



VDSL Line Driver



CE NOTICE

The CE symbol on your Black Box equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

RADIO AND TV INTERFERENCE

The VDSL Line Driver generates and uses radio frequency energy, and if not installed and used properly-that is, in strict accordance with the manufacturer's instructions-may cause interference to radio and television reception. The VDSL Line Driver has been tested and found to comply with the limits for a Class A computing device in accordance with specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Line Driver does cause interference to radio or television reception, which can be determined by disconnecting the unit, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

FCC PART 68

**Caution**

The ME0011A-VDSL is not intended to be connected to the public telephone network.

**Caution**

The VLINK port is not intended to be connected to the public telephone network. The ME0010A-VDSL contains a POTS/ISDN connection that can be connected to the public telephone network.

This equipment complies with Part 68 of the FCC Rules. Please note the following:

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

- Universal Service Order code (USOC) jack: RJ-11C
- Facility Interface Code: 02LS2
- Service Order Code (SOC): 9.0F
- REN No.: 0.2

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA.

The REN is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. In most but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. The REN for this product is part of the product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (e.g., 03 is a REN of 0.3).

If this 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 operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, for repair or warranty information, please contact our company. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

INDUSTRY CANADA NOTICE

NOTICE: This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, *IC*, before the registration number signifies that registration was performed based on a Declaration of conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

TRADEMARKS USED IN THIS MANUAL

All applied-for and registered trademarks are the property of their respective owners.

NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT

Instrucciones De Seguridad

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en librerías o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico debe ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A. El cable de poder o el contacto ha sido dañado; u
 - B. Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C. El aparato ha sido expuesto a la lluvia; o

- D. El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
- E. El aparato ha sido tirado o su cubierta ha sido dañada.

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1. General Information

Thank you for your purchase of this Black Box product. If any questions arise during installation or use of the unit, contact Black Box Tech Support at (724) 746-5500.

1.1 Features

- Easy to install standalone VDSL Line Drivers—*no configuration required*
- Auto-sensing full or half-duplex Ethernet
- Auto-sensing 10/100Base-T
- Extends network connections up to 6,652 ft. (2.03 km) over 2-wire 24-AWG unconditioned lines
- Switch selectable line rates up to 16.67 Mbps
- 7 symmetric or asymmetric settings via DIP switch
- POTS/ISDN splitter on board
- Transparent operation
- LED indicators for Power, Ethernet Link & Activity, VDSL Link & Quality of Line (QOL)
- Surge suppression up to 20 kA (8/20 μ s)
- Available in rack-mount or standalone configurations
- Made in the USA

1.2 Description

The VDSL Line Driver/CO (Central Office)* and VDSL Line Driver/CP (Customer Premise) provide high speed LAN connections between peered Ethernet LANs, remote PC's, or any other network enabled 10/100Base-T device.

Operating in pairs, a VDSL Line Driver/CO located at one end of the LAN extension and an VDSL Line Driver/CP at the other end, these units can automatically forward LAN broadcasts, multicasts, and frames across a 2-wire voice-grade

* Only the ME0010A-VDSL has POTS/ISDN splitters on board.

twisted-pair link. The data is passed transparently (unmodified) through the VDSL Line Drivers. The Line Drivers automatically add and delete MAC addresses, only passing packets across the VDSL link that are meant for the remote peered LAN.

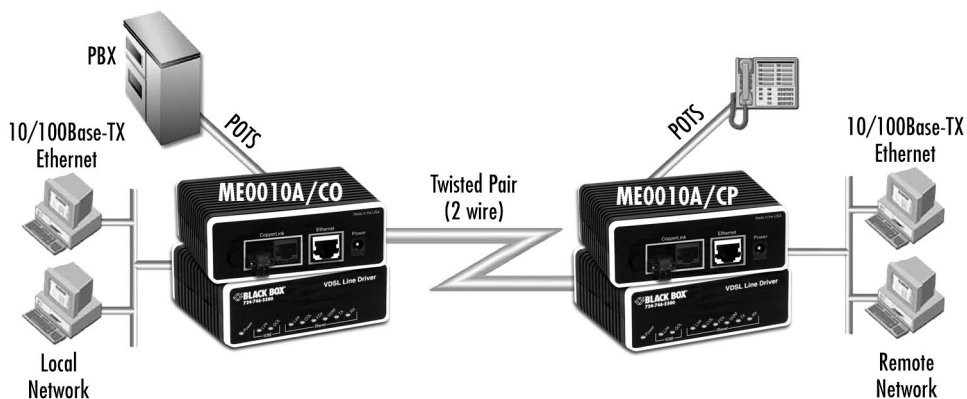


Figure 1. Typical application

The VDSL CO Line Driver and VDSL CP Line Driver work together to create a transparent extension between two peered Ethernet LANs. POTS/ISDN calls can be made over a VDSL link without interfering with the data. Figure 1 shows a typical point-to-point application.

