NetVanta 4660/5660
Hardware Installation Guide

17004660F1/F3	NetVanta 4660 Chassis
17024660F1	NetVanta 4660 Chassis (2nd Generation)
17005660F1	NetVanta 5660 Chassis
17025660F1	NetVanta 5660 Chassis (2nd Generation)
17406368F1	NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex A
17406368F3	NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex B
17806368F1	NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex A
17806368F3	NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex B
17406369F1	NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex A
17406369F3	NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex B

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

901 Explorer Boulevard
P.O. Box 140000
Huntsville, AL 35814-4000
Phone: (256) 963-8000

Conventions

Notes provide additional useful information.

Cautions signify information that could prevent service interruption or damage to the equipment.

Warnings provide information that could prevent injury or endangerment to human life.

Safety Instructions

When using your telephone equipment, please follow these basic safety precautions to reduce the risk of fire, electrical shock, or personal injury:

1. Do not use this product near water, such as a bathtub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.
2. Avoid using a telephone (other than a cordless type) during an electrical storm. There is a remote risk of shock from lightning.
3. Do not use the telephone to report a gas leak in the vicinity of the leak.
4. Use only the power cord, power supply, and batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.
5. The socket-outlet shall be installed near the equipment and shall be easily accessible.

If any of the following conditions occur, unplug the product from the electrical outlet and replace the part or contact your qualified service personnel:

1. The power cable, extension cable, or plug is damaged.
2. An object has fallen into the product.
3. The product has been exposed to water.
4. The product has been dropped or damaged.
5. The product does not operate correctly when you follow the operating instructions.

These units contain no user-serviceable parts. They should only be serviced by qualified service personnel.

Additional safety guidelines, such as Waste Electrical and Electronic Equipment (WEEE), are given in the document NetVanta Safety and Regulatory Information available online at http://supportforums.adtran.com.

Save These Important Safety Instructions

FCC-Required Information

FCC regulations require that the following information be provided in this manual:

1. This equipment complies with Part 68 of Federal Communications Commission (FCC) rules and requirements adopted by America's Carriers Telecommunications Association (ACTA). Each registered interface has a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, provide this information to the telephone company.
2. If this equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given; otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.
3. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment. Advance notification and the opportunity to maintain uninterrupted service are given.
4. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. The telephone company may require this equipment to be disconnected from the network until the problem is corrected, or it is certain the equipment is not malfunctioning.
5. This unit contains no user-serviceable parts.
6. This equipment is designed to connect to the telephone network or premises wiring using an FCC-compatible modular jack, which is compliant with Part 68 and requirements adopted by ACTA.
7. The following information may be required when applying to the local telephone company for leased line facilities:

Part Number	Registration Number	Service Type	REN/SOC	FIC	USOC
17406368F1	US:HDCDLNAN7806368F1	SHDSL	9.0F	Metallic	RJ-48C
17806368F1					
17406369F1	US:HDCDL01B7406369F1	VDSL2	0.0B	02LS2	RJ-11

8. The ringer equivalence number (REN) is useful in determining the quantity of devices you may connect to your telephone line and still have all of those devices ring when your number is called. In most areas, the sum of the RENs of all devices should not exceed five. To be certain of the number of devices you may connect to your line as determined by the REN, call your telephone company to determine the maximum REN for your calling area.
9. This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs. Contact your state public utility commission or corporation commission for information.

FCC Radio Frequency Interference Statement

This equipment has been tested and found 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 generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio frequencies. 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.

Electromagnetic Compatibility (EMC) Table

NetVanta Module P/N and Name		NetVanta 4660	NetVanta 5660
17406368F1	Carrier Ethernet Quad SHDSL EFM Module, Annex A	FCC Part 15 Class B EN 300 386	FCC Part 15 Class B EN 300 386
17406368F3	Carrier Ethernet Quad SHDSL EFM Module, Annex B	FCC Part 15 Class B EN 300 386	FCC Part 15 Class B EN 300 386
17806368F1	Carrier Ethernet Octal SHDSL EFM Module, Annex A	FCC Part 15 Class B EN 300 386	FCC Part 15 Class B EN 300 386
17806368F3	Carrier Ethernet Octal SHDSL EFM Module, Annex B	FCC Part 15 Class B EN 300 386	FCC Part 15 Class B EN 300 386
17406369F1	Carrier Ethernet Quad VDSL2 EFM Module, Annex A	FCC Part 15 Class B EN 300 386	FCC Part 15 Class B EN 300 386
17406369F3	Carrier Ethernet Quad VDSL2 EFM Module, Annex B	FCC Part 15 Class B EN 300 386	FCC Part 15 Class B EN 300 386

Industry Canada Compliance Information

This product meets the applicable Industry Canada technical specifications.

The Ringer Equivalence Number (REN) is an indication of the maximum number of devices allowed to be connected to a telephone interface. The termination of an interface may consist of any combination of devices subject only to the requirement that the sum of the RENs of all the devices not exceed five.

Le présent matériel est conforme aux specifications techniques applicables d'Industrie Canada.

L'indice d'équivalence de la sonnerie (IES) sert à indiquer le nombre maximal de terminaux qui peuvent être raccordés à une interface téléphonique. La terminaison d'une interface peut consister en une combinaison quelconque de dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excède pas cinq.

Canadian Emissions Requirements

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 the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioelectriques applicables aux appareils numériques de Class A prescrites dans la norme sur le materiel brouilleur: “Appareils Numériques,” NMB-003 edictee par le ministre des Communications.

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Third-Party Software

The software included in this product contains copyrighted software that is licensed under the GNU General Public License (GPL). For a list of third-party software and their licenses, go to http://www.adtran.com/software/EULA. You can obtain the complete corresponding source code of such software components from ADTRAN for a period of three years after our last shipment of this product by sending a money order or check for $5 to:

ADTRAN, Inc, P.O. Box 933638, Atlanta, GA 31193-3638
Please write **GPL Source for product NetVanta 4660/5660** in the memo line of your payment.

