Camera

-40℃

IP Camera

Steel Factory

IP Camera

Railway

100Base-TX UTP
VDSL2 Telephone wire
VDSL2 Coaxial Cable
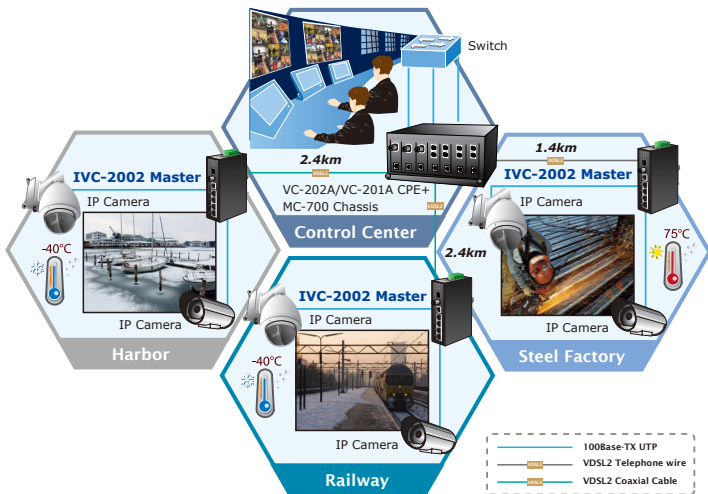
When deciding where to put the converter then you must ensure:

♦ 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 Converter.

♦ 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

3.4 Wiring the Power Inputs

The 6-contact terminal block connector on the top panel of Industrial Ethernet Extender is used for two DC redundant powers input. Please follow the steps below to insert the power wire.
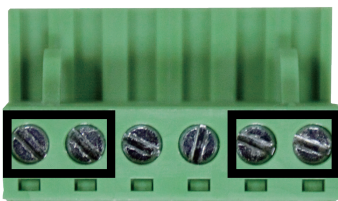
1. Insert positive / negative DC power wires into the contacts 1 and 2 for POWER 1, or 5 and 6 for POWER 2.
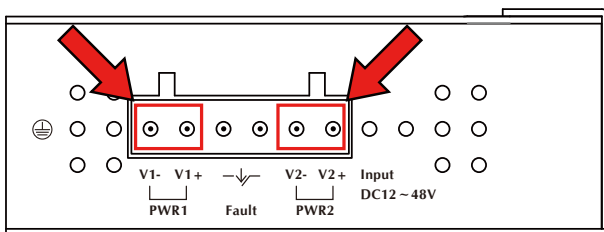

V1- V1+   V2- V2+

2. Tighten the wire-clamp screws for preventing the wires from loosing.

1	2	3	4	5	6
Power 1		Fault		Power 2	
-	+			-	+

3.5 Wiring the Fault Alarm Contact

The fault alarm contacts are in the middle of the terminal block connector as the picture shows below. Inserting the wires, the Industrial Ethernet Extender will detect the fault status of the power failure and then forms an open circuit. The following illustration shows an application example for wiring the fault alarm contacts.
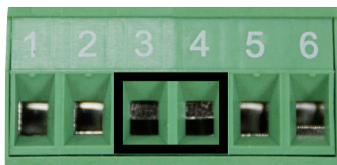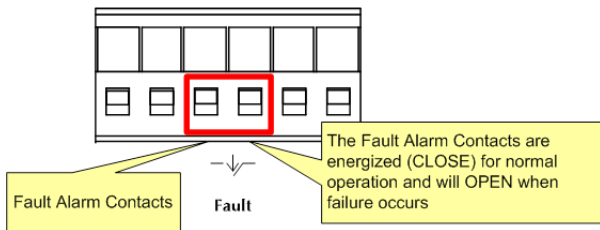

Insert the wires into the fault alarm contacts

Note	1. The wire gauge for the terminal block should be in the range between 12 ~ 24 AWG.
	2. Alarm relay circuit accepts up to 30V, max. 3A currents.

Fault Alarm Contacts

Fault

The Fault Alarm Contacts are energized (CLOSE) for normal operation and will OPEN when failure occurs

3.6 Mounting Installation

This section describes how to install the Industrial Ethernet Extender and make connection to it. Please read the following topics and perform the procedures in the order being presented.

<table>
<tr><td>Note</td><td>In the installation steps below, this Manual use IGS-801 (PLANET 8 Port Industrial Gigabit Switch) as the example. However, the steps for PLANET Industrial Switch & Industrial Ethernet Extender are similar.</td></tr>
</table>

3.6.1 Install DIN-Rail Mounting

The DIN-Rail is screwed on the Industrial Ethernet Extender when out of factory. Please refer to following figures to hang the Industrial Ethernet Extender on track.

