User's Manual

VDSL2 CO/CPE Modem

Model: SP3501C
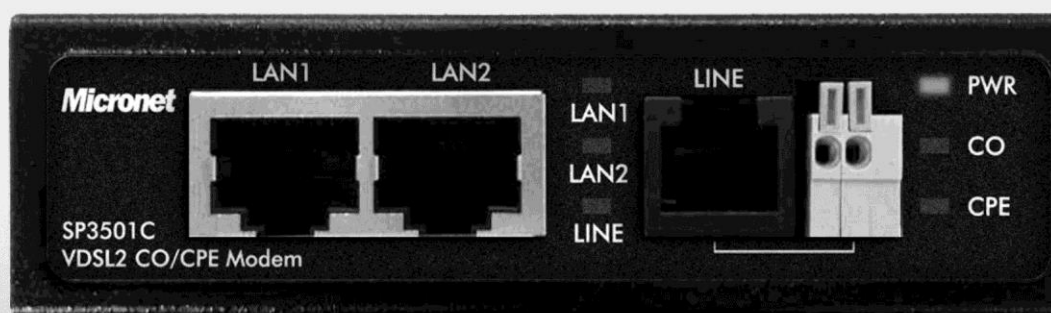
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1. Introduction

Micronet introduces the next-generation broadband access solution, with the newest VDSL2 technology, to carriers and MxU (Multi-Dwelling/Multi-Tenant Units) environments that need for new services such as IPTV, video conferencing, VoIP, peer-to-peer file sharing, and interactive gaming. Micronet SP3501C VDSL2 CO / CPE Modem are fully compliant with ITU-T G.993.2 VDSL2 standard also supports both central office (CO) and customer-premises equipment (CPE) modes selectable through DIP Switch that is able to provide the newest broadband solution with ADSL-like long-reach performance and high-speed symmetrical bandwidth up to 100Mbps.

1.1 Package Contents

Carefully unpack the package and check its contents against the checklist.

- VDSL2 Modem
    SP3501C VDSL2 Modem
- Quick Installation Guide
- Manual CD
- RJ-45 Cable
- Power Adapter
- Rubber Feet x 4

Note
1, Please inform your dealer immediately for any missing, or damaged parts. If possible, retain the carton, including the original packing materials. Use them to repack the unit in case there is a need to return for repair.
2. Do not use sub-standard power supply. Before connecting the power supply to the device, be sure to check compliance with specifications. The VDSL2 Modem of the power supply at least use DC12V/1A.
3. Power supply included in package is commercial-grade. Do not use in industrial-grade applications.
4. If you would like to use the telephone, please purchase a suitable external splitter and install to the line port.

1.2 Features

- Supports RJ-11/Terminal Block combo for Line port.
- Supports high bandwidth up to 100Mbps symmetric over Line ports
- Support long reach mode up to 3 km with 24 gauge phone wire

- Support auto speed for Line port and Interleave mode selectable through CO side DIP switch
- DIP switch with CO and CPE mode selectable
- Supports long packet size up to 1536 bytes
- Supports Surge protection
- Supports wall mounting
- Mini size and metal case design
- Supports point-to-point applications

2. Installation

2.1 Hardware Installation

This chapter describes how to install the VDSL2 Modem and establishes network connections. You may install the VDSL2 Modem on any level surface (e.g, a table or shelf). However, please take note of the following minimum site requirements before you begin.

2.2 Pre-installation Requirements

Before you start actual hardware installation, make sure you can provide the right operating environment, including power requirements, sufficient physical space, and proximity to other network devices that are to be connected. Verify the following installation requirement:

Power requirements: DC12V/1A or above.
- The VDSL2 Modem should be located in a cool dry place, with at least 10cm/4in of space at the front and back for ventilation.
- Place the VDSL2 Modem out of direct sunlight, and away from heat sources or areas with a high amount of electromagnetic interference.
- Check if network cables and connectors needed for installation are available
- Do Not install phone lines strapped together with AC power lines, or telephone office line with voice signal.
- Avoid installing this device with radio amplifying station nearby or transformer station nearby.

2.3 General Rules

Before making any connections to the VDSL2 Modem, note the following rules:
- Ethernet Port (RJ-45)
  All network connections to the Modem Ethernet port must be made using Category 5 UTP for 100Mbps;

Category 3, 4 UTP for 10Mbps
No more than 100 meters of cabling may be use between the MUX or
HUB and an end node.
- Phone Port (RJ-11)
    All Phone set connections to the RJ-11 Port made using 24~26
    Gauge phone wiring. We **do not recommend** the use of the
    telephone line 28 gauge or above.

