

TigerAccess™ EE

Ethernet-over-VDSL2 CPE

- ◆ High-speed Internet access over existing phone lines
- ◆ Concurrent data/phone services over single connection
- ◆ Always-on digital connection provides quick initialization
- ◆ Seamless rate adaptation enhances quality in video applications
- ◆ Supports PC or Mac with Ethernet adapter card installed



TigerAccess-EE CPE Installation Guide

From SMC's Tiger line of feature-rich workgroup LAN solutions

SMC[®]

Networks

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COMPLIANCES

FCC - Class B

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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 instructions, may cause harmful interference to radio communications. However, there is no guarantee that the 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 one or more of the following measures:

- Reorient the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Note: In order to maintain compliance with the limits of a Class B digital device, you are required to use a quality interface cable when connecting to this device. You may use unshielded twisted-pair (UTP) for RJ-45 connections - Category 3 or better for 10 Mbps connections, Category 5 or better for 100 Mbps connections.

FCC - Part 68

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. On the bottom of this equipment is a label that contains, among other information, a product identifier in the format US: 1KRDL09BSMC7800A. If requested, this number must be provided to the telephone company.

This equipment uses the following USOC jacks: RJ-11.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have those entire devices ring when your telephone number is called. In most, but not all areas, the sum of the REN of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to you line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

If your equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC. Your 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 to give you an opportunity to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, please contact please contact our company at the numbers shown on back of this manual for information on obtaining service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning.

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

Industry Canada - Class B

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of Industry Canada.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-003 édictée par l'Industrie.

CE Mark Declaration of Conformance for EMI and Safety (EEC)

SMC contact for these products in Europe is:

SMC Networks Europe,
Edificio Conata II,
Calle Fructuós Gelabert 6-8, 2^a, 4^a,
08970 - Sant Joan Despí, Barcelona, Spain.

This information technology equipment complies with the requirements of the Council Directive 89/336/EEC on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility and 73/23/EEC for electrical equipment used within certain voltage limits and the Amendment Directive 93/68/EEC. For the evaluation of the compliance with these Directives, the following standards were applied:

- RFI Emission:
- Limit class A according to EN 55022:1998
 - Limit class B for harmonic current emission according to EN 61000-3-2/1995
 - Limitation of voltage fluctuation and flicker in low-voltage supply system according to EN 61000-3-3/1995
- Immunity:
- Product family standard according to EN 55024:1998
 - Electrostatic Discharge according to EN 61000-4-2:1995 (Contact Discharge: ± 4 kV, Air Discharge: ± 8 kV)
 - Radio-frequency electromagnetic field according to EN 61000-4-3:1996 (80 - 1000 MHz with 1 kHz AM 80% Modulation: 3 V/m)
 - Electrical fast transient/burst according to EN 61000-4-4:1995 (AC/DC power supply: ± 1 kV, Data/Signal lines: ± 0.5 kV)
 - Surge immunity test according to EN 61000-4-5:1995 (AC/DC Line to Line: ± 1 kV, AC/DC Line to Earth: ± 2 kV)
 - Immunity to conducted disturbances, Induced by radio-frequency fields: EN 61000-4-6:1996 (0.15 - 80 MHz with 1 kHz AM 80% Modulation: 3 V/m)
 - Power frequency magnetic field immunity test according to EN 61000-4-8:1993 (1 A/m at frequency 50 Hz)
 - Voltage dips, short interruptions and voltage variations immunity test according to EN 61000-4-11:1994 (>95% Reduction @10 ms, 30% Reduction @500 ms, >95% Reduction @5000 ms)
- LVD:
- EN 60950-1:2001

Warning: Do not plug a phone jack connector in the RJ-45 port. This may damage this device.

Attention: Les raccordeurs ne sont pas utilisés pour le système téléphonique!

Warnings and Cautionary Messages

- Warning:** This product does not contain any serviceable user parts.
- Warning:** Installation and removal of the unit must be carried out by qualified personnel only.
- Warning:** When connecting this device to a power outlet, connect the field ground lead on the tri-pole power plug to a valid earth ground line to prevent electrical hazards.
- Caution:** Wear an anti-static wrist strap or take other suitable measures to prevent electrostatic discharge when handling this equipment.
- Caution:** Do not plug a phone jack connector in the RJ-45 port. This may damage this device. Les raccordeurs ne sont pas utilisé pour le système téléphonique!
- Caution:** Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Warnings (in German)

- Achtung:** Dieses Produkt enthält keine Teile, die eine Wartung vom Benutzer benötigen.
- Achtung:** Installation und Deinstallation des Gerätes müssen von qualifiziertem Servicepersonal durchgeführt werden.
- Achtung:** Wenn das Gerät an eine Steckdose angeschlossen wird, muß der Masseanschluß am dreipoligen Netzstecker mit Schutzerde verbunden werden, um elektrische Gefahren zu vermeiden.
- Achtung:** Dieses Gerät nutzt Laser zur Signalübertragung über Glasfasern. Die Laser entsprechen den Anforderungen an eine Lasereinrichtung der Klasse 1 und sind durch ihre Bauart im normalen Betrieb sicher für die Augen. Trotzdem sollte niemals direkt in den einen Übertragungskanal geblickt werden, wenn er eingeschaltet ist.

