ME231A-R2, ME232A-R2, and
ME233A-R2

G.SHDSL.bis NTU

Customer Support Information

Order toll-free in the U.S.: Call 877-877-BBOX (outside U.S. call 724-746-5500)
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RADIO FREQUENCY INTERFERENCE STATEMENTS

FEDERAL COMMUNICATIONS COMMISSION AND INDUSTRY CANADA RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate 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 communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

1. ABOUT THIS GUIDE

This guide describes installing and operating the Black Box G.SHDSL NTU Model ME231A-R2, ME232A-R2, and ME233A-R2 G.SHDSL NTU.

1.1 AUDIENCE

This guide is intended for the following users:

- Operators
- Installers
- Maintenance technicians

1.2 STRUCTURE

This guide contains the following chapters and appendices:

- "Quick Start" on page 9 provides a brief guide to starting up the device and its basic features and capabilities
- "Ethernet Management Port" on page 23 contains an overview describing the device's operations and applications
- "Configuration" on page 14 provides hardware and software configuration procedures
- "Installation" on page 30 describes how to install the device
- "Operation" on page 35 describes how to install and operate the device
- "Remote Console Operation" on page 39 describes how to operate the device remotely
- "Software upgrade" on page 42 provides information how to upgrade the device's software
- "Reset Configuration to factory defaults" on page 42 provides information on how to configure the device to its original state
- Appendix A. on page 43 contains compliance information
- Appendix B. on page 44 contains specifications
- Appendix C. on page 47 provides the factory default values
- Appendix D. on page 48 describes the device's ports and pin-outs

For best results, read the contents of this guide *before* you install the device.

1.3 PRECAUTIONS

Notes, cautions, and warnings, which have the following meanings, are used throughout this guide to help you become aware of potential problems. ***Warnings*** are intended to prevent safety hazards that could result in personal injury. ***Cautions*** are intended to prevent situations that could result in property damage or impaired functioning.

Note A note presents additional information or interesting sidelights.

The shock hazard symbol and WARNING heading indicate a potential electric shock hazard. Strictly follow the warning instructions to avoid injury caused by electric shock.

The alert symbol and WARNING heading indicate a potential safety hazard. Strictly follow the warning instructions to avoid personal injury.

The shock hazard symbol and CAUTION heading indicate a potential electric shock hazard. Strictly follow the instructions to avoid property damage caused by electric shock.

The alert symbol and CAUTION heading indicate a potential hazard. Strictly follow the instructions to avoid property damage.

Safety when working with electricity

- **Do not open the device when the power cord is connected. For systems without a power switch and without an external power adapter, line voltages are present within the device when the power cord is connected.**
- **For devices with an external power adapter, the power adapter shall be a listed *limited Power Source* The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker in compliance with local regulatory requirements.**
- **For AC powered devices, ensure that the power cable used meets all applicable standards for the country in which it is to be installed.**
- **For AC powered devices which have 3 conductor power plugs (L1, L2 & GND or Hot, Neutral & Safety/Protective Ground), the wall outlet (or socket) must have an earth ground.**
- **For DC powered devices, ensure that the interconnecting cables are rated for proper voltage, current, anticipated temperature, flammability, and mechanical serviceability.**
- **WAN, LAN & PSTN ports (connections) may have hazardous voltages present regardless of whether the device is powered ON or OFF. PSTN relates to interfaces such as telephone lines, FXS, FXO, DSL, xDSL, T1, E1, ISDN, Voice, etc. These are known as "hazardous network voltages" and to avoid electric shock use caution when working near these ports. When disconnecting cables for these ports, detach the far end connection first.**
- **Do not work on the device or connect or disconnect cables during periods of lightning activity.**

This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.