2.4 Connecting the VDSL2 Modem

The VDSL2 Modem has two Ethernet ports which support connection to
Ethernet operation. The devices attached to these ports must support
auto-negotiation or 10Base-T OR 100Base-TX unless they will always
operate at half duplex. Use any of the Ethernet ports to connect to devices
such as Monitor system, Server, Switch, modem or router.

- 2 Ethernet RJ45 jacks (Slave device(CPE) must connect Master
  device(CO) through the telephone wire. Slave cannot connect
  to Slave, and Master cannot connect to Master. Please confirm
  the DIP switch status before the link established), therefore
  straight Ethernet cables can be used.
- 1 x RJ11 jack (The RJ11 Line port is used to connect to
  telephone that is connected to VDSL CO and CPE modem
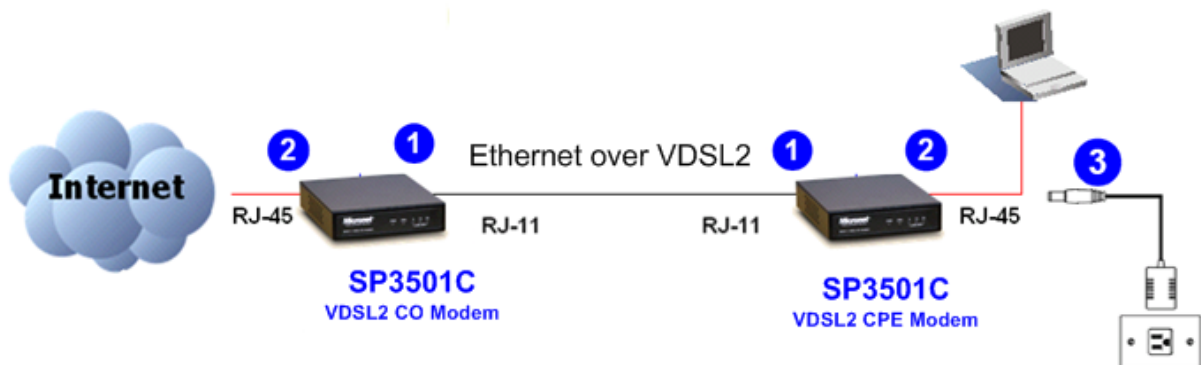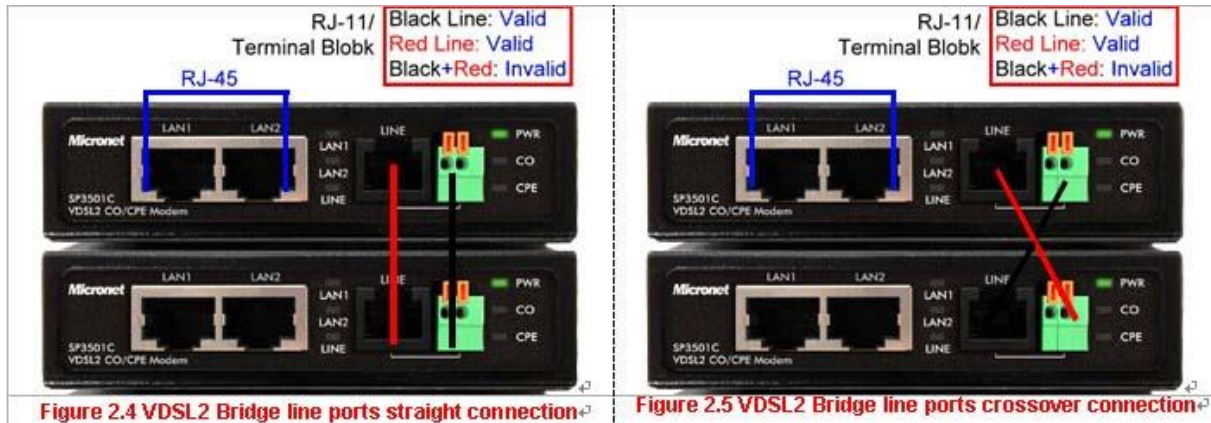 (Point-to-point solution)

Figure 2.1 VDSL2 Point to Point applications

Step 1. RJ-11 connection

The line port has 2 connectors: Either RJ-11 port is connected or terminal block is
connected using straight connection (Figure 2.4) or cross-over connection(Figure 2.5)
When inserting a RJ-11 plug, make sure the tab on the plug clicks into position to
ensure that it is properly seated.

Do not plug a RJ-11 phone jack connector into the Ethernet port (RJ-45 port). This may damage the modem. Instead, use only twisted-pair cables with RJ-45 connectors that conform to Ethernet standard.

