WAN maker™

CupréDSU SDSL
Digital Service Unit

User's Manual

CDSU-5101-001
March 2000

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Table of Contents

List of Figures

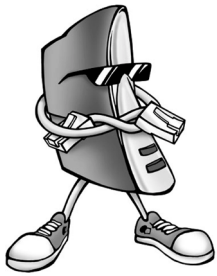
List of Tables

Safety Precautions

The following safety precautions apply to the CupréDSU:

1. Be sure to read and follow all warning notices and instructions.
2. The maximum recommended ambient temperature for CupréDSU is 50 °C. Care must be taken to allow sufficient space for air circulation between units when the CupréDSU is installed inside a closed rack assembly. The operating ambient temperature of the rack environment might be greater than room temperature. Installation in a rack without sufficient air flow can be unsafe.
3. The ac adapter must be plugged into the correct supply voltage; i.e., 120 V ac. Be sure the supplied ac voltage is correct and stable. If the input ac voltage is more than 10% lower than the standard, this may cause a malfunction of the CupréDSU unit.
4. Installation in restricted access areas must comply with Articles 110-16, 110-17, and 110-18 of the National Electrical Code (NEC), ANSI/NFPA 70.
5. Do not allow anything to rest on the power cord of the ac adapter, and do not locate the CupréDSU where anyone will walk on the connected power cord.
6. When installed in its final configuration, the CupréDSU must comply with the applicable safety standards and regulatory requirements of the country and city in which it is installed. If necessary, consult the appropriate regulatory agencies and inspection authorities to ensure compliance.
7. In rare instances, a voltage potential can be created between the earth grounds of two or more buildings. If CupréDSUs installed in separate buildings are interconnected, the difference in voltage potential can cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists and, if necessary, implement corrective action before interconnecting the products. If the equipment is to be used with telecommunications circuits, take the following precautions:
   - Never install telephone wiring during a lightning storm.

- Never install a telephone jack in a wet location unless the jack is specially designed for wet locations.
- Never touch uninstalled telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines (other than a cordless telephone) during an electrical storm. There is a remote risk of electric shock from lightning.
- Do not use a telephone or other equipment connected to telephone lines to report a gas leak that is in the vicinity of the leak.



1 Getting Started . . . 6 Easy Steps

Overview

The CupréDSU SDSL Digital Service Unit uses the latest multi-rate Symmetrical Digital Subscriber Line technology for long-range, high-speed data transmission from 144 kbps to 2.320 Mbps. This data rate automatically adapts to the best "rate versus range" performance for efficient and stable transmission.

CupréDSU uses 2B1Q line code with echo cancellation to maximize the transmission rate over a single twisted pair of telephone wires. 2B1Q line code provides high immunity to background noise and enables transmission over multi-pair cables.

The CupréDSU is designed to be compatible with Copper Mountain Networks, Inc., DSLAM (Digital Subscriber Line Access Multiplexer) technology, and meets CPE (Customer Premises Equipment) requirements to operate with Copper Mountain's CopperEdge® DSL Concentrators. Easy to configure (as a CPE device, it can be used right out of the box), the CupréDSU offers a low-cost, plug-and-play solution to moving data. Simply connect the

V.35 interface to a router, the line port to an SDSL line, the power cord to an ac line, and you're operational.

Features and Benefits

- Broadband SDSL DSU transmission
- Symmetrical multi-rate data transmission from 144 kbps to 2.3 Mbps over a single twisted-pair telephone line
- Compatible with Copper Mountain Network's DSLAMs
- V.35 (DB25) serial router interface
- 2B1Q line coding
- RS-232 (DB9) Craft port for management and control capability

STEP 1

Verify Your Order

After unpacking your CupréDSU and its accessories from the box, check the contents against the following list:

- 1 CupréDSU SDSL unit
- 1 power supply: 120 V ac to 12 V dc power converter and cable
- 1 6-foot SDSL cable (RJ11)
- 1 V.35-to-DB25 serial data cable (router connection)
- CupréDSU SDSL User's Manual (this document), Larscom Part SDSL-5101-001

If you are missing any of these non-optional items, contact your distributor or Larscom Customer Service.

What You'll Need To Provide

- If you are going to mount the CupréDSU on a wall, you will need:
  a. Two 3/4-inch sheet-metal or round-head wood screws (5/32-inch or less thread diameter)
  b. Two screw anchors (if necessary), depending on wall type
  c. Drill with bit slightly smaller than the screw anchor or screw thread diameter
- If you require a different router cable than that provided by Larscom, you should acquire the appropriate serial data cable or adapter for connecting your router to the CupréDSU **DATA** port. Contact your router manufacturer or distributor.

STEP 2

Position the CupréDSU

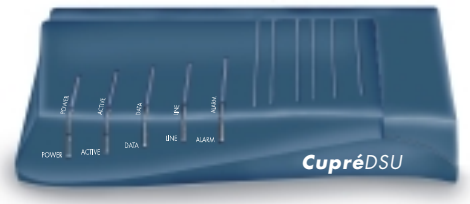
Your CupréDSU can be placed on a flat surface such as a table or desktop, or mounted on a wall (*Figure 1-1*).