2. Installation

Because the VDSL Line Driver requires no configuration, it can be installed quickly.

Note If asymmetric transmission or line rates other than 12.5 Mbps are required, refer to section 3., “Configuration” on page 17.

2.1 Installing the VDSL Line Driver

Do the following:

1. Connect the line interface between the units (refer to section 2.2, “Connecting the Twisted-Pair Line Interface” on page 12)

Note See Figure 2 for the standalone unit’s rear panel arrangements.

2. Connect the Ethernet interface (refer to section 2.3, “Connecting the 10/100Base-T Ethernet Interface” on page 13).
3. Connect the power plug (refer to section 2.5, “Connecting Power” on page 15).

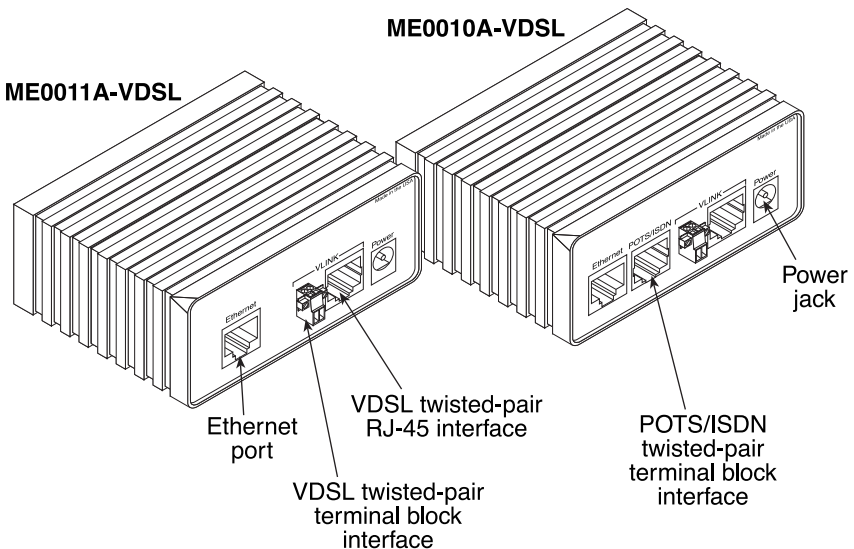


Figure 2. VDSL Line Driver standalone rear panel

2.2 Connecting the Twisted-Pair Line Interface

The VDSL Line Driver supports communication between two peer Ethernet LAN sites over a distance of up to 6,652 ft. (2.03 km) over 24 AWG (0.5 mm) twisted-pair wire.

Note Actual distance and link performance may vary depending on the environment and type/gauge of wire used.

Follow the steps below to connect the Line Driver interfaces.

The Line Driver units work in pairs. One of the units must be a Line Driver CO (Central Office), and the other unit must be a Line Driver CP (Customer Premise). It does not matter which end is the CO and which is the CP. The link is always initiated by the Line Driver CP. As long as the Line Driver CO is powered on, the Line Driver CP can establish a link by being powered on or by having its power reset.

1. To function properly, the two Line Drivers must be connected together using twisted-pair, unconditioned, dry, metal wire, between 19 (0.9mm) and 26 AWG (0.4mm). Leased circuits that run through signal equalization equipment are not acceptable.
2. The Line Driver is equipped with two interface jacks that can be used on the VDSL interface, an RJ-45 or a terminal block. These VDSL interfaces are a two-wire interface. Observe the signal/pin relationships on the Line Driver's VDSL interface jacks.

The RJ-45 connector on the Line Driver's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationship is shown in Figure 3.

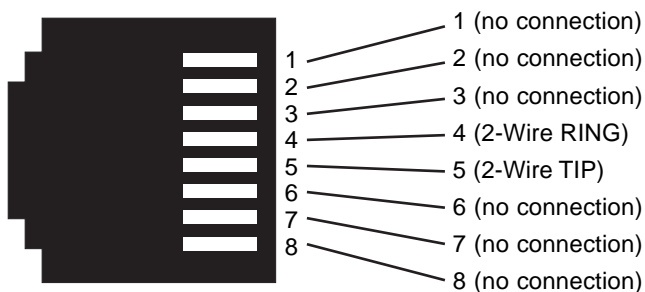


Figure 3. Line Driver (RJ-45) twisted pair line interface.