Figure 2.4 VDSL2 Bridge line ports straight connection   Figure 2.5 VDSL2 Bridge line ports crossover connection

Step 2. RJ-45 connection

The Modem provides 2 Ethernet port, which support connection through Ethernet operation.

It is used to connect from VDSL2 Modem (CO) using single pair phone cable to VDSL2 Modem (CPE) modem side (point to point solution). Take note that VDSL2 Modem line port cannot be used at the same time.

Step 3. Power connection

Use the included power adaptor (DC 12V/1A) to connect the Modem power socket to an appropriate power source.

Notes:

1. Be sure each twisted-pair cable (RJ-45 ethernet cable) does not exceed 100 meters (333 feet).
2. We advise using Category 5~7 UTP/STP cables for Cable bridge or Bridge connections to avoid any confusion or inconvenience in the future when you attached to high bandwidth devices.
3. RJ-11(VDSL2 Line port) use 24 ~ 26 gauge with twisted pair phone wiring, we do not recommend 28 gauge or above.
4. Be sure phone wire has been installed before VDSL2 Modem powered on.

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3. Hardware Description

This section describes the important parts of the VDSL2 Modem. It features the front indicators and rear connectors.

3.1 Front Panel

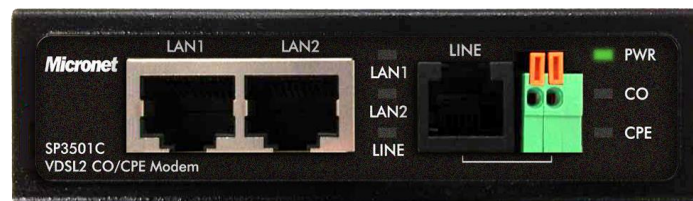The following figure shows the front panel.

Figure 3.1 Front Panel

Tip:

At a quick glance of the front panel, it is easy to determine if it has Ethernet signal from its RJ-45 port and if there is vdsl line signal on RJ-11 port.

And the table shows the description. (Table 3-1)

Table 3-1 Description of the modem front connectors

Connectors	Type	Description
LAN1 / LAN2	RJ-45	For connecting to a Ethernet equipped device.
Line	RJ-11/Terminal Block	For connecting to VDSL2 modem. (**Do not** use RJ11 and Terminal Block at the same time.)

3.2 Front Indicators

The following table describes the LEDs.

| LED	Color	Status	Descriptions
PWR (Power LED)	Green	On(Steady)	Lights to indicate that the VDSL2 modem had power
		Off	The device is not ready or has malfunctioned.
LAN 1-2 (Ethernet LED)	Green	On(Steady)	The device has a good Ethernet connection.
		Blinking	The device is sending or receiving data.
		Off	The LAN is not connected.

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CO (Local Side) (CO LED)	Green	On(Steady)	Indicate the VDSL2 modem is running at **CO(Master)** mode.
CPE (Remote Side) (CPE LED)	Green	On(Steady)	Indicate the VDSL2 modem is running at **CPE(Slave)** mode.
LINE (VDSL LINK LED)	Green	On(Steady)	The Internet or network connection is up.
		Blinking slowly	The CO device is auto-detecting CPE device.
		Blinking fastly	1. The CO device has detected a CPE device and ready to connect. 2. The device is sending or receiving data.
		Off	The Internet or network connection is down or has malfunctioned.

Note:

Two Modems connection may take within 3 minutes is normal, due to VDSL2 Modem to establish a link mechanism is auto-negotiation, with detects and calculate CO and CPE both PBO and PSD level as well as noise level ....and other argument etc. for getting a better connection.

3.3 Rear Panel

The following figure shows the rear connectors
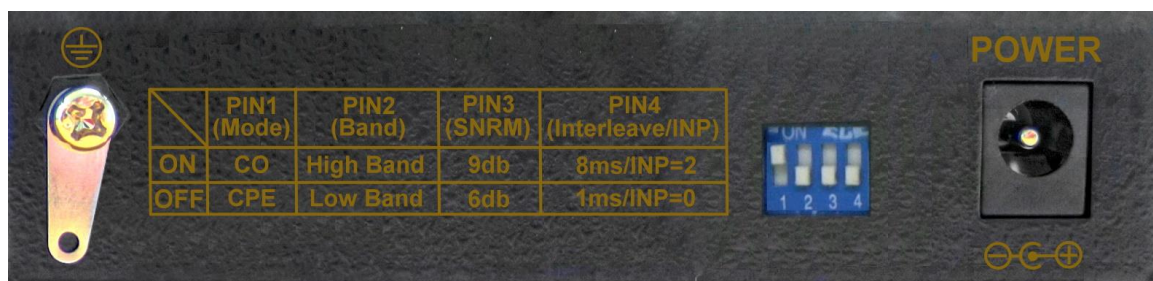
VDSL2 Modem Rear Connectors

Connectors	Type	Description
Power	DC Power Jack	External Power Adapter: Input: AC 85~240Volts/50~60Hz Output: DC 12V/1A
DIP Switch	4 Pins DIP Switch	Provide 4 selectable transmission modes.
Ground ⏚	Ground lug	Please connect the ground lug to the earth. To prevent a electric shock when user touches.