Desktop Position

The CupréDSU should be located near an ac source and within easy access to an SDSL WAN (Wide Area Network) connection, a data terminal or PC (Personal Computer), and a V.35 router connection. Make sure that the area around the unit is clean and away from any heat source.

Wall Mounting

To mount the CupréDSU on a wall, you will need two 3/4-inch sheet-metal or round-head wood screws (5/32-inch or less thread diameter), and perhaps two screw anchors, depending on the type of wall.



Front (desktop) view

Bottom view showing wall mounts

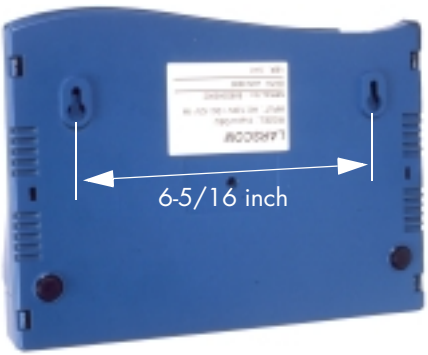


Figure 1-1. The CupréDSU

To wall-mount your CupréDSU:

CAUTION: ***Be sure that the anchoring method you use will support a load of at least 10 pounds.***

1. Select an area of the wall where the CupréDSU will be mounted.
2. Holding a copy of the template printed to the right—drill two holes to match the center points of the two circular mounting holes on the back of the unit (**6-5/16 inch** center-to-center; see *Figure 1-1*). [Photocopying the template may distort dimensions slightly.]

   Note: *Use a drill bit that will allow the threads of the screws to firmly secure the unit to the wall, or prevent the screw anchors (if used) from rotating when inserted.*

3. Install the two screws just deep enough into the wall so that when the mounting holes on the bottom of the CupréDSU are placed over the screw heads and slid slightly downward, the unit is held firmly against the wall. [This is approximately 1/8-inch from the wall surface to the bottom of the screw head.]

Note: *To allow more freedom of movement, do not wall-mount your unit until all cables have been installed.*

STEP 3

Check the Default Configuration

The default configuration of the CupréDSU is that used in a **Service Provider** application (*Figure 1-2*). In this application, a single CupréDSU is connected as a CPE (also called RT for remote terminal) device through the SDSL port to a Service Provider's DSLAM located at the remote Central Office (CO). *No configuration by the user is necessary; the CupréDSU will work directly as shipped.*

Note: *The CupréDSU has been tested successfully with the Copper Mountain CopperEdge® DSL Concentrator. If you are connecting to another brand of DSLAM, call your distributor or Larscom Customer Service to receive compatibility information.*

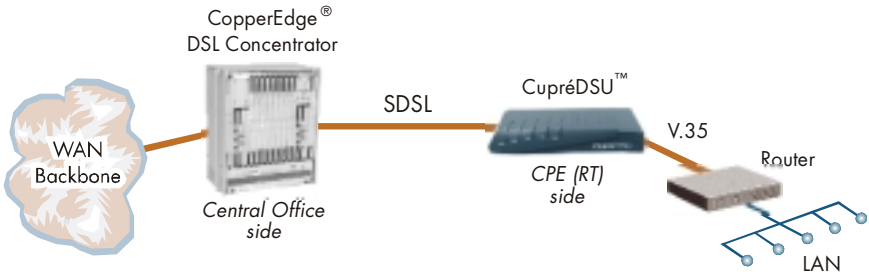


Figure 1-2. Service Provider Application

Service Provider Application

SDSL Data Rate

When connected to a WAN backbone in a Service Provider environment, the CupréDSU data rate is automatically set by the Central Office DSLAM and does not require customer intervention. In effect, the DSLAM overrides the SDSL data-rate configuration of the DIP-

switches on the back of the CupréDSU, no matter how they are configured.

Operation Mode

Since the CupréDSU is configured at the factory as a CPE device, there is no need to set the DIP-switches on the back of the CupréDSU. *As a precaution, check that DIP-switch 4 is OFF.*

STEP 4

Connect to the SDSL Line

Using the RJ11 cable included in your CupréDSU package, plug one end of the cable into your external SDSL WAN line, and the other end into the **LINE SDSL** jack on the rear panel of the CupréDSU (*Figure 1-3*).