Step 1: Lightly press the button of DIN-Rail into the track.

Step 2: Check the DIN-Rail is tightly on the track.

Step 3: Please refer to following procedures to remove the Industrial Ethernet Extender from the track.

Step 4: Lightly press the button of DIN-Rail for remove it from track.

3.6.2 Wall Mount Plate Mounting

To install the Industrial Ethernet Extender on the wall, please follows the instructions described below.

Step 1: Remove the DIN-Rail from the Industrial Ethernet Extender; loose the screws to remove the DIN-Rail.

Step 2: Place the wall mount plate on the rear panel of the Industrial Ethernet Extender.

Step 3: Use the screws to screw the wall mount plate on the Industrial Ethernet Extender.

Step 4: Use the hook holes at the corners of the wall mount plate to hang the Industrial Ethernet Extender on the wall.

Step 5: To remove the wall mount plate, reverse steps above.

4. 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 IVC-2002 not more than 2.4km (BNC) and 1.4km (RJ-11). Please also try to adjust the DIP switch of IVC-2002 to other SNR mode.

2. Please note you must use one IVC-2002 with Master mode and the other IVC-2002 with Slave 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, 5e or 6 cables with RJ-45 connector to connect to the port.

2. If your device (like LAN card) supports Auto-Negotiation, please try to modify at a fixed speed of your device by manually.

3. Check the converter and the connected device's power are ON or OFF.

4. Check the cables are firmly seated in its connectors in the switch and in the associated device.

5. Check the connecting cables are good.

6. Check the power adapter is functional, including the connecting device.

5. FAQ

Q1: What Power Input that IVC-2002 used?

A1: 12 ~ 48V DC

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 inter-active gaming, VDSL2 enable operators and carrier to gradually, flexibly, and cost efficiently upgrade exiting xDSL-infrastructure.

Q3: What is the best distance for IVC-2002?

A3: In order to guarantee the stability and better quality of network, so we would suggest the distance within 1.4 kilometer is the best for RJ-11 Connecting and 2.4 kilometer for BNC Connecting.

Q4: What is the best date rate for IVC-2002?

A4: We provide the data rate of the IVC-2002 is up to:

99Mbps/63Mbps for RJ-11 Connecting and the BNC Connecting is up to 99Mbps/65Mbps (downstream / upstream) in 200 meters

Q5: Can IVC-2002 compatible with VC-201A / VC-202A?

A5: YES, IVC-2002 (profile 17a) and VC-201A / VC-202A (profile 17a) are base on ITU-T G.993.2 VDSL2 with same Profiles, so far they are 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 band plan and what's the effect?

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 Symmetric is selected that provides better downstream performance, when Asymmetric is selected that provides better upstream performance.

PLANET
Networking & Communication

EC Declaration of Conformity

For the following equipment:

*Type of Product: Industrial Ethernet Extender (1 BNC / RJ-11 + 4-Port 10/100TX-17a Profile, -40~75 Degree C)
*Model Number: IVC-2002

* Produced by:
Manufacturer's Name : **Planet Technology Corp.**
Manufacturer's Address: 11F, No 96, Min Chuan Road,
Hsin Tien, Taipei, Taiwan, R.O.C.

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility Directive on (2004/108/EC).
For the evaluation regarding the EMC, the following standards were applied:

Emission	EN 55022	(Class A: 2006)
Harmonic	EN 61000-3-2	(2006)
Flicker	EN 61000-3-3	(1995/A1: 2001/A2:2005)
Immunity	EN 55024	(1998/A1: 2001/A2:2003)
ESD	IEC 61000-4-2	(2001)
RS	IEC 61000-4-3	(2008)
EFT/ Burst	IEC 61000-4-4	(2004)
Surge	IEC 61000-4-5	(2005)
CS	IEC 61000-4-6	(2008)
Magnetic Field	IEC 61000-4-8	(2001)
Voltage Disp	IEC 61000-4-11	(2004)

Responsible for marking this declaration if the:

☒ **Manufacturer** ☐ **Authorized representative established within the EU**

Authorized representative established within the EU (if applicable):

Company Name: Planet Technology Corp.

Company Address: 11F, No.96, Min Chuan Road, Hsin Tien, Taipei, Taiwan, R.O.C

Person responsible for making this declaration

Name, Surname Kent Kang

Position / Title : Product Manager

Taiwan
Place

15 Oct., 2010
Date

Legal Signature

PLANET TECHNOLOGY CORPORATION

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