3.4 DIP switch

The following figure shows the DIP switch connection. By switching the transmission modes, you can obtain a best transmission mode to suit with phone line quality or distance or connectivity.
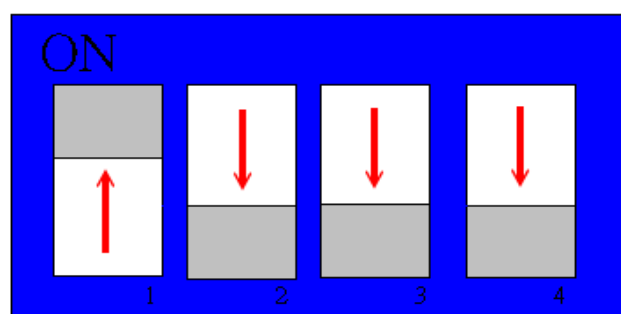
DIP switch setting

The following is table of DIP Switch configuration. (Table 3-4)

Table 3-4 DIP Switch Configuration

On/OFF	Pin 1 CO/CPE Mode	Pin 2 Band	Pin 3 SNRM	Pin 4 Interleave / INP
On	CO Mode	High Band	9db	8ms / INP=2
Off	CPE Mode	Low band	6db	1ms / INP=0

Note:
1,The DIP switch default value are OFF.
2, Please power off VDSL2 Modem, before making any transmission mode configuration.

● **PIN1:**

ON: CO(Central Office) Mode or called Local Side, usually the CO device will be located at the data enter of enterprise to link to the backbone.
OFF: CPE(Customer Premises Equipment) Mode or called Remote Side, usually the CPE side will be located at building,
monitoring for car parks and train station as the long reach data receiver.

Tip:

When the VDSL2 Modem operates at **CPE** mode, the DIP switch 2, 3, 4 has **no function**.

● **PIN2:**

ON: High Band mode(500KHz to 30MHz), and enable VDSL2 spectrum is 500kHz to 30MHz. It can pass through **ISDN** spectrum(0 ~ 499KHz are empty).
OFF: Low Band Mode(25KHz to 30MHz), the VDSL2 Modem will auto-detect the cable length and auto choice speed mode. VDSL2 spectrum is 25KHz to 30MHz.

● **PIN3:**

When SNR margin is selected, the system provide **6db/9db** SNR margin for across all usable loop length. Please note that the 6db SNR margin is for telecom standard. Generally speaking, the higher SNR value gets better line quality, but lower performance.

- **PIN4:**

ON: Interleaved mode has a maximum end to end latency of **8m** sec and **INP=2**. When field environment has heavy noise, in order to obtain high link quality, user can configure pin4 to "ON", but this function will **reduce performance**.
OFF: Interleaved mode provides impulse noise protection for any impulse noise with a duration less than **1ms**.

TIP(Reference Only):

Interleave delay function is used in digital data transmission technology to protect the transmission against noise issue
and data error.
If during transit more than a certain amount of data has been lost then the data cannot be correctly decoded. Short bursts
of noise on the line can cause these data packets to become corrupt and the modem has to re-request data which in turn
can slow down the overall rate at which data is transmitted.
Interleaving is a method of taking data packets, chopping them up into smaller bits and then rearranging them so that
once contiguous data is now spaced further apart into a non continuous stream. Data packets are re-assembled by your
modem.
The diagram below is an example of how interleaved traffic is transmitted.