CAUTION: ***To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.***

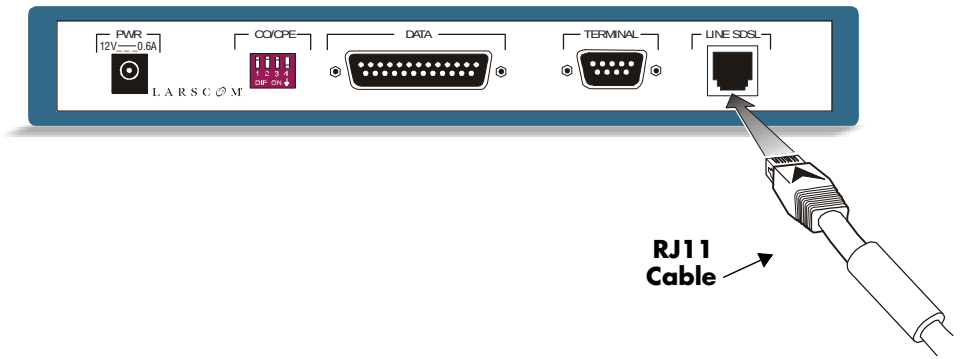


Figure 1-3. Connect the SDSL WAN Line

STEP 5

Connect to Your Local Network

Connect the CupréDSU to your local network by attaching the M34S (V.35) end of the serial data cable included in your package to your router, and the DB25 end to the **DATA** port on the rear panel of the CupréDSU (*Figure 1-4*). Consult your distributor or Larscom Customer Service if you have special cable or cable adapter requirements (see "What You'll Need To Provide" on page 1-3).

A pinout of the **DATA** port is given in Appendix A, "Specifications".

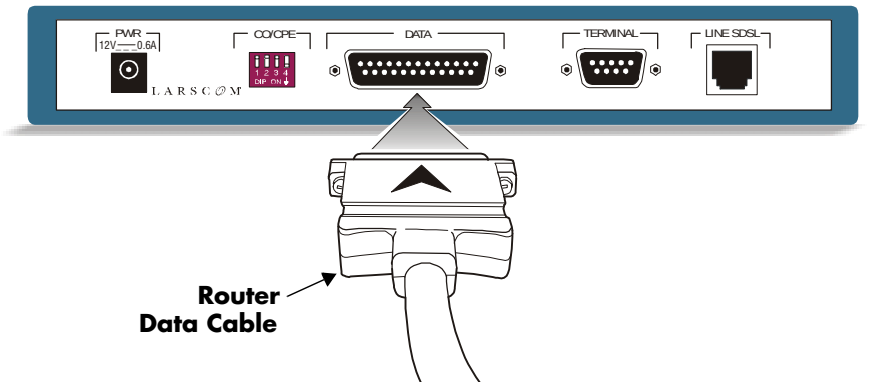


Figure 1-4. Connect the Router to the Data Port

STEP 6

Connect to Power

Plug the transformer end of the ac-to-dc power converter into an ac outlet. Then connect the dc-connector end to the **PWR** jack on the rear panel of the CupréDSU (*Figure 1-5*). On power-up, the **POWER** LED on the front panel turns green. If this LED does not turn on, check your ac connection. If the LED still remains off, call your distributor or Larscom Customer Service.

WARNING: ***Do not apply ac power to the CupréDSU before making the connections of Steps 4 and 5.***

When using your telecommunication equipment, always follow basic safety precautions to reduce the risk of fire, electrical shock, and injury.

Do not use this product near water.

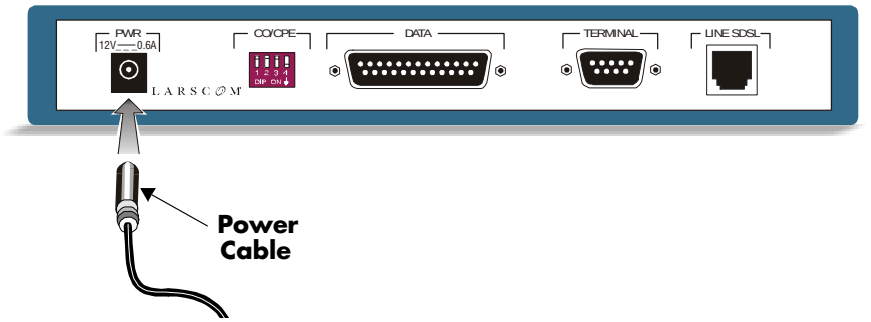


Figure 1-5. Connect the Power Cable

Verify the LED Indicators

After the CupréDSU is powered on, check the five LEDs on the front panel (see *Figure 1-6*). These should be interpreted as follows:

POWER If steady green, the system is powered on.

ACTIVE Green only when data is being transmitted by the CupréDSU.

DATA If steady green, the **DATA** port is connected to a router and functioning normally.

LINE If steady green, the **LINE SDSL** port is connected to the WAN (*SDSL Sync*); otherwise, it will blink when power is on.

ALARM Off during normal operation; steady green when an operation error is detected, either during self-test or after start-up. If this LED remains on, call your distributor or Larscom Customer Service.