Environmental Statement

The manufacturer of this product endeavours to sustain an environmentally-friendly policy throughout the entire production process. This is achieved through the following means:

- Adherence to national legislation and regulations on environmental production standards.
- Conservation of operational resources.
- Waste reduction and safe disposal of all harmful un-recyclable by-products.
- Recycling of all reusable waste content.
- Design of products to maximize recyclables at the end of the product's life span.
- Continual monitoring of safety standards.

End of Product Life Span

This product is manufactured in such a way as to allow for the recovery and disposal of all included electrical components once the product has reached the end of its life.

Manufacturing Materials

There are no hazardous nor ozone-depleting materials in this product.

Documentation

All printed documentation for this product uses biodegradable paper that originates from sustained and managed forests. The inks used in the printing process are non-toxic.

Purpose

This guide details the hardware features of the switches, including Its physical and performance-related characteristics, and how to install each switch.

Audience

This guide is for system administrators with a working knowledge of network management. You should be familiar with switching and networking concepts.

Zielgruppe Dieser Anleitung ist fuer Systemadministratoren mit Erfahrung im Netzwerkmanagement. Sie sollten mit Switch- und Netzwerkkonzepten vertraut sein.

COMPLIANCES

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Glossary

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CHAPTER 1

ABOUT THE TIGERACCESS-EE CPE

Overview

This Ethernet-Over-VDSL2 CPE system consists of an end-user CPE (Customer Premise Equipment) and a VDSL2 switch that are connected by standard telephone cable. The VDSL connection delivers an Ethernet data link rated up to 100 Mbps symmetric (full duplex), while simultaneously supporting standard telephone services. The system can be deployed in any multi-dwelling/multi-tenant environment (apartment blocks, hotels, or office complexes) to provide both high-speed Internet access and telephone services without any need for re-wiring.

VDSL switches combine both the data and phone signals coming from your Internet and telephone service providers, and pass these signals directly over standard telephone wiring to multiple users in the same building. The CPE is used to separate these signals and pass them on to a customer's computer and telephone equipment.

The VDSL2 switch is typically located in a wiring closet or other central location of a multi-dwelling/multi-tenant unit, campus, or enterprise. An Internet connection is provided from the ISP to the customer's building over fiber optic cable, running Ethernet directly over a 1 to 10 Gbps connection. This kind of WAN connection is referred to as Fiber To The Building (FTTB). Data signals entering a site are first passed through an Ethernet switch that segregates the signals for individual user connections, and are then fed into the switch. Phone signals are also routed from PBX/

ABOUT THE TIGERACCESS-EE CPE

MDF distribution equipment into the switch. The data and phone signals for each user are combined in the switch, and passed over VDSL lines to individual customers.

The CPE at the customer end of the VDSL line connects to any PC or Macintosh equipped with a 10BASE-T or 100BASE-TX network interface card. Your existing telephone, modem, or fax machine simply plugs into the CPE's phone port. There is no need for splitters, terminators, or filters. In fact, there is no need to modify the home wiring at all. And because the VDSL connection is based on Ethernet, no complex software configuration is required.

VDSL Technology

VDSL (Very High Bit-Rate Digital Subscriber Line) is at the high-end of all the DSL technologies, offering the best combination of fiber optics and copper to provide high-speed broadband Internet access. VDSL's primary application is in providing a broadband data service to multi-tenant residential or commercial buildings. In this implementation, fiber optic cable carries the data from a telephone company's central office to the building; then the installed telephone copper wires take the data and deliver it to individual units within that building.