Blocks of Data
Raw data stream
Interleaved data stream
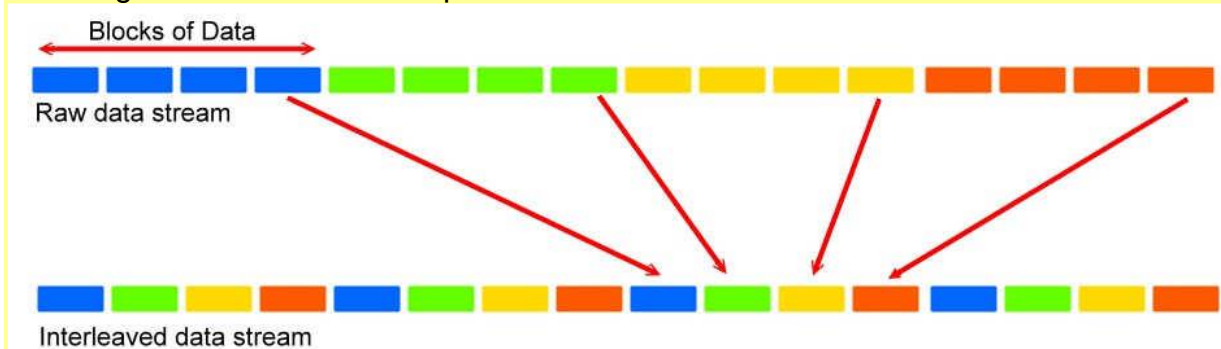
If your line is particularly susceptible to bursts of noise then interleaving should improve your VDSL2 experience simply
because if you lose a whole batch of data then this could cause your modem to loose sync with the exchange.
Using Interleaving, the modem is able to re-assemble the data or if necessary just re-request the part of the data that it is
unable to recover. By increasing the interleave depth of each ports that are susceptible to noise, this will improve error
performance and stability of marginal lines.

INP(Impulse Noise Protection): Impulse noise in multicarrier communication systems behaves effectively as a modulating
signal that controls the first moment of the background Gaussian noise. The composite noise, which is the aggregate of the
Gaussian noise and impulse noise, has a probability density function that is conditionally Gaussian with non-zero average,
hence referred to as biased-Gaussian. The BER-equivalent power of the composite noise source is defined as the power of a
pure Gaussian noise source that yields the same bit-error rate (BER). The BER-equivalent noise for a biased-Gaussian noise
is simply the amplified version of the underlying Gaussian noise source. The amplification factor is derived from the
characteristics of the impulse interference. Any bit-loading algorithm designed for Gaussian noise sources is also applicable to
biased-Gaussian noise sources provided that the BER-equivalent SNR is used in place of the measured SNR.

SNRM(Signal to Noise Ratio Margin): It's very similar to a conversation at a party and it's dealt with in the same way; we naturally account for both distance from the other person and the amount of background noise. When we do we don't just talk loud enough to be heard, we speak a bit louder waiting for the idiot with the stupid, loud laugh to start up again. We add a bit extra on to make sure we're louder than the average change in background noise.
That ratio is a major factor in determining the connection speed, as the higher the ratio the higher the possible speed. The SNRM is a margin which by which the noise level can rise before connection is lost.

Safety Caution!
1. **Be sure to disconnect the power when installing(uninstalling) the terminal block and power cable.**
2. Please note that the user can use 12VDC power input. Do not exceed DC 12V.
3. Be sure to disconnect the power before installing and/or wiring your VDSL2 Modem.
4. Please calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

Grounding the VDSL2 Modem
VDSL2 MODEM is designed to enhance EMS performance by grounding. VDSL2 MODEM come with for grounding the switches. For optimal EMS performance, connection of the left side of the VDSL2 MODEM rear panel ground lug to the grounding point.

Before user installed power and device, please read and follow these essentials:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.

Note:

Do not run signal or communications wiring and power wiring through the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

- You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring sharing similar electrical characteristics can be bundled together.
- You should separate input wiring from output wiring.
- We recommend that you mark all equipment in the wiring system.

Appendix A: Cable Requirements

Ethernet Cable

A CAT 3~7 UTP (unshielded twisted pair) cable is typically used to connect the Ethernet device to the modem. A 10Base-T cable often consists of four pairs of wires, two of which are used for transmission. The connector at the end of the 10Base-T cable is referred to as an RJ-45 connector and it consists of eight pins. The Ethernet standard uses pins 1, 2, 3 and 6 for data transmission purposes. (Table A-1)

Table A-1 RJ-45 Ethernet Connector Pin Assignments

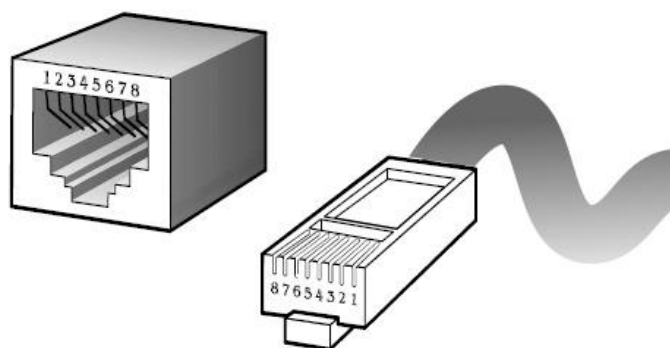| PIN #	MDI		MDI-X	
	Signal	Media Dependant interface	**Signal**	Media Dependant interface-cross
1	TX+	Transmit Data +	RX+	Receive Data +
2	TX-	Transmit Data -	RX-	Receive Data -
3	RX+	Receive Data +	TX+	Transmit Data +
4	--	Unused	--	Unused
5	--	Unused	--	Unused
6	RX-	Receive Data -	TX-	Transmit Data -
7	--	Unused	--	Unused
8	--	Unused	--	Unused