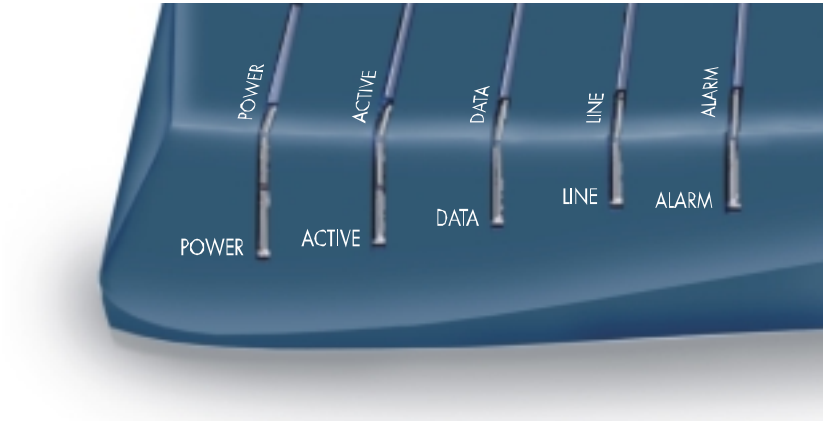
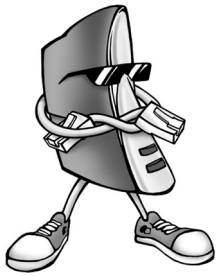


Figure 1-6. Check the LEDs on the CupréDSU Front Panel



2 Console Operation

The Terminal

Requirements

To access the CupréDSU through its terminal port, you must have the following items available:

- VT100 ASCII terminal or PC with VT100 terminal-emulation program
- 1 DB9-to-DB9 (male-to-female) straight-through serial (RS232) cable. This will connect from the CupréDSU **TERMINAL** port to the COM port of the terminal or PC

Note: *For the purposes of this document, it is assumed that you have a PC with a Windows 95 or Windows NT operating system and the Microsoft® HyperTerminal program installed.*

Connection

To view the CupréDSU configuration and perform upgrades, first connect the female end of the DB9 serial cable to a VT100 terminal or PC. Then con-

nect the male end to the **TERMINAL** port on the rear panel of the CupréDSU (see "Terminal Port" in Appendix A for pin assignments). The CupréDSU is viewed as a DCE (modem) device to the terminal program of the PC.

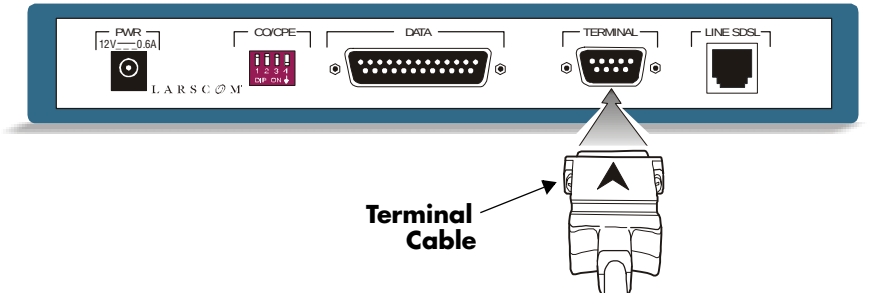


Figure 2-1. Connect the DB9 Serial Terminal Cable

Configuration

Turn your PC on and begin the HyperTerminal program by clicking the **Start** button at the bottom left of your screen and following the path Programs→Accessories→Hyperterminal→**Hypertrm.exe**.

1. Enter a name to identify the connection (see *Figure 2-2* on page 2-3), select an appropriate icon, then click OK.
2. In the **Properties** window that follows, assign a COM port (COM1 or COM2) through which to communicate with the CupréDSU (see *Figure 2-3* on page 2-3), then click OK.
3. In the next window (see *Figure 2-4* on page 2-4) under **Port Settings**, configure COM port parameters as follows:
    - Bits per second..... **57600**
    - Data bits..... **8**
    - Parity..... **None**
    - Stop bits..... **1**
    - Flow control..... **None**