The terminal block connector on the Line Driver's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships is shown in Figure 4.

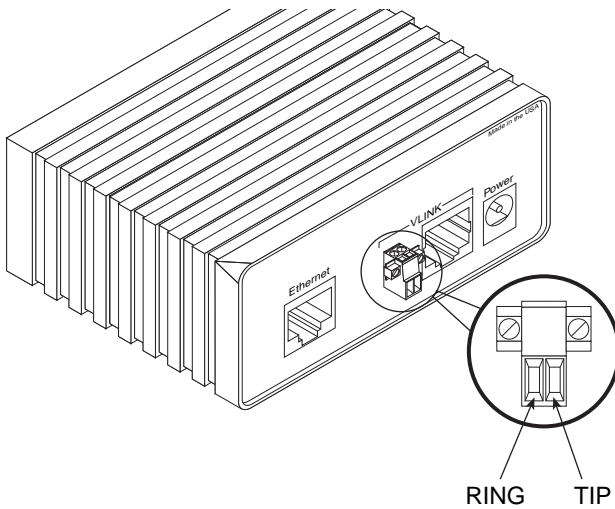


Figure 4. ME0011A-VDSL (Terminal Block) twisted pair line interface.

2.3 Connecting the 10/100Base-T Ethernet Interface

The shielded RJ-45 port labeled *Ethernet* is the 10/100Base-T interface. This port is designed to connect directly to a 10/100Base-T network. Figure 5 shows the signal/pin relationships on this interface. You may connect this port to another Ethernet device via a Type 4 or Type 5 cable that is up to 328 ft. (100 m) long.

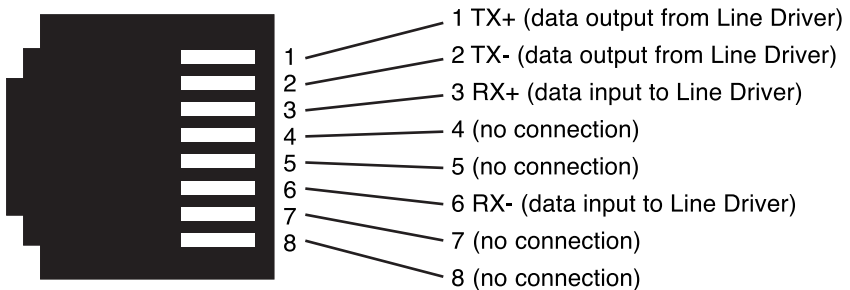


Figure 5. Line Driver 10/100Base-T RJ-45 Connector Pinout.

2.3.4 CONNECTING THE 10/100BASE-T ETHERNET PORT TO A HUB

The Line Driver 10/100Base-T interface is configured as DTE (Data Terminal Equipment), just like a 10/100Base-T network interface card in a PC. Therefore, it “expects” to connect to a 10/100Base-T Hub using a straight-through RJ-45 cable. Figure 6 diagrams the cable wiring for connecting the Line Driver to a 10/100Base-T hub.

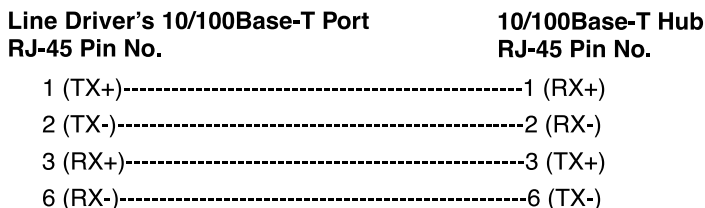


Figure 6. Wiring diagram for connecting the Line Driver to a 10/100Base-T hub

2.3.5 CONNECTING THE 10/100BASE-T ETHERNET PORT TO A PC (DTE)

The Line Driver 10/100Base-T interface is configured as DTE (Data Terminal Equipment). If you wish to connect the Line Driver to another DTE devices such as 10/100Base-T network interface card in a PC (or Line Drivers in a back-to-back arrangement), you must construct a 10/100Base-T crossover cable as shown in Figure 7.