Figure A-1 Standard RJ-45 repectacle/connector

Note:

Please make sure your connected cables are with same pin assignment as above table before deploying the cables into your network.

Figure A-2 Pin Assignments and Wiring for an RJ-45 Straight-Through Cable
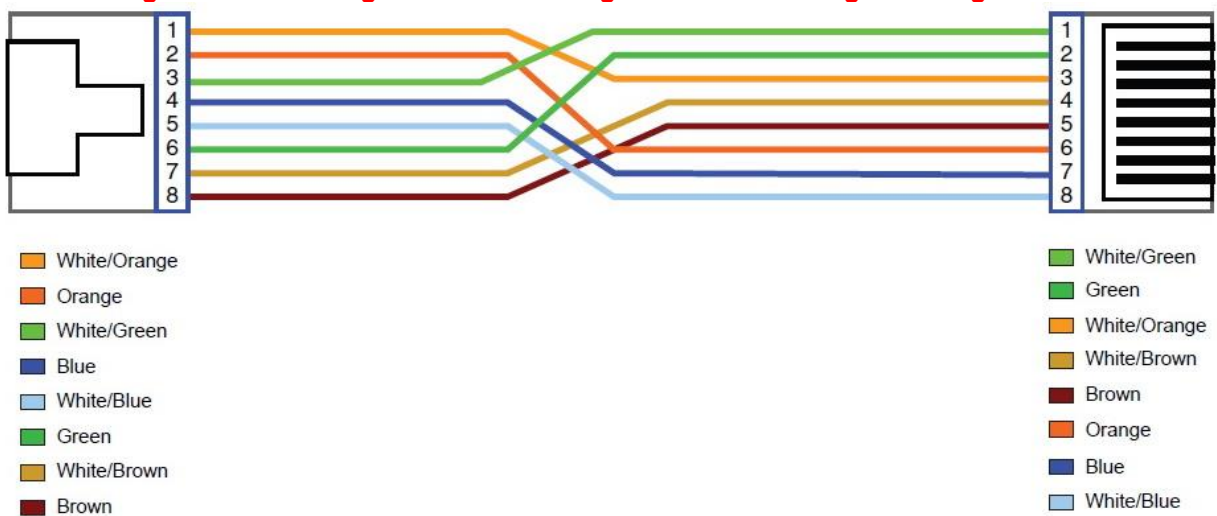
Pin Assignments and Wiring for an RJ-45 Crossover Cable

Appendix B: Product Specification

Model	SP3501C
Standards	• IEEE802.3 10BASE-T, IEEE802.3u 100BASE-TX • ITU-T G993.2
Interface	• 2 x RJ-45 10/100Mbps Ethernet ports • 1 x RJ-11 connector for EoVDSL • 1 x DIP Switch • 1 x Power Jack
VDSL Line Code	DMT modulation
VDSL2 Transmission Mode	Packet Transfer Mode (PTM)
Operating Temperature	0°C ~ 50°C (32°F ~ 122°F) Fanless, free air cooling
Storage Temperature	-20°C ~ 70°C (-4°F ~158°F)
Humidity	10% to 90% (non-condensing)
Power Supply	DC 12V, 1A
Power Consumption	5W
Emission	CE class A, FCC

Appendix C: Troubleshooting

1. Symptom:	POWER indicator does not light up (green) after power on.
Cause:	Defective External power supply
Solution:	Check the power plug by plugging in another that is functioning properly. Check the power cord with another device. If these measures fail to resolve the problem, have the unit power supply replaced by a qualified distributor.

2. Symptom:	**Link indicator does not light up (green) after making a connection.**
Cause:	Network interface (ex. a network adapter card on the attached device), network cable, or switch port is defective.
Solution:	2.1 Power off and re-power on the VDSL modem. 2.2 Verify that the modem and attached device are power on. 2.3 Be sure the cable is plugged into both the modem and corresponding device. 2.4 Verify that the proper cable type is used and its length does not exceed specified limits. 2.5 Check the modem on the attached device and cable connections for possible defects. 2.6 Make sure the phone wire must be connecting VDSL2 Modem first, when powered on. 2.7 Replace the defective modem or cable if necessary.