This device is NOT intended nor approved for connection to the PSTN. It is intended only for connection to customer premise equipment.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Do the following to prevent ESD:

- Always follow ESD prevention procedures when removing and replacing cards.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground.
- To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

1.4 GENERAL OBSERVATIONS

- Clean the case with a soft slightly moist anti-static cloth
- Place the unit on a flat surface and ensure free air circulation
- Avoid exposing the unit to direct sunlight and other heat sources
- Protect the unit from moisture, vapors, and corrosive liquids

2. QUICK START

2.1 SELECT CONFIGURATION METHOD

Before powering up, you must select one of the following methods for configuring your Black Box:

- **Plug 'n' Play**—The Black Box G.SHDSL NTU comes factory-configured for Plug 'n' Play configuration when connected to a service-provider network.

- **DIP Switch**—For deploying the Black Box G.SHDSL NTU in back-to-back applications. To use DIP-switch configuration you must first set the DIP switches to a position other than all *OFF* or all *ON* before powering-up the Black Box.
- **Software Configuration**—Allows you to modify configurable parameters by connecting a PC to the console port and issuing software commands. To use software configuration you must set all the DIP switches to the *ON* position before powering-up the Black Box.

2.2 POWER UP THE NTU

Your G.SHDSL.bis NTU comes with one of the following power supply options:

- External AC adapter with detachable power cord
- External DC power supply with terminal block connector (model 48V-PSM3)

Models with external AC adapter

1. Connect female plug of the AC power cord to the AC adapter provided.
2. Connect the barrel-type connector of the AC adapter to the Power connector on the Black Box.
3. Insert the male plug of the AC power cord into an AC power outlet (100–240 VAC).

Models with external DC power supply

The 36–60 VDC DC to DC adapter is supplied with the DC version of the G.SHDSL.bis NTU. The black and red leads plug into a DC source (nominal 48VDC) and the barrel power connector plugs into the barrel power supply jack on the G.SHDSL.bis NTU.

Power up indication

Verify that the *Power* LED illuminates and remains lit. Once the G.SHDSL.bis NTU is properly configured and installed, it should operate transparently.

The following sections describe power-up and reading the LED status monitors.

2.3 CONNECT THE G.SHDSL PORT

1. Obtain single-twisted-pair cable with an RJ-45 plug connector at each end.
2. Plug one end of the cable into the RJ-45 socket (labeled *DSL*) on the Black Box NTU.
   - If you are connecting to a DSL service, plug the other end of the cable into the RJ-45 wall socket that provides your G.SHDSL service.

- If connecting to another Black Box, verify the other end of the cable is connected to the DSL port on other Black Box G.SHDSL NTU and the DSL port is correctly configured.

3. When a DSL link is established, the front-panel DSL LED will turn on.

2.4 CONNECT THE SERIAL PORT

Your Black Box G.SHDSL NTU comes with one of the following serial WAN ports for connection to an NTU:

- V.35 (DB-25F)—ME233A-R2
- X.21 (DB-15)—ME232A-R2
- E1 (120-Ohm RJ-48C and dual 75-Ohm BNC connectors)—ME231A-R2

Connect the serial cable to the Black Box G.SHDSL NTU serial port as follows:

1. Attach the male connector of the serial cable to the female serial connector on the Black Box.

2. Attach the other end of the cable to the serial connector on the local serial NTU.

Note You can connect the V.35 interface to an M/34 connector using the interface adapter.

Note You can configure the E1 interface to either recover the network clock from the E1 line or supply the network clock for the E1 line.

3. ME231A-R2, ME232A-R2, AND ME233A-R2 OVERVIEW

The Black Box G.SHDSL NTU ME231A-R2, ME232A-R2, and ME233A-R2 provides high speed 2-wire connectivity to ISPs, PTTs, and enterprise environments using Symmetrical High-data-rate Digital Subscriber Line (G.SHDSL) technology.

As a symmetric DSL CPE, DSL offers the same data rates in both directions over a single pair of regular twisted pair lines using TC-PAM modulation. Line connection is made with an RJ-45 jack. Standard versions of Model ME231A-R2, ME232A-R2, and ME233A-R2 are powered by an 100/230 VAC (Universal) supply. The CPE features externally-accessible DIP switches, loopback diagnostics, SNMP/HTTP remote-management capabilities using Plug ‘n’ Play, as well as in-band management.