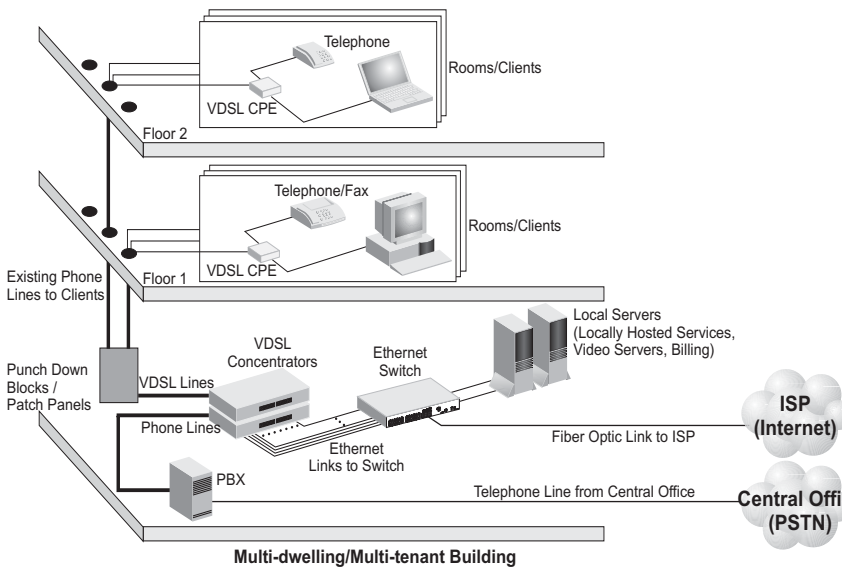


Figure 1-1 Providing Broadband Internet Access through VDSL

VDSL provides high-speed Internet access over existing phone lines by making use of previously unused frequency bandwidth above the voice band (i.e., up to 30 MHz with VDSL2). By placing VDSL signals above the frequency of the voice signal, a VDSL service can coexist on the same line with other telephone services. VDSL can operate symmetrically, providing the same data rate in both directions, or asymmetrically, providing a higher

data rate in the downstream (receive) direction than in the upstream (transmit) direction.

VDSL delivers high-performance online applications, such as high-quality video and other switched multimedia services. This Ethernet VDSL2 CPE system provides robust performance, with a symmetric data rate up to 100 Mbps, and a range up to 200 meters (656 ft).

This system is based on advanced VDSL2 Multi-Carrier Modulation (MCM) technology with adaptive channel equalization that overcomes bridge taps and other line distortions. Reed-Solomon Forward Error Correction and interleaving protects against errors due to impulse noise, and enables recovery from signal interruptions. Frequency Division Duplexing (FDD) separates downstream and upstream channels and allows VDSL signals to coexist with regular telephone services. A power back-off mechanism is also implemented to reduce noise from crosstalk in line bundles.

Features and Benefits

VDSL features (CPE side) include:

- High-speed Internet access over existing phone lines
- VDSL2 connection provides the following rate/range options:

Table 1-1 Maximum Rates and Distances

Rate	Mode	Max. Range
100 Mbps	Symmetric	200 m (656 ft)
80/35 Mbps	Asymmetric	300 m (984 ft)

- Concurrent data and telephone services (voice/ISDN) over a single connection
- Always-on digital connection eliminates dial-up delays, providing transparent reconnection when initiating a network request

- Supports ITU-T VDSL/VDSL2 and ANSI T1E1.4 Part 1 VDSL interface standards, as well as other evolving ETSI, ANSI, and ITU VDSL standards for the copper local loop
- Spectral compatibility with VDSL, VDSL2, ADSL, ADSL2+, ISDN (2B1Q/4B3T), Smartphone digital PBX extensions and narrowband interference
- Robust operation on severely distorted lines
- Supports power back-off algorithm that permits a mixed distance deployment
- LEDs indicate VDSL link status, and power
- Simple plug-and-play installation

Additional VDSL2 features (CPE side) include:

- Fast startup for quick initialization
- Trellis coding modulation for higher performance
- Seamless rate adaption for enhanced quality in video applications
- Variable tone spacing enables best performance for long and short reach lines
- Improved framing, overhead channel, and interleaving

System Requirements

Before you start installing the CPE, make sure you can provide the right operating environment. See the following installation requirements:

- A PC or Macintosh with a 10/100 Mbps Ethernet adapter card installed.
- For Internet access, the computer must be configured for TCP/IP.

ABOUT THE TIGERACCESS-EE CPE

- Power requirements: 12 VDC via the included AC power adapter. Make sure that a properly grounded power outlet is within 1.8 m (6 ft) of the CPE.
- The CPE should be located in a cool dry place, with at least 5 cm (2 in.) of space on all sides for ventilation.
- Place the CPE out of direct sunlight, and away from heat sources or areas with a high amount of electromagnetic interference. The temperature and humidity should be within the ranges listed in the specifications.
- Be sure that the CPE is also accessible for the Ethernet and telephone cabling.

CHAPTER 2

HARDWARE DESCRIPTION

Unpacking

After unpacking this CPE, check the contents to be that sure you have received all the components. Then, before beginning the installation, be sure that you have all other necessary installation equipment.