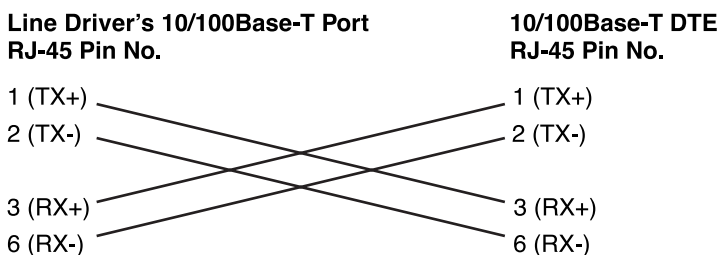


Figure 7. 10/100Base-T crossover cable

2.4 Connecting the POTS/ISDN line

The RJ-45 port labeled “POTS/ISDN” is the POTS/ISDN interface. A telephone or an ISDN device may be connected to this port and carried over the VDSL line. The units do not need power for the POTS interface to work. The RJ-45 connector in the Line Driver’s POTS/ISDN interface is wired as shown in Figure 8.

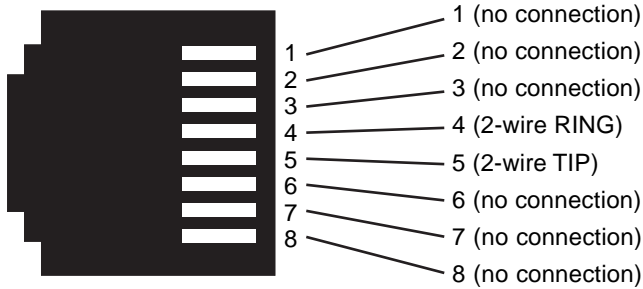


Figure 8. ME0010A-VDSL (RJ-45) POTS/ISDN interface

2.5 Connecting Power

An external AC or DC power supply is available separately. This connection is made via the barrel jack on the rear panel of the Line Driver. No configuration is necessary for the power supply (See Appendix B for domestic and international power supply and cord options).

DC power (supplied via the power supply jack to the Line Driver) must meet the following requirements; DC power supplied must be regulated +5VDC $\pm 5\%$, 1.0A minimum. Center pin is +5V. The barrel type plug has a 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

- Connect the equipment to a 5 VDC supply source that is electrically isolated from the AC source. The 5 VDC source must be reliably connected to earth.
- An approved external SELV source—rated a maximum of 5 VDC, 2 A—that incorporates a disconnect device must be used and positioned within easy reach of the operator’s position.

The Line Driver does not have a power switch, so it powers up as soon as it is plugged in.



WARNING

There are no user-serviceable parts in the VLINK modem. Fuse replacement should only be performed by qualified service personnel. Contact Black Box Technical support at (724) 746-5500 for more information.

3. Configuration

The VDSL Line Driver has four DIP switches for configuring the unit for a wide variety of applications. This section describes switch locations and explains the different configurations.

Using a small flat-tip screwdriver, remove the protective cover located on the underside of the Line Driver (see Figure 9).

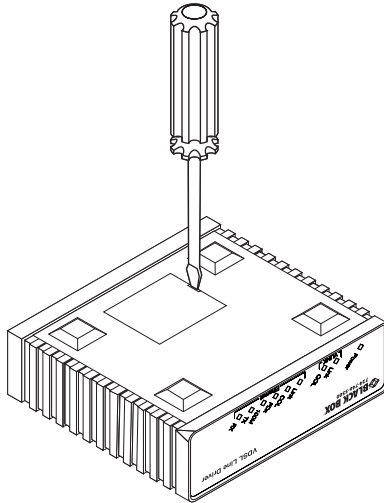


Figure 9. Removing protective cover

Figure 10 show the orientation of the DIP switches in the On and Off positions.

