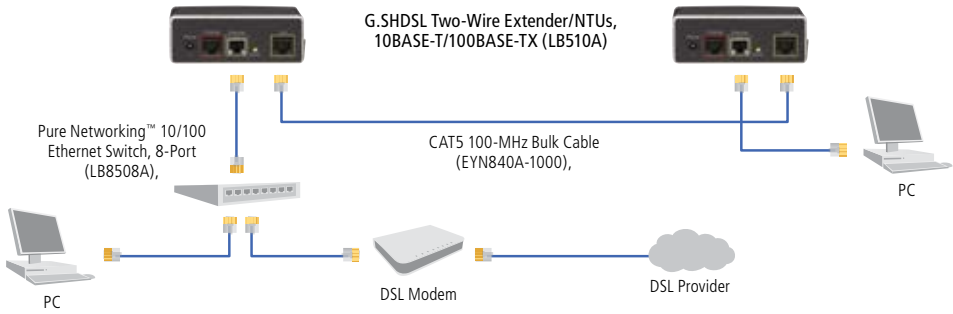
G.SHDSL Two-Wire Extender/NTUs

Use just two wires to extend Ethernet, E1/T1, X.25, or V.35 networks and achieve G.SHDSL performance!

FEATURES

- Deliver symmetrical high data rate DSL (G.SHDSL) over 2-wire, voice-grade copper wiring.
- Offer high data rates up to 4.6 Mbps.
- Line rates can be selected in 64-kbps intervals.
- Select lower speeds for applications requiring long distances, as far as 9.9 miles (15.9 km).
- Use existing wiring and avoid the expense and trouble of procuring and pulling new cable.
- Choose from 10BASE-T/100BASE-TX, E1/T1, X.21, and V.35 interfaces.
- All versions are interoperable with one another.
- Easy to manage and configure via an RS-232 console port connection.
- Built-in testing and diagnostics with a line probe that determines the optimum rate supported on the DSL side.
- 10/100 version is ideal for Ethernet bridging applications between a LAN and a WAN.
- Once configured, operate transparently without any further user intervention.
- Two-wire interface is a transformer coupled with 2500-VRMS isolation.
- Front-panel LEDs for at-a-glance status monitoring and troubleshooting.

Typical Application



OVERVIEW

Bring symmetric high-speed digital subscriber line technology to your network users without spending extra for your cable infrastructure.

The BLACK BOX® G.SHDSL Two-Wire Extender/NTUs interface with Ethernet, T1/E1, X.21, or V.35 networks to extend services point-to-point to remote users at speeds up to 4.6 Mbps in both directions. And the best part is, this higher speed is possible over just two copper wires! Other G.SHDSL solutions require four wires to reach similar speeds.

They're not only ideal for any far-flung campus application where you want to use existing infrastructure to extend your network, but they're also particularly great for ISPs or other service providers who want to use G.SHDSL to expand their customer base.

The units work in pairs, with one unit set as the central office (CO) unit and the other as the customer premises (CP) unit, and both set to communicate the same DTE rate. For DSL interconnections, the G.SHDSL Two-Wire Extender/NTUs use two-wire copper cable of any gauge from 19 AWG (0.9 mm) to 26 AWG (0.4 mm).

Choose the speed appropriate for your application or the demands of your users or customers. All extender/NTUs feature configurable nx64 data rates. Of course, at lower speeds you can extend the reach of your network a greater distance. The extender/NTUs use Trellis Coded Pulse Amplitude Modulation (TCPAM) that enhances the spectral compatibility with the DSL line. Communicating across a single pair of regular twisted-pair lines, a pair of extender/NTU units enables you to extend a network or service more than twice as far as conventional TDM technologies—up to 9.9 miles (15.9 km) over 19 AWG (0.9-mm) wiring at 192-kbps rates.

You can achieve this by using lower-cost cable, such as the telephone wiring that you probably already have running between offices or buildings. Plus, there's no need to buy and install expensive DSLAMs or other DSL interface equipment for your central office.

To set passwords and configure the units, use their DIP switches and/or a software-controlled console (such as a VT100™ terminal) plugged into the RS-232 port on either the local or remote end. The same DIP switches and/or console connection are also used to set DSL speeds (and, on applicable models, serial data rates) in 64-kbps increments up to 4608 kbps (4.6 Mbps).

The G.SHDSL Two-Wire Extender/NTUs also include a probe to determine the best DSL data rate reliably supported by the DSL link between local and remote units. In addition, a DSL error monitor inspects the line for intervals that exceed its user-set error threshold and, if necessary, restarts the link automatically.