Please inform your dealer if there are any incorrect, missing, or damaged parts. If possible, retain the carton, including the original packing materials. Use them again to repack the product in case there is a need to return it for repair.

Front and Rear Panel

This device is an external VDSL2 CPE for high-speed Internet access applications. The front panel of the CPE provides an array of system and port status indicators. The rear panel includes ports for the VDSL line, a 10/100 Mbps Ethernet connection to a computer, and an RJ-11 phone jack for connection to a telephone. The rear panel also includes a DC power input jack.

The following figure shows the external components of the CPE:

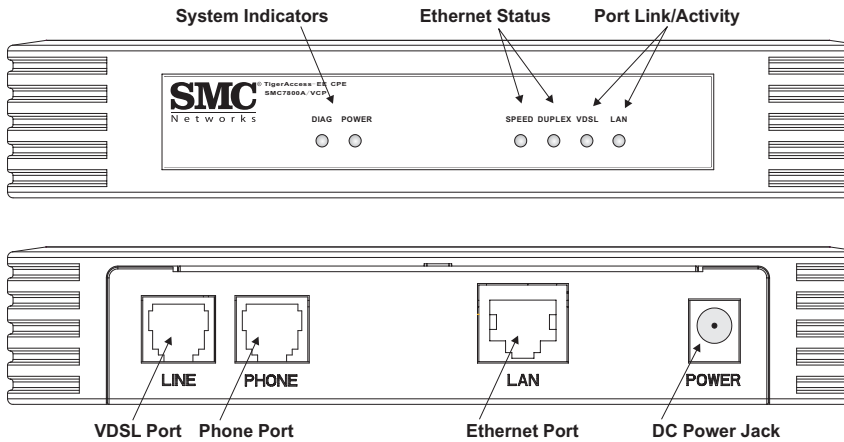


Figure 2-1 Front and Rear Panels

System and Port Status LEDs

The CPE includes key system and port indications that simplify installation and network troubleshooting. The LEDs, which are located on the front panel for easy viewing, are described in the following table.

Table 2-1 System and Port Status LEDs

LED	Status	Description
<i>System Status Indicators</i>		
POWER	On	Power is being supplied to the CPE.
	Off	No power is being supplied to the CPE.
DIAG*	On	A failure has been detected during bootstrap (including self-test failure or other problem).
	Off	CPE successfully passed bootstrap diagnostics.
	Flashing	Diagnostics are in progress.
<i>Port Status Indicators</i>		
SPEED	On	Ethernet port is operating at 100 Mbps.
	Off	Ethernet port is operating at 10 Mbps.
DUPLEX	On	Ethernet port is operating at full duplex.
	Off	Ethernet port is operating at half duplex.
VDSL*	On	VDSL port has a valid link with a VDSL switch.
	Off	VDSL port has no link with a VDSL switch.
	Flashing	VDSL port training connection to VDSL switch.
LAN	On	Ethernet port has a valid link with attached device.
	Off	Ethernet port has no link with other device.
	Flashing	CPE is transmitting or receiving data on this port.

* These LEDs also turn on when firmware is being updated.

HARDWARE DESCRIPTION

CHAPTER 3

INSTALLATION

Installation Overview

Before installing the CPE, verify that you have all the items listed in the “Unpacking” on page 2-1. If any of the items are missing or damaged, contact your local distributor. Also, be sure you have all the necessary tools and cabling before installing the CPE.

Cable Connections

Depending on the wiring configuration used in your house, separate wall jacks may be used for telephone and VDSL services. Otherwise, you will need to connect telephones and your computer directly to the CPE.