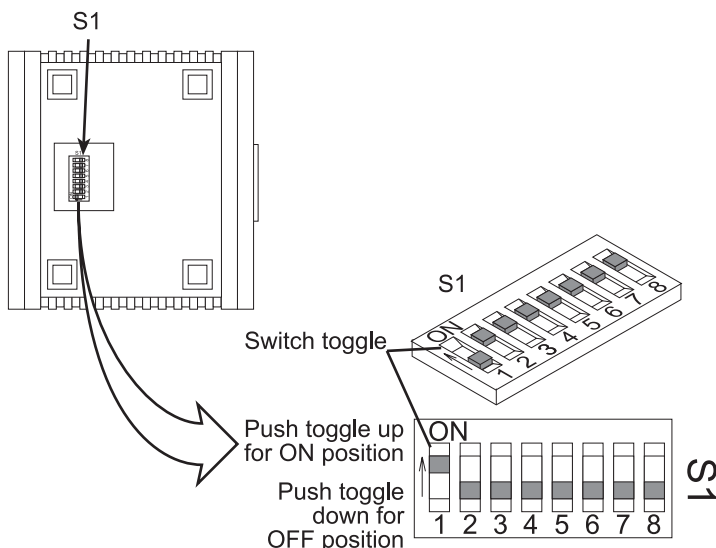


Figure 10. DIP switch orientation

3.1 Configuring DIP Switch S1

DIP switch S1 is where you configure the VDSL line rate, symmetric or asymmetric, Ethernet full auto negotiation capability (100Base-T full or half duplex, 10Base-T full or half duplex) or limited auto sense (only 100Base-T half duplex, 10Base-T full or half duplex).

3.1.1 SWITCH S1-1: ETHERNET AUTO SENSE

Use switch S1-1 to configure the unit for full auto sense capability or limited auto sense capability. Full Auto sense capability consists of standard Ethernet Auto sensing (100BaseT full duplex, 100BaseT half duplex, 10BaseT full duplex, and 10BaseT half duplex). Limited Auto sensing capability consists on only auto sensing for 100BaseT half duplex, 10BaseT full duplex, and 10BaseT half duplex. The limited auto negotiation feature is used when an Ethernet device does not comply with IEEE 802.3x (back pressure flow control) at 100M full duplex.

Table 1: Ethernet Auto Negotiation Selection Chart

S1-1	Setting
OFF	Full Auto Negotiation (Factory Default) (100 Mbps, Full or Half Duplex) (10 Mbps, Full or Half Duplex)

Table 1: Ethernet Auto Negotiation Selection Chart

S1-1	Setting
ON	Limited Auto Negotiation (100 Mbps Half Duplex) 10 Mbps Full or Half Duplex)

3.1.2 SWITCHES S1-2 AND S1-4: DATA RATE

Use switches S1-2 and S1-4 to configure the VDSL line rates.

Table 2: Symmetric VDSL Line Rates Selection Chart

S1-2	S1-3	S1-4	Symmetric Line Rate
ON	ON	ON	6.25 Mbps
ON	ON	OFF	9.38 Mbps
ON	OFF	OFF	12.5 Mbps (Factory Default)
ON	OFF	ON	16.67 Mbps

Table 3: Asymmetric VDSL Line Rates Selection Chart

S1-2	S1-3	S1-4	Asymmetric Line Rates DS/US
OFF	OFF	ON	4.17 Mbps/1.56 Mbps (Mode 0)
OFF	ON	ON	9.38 Mbps/1.56 Mbps
OFF	ON	OFF	16.67 Mbps/2.34 Mbps

Table 4: Reserved for future use

S1-5	S1-6	S1-7	S1-8	Reserved for future use
OFF	OFF	OFF	OFF	Reserved (Factory Default)

4. Operation

Once the VDSL Line Drivers are properly installed, they should operate transparently. No user settings required. This section describes reading the LED status monitors.

4.1 Power Up

Before applying power to the Line Driver, review section 2.5, “Connecting Power” on page 15 to verify that the unit is connected to the appropriate power source.



WARNING

There are no user-serviceable parts in the VLINK modem. Fuse replacement should only be performed by qualified service personnel. Contact Black Box Technical support at (724) 746-5500 for more information.

4.2 Front Panel LED Status Monitors

The Line Driver features five front panel LEDs that monitor power, the Ethernet signals, and the VDSL connection. Figure 11 on page 21 shows the front panel location of each LED. Table 5 on page 21 describes the LED functions.