Figure 2-2. Create a Terminal Connection

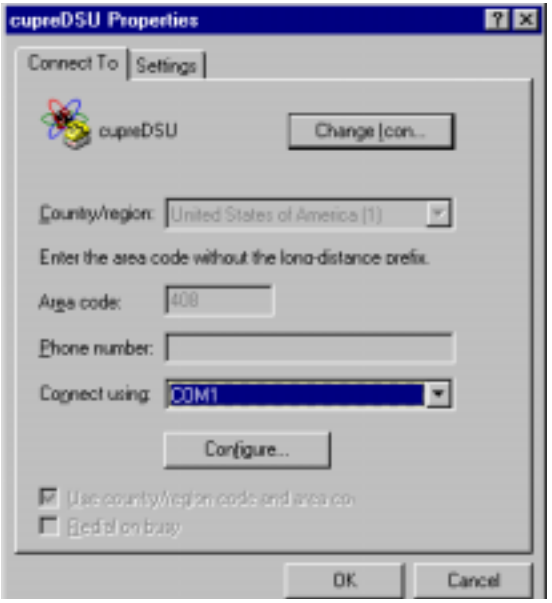


Figure 2-3. Assign a COM Port

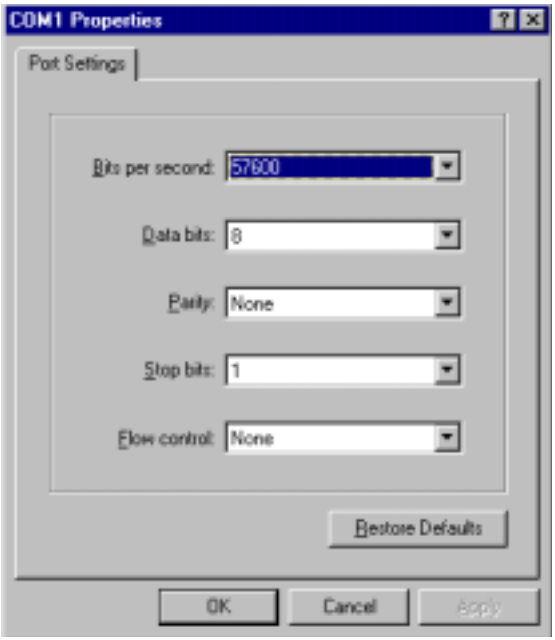


Figure 2-4. Enter the COM Port Properties

4. In the HyperTerminal window, select **File→Properties**, press the settings tab, and select the following:
   - Function, arrow, and ctrl keys act as.... **Window keys**
   - Emulation:..... **Auto detect**
   - Backscroll buffer lines: **500**
5. Press the **ASCII Setup...** button and configure text as follows:
   - Echo typed characters locally ..... **Enable**
   - Line delay ..... **0** milliseconds
   - Append line feeds to incoming line ends..... **Enable**

Terminal Operation

Once the terminal emulation parameters have been configured, carry out the following steps to begin CupréDSU console operation:

1. Open a connection to the CupréDSU from the HyperTerminal **File→Open** window.
2. If the CupréDSU is powered up, press the Enter key, which will display the Main Menu shown in *Figure 2-6* (page 2-6).
3. If the CupréDSU is not powered up, attach the power cord (see Step 6 in Chapter 1). This will cause the system to display the window of *Figure 2-5* as it boots.

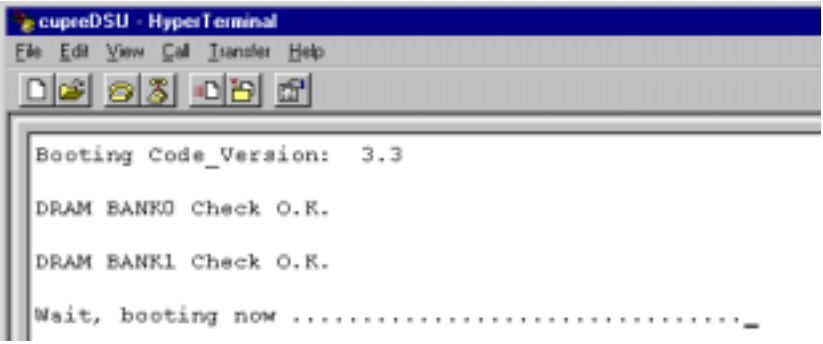


Figure 2-5. Terminal Screen During CupréDSU Reboot

After the system boots (approximately 6 seconds), the Main Menu will appear (see *Figure 2-6*).

4. Three options are available at the present time:

   0 ..... **Show DSL Status**

   1 ..... **Upgrade Operation Software**

   2 ..... **Upgrade SDSL Firmware**

   Enter **0** to display the window shown in *Figure 2-7*. Options **1** and **2** should only be used to upgrade Operation Software or SDSL

Firmware. Availability of software upgrades will be announced by Larscom and/or your distributor.

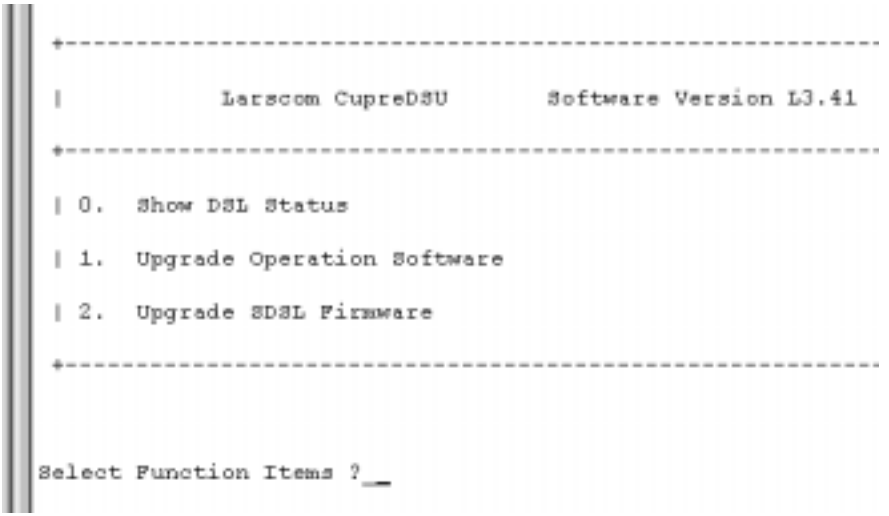


Figure 2-6. CupréDSU Main Menu

Definitions for the **Show DSL Status** display are given in *Table 2-A* on page 2-7.