3. Symptom:	**VDSL Link cannot be established.**
Cause:	VDSL setting failure or phone cable length is over the specification limit.
Solution:	3.1 Please make sure that the phone wire must be connected between VDSL2 Modem (CO) and VDSL2 Modem (CPE) when both are power on. VDSL2 Modem (CO) will do link speed function depending on phone wire length, therefore if VDSL2 Modem (CO) can't detect VDSL2 Modem (CPE) over phone wire while both power on, this will cause the link to fail. 3.2 Please check phone wire, we recommend use 24 gauge with twisted pair and without rust, and the length is not over 3 km. 3.3 Please check the correct Dip Switch setting. (CO: PIN1 ON, CPE: PIN1 OFF) 3.4 Please reinsert power when change cable length or link time over 3 minutes.
Note:	Phone wire must meet CAT 3 standard or above and **without clustering**, otherwise will cause more cross talk issue to reduce DSL power driver.

4. Problem:	**What is VDSL2?**

	Very-high-speed digital subscriber line 2 (VDSL2) is an access technology that exploits the existing infrastructure of copper wires that were originally deployed for traditional telephone service. It can be deployed from central offices, from fiber-optic connected cabinets located near the customer premises, or within buildings. It was defined in standard ITU-T G.993.2 finalized in 2005. VDSL2 was the newest and most advanced standard of digital subscriber line (DSL) broadband wireline communications. Designed to support the wide deployment of triple play services such as voice, video, data, high definition television (HDTV) and interactive gaming, VDSL2 was intended to enable operators and carriers to gradually, flexibly, and cost-efficiently upgrade existing xDSL infrastructure. The protocol was standardized in the International Telecommunication Union telecommunications sector (ITU-T) as Recommendation G.993.2. It was announced as finalized on 27 May 2005,[1] and first published on 17 February 2006. Several corrections and amendments were published in 2007 through 2011. VDSL2 is an enhancement to very-high-bitrate digital subscriber line (VDSL), Recommendation G.993.1. It permits the transmission of asymmetric and symmetric aggregate data rates up to 200 Mbit/s downstream and upstream on twisted pairs using a bandwidth up to 30 MHz. VDSL2 deteriorates quickly from a theoretical maximum of 250 Mbit/s at source to 100 Mbit/s at 0.5 km (1,600 ft) and 50 Mbit/s at 1 km (3,300 ft), but degrades at a much slower rate from there, and still outperforms VDSL. Starting from 1.6 km (1 mi) its performance is equal to ADSL2+. ADSL-like long reach performance is one of the key advantages of VDSL2. LR-VDSL2 enabled systems are capable of supporting speeds of around 1–4 Mbit/s (downstream) over distances of 4–5 km (2.5–3 miles), gradually increasing the bit rate up to symmetric 100 Mbit/s as loop-length shortens. This means that VDSL2-based systems, unlike VDSL1 systems, are not limited to short local loops or MTU/MDUs only, but can also be used for medium range applications.
Answer:	

5. Problem:	What is SNR(Signal-to-Noise)
Answer:	Signal-to-noise ratio (often abbreviated SNR or S/N) is a measure used in science and engineering that compares the level of a desired signal to the level of background noise. It is defined as the ratio of signal power to the noise power. A ratio higher than 1:1 indicates more signal than noise. While SNR is commonly quoted for electrical signals, it can be applied to any form of signal (such as isotope levels in an ice core or biochemical signaling between cells). The ratio is usually measured in decibels(dB) The signal-to-noise ratio, the bandwidth, and the channel capacity of a communication channel are connected by the Shannon–Hartley theorem. 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.

6. **Problem:**	**Connected the CO Modem with CPE Modem within 300 meters RJ-11 phonecable got only less than 10 Mbit/s.**
Cause:	Some testing program that is base on TCP/IP protocol such as FTP, Iperf, NetIQ, and the bandwidth of testing outcome will be limited by TCP window size.
Answer:	We recommand to test VDSL2 bandwidth best by Smartbit equipment, if you don't have Smartbit, we recommand test that by IPERF program and TCP window size must be setted max. 64k, the parameter as iperf –c co side ip address–I 1 –t 50 –w 65535 for client side.

Appendix D : Compliance and Safety Information

FCC Radio Frequency Interference Statement
This equipment has been tested to comply with the limits for a computing device, pursuant to Part 15 of FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment can generate, use and radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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, the user is encouraged to try to correct the interference by taking one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the distance between the equipment and receiver.
3. The equipment and the receiver should be connected to outlets on separate circuits.
4. Consult the dealer or an experienced radio/television technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

If this telephone equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance in order for you to make necessary modifications to maintain uninterrupted service.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

Important Safety Instructions
Caution: The direct plug-in wall transformer serves as the main product for disconnecting. The socket outlet shall be installed near the product and be readily accessible.