Once configured and connected to your local network and the two-wire line, the G.SHDSL Two-Wire Extender/NTUs operate transparently. For at-a-glance troubleshooting, simply observe the front-panel diagnostic LEDs. On all models, the Power LED lights during normal operation, and on most models, the DSL LED lights when the unit establishes a DSL link (on the Ethernet model, a Link LED signals a detected link). There's also an indicator that tells you when a test mode is in progress or when the extender/NTU detects an error. (See Tech Specs for a full description of each model's indicators.)

A choice of four interfaces.

You have four models to choose from, including one with an Ethernet/Fast Ethernet interface, one with an E1/T1 interface, and two serial (V.35 or X.21) interface models.

All versions work with one another, which means that, along with network or service extension, you can provide interface conversion, too. Use, for instance, a V.35 model at one end of a circuit and an E1/T1 model at the other end.

Extending an Ethernet network.

The 10BASE-T/100BASE-TX G.SHDSL Two-Wire Extender/NTU (LB510A) has an RJ-45 interface for 10-/100-Mbps network links and a G.SHDSL network termination unit (NTU) for accessing IP services over the two-wire infrastructure. It's unique because it has both a built-in Ethernet port and TDM-based G.SHDSL network access for maximized bandwidth.

Working as a low-cost customer premise equipment (CPE) solution, the LB510A delivers long-range, dedicated, bridged-Ethernet connections to distant users or customers running bandwidth-intensive applications.

In an enterprise environment, you can use the 10BASE-T/100BASE-TX G.SHDSL Two-Wire Extender/NTU to extend your corporate LAN across a campus or across town to deliver services to users at the higher speeds. The LAN port on the LB510A autosenses 10BASE-T/100BASE-TX connections to match your local network speed and autonegotiates for full or half-duplex connection. It also has an MDI-X button on its front panel that enables you to switch between network-side straight-through and crossover cabling.

For easy management, the 10BASE-T/100BASE-TX model features an embedded Web server and can be configured remotely from an IP network-based GUI simply by entering the LB510A's IP address into a standard browser. Because it has an EOC management channel, the extender/NTU can be remotely managed end to end.

The LB510A also features an IEEE 802.1d transparent learning bridge up to 1024 addresses, uses the Spanning Tree Protocol, and has built-in ping and traceroute facilities.

Comprehensive hardware diagnostics on the 10BASE-T/100BASE-TX model enable you to easily maintain and install the unit independent of your operating system.

Extend an E1/T1, X.21, or V.35 network.

Although similar in size and function to the LB510A, the E1/T1, X.21, and V.35 models differ not only in their interface, but their diagnostics and clocking modes, too.

With these G.SHDSL Two-Wire Extender/NTUs, you can run local and remote loopbacks, including both local analog loopbacks (LALs) and remote digital loopbacks (RDLs). The V.35 model can also be used to enable DTE loops.

You can also run basic error rate (BER) tests with the E1/T1, X.21, and V.35 extender/NTUs. They include an internal PRBS pattern generator and detector that you can use to run tests of this type without the need for any external equipment.

For controlling DSL and serial clock sources, the E1/T1, X.21, and V.35 models support internal or receive recover clock modes. The V.35 and X.21 models also support external mode clocking, and the E1/T1 model also supports network clocking.

With a G.703/G.704 interface on a pair of BNC connectors as well as an RJ-48C jack, the E1/T1 G.SHDSL Two-Wire Extender/NTU (ME231A) suits both balanced and unbalanced E1/T1 connections. Use the dual BNC (TX and RX) to connect a 75-ohm dual coax E1 or T1 network interface and the RJ-48C to link to either a 120-ohm E1 or 100-ohm T1 twisted-pair network interface.

The X.21 G.SHDSL Two-Wire Extender/NTU (ME232A) has a DB15 connector, which by default is configured as data circuit terminating equipment (DCE) for connection to data terminal equipment (DTE), such as a router. But you can also use the X.21 interface configured as DTE for connecting a DCE, such as a modem or multiplexor. In either case, connect DTE or DCE devices with an X.21 straight-through cable.

Supporting connections to V.35 serial equipment, the V.35 G.SHDSL Two-Wire Extender/NTU (ME233A) has a DCE interface on a DB25 connector. Use this interface to connect to DTE equipment, such as a router, through a V.35 straight-through cable. To connect to another DCE device, such as a multiplexor or a G.703 NTU, simply add a tail-circuit cable.

NOTE: Actual distance and link performance may vary depending on the environment and the gauge and type of wire you use.