5. If you elect to download operating system or SDSL software to the CupréDSU, a warning will appear before beginning the download (see *Figure 2-8*).

   After answering **Y** (or **N** to return to the Main Menu), you are prompted to enter a password, which is **2000**. Before download, an XMODEM window will open; type in the drive and file name from which the download is being transmitted (**A:***filename***.bin**, for example) and indicate the Communication Protocol as **X modem**.

   As the software is downloaded, its status will be displayed. After completion of the download, the CupréDSU will be reset and the terminal screen will appear as in *Figure 2-6*.

```
+-------------------------------------------------------------------------
¦   Firmware Version: 4.2          Software Version: L3.41
+-------------------------------------------------------------------------
¦   Bitpump Status:   OK           Terminal_Type:  RT
¦   Operation Status: DN           V.35  ON_Line
¦   Noise Margin: -15.5 dB         Data Rate:  768 kbps
+-------------------------------------------------------------------------
Press any key to return main manual ........
```

Figure 2-7. The DSL Status Screen

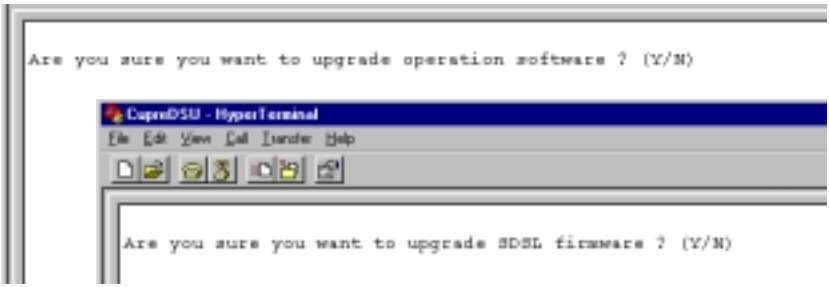


Figure 2-8. Software Download Warning Screens

Table 2-A. CupréDSU Status Definitions

Parameter	Value	Definition
Bitpump Status	OK NG	Good No good
Terminal Type	RT CO	Remote Terminal (CPE) Central Office
Operation Status	UP DN	Normal operation Operation is down
V.35	ON_Line OFF_Line	Router line is active Router line is inactive
Noise Margin	—	Value in dB
Data Rate	144 to 2320 kbps	Current transmission rate

Specifications

A

Table A-1. General Specifications

	Parameter	Value
Data (Router) Port	Interface: Connector:	V.35 DB25
WAN (SDSL) Port	Transmission rate: Line code: Line impedance: Test standard: Connection: Connector:	144 kbps to 2320 kbps 2B1Q 135 ohms ANSI T1E1.4/94-006; ETSI ETR 152 One pair (2-wire) RJ11
Management Port (OAM&P)	Local:	ASCII terminal via DB9 Craft port
LED Indicators	Power: Active: Data: Line: Alarm:	Steady Green = power on Green = indicates data transmission Steady Green = router is connected Steady Green = WAN is connected Green = operation error (normally off)
Environment	Temperature: Humidity:	0 °C to 50 °C 5% to approximately 95% NC
Electrical	Power input: Power Consumption: Safety:	12 V dc via ac converter (120 V ac, 0.6 A) Less then 7 watts FCC Class B, UL 1950
Dimensions	H x W x D	1.4 x 8.7 x 6.1 inches 3.5 x 22.0 x 15.5 cm

Cable Pinouts

Terminal Port

The CupréDSU **TERMINAL** port is connected to a VT100 ASCII terminal (or PC with terminal-emulation software) by an RS232 straight-through serial cable with a DB9 male Craft port connector on one end and a DB9 female connector (to connect with a terminal or PC) at the other end.

CAUTION: ***Do not use a cross-over type serial cable.***

Terminal port pin assignments are as follows:

Pin	Function
Pin 2	Transmit; XMT
Pin 3	Receive; RCV
Pin 5	Ground; GND

Terminal port transmission parameters are as follows:

Parameter	Value
Data speed	57,600 bps
Data bits	8
Parity	None
Stop bits	1
Flow control	None

Data Port

The CupréDSU **DATA** port is connected to a LAN router by a DCE-to-DTE (EIA530 to V.35) shielded cable. The DB25 male connector end and the M34S female connector end of this cable are shown in *Figure A-1;* cable pinouts for both connectors are described in *Table A-2* on page A-4.