Caution: Use only the power supply included with this product. In the event the power supply is lost or damaged:In the United States, use only with CSA certified or UL listed Class 2 power supply, rated 12Vdc 1A or above.
IN Europe, use only with CE certified power supply, rated 12Vdc 1A or above.

Do not use this equipment near water, for example in a wet basement.

Avoid using a telephone during an electrical storm. There may be a remote risk of electrical shock from lightning.

Do not use the telephone to report a gas leak in the vicinity of the leaking area.

If you experience trouble with this unit, please contact customer service at the address and phone listed below.

DO NOT DISASSEMBLE THIS EQUIPMENT. It does not contain any user serviceable components.

Warranty

The original owner of this package will be free from defects in material and workmanship for one year parts after purchase. For the warranty to apply, you must register your purchase by returning the registration card indicating the date of purchase.

There will be a minimal charge to replace consumable components, such as fuses, power transformers, and mechanical cooling devices. The warranty will not apply to any products which have been subjected to any misuse, neglect or accidental damage, or which contain defects which are in any way attributable to improper installation or to alteration or repairs made or performed by any person not under control of the original owner.

The above warranty is in lieu of any other warranty, whether express, implied, or statutory, including but not limited to any warranty of merchantability, fitness for a particular purpose, or any warranty arising out of any proposal, specification, or sample. It shall not be liable for incidental or consequential damages. We neither assume nor authorize any person to assume for it any other liability.

VDSL2 Point to Point Solution

VDSL2 (Very-High-Bit-Rate Digital Subscriber Line 2, ITU-T G.993.2 Standard) is an access technology that exploits the existing infrastructure of copper wires that were originally deployed for POTS services. It can be deployed from central offices, from fibre-fed cabinets located near the customer premises, or within buildings.

ITU-T G.993.2 VDSL2 is the newest and most advanced standard of DSL broadband wireline communications. Designed to support the wide deployment of Triple Play services such as voice, video, data, high definition television (HDTV) and interactive gaming, VDSL2 enables operators and carriers to gradually, flexibly, and cost efficiently upgrade existing xDSL-infrastructure.

ITU-T G.993.2 (VDSL2) is an enhancement to G.993.1 VDSL that permits the transmission of asymmetric and symmetric (Full-Duplex) aggregate data rates up to 200 Mbit/s on twisted pairs using a bandwidth up to 30 MHz.

VDSL2 deteriorates quickly from a theoretical maximum of 200 Mbit/s (Full-Duplex) at 'source' to 100 Mbit/s at 0.3 km (symmetric).

Safety Warnings

For your safety, be sure to read and follow all warning notices and instructions before device use.

- DO NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel can service the device. Please contact your vendor for further information.
- Use ONLY the dedicated power supply for your device. Connect the power cord or power adaptor to the right supply voltage (110V AC in North America or 230V AC in Europe).
- DO NOT use the device if the power supply is damaged as it might cause electrocution.
- If the power supply is damaged, remove it from the power outlet.
- DO NOT attempt to repair the power supply. Contact your local vendor to order a new power supply.
- Place connecting cables carefully so that no one will step on them or stumble over them. DO NOT allow anything to rest on the power cord and do NOT locate the product where anyone can work on the power cord.
- DO NOT install nor use your device during a thouderstorm. There may be a remote risk of electric shock from lightning.
- DO NOT expose your device to dampness, dust or corrosive liquids.
- DO NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Connect ONLY suitable accessories to the device.
- Make sure to connect the cables to the correct ports.
- DO NOT obstruct the device ventilation slots, as insufficient airflow may harm your device.
- DO NOT store things on the device.
- DO NOT use the device outside, and make sure all the commections are indoors. There may be a remote risk of electric shock from lightning.
- Be careful when unplugging the power, because the transformer may be very hot.
- Keep the device and all its parts and accessories out of children's reach.
- Clean the device using a soft and dry cloth rather than liquid or atomizers. Power off the equipment before cleansing it.
- This product is recyclable. Dispose of it properly.

FCC Warning

This equipment has been tested to comply with the limits 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 can generate, use, and radiate radio

frequency energy and, if not installed and used in accordance with the instruction manual, 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 owner's expense.

CE Mark Warning

This is a CE 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.

WARNING:

DO NOT TEAR OFF OR REMOVE THE WARRANTY STICKER AS SHOWN, OR THE WARRANTY IS VOID.