This offer is valid to anyone in receipt of this information.

Service and Warranty

For information on the service and warranty of ADTRAN products, visit the *Support* section of the ADTRAN website at http://www.adtran.com.

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List of Tables

1. INTRODUCTION

This hardware installation guide describes the NetVanta 4660/5660 Series units' physical characteristics, lists their features and specifications, introduces basic functionality, and provides installation instructions in the following sections:

- *Physical Description on page 12*
- *Features and Specifications on page 15*
- *Option Modules on page 19*
- *Unit Installation on page 26*

For additional information on shipping contents, mounting options, network module installation, and power the unit, refer to the following sections:

- *Shipping Contents on page 12*
- *Mounting Options on page 27*
- *Supplying Power to the Unit on page 29*
- *Installing Network Modules on page 29*

For information on NetVanta 4660/5660 Series configuration for a specific application, refer to the configuration guides provided on the ADTRAN Support Community. For details on the command line interface (CLI), refer to the *AOS Command Reference Guide*. All other related documents are also available online at http://supportforums.adtran.com.

2. PHYSICAL DESCRIPTION

The NetVanta 4660 is an integrated Layer 2 and Layer 3 carrier Ethernet services router providing a universal edge device supporting any mix of Layer 3 IP Virtual Private Network (VPN), Layer 2 VPN (E-LINE/E-LAN), and Internet access services. The NetVanta 4660 eases the transition from Layer 3 IP VPN services delivered over TDM-based Point-to-Point Protocol (PPP) or Frame Relay circuits to Ethernet-based services delivered over broadband access networks (EoX, VDSL2, GPON, PPP over Ethernet (PPPoE)).

The NetVanta 5660 builds on the architecture of the NetVanta 4660 and is designed to allow service providers to provide Gigabit throughput for both Layer 2 and Layer 3 services. Service providers can deliver higher bandwidth services to their customers for mobile devices as well as reliable and fast connectivity for cloud-based applications.

All NetVanta 4660/5660s include an option module slot for future VDSL and SHDSL modules. There are four 10/100/1000Base-T combination (copper or small form factor pluggable (SFP)) local area network (LAN) interfaces – all with carrier Ethernet functionality – and one fiber-only interface.

In the event that a single EFM loop fails, the NetVanta 4660/5660 will continue to operate on the remaining loop, providing redundancy. Once the failed loop is operational again, the NetVanta 4660/5660 will automatically detect its availability and will automatically recover to the original configuration.

Network Modules Supported

The main base unit supports interchangeable network modules. The network modules currently available in this series include the following:

- Carrier Ethernet Quad SHDSL EFM Module, Annex A
- Carrier Ethernet Quad SHDSL EFM Module, Annex B
- Carrier Ethernet Octal SHDSL EFM Module, Annex A
- Carrier Ethernet Octal SHDSL EFM Module, Annex B
- Carrier Ethernet Quad VDSL2 EFM Module, Annex A
- Carrier Ethernet Quad VDSL2 EFM Module, Annex B

SFP Module Slots

The NetVanta 4660/5660 Series has five small form-factor pluggable (SFP) slots that accept a number of industry standard SFP modules. The SFP modules provide Gigabit Ethernet fiber connectivity for high-speed uplinks. For a list of supported SFP modules, visit the ADTRAN website at http://www.adtran.com.

Shipping Contents

Each NetVanta 4660/5660 Series units are shipped in their own cardboard shipping carton. Open each carton carefully, and avoid deep penetration into the carton with sharp objects.

After unpacking the unit, inspect it for possible shipping damage. If the equipment has been damaged in transit, immediately file a claim with the carrier and contact ADTRAN Customer Service (refer to the *Support* page on the ADTRAN website at http://www.adtran.com/support).

NetVanta 4660/5660 Series Domestic Shipping Contents

Domestic shipments of the NetVanta 4660/5660 Series include the following items:

- NetVanta 4660/5660 base unit
- Set of two 19-inch rack mounting brackets
- Set of 4 rubber mounting feet
- Six mounting screws
- Quick start guide

NetVanta 4660/5660 Series International Shipping Contents

International shipments of the NetVanta 4660/5660 Series include the following items:

- NetVanta 4660/5660 base unit
- Set of two ETSI/23-inch rack mounting brackets
- Set of 4 rubber mounting feet
- Six mounting screws
- Quick start guide

NetVanta 4660/5660 Series Front Panel Design

The NetVanta 4660/5660 Series front panel is shown below along with a description of all connectors and interfaces.

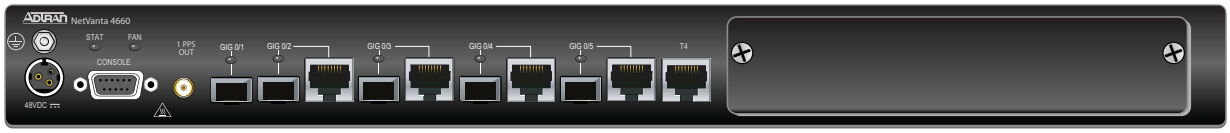

Figure 1. NetVanta 4660/5660 Series Front Panel Layout

Power Connector

The power connector, labeled **48VDC**, provides connection for a 48 VDC power source. Please refer to *Supplying Power to the Unit on page 29* for connection details.

Status LEDs

The **STAT** LED indicates the unit's status. The **FAN** LED reflects the status of the fan. The **GIG 0/1** through **GIG 0/5** LEDs reflect the status of the 10/100/1000Base-T Ethernet interfaces. See the *Table 1 on page 14* for LED behaviors.

CONSOLE Interface

The **CONSOLE** interface is an EIA-232 serial port (DCE), which provides for local management and configuration (via a DB-9 female connector). See *Table A-1 on page 31* for the **CONSOLE** interface pinouts.