Figure 1. ME231A-R2, ME232A-R2, and ME233A-R2

3.1 SERIAL INTERFACE TYPES

The ME231A-R2, ME232A-R2, and ME233A-R2 versions listed below provide the following types of built-in serial interfaces:

- Model ME233A-R2 provides a **V.35** interface on a DB-25 female connector.
- Model ME232A-R2 provides an **X.21** interface on a DB-15 female connector.
- Model ME231A-R2 provides an **E1** (G.703/G.704) interface on dual BNC connectors and an RJ-48C receptacle.

3.2 FEATURES

- Symmetrical high data-rate DSL (G.SHDSL)
- Data rates up to 5.69 Mbps in 64-kbps intervals for X.21 and V.35 models
- Data rates up to 2.048 Mbps in 64-kbps intervals for E1 models
- One of the following built-in serial interfaces:
- V.35 (selectable DCE or DTE) — Model ME231A-R2
- X.21 (selectable DCE or DTE) — Model ME232A-R2
- E1 — Model ME233A-R2
- Data rates up to 256kbps in 64-kbps intervals for RS-232 model (Model ME231A-R2, ME232A-R2, and ME233A-R2/A)
- 10/100 Ethernet port for management and configuration
- Built-in testing and diagnostics
- Interoperable with other Black Box's G.SHDSL NTUs

- Configurable as remote (CP) units
- Configurable as central (CO) units to operate back-to-back
- Front-panel status indicators
- CE marked

3.3 POWER INPUT CONNECTOR

The NTU comes with an AC or DC power supply. (See section “Power and power supply specifications” on page 46.)

- The power connection to the CPE is a 2.5 mm barrel receptacle with the center conductor positive (see Figure 2).
- Rated voltage: 5 VDC

Rated current: 1 A

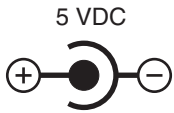


Figure 2. Power connection barrel receptacle 5 VDC diagram

External AC universal power supply

For additional specifications, see section “Power and power supply specifications” on page 46.

- Output from power supply: 5 VDC, 2 A
- Input to power supply: universal input 100–240 VAC 50/60 Hz 0.3A

The external AC adapter shall be a listed limited power source that incorporates a disconnect device and shall be positioned within easy reach of the operator. Ensure that the AC power cable meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground.

4. CONFIGURATION

You can configure the NTU (see Figure 3) in one of two ways:

- Software configuration using command line interface (CLI) via the console port
- Hardware configuration via DIP switches

Figure 3. ME232A-R2 Shown

4.1 SOFTWARE (CLI) CONFIGURATION

To use the software configuration, you must set the *S4* (Rate) DIP switches to the *OFF* position *before* powering up the NTU. When it is set for software-configuration mode, the NTU will read any configuration data previously saved to FLASH memory during system power-up. If no configuration data was previously saved to FLASH, then the NTU will load the factory-default configuration from FLASH memory. After power-up, you may use console commands or the Embedded Operations Channel (EOC) to modify the configuration parameters.

4.2 HARDWARE (DIP-SWITCH) CONFIGURATION

To use DIP-switch configuration you must first set the DIP switches to a position other than all *OFF* or all *ON before* powering-up the NTU. When all the DIP switches are set to any position other than all *OFF* or all *ON* the NTU will operate in hardware (DIP-switch)-configuration mode. In DIP-switch-configuration mode the NTU will read the DIP-switch settings during system startup and configure itself according to the switch settings.

Once you power-up the NTU in DIP-switch mode, it will operate in DIP-switch mode until powered down. When operating in DIP-switch mode you cannot change any configuration settings:

- Changing the DIP switch settings while the device is running requires the *dsl start* command.
- If you attempt to modify the configuration by issuing console commands, the device will not execute your commands- except for the *dsl start* command and the *show* commands. Instead, the NTU will respond with a message indicating the device is operating in DIP-switch-configuration mode.
- If you attempt to modify any configuration parameters via the EOC (by changing (EOC variables), the NTU will not execute your changes.

Table 1 lists the Model ME231A-R2, ME232A-R2, and ME233A-R2's configurable parameters.