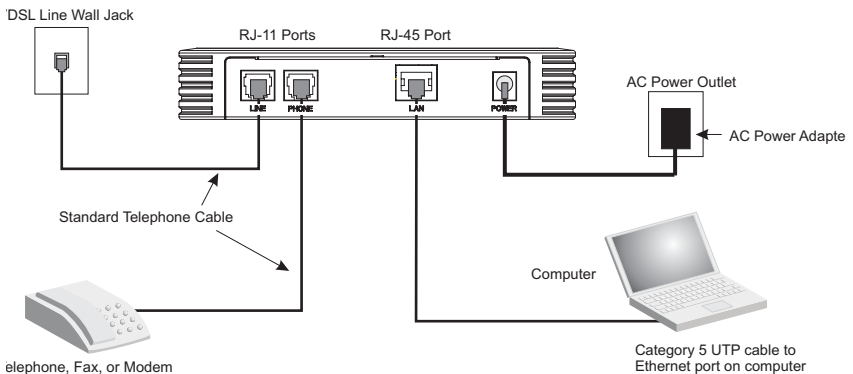


Figure 3-1 Connecting the CPE

INSTALLATION

1. Using standard telephone cable, connect the CPE's RJ-11 LINE port to the RJ-11 telephone wall jack providing the VDSL service.
2. Connect a telephone or fax machine to the RJ-11 port on the CPE labeled PHONE.
3. For the Ethernet connection, make sure you have installed a 10BASE-T or 100BASE-TX network adapter card in the computer.
4. Prepare straight-through shielded or unshielded twisted-pair cables with RJ-45 plugs at both ends. Use 100-Ohm Category 3, 4, or 5 cable for a 10 Mbps Ethernet connection, or Category 5 cable for a 100 Mbps connection.
5. Connect one end of the cable to the RJ-45 port of the network interface card, and the other end to the RJ-45 LAN port on the CPE.

When inserting an RJ-45 plug, be sure the tab on the plug clicks into position to ensure that it is properly seated.

Caution: Do not plug a phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

- Notes:**
1. When connecting to a hub or switch, use crossover cabling. (Refer to “Crossover Wiring” on page B-4 for a description of crossover cable.)
 2. Make sure the twisted-pair cable connected to the CPE LAN port does not exceed 100 meters (328 feet).

Powering On

Plug the power adapter cord into the DC 12V power socket on the CPE, then plug the power adapter directly into a power outlet. Check the LED marked POWER on the front panel to be sure it is on.

Configuring the TCP/IP Protocols

To connect the CPE to a computer through its Ethernet port, the computer must have an Ethernet network adapter card installed, and be configured for the TCP/IP protocol. Many service providers configure TCP/IP for client computers automatically using a networking technology known as Dynamic Host Configuration Protocol (DHCP). Other service providers may specify an IP configuration (known as a static IP address), which must be entered manually.

Carry out the following steps to check that the computer's Ethernet port is correctly configured for DHCP.

Windows 95/98/NT

1. Click "Start/Settings/Control Panel."
2. Click the "Network" icon.
3. For Windows NT, click the "Protocols" tab.
4. Select "TCP/IP" from the list of network protocols; this may include details of adapters installed in your computer.
5. Click "Properties."
6. Check the option "Obtain an IP Address."

Windows 2000

1. Click "Start/Settings/Network/Dial-up Connections."
2. Click "Local Area Connections."
3. Select "TCP/IP" from the list of network protocols.
4. Click on "Properties."
5. Select the option "Obtain an IP Address."

Windows XP

1. Click “Start/Control Panel/Network Connections.”
2. Right-click the “Local Area Connection” icon for the adapter you want to configure.
3. Highlight “Internet Protocol (TCP/IP).”
4. Click on “Properties.”
5. Select the option “Obtain an IP address automatically” and “Obtain DNS server address automatically.”

Mac OS

1. Pull down the Apple Menu. Click “Control Panels” and select “TCP/IP.”
2. In the TCP/IP dialog box, verify that “Ethernet” is selected in the “Connect Via:” field.
3. If “Using DHCP Server” is already selected in the “Configure” field, your computer is already configured for DHCP. Otherwise, select “Using DHCP Server” in the “Configure” field and close the window.
4. Another box will appear asking whether you want to save your TCP/IP settings. Click “Save.”
5. Your service provider will now be able to automatically assign an IP address to your computer.

APPENDIX A

TROUBLESHOOTING

Diagnosing CPE Indicators

CPE operation is easily monitored via the LED indicators to identify problems. The table below describes common problems you may encounter and possible solutions. If the solutions in the table fail to resolve the problem, contact technical support for advice.

Table A-1 Troubleshooting Chart

Symptom	Cause	Solution
POWER indicator does not light up after power on.	Power outlet, power cord, or external power adapter may be defective.	<ul style="list-style-type: none">• Check the power outlet by plugging in another device that is functioning properly.• Check the power adapter with another CPE.
LAN link indicator does not light up after making a connection.	Network interface (e.g., a network adapter card in the attached computer), network cable, or CPE LAN port may be defective.	<ul style="list-style-type: none">• Verify that the CPE and computer are powered on.• Be sure the cable is plugged into both the CPE and the computer.• Verify that the proper cable type is used and its length does not exceed specified limits.• Check the network adapter in the computer and cable connections for possible defects. Replace the defective adapter or cable if necessary.