> **NOTE** *Connection directly to an external modem requires a cross-over cable.*

10/100/1000Base-T Ethernet Interfaces

The **GIG 0/1** port consists of one SFP slot for connectivity over fiber. The status LED is located above the interface.

The **GIG 0/2** through **GIG 0/5** ports consist of one RJ-45 and one SFP slot for connectivity over fiber. (Use either the RJ-45 connector *or* the SFP slot. The fiber slot has precedence.) See *Table A-3 on page 32* for the Ethernet interface pinouts. The status LEDs, are located above each interface.

1 PPS 50 ohm Phase Synchronization Measurement Interface

The phase synchronization interface, labeled **1 PPS OUT**, provides a one pulse per second output which can be used to connect to measurement equipment.

- Period: 1 second +/-1 ppm
- Pulse Width: 200 ns (minimum), 500 ms (maximum), 10 us (typical)
- Rise Time: 5 ns (maximum)
- Voh: 5.5 V (maximum), 1.2 V (minimum)
- Vol: 0.3 V (maximum), -0.3 V (minimum)

Timing Interface

The RJ-45 interface, labeled **T4**, is provided for timing output in both T12 and E12 modes.

Option Slot

The option slot accepts a variety of network modules (refer to *Option Modules on page 19*).

LED Descriptions

The following table describes LED activity for the NetVanta 4660/5660 Series.

Table 1. Front Panel Status LED Behaviors

LED	Color	Indication
STAT	Off	Unit is not receiving power.
	Green (flashing)	The unit is powering up. On power up the **STAT** LED flashes rapidly for five seconds, during which time the user can escape to boot mode from the **CONSOLE** port.
	Green (solid)	The power is on and self-test passed.
	Red (solid)	The power is on, but the self-test failed or the application code could not be booted.
STAT	Off	Unit is not receiving power.
FAN	Green (solid)	Both fans are functioning properly.
	Amber (solid)	Only one fan is functioning.
	Red (solid)	Neither fan is functioning.
GIG 0/1 through **GIG 0/5**	Off	Port is inactive or administratively disabled.
	Green (solid)	The link is up.
	Amber (flashing)	There is activity on the link.

3. FEATURES AND SPECIFICATIONS

NetVanta 4660

- Universal edge device supporting modular Layer 2/3 Carrier Ethernet services with Gigabit combo interfaces

NetVanta 5660

- Same functionality as the NetVanta 4660 with the addition of Gigabit line rate for both Layer 2 and Layer 3 routing

Physical Interfaces

Ethernet

- Four 10/100/1000Base-T dual copper or SFP and one fiber-only SFP for a total of five Gigabit Ethernet interfaces
  - All ports included in chassis
  - All Ethernet interfaces include carrier Ethernet functionality
- Full duplex
- RJ-45 connectors
- Supports 802.1q VLAN trunking

Modular WAN Options

- Quad SHDSL, Annex A and B
- Octal SHDSL, Annex A and B
- Quad VDSL2, Annex A and B

Processor and Memory

- RAM: 512 MB
- Flash: 128 MB

Protocols

- eBGP/iBGP
- Open Shortest Path First (OSPF)
- RIP (v1 and v2)
- GRE
- IGMP v2
- Layer 3 Backup
- Multi-VRF CE
- PPP
- PPPoE
- PAP and CHAP
- Multihoming
- VRRP

Management and Utilities

- AOS command line interface (CLI)
- ADTRAN n-Command® Managed Service Platform (MSP)
- Simple Network Management Protocol version 3 (SNMPv3)
- SYSLOG logging
- Telnet, craft/console port, SSH, ping, trace route, NTP
- TCL scripting
- Policy statistics
- Email alerts (SMTP)

LEDs

- Status
- Fan
- GIG 0/1 through GIG 0/5

Layer 3 Quality of Service (QoS)

- Low Latency Queuing, Weighted Fair Queuing (WFQ), and Class-based WFQ
- DiffServ packet marking and recognition
- Frame Relay fragmentation
- Traffic monitoring (NetFlow 9)

Security

Firewall

- Stateful inspection firewall
- Denial of service (DoS) protection
- Access control lists (ACLs)
- Application level gateways (ALGs)

Network Address Translation

- Network address translation (NAT) (1:1, many:1) and 1:1 port translation
- NAT-compatible SIP ALG

Secure Management

- Multi-level access control
- TACACS+
- RADIUS AAA
- SSH CLI and SSL GUI

Content Filtering

- Inherent URL filter
- Top website reports
- Integration with Websense®

Virtual Private Network (VPN) (Optional)

- IPSec Tunnel Mode: Tunnels 1,000

- Encryption: DES, 3DES, and AES
- Authentication Mechanisms:
  - XAUTH Secure ID
  - X.509 digital certificates
  - DSS Signatures
  - Preshared keys

DSL Features

- Variable rate bonding for the SHDSL loops
- Automatic failover and recovery
- Plug-and-play automatic line detection

Ethernet Features

- IEEE 802.1p priority marking
- IEEE 802.1d dynamic/transparent bridging
- IEEE 802.1Q virtual local area network (VLAN) tagging
- IEEE 802.3u Ethernet
- MEF 9/14 certified EPL, EVPL

Ethernet Services Support

- Priority queuing of traffic based on VLAN priority
  - Supports eight class of service (CoS) queues
  - Per UNI port, CE VLAN ID (C-Tag) and/or CE VLAN P-bits, DSCP fields
- Single stack VLAN and double stack VLANs (Q-in-Q)
  - Manipulation based on 802.1p and DSCP fields
  - STAG TPID provisioning supports 802.1ad and802.1Q standards
  - Port-based service support
- Services Scale and Flexibility
  - Configurable EtherType and TPID for service flexibility
  - VLAN IDs 2 to 4090; EVC configurable in the range of 1 to 4090
  - Ingress policers (tr3CM), CIR and EIR settings to 64 kbps granularity, configurable burst through EBS, CBS settings
  - Egress shaping per port
  - Up to 8 shapers per interface