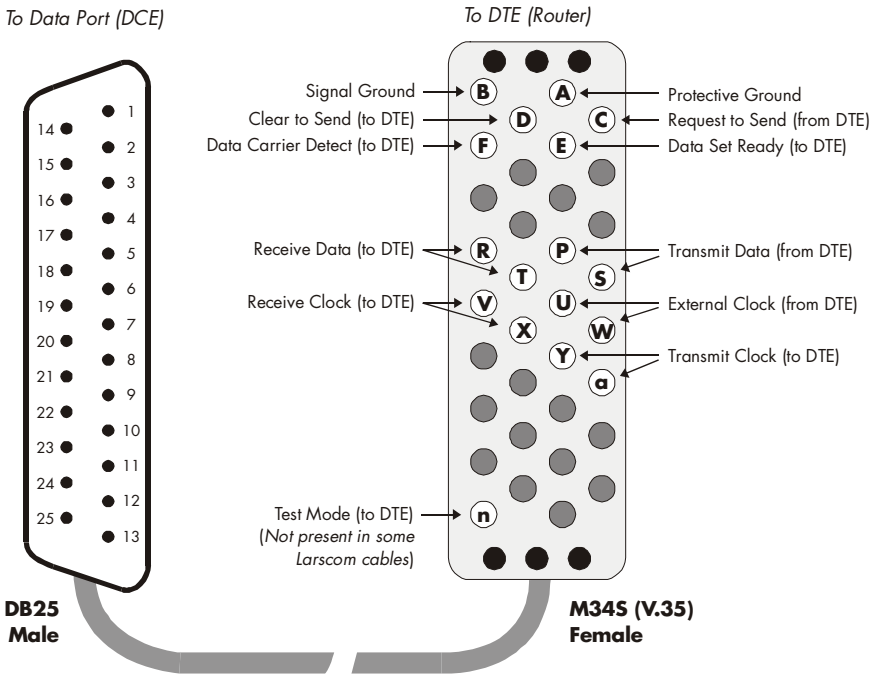


Figure A-1. DCE-to-DTE Data Port Cable

Table A-2. Data Cable Connector Pinouts

DB25 Pin	Signal	M34S Pin
1	Cable Shield	A
2	Transmit Data	P
3	Receive Data to DTE	R
4	RTS (Request to Send)	C
5	CTS (Clear to Send) to DTE	D
6	DSR (Data Set Ready) to DTE	E
7	Signal Ground	B
8	Data Carrier Detect to DTE	F
9	Receive Clock Return	X
10	Data Carrier Detect Return	*Unassigned*
11	External Clock Return	W
12	Transmit Clock Return	AA
13	Clear to Send Return	*Unassigned*
14	Transmit Data Return	S
15	Transmit Clock to DTE	Y
16	Receive Data Return	T
17	Receive Clock to DTE	V
18	Local Loopback	*Unassigned*
19	Request to Send Return	*Unassigned*
20	Data Terminal Ready	H
21	*Unassigned*	*Unassigned*
22	Data Set Ready Return	*Unassigned*
23	*Unassigned*	*Unassigned*
24	External Clock	U
25	Test Mode to DTE	*Unassigned*

B Setup for Point-to-Point Applications

The CupréDSU can be used in one of two applications, *Service Provider* (see Chapter 1) and *Point-to-Point*. To change the default configuration to Point-to-Point, you must reconfigure the DIP switches of at least one CupréDSU, and open the case of both CupréDSU systems to change internal jumpers.

DIP Switches

In a **Point-to-Point** (LAN-to-LAN) or Campus application (*Figure B-1*), where two CupréDSU units are used, one CupréDSU must be set as a CO device and the second CupréDSU set as a CPE.

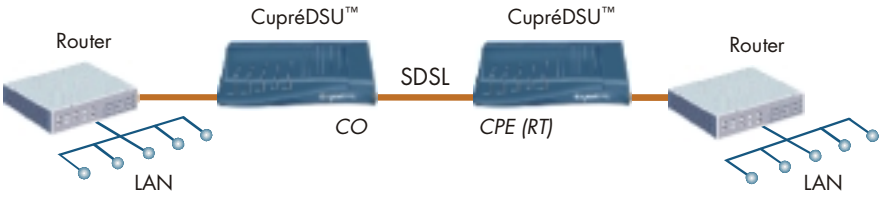


Figure B-1. Point-to-Point (Campus) Application

Each CupréDSU contains a DIP-switch on the rear panel (see *Figure B-2*) that determines the mode (CPE or CO) in which the system operates, and the rate (144 to 2320 kbps) at which data is handled by the SDSL port.