Table 1. Configurable Parameters

Parameter	Description	Possible Values
Password	The password used to login to the console.	1-10 characters
Circuit ID	The circuit ID used to identify the unit.	1-64 characters
DTE Loops (model ME233A-R2)	The DB-25 interface can request LALs and RDLs using its RRDL and RLAL pins. If DTE loops are disabled, requests for loopbacks on these pins will be ignored.	Enabled or Disabled
TX Clock (models ME232A-R2 and ME233A-R2)	Defines where (RS-232, V.35 or X.21) serial transmit data is sampled in relation to the TX clock: on the falling edge (normal) or the rising edge (inverted) of the TX clock.	Normal or Inverted
DSL Data Rate/Timeslots	Defines the number of DSL timeslots. The DSL data rate is calculated by the equation: data rate = DSL timeslots x 64k. This value also defines the maximum serial/E1 data rate.	1–72
Serial/E1 Timeslots	Defines the total number of serial/E1 timeslots utilized. This value must be less than or equal to DSL timeslots.	3–89 (RS-232) 3–89 (V.35) 3–89 (X.21) 1–32 (E1)

Table 1. Configurable Parameters (Continued)

Parameter	Description	Possible Values
Timeslot Mapping (Model ME231A-R2)	Defines E1–to–DSL timeslot mapping. By default defined/utilized DSL timeslots are mapped to the first n data–bearing timeslots on the E1 line. Line type determines which timeslots are data–bearing: E1–Unframed: 0–31 E1–Fractional: 1–31 E1–CRC: 1–31 E1–MF: 1–15,17–31 E1–CRCMF: 1–15,17–31	
Line Type (Model ME231A-R2)	Defines the framing format of the E1 line.	E1–Unframed (Clear Channel G.703) E1–Fractional E1–CRC E1–Multiframe E1–CRC & Multiframe
Line Code (Model ME231A-R2)	Selects line coding for the E1 line.	AMI HDB3 (E1 only)
Line Build Out (Model ME231A-R2)	Selects wave form used on the E1 line.	Pulse–75 Ohm(E1) Pulse–120 Ohm (E1)
RX Equalizer (Model ME231A-R2)	When enabled, this feature removes signal distortion introduced on the E1 cable.	Enabled (select for long–haul link). Disabled (select for short–haul link). Long haul LBO (line buildout) is defined by ANSI T1.403).

Table 1. Configurable Parameters (Continued)

Parameter	Description	Possible Values
Pass Framing (Model ME231A-R2)	When enabled, the NTU transparently passes framing information (E1 TS0) over the DSL link to the remote E1 network.	Enabled or Disabled.
Pass Alarms (Model ME231A-R2)	When enabled, the NTU passes alarms detected on one E1 network over the DSL link to the remote E1 network.	Enabled or Disabled
Clock Mode	Defines the clock source operation for both DSL and serial/E1 ports as follows. Internal: the on–board oscillator in the ME231A-R2, ME232A-R2, and ME233A-R2 provides clock for both serial/E1 and DSL lines. External: the serial/E1interface provides clock for the DSL line. Receive Recover: the DSL interface provides clock for the serial/E1 line.	Internal External Receive Recover
Annex	The G.991.2 Annex.	A or B
Loopback	The ME231A-R2, ME232A-R2, and ME233A-R2 provides both a local loopback (LAL) and a remote loopback (RDL). This can be used to troubleshoot problems.	OFF, LAL, or RDL
Pattern	The ME231A-R2, ME232A-R2, and ME233A-R2 provides an internal PRBS pattern generator and detector that can be used to run BER tests without external equipment.	OFF or 511/511e

Configuring the DIP switches

The Model ME231A-R2, ME232A-R2, and ME233A-R2 is equipped with three sets of DIP switches, which you can use to configure the NTU for a broad range of applications. This section describes switch locations and discusses the configuration options available. The three sets of DIP switches are externally accessible from the underside of the Model ME231A-R2, ME232A-R2, and ME233A-R2 (see Figure 4).