Fault and Performance Management

- IEEE 802.3ah EFM standard
- ITU-T Y.1731 CFM, PM
- IEEE 802.3ah Link OAM
- ITU-T Y.1731 CFM, PM
- Supports OAM management status and loopback messaging
- Network monitoring enhancements

Environment

- Operating Temperature without AC power supply: -25°C to 70°C (-13°F to 158°F)
- Operating Temperature with AC power supply: 0°C to 40°C (32°F to 104°F)
- Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Relative Humidity: Up to 95 percent, noncondensing

Physical and Input Power

- Chassis: 1U high, 19-inch or 23-inch rack mountable metal enclosure
- Dimensions (1st Gen 4660/5660): 1.72-inch H x 17.22-inch W x 11.5-inch D
- Dimensions (2nd Gen 4660/5660): 1.72-inch H x 17.22-inch W x 8.66-inch D
- Input Voltage: 48 VDC

Agency Approvals

- FCC Part 15, Class B
- UL 60950-1, Second Edition
- EN 60950, Second Edition, A1, A11, A12
- AS/NZS 60950.1
- CSA C22.2 No. 60950-1, Second Edition
- CE Mark
- ETSI 300
- RoHS

4. OPTION MODULES

The NetVanta 4660/5660 Series supports several option modules designed to meet a variety of networking requirements. The option modules include plug-in network modules.

Network modules are cards that plug directly into the option module slot located on the front of the base unit. These cards provide the following types of interfaces:

This section describes each module, providing individual card specifications and features. Refer to *Appendix A on page 31* for pinout information. *Installing Network Modules on page 29* provides information on card installation.

Network Modules

NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex A (P/N 17406368F1)

The NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex A (shown in *Figure 2*) provides a WAN-SHDSL EFM interface. See *Table A-5 on page 33* for the Quad SHDSL EFM connector pinouts.

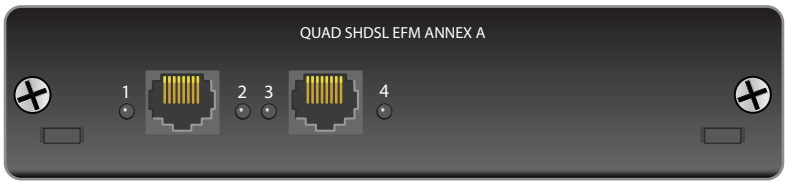

Figure 2. NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex A

Features and Specifications

Operating Mode
- Line termination (CO)
- Network termination (CPE)

SHDSL Interface
- Four 2-wire eSHDSL loops
- Supported Standards: ITU-T G.991.2 Annex A
- IEEE 802.3ah EFM bonding
- MEF compliant

Clock Source
- CPE Operating Mode: Network
- CO Operating Mode: Internal

Compliance
- EMC - see *Electromagnetic Compatibility (EMC) Table on page 6*.
- UL/CUL 60950-1
- ACTA/FCC Part 68
- IC CS-03
- RoHS compliant

Environmental
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Relative Humidity: Up to 95 percent, noncondensing

Physical
- Dimensions: 6.75-inch W x 6.59-inch D

Table 2. NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex A LED Behaviors

LED	Color	Indication
SHDSL 1 through **4**	Off	SHDSL loop is administratively shut down.
	Green (flashing)	SHDSL loop is training.
	Green (solid)	SHDSL loop is trained and EFM group is established.
	Amber (flashing)	SHDSL loop is trained but EFM group is not established.
	Amber (solid)	SHDSL loop is in test.
	Red (flashing)	SHDSL loop is in handshake process.
	Red (solid)	SHDSL loop connection failure.

NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex B (P/N 17406368F3)

The NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex B (shown in *Figure 3*) provides a WAN-SHDSL EFM interface. See *Table A-5 on page 33* for the Quad SHDSL EFM connector pinouts.

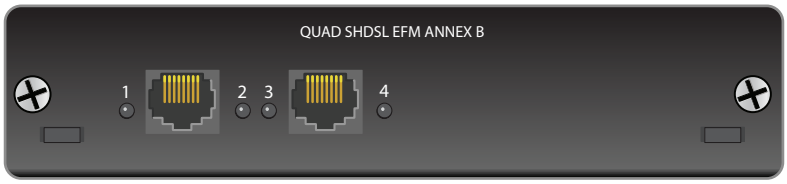

Figure 3. NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex B

Features and Specifications

Operating Mode
- Line termination (CO)
- Network termination (CPE)

SHDSL Interface
- Four 2-wire eSHDSL loops
- Supported Standards: ITU-T G.991.2 Annex B
- IEEE 802.3ah EFM bonding
- MEF compliant

Clock Source
- CPE Operating Mode: Network
- CO Operating Mode: Internal

Compliance
- EMC - see *Electromagnetic Compatibility (EMC) Table on page 6*.
- UL/CUL 60950-1
- AS/ACIF S043
- IEC 60950-1, Second Edition
- EN 60950-1, Second Edition
- AS/NZS 60950.1
- RoHS compliant

Environmental
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Relative Humidity: Up to 95 percent, noncondensing

Physical
- Dimensions: 6.75-inch W x 6.59-inch D

Table 3. NetVanta Carrier Ethernet Quad SHDSL EFM Module, Annex B LED Behaviors

LED	Color	Indication
SHDSL 1 through **4**	Off	SHDSL loop is administratively shut down.
	Green (flashing)	SHDSL loop is training.
	Green (solid)	SHDSL loop is trained and EFM group is established.
	Amber (flashing)	SHDSL loop is trained but EFM group is not established.
	Amber (solid)	SHDSL loop is in test.
	Red (flashing)	SHDSL loop is in handshake process.
	Red (solid)	SHDSL loop connection failure.

NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex A (P/N 17806368F1)

The NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex A (shown in *Figure 4*) provides a WAN-SHDSL EFM interface. See *Table A-6 on page 33* and *Table A-7 on page 33* for the Octal SHDSL EFM connector pinouts.

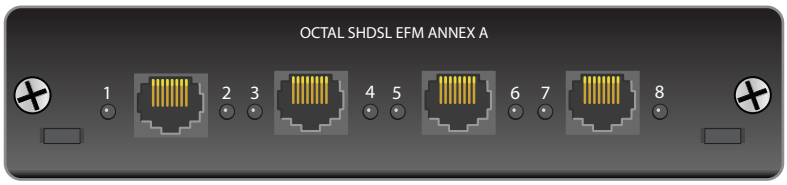

Figure 4. NetVanta Octal SHDSL EFM Network Module, Annex A

Features and Specifications

Operating Mode
- Line termination (CO)
- Network termination (CPE)

SHDSL Interface
- Eight 2-wire eSHDSL loops
- Supported Standards: ITU-T G.991.2 Annex A
- IEEE 802.3ah EFM bonding
- MEF compliant

Clock Source
- CPE Operating Mode: Network
- CO Operating Mode: Internal

Compliance
- EMC - see *Electromagnetic Compatibility (EMC) Table on page 6*.
- UL/CUL 60950-1
- ACTA/FCC Part 68
- IC CS-03
- RoHS compliant

Environmental
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Relative Humidity: Up to 95 percent, noncondensing

Physical
- Dimensions: 6.75-inch W x 6.59-inch D

Table 4. NetVanta Octal SHDSL EFM Network Module, Annex A LED Behaviors

LED	Color	Indication
SHDSL 1 through **8**	Off	SHDSL loop is administratively shut down.
	Green (flashing)	SHDSL loop is training.
	Green (solid)	SHDSL loop is trained and EFM group is established.
	Amber (flashing)	SHDSL loop is trained but EFM group is not established.
	Amber (solid)	SHDSL loop is in test.
	Red (flashing)	SHDSL loop is in handshake process.
	Red (solid)	SHDSL loop connection failure.

NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex B (P/N 17806368F3)

The NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex B (shown in *Figure 5*) provides a WAN-SHDSL EFM interface. See *Table A-6 on page 33* and *Table A-7 on page 33* for the Octal SHDSL EFM connector pinouts.

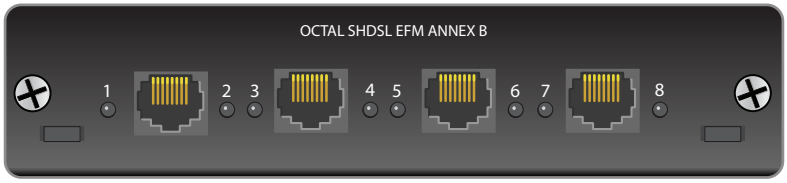

Figure 5. NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex B

Features and Specifications

Operating Mode
- Line termination (CO)
- Network termination (CPE)

SHDSL Interface
- Eight 2-wire eSHDSL loops
- Supported Standards: ITU-T G.991.2 Annex B
- IEEE 802.3ah EFM bonding
- MEF compliant

Clock Source
- CPE Operating Mode: Network
- CO Operating Mode: Internal

Compliance
- EMC - see *Electromagnetic Compatibility (EMC) Table on page 6*.
- UL/CUL 60950-1
- AS/ACIF S043
- IEC 60950-1, Second Edition
- EN 60950-1, Second Edition
- AS/NZS 60950.1
- RoHS compliant

Environmental
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Relative Humidity: Up to 95 percent, noncondensing

Physical
- Dimensions: 6.75-inch W x 6.59-inch D

Table 5. NetVanta Carrier Ethernet Octal SHDSL EFM Module, Annex B LED Behaviors

LED	Color	Indication
SHDSL 1 through **8**	Off	SHDSL loop is administratively shut down.
	Green (flashing)	SHDSL loop is training.
	Green (solid)	SHDSL loop is trained and EFM group is established.
	Amber (flashing)	SHDSL loop is trained but EFM group is not established.
	Amber (solid)	SHDSL loop is in test.
	Red (flashing)	SHDSL loop is in handshake process.
	Red (solid)	SHDSL loop connection failure.

NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex A (P/N 17406369F1)

The NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex A (shown in *Figure 6*) provides a WAN-VDSL interface. See *Table A-8 on page 34* for the Quad VDSL2 connector pinouts.

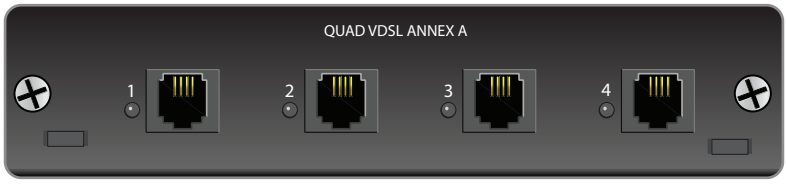

Figure 6. NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex A

Features and Specifications

Operating Mode
- Line termination (CO)
- Network termination (CPE)

SHDSL Interface
- Four 2-wire VDSL loops
- Supported Standards: ITU-T G.991.2 Annex A
- IEEE 802.3ah EFM bonding
- MEF compliant

Clock Source
- CPE Operating Mode: Network
- CO Operating Mode: Internal

Compliance
- EMC - see *Electromagnetic Compatibility (EMC) Table on page 6*.
- UL/CUL 60950-1
- ACTA/FCC Part 68
- IC CS-03
- RoHS compliant

Environmental
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Relative Humidity: Up to 95 percent, noncondensing

Physical
- Dimensions: 6.75-inch W x 6.59-inch D

Table 6. NetVanta Carrier Ethernet Quad VDSL EFM Module, Annex A LED Behaviors

LED	Color	Indication
SHDSL 1 through **4**	Off	VDSL loop is administratively shut down.
	Green (flashing)	VDSL loop is training.
	Green (solid)	VDSL loop is trained and EFM group is established.
	Amber (flashing)	VDSL loop is trained but EFM group is not established.
	Amber (solid)	VDSL loop is in test.
	Red (flashing)	VDSL loop is in handshake process.
	Red (solid)	VDSL loop connection failure.

NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex B (P/N 17406369F3)

The NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex B (shown in *Figure 7*) provides a WAN-VDSL interface. See *Table A-8 on page 34* for the Quad VDSL2 connector pinouts.

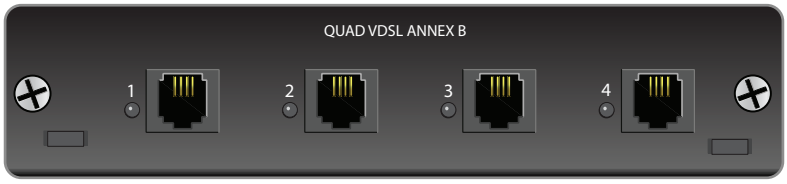

Figure 7. NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex B

Features and Specifications

Operating Mode
- Line termination (CO)
- Network termination (CPE)

SHDSL Interface
- Four 2-wire VDSL loops
- Supported Standards: ITU-T G.991.2 Annex B
- IEEE 802.3ah EFM bonding
- MEF compliant

Clock Source
- CPE Operating Mode: Network
- CO Operating Mode: Internal

Compliance
- EMC - see *Electromagnetic Compatibility (EMC) Table on page 6*.
- UL/CUL 60950-1
- AS/ACIF S043
- IEC 60950-1, Second Edition
- EN 60950-1, Second Edition
- AS/NZS 60950.1
- RoHS compliant

Environmental
- Operating Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Temperature: -40°C to 85°C (-40°F to 185°F)
- Relative Humidity: Up to 95 percent, noncondensing

Physical
- Dimensions: 6.75-inch W x 6.59-inch D

Table 7. NetVanta Carrier Ethernet Quad VDSL2 EFM Module, Annex B LED Behaviors

LED	Color	Indication
SHDSL 1 through **4**	Off	VDSL loop is administratively shut down.
	Green (flashing)	VDSL loop is training.
	Green (solid)	VDSL loop is trained and EFM group is established.
	Amber (flashing)	VDSL loop is trained but EFM group is not established.
	Amber (solid)	VDSL loop is in test.
	Red (flashing)	VDSL loop is in handshake process.
	Red (solid)	VDSL loop connection failure.

5. UNIT INSTALLATION

The instructions and guidelines provided in this section cover hardware installation topics, such as mounting options, supplying power to the unit, and installing option cards. These instructions are presented as follows:

For information on configuring a specific application, refer to the configuration guides provided on the ADTRAN's Support Forum or the *AOS Command Reference Guide*.

WARNING

To prevent electrical shock, do not install equipment in a wet location or during a lightning storm.

CAUTION

- *The NetVanta 4660/5660 Series is intended to be installed, maintained, and serviced by qualified service personnel only and should be installed in a restricted access location as described in UL/IEC 60950-1.*
- *Ethernet cables are intended for intrabuilding use only. Connecting an ADTRAN unit directly to Ethernet cables that run outside the building in which the unit is housed will void the user's warranty and could create a fire or shock hazard. To connect an ADTRAN unit to Ethernet cables that run outside the building, ADTRAN's Ethernet Port Protection Device (EPPD) (P/N 1700502G1) must be connected between the unit and the outside plant cable. Use of any Ethernet protector other than ADTRAN's for this purpose will void the user's warranty.*

CAUTION

Electronic modules can be damaged by static electrical discharge. Before handling modules, put on an antistatic discharge wrist strap to prevent damage to electrical components. Place modules in antistatic packing material when transporting or storing. When working on modules, always place them on an approved antistatic mat that is electrically grounded.

Tools Required

The customer-provided tools required for the hardware installation of the NetVanta are:

- Ethernet cables
- Network cables (module dependent)
- Phillips-head screwdriver (rackmount applications only)
- Drill and drill bit set (wallmount applications only)

NOTE

To access the CLI of the NetVanta, you will also need a PC with terminal emulation software and a console port cable. Instructions on how to access the CLI are available in the quick start guide shipped with your unit or online at ADTRAN's Support Forum.

Mounting Options

The unit may be installed in rackmount, wallmount, or tabletop configurations. The following sections provide step-by-step instructions for rack mounting and wall mounting.

Rack Mounting the NetVanta

The NetVanta is a 1U-high, rack-mountable unit that can be installed in a 19-inch, 23-inch, or ETSI equipment rack. The following steps guide you in mounting the NetVanta into a rack.

- *If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature specified by the manufacturer.*
- *Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.*
- *Be careful not to compromise the stability of the equipment mounting rack when installing this product.*
- *Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading the circuit might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.*
- *Reliable grounding of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use of power strips).*

Instructions for Rack Mounting the NetVanta	
Step	**Action**
1	Attach the appropriate rackmount brackets in the appropriate (either 19-inch, 23-inch, or ETSI) position using the supplied screws.
2	To allow proper grounding, scrape the paint from the rack around the mounting holes where the NetVanta will be positioned.
3	Position the NetVanta in a stationary equipment rack allowing 1U space above the unit for ventilation.
4	Have an assistant hold the unit in position as you install two mounting bolts through the unit's brackets and into the equipment rack using a #2 Phillips-head screwdriver.
5	Apply power to the unit (refer to *Supplying Power to the Unit on page 29*).

Wall Mounting the NetVanta

By following these instructions exactly, the NetVanta can be safely mounted on the wall.