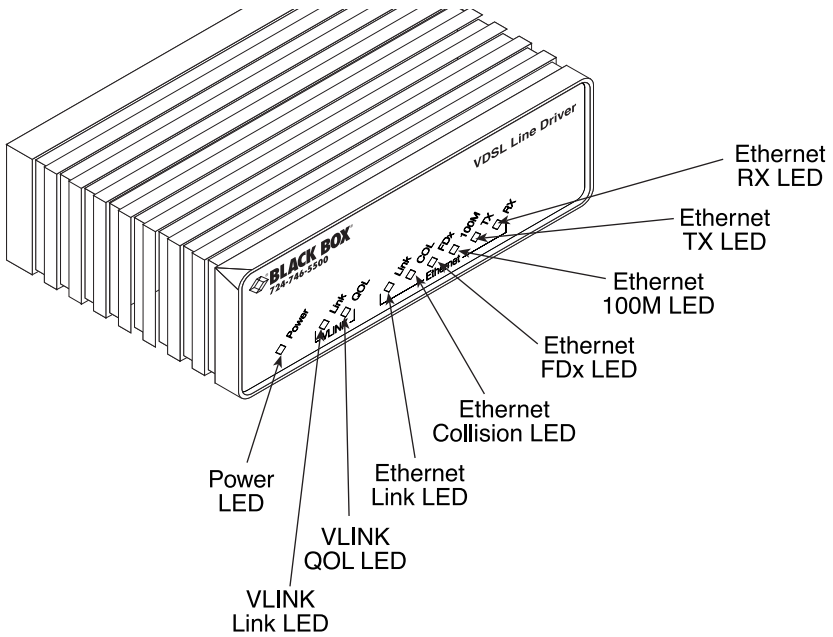


Figure 11. Line Driver front panel

Table 5: Front panel LED description

LED	Description
Power	Solid GREEN to indicate the unit is powered on.
VDSL Link	(Active Green) Solid green (ON) to indicate that the end-to-end VDSL link between the Line Drivers is established. The VLINK LED is OFF when the link is down.
VDSL QOL	(Active Yellow) Flashes YELLOW to indicate the processor is correcting an error in the data thus preventing the transmission of corrupted data to the Ethernet port. The more error corrections, the more often the LED blinks. If the light remains lit continuously, it means that the VDSL line is noisy—although the data at the Ethernet port remains uncorrupted. Further impairment of the line however, risks having the line fail, as indicated by the green VDSL Link LED extinguishing.
Ethernet Link	(Active Green) Solid Green indicates that 10/100Base-T Ethernet link has been established.
Ethernet Activity	(Active Yellow) Flashes yellow to indicate Ethernet activity on the Line Driver's 10/100Base-T Ethernet port.

A. Specifications

A.1 LAN Connection

- Shielded RJ-45, 10/100Base-T, IEEE 802.3 Ethernet
- VDSL Connection: RJ-45 and Terminal Block

A.2 Transmission Line

Two-wire unconditioned twisted pair.

A.3 VDSL Line Rate

16.67 Mbps, symmetric upstream/downstream. Additional symmetric and asymmetric rates are available via DIP switch settings.

A.4 VDSL Distance

6,000 ft. (1.83 km) at 1.56 Mbps upstream/4.17 Mbps downstream

Note Distances depend on selected line rate.

A.5 VDSL Surge Suppressor

Gas tube with maximum current surge: 20 kA (8120 μ s).

A.6 LED Status Indicators

- Power (Green)
- VDSL: Link (Green) & QOL (Red)
- Ethernet: Link (Green) & Activity (Yellow)

A.7 Power Supply

Input power: 5 VDC, 1A

Power consumption: 450 mA at 5 VDC

External AC and DC options:

- AC: 120 VAC, 220 VAC, and UI (120–240 VAC)
- DC: 12 VDC, 24 VDC and 48 VDC

A.8 Temperature Range

32–122°F (0–50°C)

A.9 Humidity

Up to 90% non-condensing.

A.10 Dimensions

1.58H x 4.16W x 3.75D in. (10.6H x 4.1W x 8.8D cm)

B. VDSL Line Driver Interface Pin Assignment

B.1 10/100Base-T Interface

RJ-45

- Pin 1: TX+
- Pin 2: TX-
- Pin 3: RX+
- Pin 6: RX-
- Pins 4, 5, 7, 8: no connection

B.2 VDSL Interface

RJ-45

- Pin 4: RING
- Pin 5: TIP
- Pins 1, 2, 3, 6, 7, 8: no connection

Terminal Block

See Figure 4 on page 13.

B.3 POTS/ISDN Interface

RJ-45

Pin 4: 2-wire RING

Pin 5: 2-wire TIP

Pins 1, 2, 3, 6, 7, 8: no connection

C. Distance Chart, Based on 24 AWG (0.5 MM)

Symm Line Rate (DS/US)	Distance in feet (km)
6.25 Mbps	4,500 (1.37)
9.38 Mbps	4,150 (1.26)
12.5 Mbps	4,000 (1.22)
16.67 Mbps	3,300 (1.00)

Asymm Line Rate (DS/US)	Distance in feet (km)
4.17 Mbps/1.56 Mbps (Mode 0)	6,000 (1.83)
9.38 Mbps/1.56 Mbps	5,500 (1.68)
16.67 Mbps/2.34 Mbps	5,000 (1.52)



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1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746