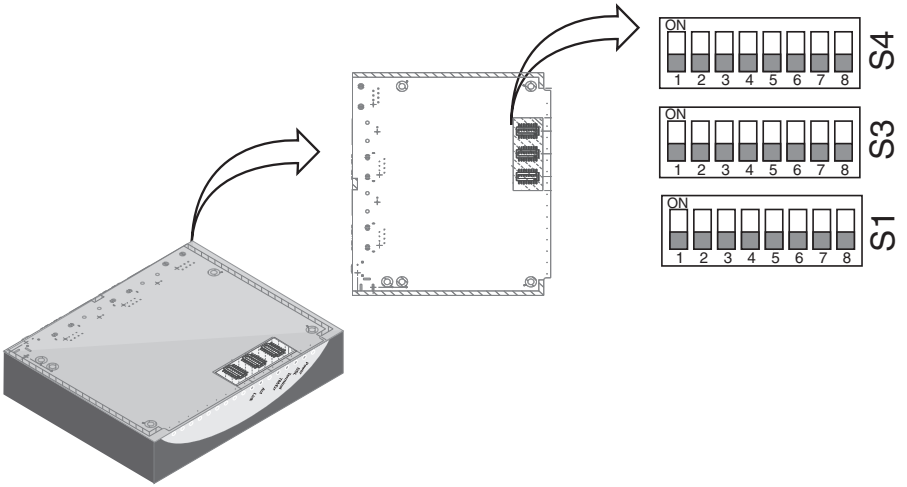
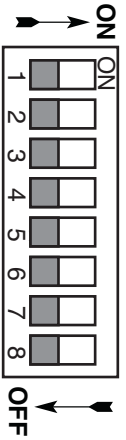


Figure 4. Underside of ME231A-R2, ME232A-R2, and ME233A-R2 showing location of DIP switches

The three sets of DIP switches on the underside of the Model ME231A-R2, ME232A-R2, and ME233A-R2 are referred to as *S1*, *S3* and *S4*. For basic **configuration**, use DIP switch ***S1***. For **testing** the ME231A-R2, ME232A-R2, and ME233A-R2, use DIP switch ***S3*.** To configure the **rate**, use DIP switch ***S4***. This figure shows the DIP switch orientation with respect to *ON* and *OFF* positions is consistent for all switches.



System reset mode

To enter system reset mode, turn the *S1-1* DIP switch to the *ON* position and power cycle the unit. For information on how to upgrade the software, refer to Chapter "Software upgrade" on page 42. For more information on applying factory default configuration to the ME231A-R2, ME232A-R2, and ME233A-R2, refer to Chapter "Reset Configuration to factory defaults" on page 42.

DIP switch settings

You can configure the ME231A-R2, ME232A-R2, and ME233A-R2 by setting the DIP switches to the desired positions *before* you power up the NTU. If the DIP switches are set to anything other than all *OFF* or all *ON*, the NTU will operate in DIP switch configuration mode. Once the device is powered up and operating in DIP switch configuration mode, you cannot change configuration by any method until you power it down again.

The following tables provide an overview of the NTU DIP switch functions.

Table 2. Model ME231A-R2, ME232A-R2, and ME233A-R2 Series - S1 DIP-Switch Functions (Configuration)

Position	Function (ME232A-R2 & ME233A-R2 models)	Function (ME231A-R2 models)
S1-1	Software Reset	Software Reset
S1-2	Reserved	ON - Multiframe OFF - Fractional/Unframed*
S1-3		ON - CRC OFF - Fractional/Unframed
S1-4		Line Coding ON - HDB3 OFF - AMI
S1-5	DTE/DCE (CO Only) ON - DTE OFF - DCE	Reserved (Leave OFF)
S1-6	Annex ON - Annex B OFF - Annex A	Annex ON - Annex B OFF - Annex A
S1-7	Timing Source (CO only) ON - Internal OFF - External (Network)	Timing Source ON - Internal OFF - External (Network)
S1-8	DSL Mode ON - CO OFF - CPE	DSL Mode ON - CO OFF - CPE

*. For the Fractional or Unframed setting, both S1-2 and S1-3 must be set to the OFF position. For the Fractional setting, timeslots must be set to a value less than 32 (a data rate set at 1984 or less on DIP switch S4). For the Unframed setting, timeslots must be set to a value equal to 32 (the 2048 data rate on DIP switch S4).