Table A-1 Troubleshooting Chart (Continued)

<p>VDSL indicator does not light up after making a connection.</p>	<p>VDSL switch, cabling, or CPE LINE port may be defective.</p>	<ul style="list-style-type: none"> • Verify that the CPE and attached VDSL switch are powered on. • Be sure the cable is plugged into both the CPE and an RJ-11 telephone jack. • Check the cable connections on the CPE, wall jack, punch-down block/patch panel, and the VDSL switch for possible defects. Replace the defective cable if necessary.
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If You Cannot Connect to the Internet

- Check that your computer is properly configured for TCP/IP. See “Configuring the TCP/IP Protocols” on page 3-3.
- Make sure the correct network adapter driver is installed for your operating system. If necessary, try reinstalling the driver.
- Check that the network adapter’s speed or duplex mode has not been configured manually. We recommend setting the adapter to auto-negotiation when installing the network driver.

APPENDIX B

CABLES

Twisted-Pair Cable and Pin Assignments

For 10BASE-T and 100BASE-TX connections, the twisted-pair cable must have two pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

Caution: DO NOT plug a phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform with FCC standards.

Caution: Each wire pair must be attached to the RJ-45 connectors in a specific orientation. (See “10BASE-T/100BASE-TX Pin Assignments” on page B-2 for an explanation.)

The figure below illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.

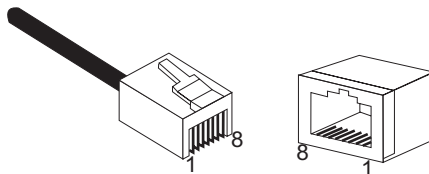


Figure B-1 RJ-45 Connector Pin Numbers

10BASE-T/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3, 4 or 5 cable for 10 Mbps connections, or 100-ohm Category 5 cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

The RJ-45 ports on the CPE support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or gateways. In straight-through cable, pins 1, 2, 3, and 6, at one end of the cable, are connected straight through to pins 1, 2, 3, and 6 at the other end of the cable. When using the RJ-45 port on this CPE, you can use either straight-through or crossover cable.

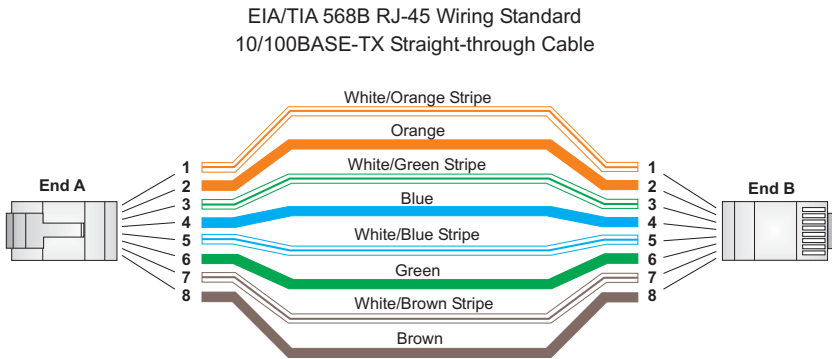
Table B-1 10/100BASE-TX MDI and MDI-X Port Pinouts

Pin	MDI Signal Name	MDI-X Signal Name
1	Transmit Data plus (TD+)	Receive Data plus (RD+)
2	Transmit Data minus (TD-)	Receive Data minus (RD-)
3	Receive Data plus (RD+)	Transmit Data plus (TD+)
6	Receive Data minus (RD-)	Transmit Data minus (TD-)
4,5,7,8	Not used	Not used

Note: The “+” and “-” signs represent the polarity of the wires that make up each wire pair.

Straight-Through Wiring

If twisted-pair cable is to join two ports and only one of the ports has an internal crossover (MDI-X), the two pairs of wires must be straight-through. (When auto-negotiation is enabled for the RJ-45 port on the CPE, you can use either straight-through or crossover cable to connect to any device type.)



Crossover Wiring

If the twisted-pair cable is to join two ports and either both ports are labeled with an “X” (MDI-X) or neither port is labeled with an “X” (MDI), a crossover must be implemented in the wiring. (When auto-negotiation is enabled for the RJ-45 port on the CPE, you can use either straight-through or crossover cable to connect to any device type.)