CAUTION

- *To avoid damaging the unit, use only the screws included in the shipment when attaching mounting ears to the chassis.*
- *When wall mounting the NetVanta, care must be taken not to damage the power cord. Do not attach the power cord to the building surface or run it through walls, ceilings. floors, or openings in the building structure.*
- *The socket-outlet must be installed near the equipment and must be easily accessible.*

Instructions for Wall Mounting the NetVanta	
Step	**Action**
1	Attach the 19-inch rack mounting brackets rotated 90 degrees so the rackmount tab (two screw holes) is parallel with the unit (see *Figure 8 on page 28*).
2	Decide on a location for the NetVanta, keeping in mind that the unit needs to be mounted at or below eye-level so that the LEDs are viewable. The NetVanta 4660/5660 Series can only be wall mounted with the front panel facing upward (see *Figure 8 on page 28*).
3	Prepare the mounting surface by attaching a board (typically plywood, 3/4-inch to 1-inch thick) to a wall stud using #6 to #10 (2.5-inch or greater in length) wood screws. ***Important!*** *Mounting to a stud ensures stability. Using sheetrock anchors may not provide sufficient long-term stability.*
4	Have an assistant hold the unit in position as you install two #6 to #10 (1-inch or greater in length) wood screws through the unit's brackets and into the mounted board (see *Figure 8 on page 28*).
5	Proceed to the steps given in *Connecting Ground to the Unit on page 29* and *Supplying Power to the Unit on page 29*.

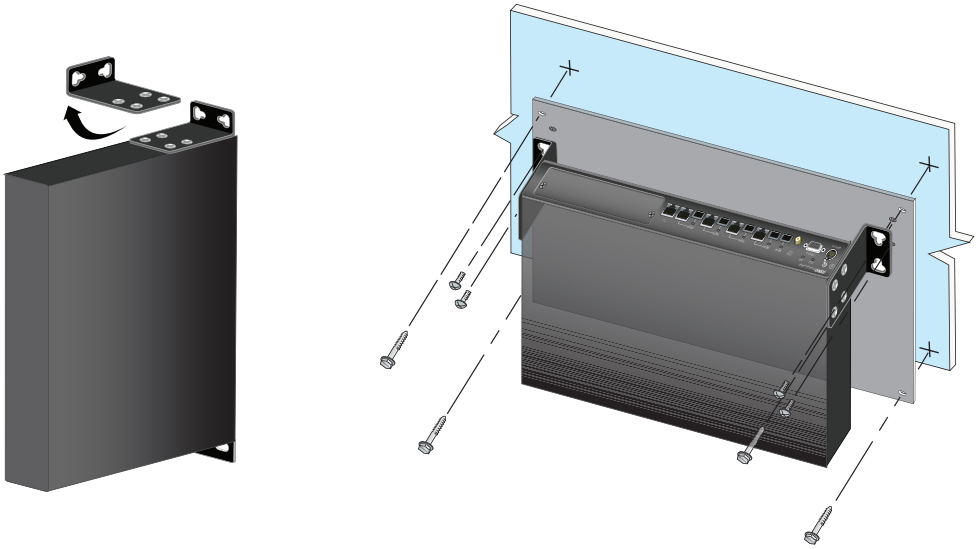

Figure 8. Wallmount Installation

Connecting Ground to the Unit

Connect the supplemental ground before connecting the power and signal connectors. Connect the unit to a reliable ground point using a minimum 18 AWG (0.75 mm sq.) ground wire and a UL listed closed loop connector that is suitable for the ground stud and wire size.

Supplying Power to the Unit

The NetVanta 4660/5660 Series connects to a 48 VDC power source. To power this unit, follow the steps below.

- *Use a reliably grounded 48VDC SELV source.*
- *Use a branch circuit over-current protective device rated maximum 20 A.*
- *Use a power cable having a construction and wire size based on the branch overcurrent device suitable for the NEC or Authority Having Jurisdiction.*
- *This unit shall be installed in accordance with Articles 300 and 400 of NEC NFPA 70.*
- *Maximum recommended ambient operating temperature is 70ºC.*
- *The maximum ambient operating temperature may be limited by the maximum operating temperature of the power supply used with the unit. Review the operating requirements for all devices during deployment to ensure the proper operating environment is maintained.*

Instructions for Powering the NetVanta 4660/5660 Series	
Step	**Action**
1	With the flat side up, insert the locking DC power plug into the receptacle labeled **48VDC** on the front of the unit. You will hear a click indicating the connector is fully inserted and locked into the receptacle.
2	Insert the power cable into the appropriate receptacle on the adapter.
3	Insert the other end of the power cable into a properly grounded power source.

Installing Network Modules

The network modules are installed into the front panel option module slot. The following table lists the installation steps. Also, see *Figure 9 on page 30*.

WARNING

For NetVanta modules with outside plant connections, ensure that all cables are removed from the module before installing or removing it from the NetVanta chassis.

CAUTION

- *Electronic modules can be damaged by static electrical discharge. Before handling modules, put on an antistatic discharge wrist strap to prevent damage to electrical components. Place modules in antistatic packing material when transporting or storing. When working on modules, always place them on an approved antistatic mat that is electrically grounded.*
- *Always remove power from the unit prior to removing or installing a module.*
- *Improper installation could result in damage to the modules.*

Instructions for Installing the Network Modules	
Step	**Action**
1	Remove power from the unit.
2	Use a screwdriver to remove the cover plate from the option slot in the NetVanta base unit.
3	Slide the option module into the option slot until the module is firmly seated against the chassis (see *Figure 9*).
4	Secure the screws at both edges of the module using a screwdriver.
5	Connect the cables to the associated device(s).
6	Restore power to the unit.