Buyer's Guide | Maximum Distances

Wire Gauge	Distance at 192 kbps	Distance at 4.6 Mbps
26 AWG (0.4-mm) wire	4 mi. (6.4 km)	1 mi. (1.6 km)
24 AWG (0.5-mm) wire	5.3 mi. (8.5 km)	1.3 mi. (2.1 km)
22 AWG (0.6-mm) wire	6.6 mi. (10.6 km)	1.7 mi. (2.7 km)
19 AWG (0.9-mm) wire	9.9 mi. (15.9 km)	2.5 mi. (4 km)

LB510A: rear view

TECH SPECS

Clocking Modes — ME231A–ME233A: Internal, receive recovered; ME233A also supports external clocking
Data Rates — From 64 kbps to 4608 kbps (4.6 Mbps) in 64-kbps steps
Diagnostics — LB510A: Ping and traceroute facilities, DSL run-time statistics, DSL line error counters, local interface error counters, bridged PPP statistics, Ethernet port statistics;
ME231A–ME233A: V.52 compliant (511/511E) pattern generator/detector with error injection mode controlled by front-panel switch; local and remote loopback control either by a front-panel switch or from the DTE interface
Distance (Maximum) — See chart on **page 2**
Interconnection Cable Required — Twisted-pair, unconditioned, dry, metal wire 19 AWG (0.9 mm) to 26 AWG (0.4 mm)
Line Coding — Trellis Coded Pulse Amplitude Modulation (TC-PAM)
CE Approval — Yes
Connectors — LB510A: Interface: (1) RJ-45 (10-Mbps/100-Mbps);
G.SHDSL: (1) RJ-11 (2-wire polarity insensitive on Pins 3 and 4);
Console: (1) RJ-45 (RS-232);
E1/T1, X.21, and V.35 models: Interface: ME231A: (2) BNC F, (1) RJ-48C;
ME232A: (1) DB15 F;
ME233A: (1) DB25 F with M/34 converter (included);
G.SHDSL: All: (1) RJ-45 (2-wire polarity insensitive on Pins 4 and 5);
Console: All: (1) RJ-11 (RS-232)
Indicators — LB510A: Power LED (solid yellow during normal operation);
WAN: Link LED (solid yellow when DSL link in established, blinks when DSL link is in training);
Tx LED (solid yellow when DSL port is transmitting data);
Rx LED (solid yellow when data is received from the DSL port);
Ethernet: Link LED (solid yellow when valid signal is received on the Ethernet port);
100 M LED (solid yellow when 100-Mbps link is negotiated);
Tx LED (solid yellow when LAN port is transmitting data);
Rx LED (solid yellow when data is received from LAN port);
E1/T1, X.21, and V.35 models: All: Power LED (solid green during normal operation);
DSL LED (solid green when a DSL link is established, blinks once every second while the DSL link is training);
TM/ER LED (solid red to indicate a test mode in progress, blinks red if an error is detected either during a test mode or during normal DSL operation)
ME232A–ME233A only: Terminal LED (ME232A: Solid green when control signals have been asserted [while operating as a DCE] and when indication signals have been asserted [while operating as a DTE]; On ME233A, solid green when serial interface asserts DTR;
ME231A only: LINK LED (solid green when valid framing is detected, blinks once per second when signal without valid framing is detected;
LOSS LED: Blinks once per second to indicate either framing errors or clock slips
Operating Environment — Temperature: 32 to 122°F (0 to 50°C); Humidity: 5 to 95%, noncondensing
Power — Input: 90–260 VAC, 50–60 Hz, autosensing, external
Size — Each extender unit: 1.6"H x 5.5"W x 4.2"D (4 .1 x 14 x 10.7 cm)

Why Buy From Black Box? Exceptional Value. Exceptional Tech Support. Period.

Recognize any of these situations?

- You wait more than 30 minutes to get through to a vendor's tech support.
- The so-called "tech" can't help you or gives you the wrong answer.
- You don't have a purchase order number and the tech refuses to help you.
- It's 9 p.m. and you need help, but your vendor's tech support line is closed.

According to a survey by *Data Communications* magazine, 90% of network managers surveyed say that getting the technical support they need is extremely important when choosing a vendor. But even though network managers pay anywhere from 10 to 20% of their overall purchase price for a basic service and support contract, the technical support and service they receive falls far short of their expectations—and certainly isn't worth what they paid.

At Black Box, we guarantee the best value and the best support. You can even consult our Technical Support Experts before you buy if you need help selecting just the right component for your application.

Don't waste time and money—call Black Box today.

Item	Code
G.SHDSL Two-Wire Extender/NTUs ***(NOTE: Must be used in pairs.)***	
10BASE-T/100BASE-TX	**LB510A**
E1/T1	**ME231A**
X.21	**ME232A**
V.35	**ME233A**