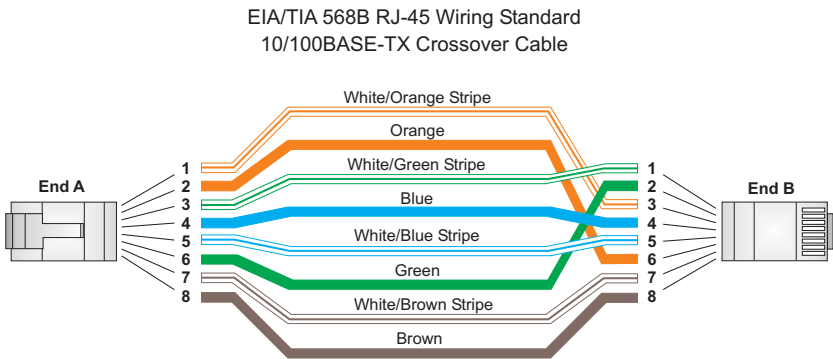


Figure B-3 Crossover Wiring

Cable Testing for Existing Category 5 Cable

Installed Category 5 cabling must pass tests for Attenuation, Near-End Crosstalk (NEXT), and Far-End Crosstalk (FEXT). This cable testing information is specified in the ANSI/TIA/EIA-TSB-67 standard. Additionally, cables must also pass test parameters for Return Loss and Equal-Level Far-End Crosstalk (ELFEXT). These tests are specified in the ANSI/TIA/EIA-TSB-95 Bulletin, “The Additional Transmission Performance Guidelines for 100 Ohm 4-Pair Category 5 Cabling.”

Note that when testing your cable installation, be sure to include all patch cables between switches and end devices.

RJ-11 Ports

Standard telephone RJ-11 connectors and cabling can be found in several common wiring patterns. These six-pin connectors can accommodate up to three wire-pairs (three telephone lines), but usually only one or two pairs of conductor pins and wires are implemented.

The RJ-11 ports on the side of the CPE contain two wire-pairs, an inner pair (pins 3 and 4) and outer pair (pins 2 and 5). On the LINE port, the inner wire-pair carries both voice and digital data. On the PHONE port, the inner wire-pair carries voice only.

The outer wire-pair is only connected if there is a second telephone line, and carries voice only.

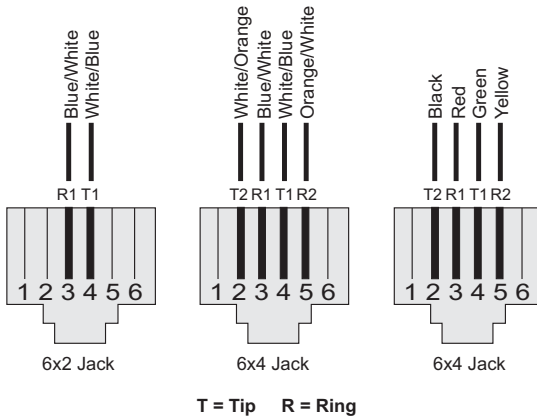


Figure B-4 RJ-11 Wiring

Table B-2 RJ-11 Port Pinouts

Pin	Signal Name	Wire Color
1	Not used	
2	Line 2 Tip	Black or White/Orange
3	Line 1 Ring	Red or Blue/White
4	Line 1 Tip	Green or White/Blue
5	Line 2 Ring	Yellow or Orange/White
6	Not used	

APPENDIX C

SPECIFICATIONS

VDSL Functional Criteria

Band Plan: Up to 6 bands

Signal Bandwidth: 25 kHz to 30MHz

Optional Band: US0 operating at 4~25 kHz (low end) to 138~276 kHz (high end)

Multi-Carrier-Modulation (MCM) - DMT modulation

Interleaving: general convolution

Tone Spacing: 8.6 kHz

Upstream Power Back-off (UPBO)

Remote firmware upgrade

Physical Characteristics

Ports

1 RJ-11 VDSL line (to phone jack in the wall)

1 RJ-11 phone line (POTS connection to telephone)

1 RJ-45 10/100BASE-TX (Ethernet connection to PC or gateway)

Ethernet Interface

RJ-45 connector, auto MDI/X pinout detection

10BASE-T: 100-ohm, UTP cable; Category 3 or better

100BASE-TX: 100-ohm, UTP cable; Category 5 or better

* Maximum Cable Length - 100 m (328 ft)

VDSL2 Interface

RJ-11 connector, using standard phone cable (26 AWG)

SPECIFICATIONS

Power Consumption

7 Watts maximum

Input Power

12 VDC (via AC power adapter), 1 A maximum
Typical 700 mA maximum

Size

15.5 x 12.85 x 2.8 cm (6.1 x 5.06 x 1.1 in.)