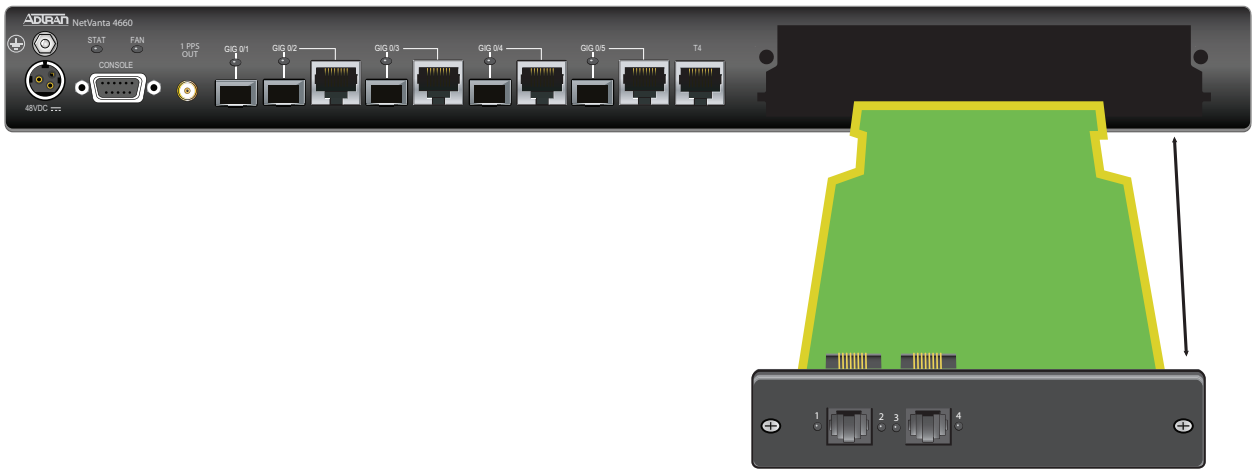

Figure 9. Network Module Installation

Your NetVanta unit is now ready to be configured and connected to the network. For information on configuration for a specific application, refer to the configuration guides provided online on ADTRAN's Support Forum For details on the CLI, refer to the *AOS Command Reference Guide*. All other related documents are also available online on ADTRAN's Support Forum.

APPENDIX A. CONNECTOR PIN DEFINITIONS

The following tables provide the pin assignments for the base unit and network interface modules (NIMs).

Base Unit Pinouts

Table A-1. CONSOLE Port Pinouts

Pin	Name	Description
1	DCD	Data Carrier Detect (output)
2	RD	Receive Data (output)
3	TD	Transmit Data (input)
4	DTR	Data Terminal Ready (input)
5	SG	Signal Ground
6	DSR	Data Set Ready (output)
7	RTS	Request to Send (input)
8	CTS	Clear to Send (output)
9	—	Unused

Table A-2. SFP Slot Pinouts

Pin	Name	Pin	Name
1	TGND	11	RGND
2	TX FAULT	12	RX-
3	TX DISABLE	13	RX+
4	MOD DEF(2)	14	RGND
5	MOD DEF(1)	15	VccR
6	MOD DEF(0)	16	VccT
7	RATE SELECT	17	TGND
8	LOS	18	TX+
9	RGND	19	TX-
10	RGND	20	TGND

Table A-3. 1000Base-T Gigabit Ethernet Port Pinouts

Pin	Name	Description
1	TRD0+	Transmit/Receive Positive
2	TRD0-	Transmit/Receive Negative
3	TRD1+	Transmit/Receive Positive
4	TRD2+	Transmit/Receive Positive
5	TRD2-	Transmit/Receive Negative
6	TRD1-	Transmit/Receive Negative
7	TRD3+	Transmit/Receive Positive
8	TRD3-	Transmit/Receive Negative

Table A-4. T4 Port Pinouts

Pin	Name	Description
1-3	—	Unused
4	R	Transmit data toward the network–Ring
5	T	Transmit data toward the network–Tip
6	—	Unused
7	GND	Ground
8	—	Unused

Network Module Pinouts

Table A-5. Quad SHDSL EFM Pinouts

Ports 1 and 2			Ports 3 and 4		
Pin	**Name**	**Description**	**Pin**	**Name**	**Description**
1	T02	Loop 2 - Tip	1	T04	Loop 4 - Tip
2	R02	Loop 2 - Ring	2	R04	Loop 4 - Ring
3	—	Unused	3	—	Unused
4	T01	Loop 1 - Tip	4	T03	Loop 3 - Tip
5	R01	Loop 1 - Ring	5	R03	Loop 3 - Ring
6-8	—	Unused	6-8	—	Unused

Table A-6. Octal SHDSL EFM (Ports 1 through 4) Pinouts

Ports 1 and 2			Ports 3 and 4		
Pin	**Name**	**Description**	**Pin**	**Name**	**Description**
1	T02	Loop 2 - Tip	1	T04	Loop 4 - Tip
2	R02	Loop 2 - Ring	2	R04	Loop 4 - Ring
3	—	Unused	3	—	Unused
4	T01	Loop 1 - Tip	4	T03	Loop 3 - Tip
5	R01	Loop 1 - Ring	5	R03	Loop 3 - Ring
6-8	—	Unused	6-8	—	Unused

Table A-7. Octal SHDSL EFM (Ports 5 through 8) Pinouts

Ports 5 and 6			Ports 7 and 8		
Pin	**Name**	**Description**	**Pin**	**Name**	**Description**
1	T06	Loop 6 - Tip	1	T08	Loop 8 - Tip
2	R06	Loop 6 - Ring	2	R08	Loop 8 - Ring
3	—	Unused	3	—	Unused
4	T05	Loop 5 - Tip	4	T07	Loop 7 - Tip
5	R05	Loop 5 - Ring	5	R07	Loop 7 - Ring
6-8	—	Unused	6-8	—	Unused

Table A-8. Quad VDSL2 Pinouts

Pin	Name	Description
1, 2	—	Unused
3	Ring	Ring lead of the 2-wire interface
4	Tip	Tip lead of the 2-wire interface
5, 6	—	Unused