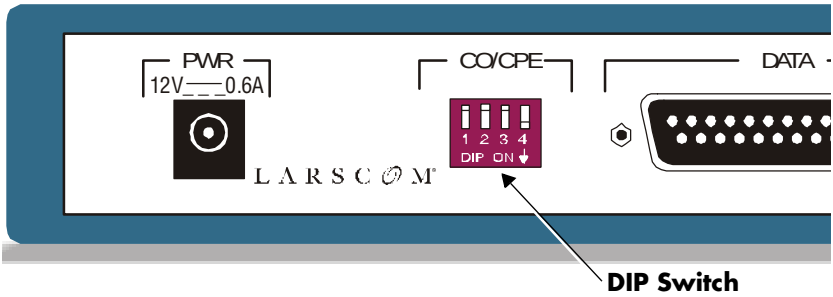


Figure B-2. Configure the DIP Switch

Data rates in a Point-to-Point (campus) application vary from 144 kbps to 2320 kbps, determined by the ON/OFF position of DIP switches 1 through 3 (see *Table B-1*). Since two CupréDSUs are used, both must be set to the same data rate, which is selected to suit the operating conditions of the network.

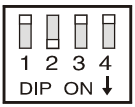
CAUTION: It is important to configure both CupréDSU systems in a Point-to-Point application to the same data rate.

Test the optimum data rate by using the Ping command of your FTP suite.

Set the first CupréDSU as a CO device and the second CupréDSU as a CPE device.

Table B-1. DIP-Switch Configuration

Application Mode	DIP Switch (ON is down)				Data Rate, kbps
	1	2	3	4	
Customer Premises Equipment (CPE or RT)	ON	ON	ON	OFF	144
	ON	ON	OFF	OFF	272
	ON	OFF	ON	OFF	400
	ON	OFF	OFF	OFF	528
	OFF	ON	ON	OFF	784
Default configuration (from factory):	OFF	ON	OFF	OFF	**1168**
	OFF	OFF	ON	OFF	1552
	OFF	OFF	OFF	OFF	2320
Central Office (CO)	ON	ON	ON	ON	144
	ON	ON	OFF	ON	272
	ON	OFF	ON	ON	400
	ON	OFF	OFF	ON	528
	OFF	ON	ON	ON	784
	OFF	ON	OFF	ON	1168
	OFF	OFF	ON	ON	1552
	OFF	OFF	OFF	ON	2320



Example: DIP switch with switches 1, 2, 3, and 4 in the OFF, ON, OFF, OFF positions, indicating 1168 kbps in CPE mode.

CAUTION: ***Point-to-Point Router Considerations***
Routers used at both ends of a Point-to-Point application must be set with the same link protocols (PPP or Frame Relay, for example), or they may fail to communicate with each other, even when the CupréDSU SDSL link is successful.

Consult the respective router manuals and follow all procedures concerning IP and other parameters.

Internal Jumpers

When the application has changed to Point-to-Point, carry out the following steps to re-configure internal jumpers.

1. ***Unplug the power supply cord from the CupréDSU.***
2. Remove the Phillips-head screw on the bottom of the CupréDSU (see *Figure B-3*) and store it in a safe place.

Figure B-3. Open the CupréDSU Case (bottom view)

3. Facing the bottom of the CupréDSU, carefully depress each snap clip on the sides (two per side), at the same time pulling the bottom of the case away from the top.
4. On the component surface of the PC board, remove the jumper from pin-pair **JP5** and place the jumper on pin-pair **JP3** (see *Figure B-4*).
5. Carefully snap the case cover firmly onto the bottom, securing each of the four clips, and replace the screw previously removed.
6. Repeat Steps 1 through 5 for the second CupréDSU.

Note: *To reconfigure the CupréDSU for use in a Service Provider application, return the jumper from JP3 to JP5, and ensure that DIP switch 4 is OFF.*

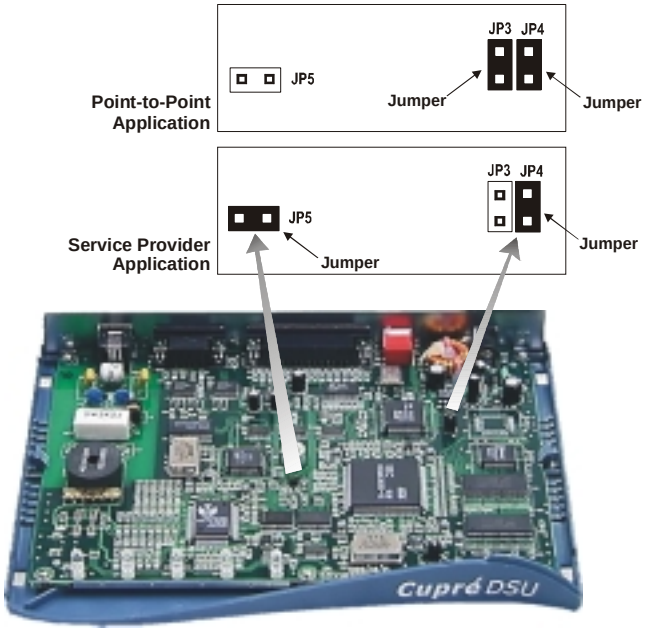
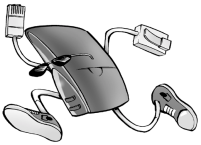


Figure B-4. Move Jumper from JP5 to JP3



Index

S

T

V

X

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