Weight

374 g (13.19 oz)

Temperature

Operating: 0 °C to 40 °C (32 °F to 104 °F)
Storage: -40 °C to 70 °C (-40 °F to 158 °F)

Humidity

Operating: 5% to 95% (non-condensing)

LED Indicators

System: POWER, DIAG (diagnostic)
Port: SPEED (Ethernet), DUPLEX, VDSL, LAN

Standards

Ethernet Standards

IEEE 802.3 10BASE-T
IEEE 802.3U 100BASE-T
IEEE 802.3x Flow Control

VDSL Standards

ANSI T1E1.4 Part 1 - VDSL Interface
ITU-T G.993.1 - VDSL
ITU-T G.993.2 - VDSL2
ITU-T G.993.2 Annex C - Band Plan for Japan
ITU-T 997 and 998 Band Plans
Other evolving ETSI, ANSI, ITU standards

Compliances

CE Mark

Emissions

FCC Class B

FCC Part 68

Industry Canada Class B

EN55022 (CISPR 22) Class B

EN 61000-3-2/3

CNS 13438 Class B

Immunity

EN 61000-4-2/3/4/5/6/8/11

Safety

CSA/CUS (CSA 22.2. NO 60950-1 & UL60950-1)

CB (IEC60950-1)

SPECIFICATIONS

GLOSSARY

10BASE-T

IEEE 802.3 specification for 10 Mbps Ethernet over two pairs of Category 3, 4, or 5 UTP cable.

100BASE-TX

IEEE 802.3u specification for 100 Mbps Fast Ethernet over two pairs of Category 5 or better UTP cable.

Auto-Negotiation

Signalling method allowing each node to select its optimum operational mode (e.g, speed and duplex mode) based on the capabilities of the node to which it is connected.

Bandwidth

The difference between the highest and lowest frequencies available for network signals. Also synonymous with wire speed, the actual speed of the data transmission along the cable.

Domain Name Service (DNS)

A system used for translating host names for network nodes into IP addresses.

Dynamic Host Control Protocol (DHCP)

Provides a framework for passing configuration information to hosts on a TCP/IP network. DHCP is based on the Bootstrap Protocol (BOOTP), adding the capability of automatic allocation of reusable network addresses and additional configuration options.

End Station

A workstation, server, or other device that does not forward traffic.

Ethernet

A network communication system developed and standardized by DEC, Intel, and Xerox, using baseband transmission, CSMA/CD access, logical bus topology, and coaxial cable. The successor IEEE 802.3 standard provides for integration into the OSI model and extends the physical layer and media with repeaters and implementations that operate on fiber, thin coax and twisted-pair cable.

Fast Ethernet

A 100 Mbps network communication system based on Ethernet and the CSMA/CD access method.

Full Duplex

Transmission method that allows two network devices to transmit and receive concurrently, effectively doubling the bandwidth of that link.

ITU

International Telecommunication Union

ITU-T

Telecommunication Standardization Section of ITU

LAN Segment

Separate LAN or collision domain.

Layer 2

Data Link layer in the ISO 7-Layer Data Communications Protocol. This is related directly to the hardware interface for network devices and passes on traffic based on MAC addresses.

LED

Light emitting diode used for monitoring a device or network condition.

Local Area Network (LAN)

A group of interconnected computer and support devices.

Media Access Control (MAC)

A portion of the networking protocol that governs access to the transmission medium, facilitating the exchange of data between network nodes.

Management Information Base (MIB)

An acronym for Management Information Base. It is a set of database objects that contains information about a specific device.

Plain Old Telephone Service (POTS)

One of the services using voice band. Sometimes used as a descriptor for all voice band services.

Private Branch Exchange (PBX)

A telephone exchange local to a particular organization who use, rather than provide, telephone services.

RJ-45 Connector

A connector for twisted-pair wiring.

Splitter

A filter to separate VDSL signals from POTS or ISDN signals to prevent mutual interference. (Note that an external splitter is not required for this CPE.)

TIA

Telecommunications Industry Association

Transmission Control Protocol/Internet Protocol (TCP/IP)

Protocol suite that includes TCP as the primary transport protocol, and IP as the network layer protocol.

UTP

Unshielded twisted-pair cable.

User Datagram Protocol (UDP)

UDP provides a datagram mode for packet-switched communications. It uses IP as the underlying transport mechanism to provide access to IP-like services. UDP packets are delivered just like IP packets – connection-less datagrams that may be discarded before reaching their targets. UDP is useful when TCP would be too complex, too slow, or just unnecessary.

Very high data rate Digital Subscriber Line (VDSL)

A family of digital telecommunications protocols designed to allow high speed data communication at data rates from below 1 Mbps to 52.8 Mbps with corresponding maximum reach ranging from 4500 feet to 1000 feet using 24 gauge twisted pair cable over the existing copper telephone lines between end-users and service providers.

Very high data rate Digital Subscriber Line 2 (VDSL2)

VDSL2 as defined in ITU-T Recommendation G.993.2 is an enhancement to the first VDSL standard (G.993.1). It supports transmission at a bi-directional net data rate (the sum of upstream and downstream rates) of up to 200 Mbps on twisted pair cables using a bandwidth of up to 30 MHz.

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