Table 3. S3 DIP-Switch Functions

Position	Function
S3-1	Reserved
S3-2	
S3-3	
S3-4	
S3-5	511e Pattern
S3-6	511 Pattern
S3-7	Test Mode Remote
S3-8	Test Mode Local

S4-2 through S4-8: Data Rate

Switches S4-2 through S4-8 define both the DSL line rate and the serial data rate.

Note For **ME231A-R2 model**, only columns **S4-4** through **S4-8** apply in this table.
Also, use **S4-1** to configure the **Line Build Out**:
OFF = 75 ohms, **ON** = 120 ohms.

Table 4. S4-2 through S4-8 Data Rate DIP switch settings

S4-2	S4-3	S4-4	S4-5	S4-6	S4-7	S4-8	Data Rate (kbps)
OFF	OFF	OFF	OFF	OFF	OFF	ON	192
OFF	OFF	OFF	OFF	OFF	ON	OFF	256
OFF	OFF	OFF	OFF	OFF	ON	ON	320
OFF	OFF	OFF	OFF	ON	OFF	OFF	384
OFF	OFF	OFF	OFF	ON	OFF	ON	448
OFF	OFF	OFF	OFF	ON	ON	OFF	512
OFF	OFF	OFF	OFF	ON	ON	ON	576
OFF	OFF	OFF	ON	OFF	OFF	OFF	640
OFF	OFF	OFF	ON	OFF	OFF	ON	704
OFF	OFF	OFF	ON	OFF	ON	OFF	768
OFF	OFF	OFF	ON	OFF	ON	ON	832
OFF	OFF	OFF	ON	ON	OFF	OFF	896
OFF	OFF	OFF	ON	ON	OFF	ON	960
OFF	OFF	OFF	ON	ON	ON	OFF	1024
OFF	OFF	OFF	ON	ON	ON	ON	1088
OFF	OFF	ON	OFF	OFF	OFF	OFF	1152

Table 4. S4-2 through S4-8 Data Rate DIP switch settings (Continued)

S4-2	S4-3	S4-4	S4-5	S4-6	S4-7	S4-8	Data Rate (kbps)
OFF	OFF	ON	OFF	OFF	OFF	ON	1216
OFF	OFF	ON	OFF	OFF	ON	OFF	1280
OFF	OFF	ON	OFF	OFF	ON	ON	1344
OFF	OFF	ON	OFF	ON	OFF	OFF	1408
OFF	OFF	ON	OFF	ON	OFF	ON	1472
OFF	OFF	ON	OFF	ON	ON	OFF	1536
OFF	OFF	ON	OFF	ON	ON	ON	1600
OFF	OFF	ON	ON	OFF	OFF	OFF	1664
OFF	OFF	ON	ON	OFF	OFF	ON	1728
OFF	OFF	ON	ON	OFF	ON	OFF	1792
OFF	OFF	ON	ON	OFF	ON	ON	1856
OFF	OFF	ON	ON	ON	OFF	OFF	1920
OFF	OFF	ON	ON	ON	OFF	ON	1984
OFF	OFF	ON	ON	ON	ON	OFF	2048
OFF	OFF	ON	ON	ON	ON	ON	2112
OFF	ON	OFF	OFF	OFF	OFF	OFF	2176
OFF	ON	OFF	OFF	OFF	OFF	ON	2240
OFF	ON	OFF	OFF	OFF	ON	OFF	2304
OFF	ON	OFF	OFF	OFF	ON	ON	2368
OFF	ON	OFF	OFF	ON	OFF	OFF	2432
OFF	ON	OFF	OFF	ON	OFF	ON	2496
OFF	ON	OFF	OFF	ON	ON	OFF	2560
OFF	ON	OFF	OFF	ON	ON	ON	2624
OFF	ON	OFF	ON	OFF	OFF	OFF	2688
OFF	ON	OFF	ON	OFF	OFF	ON	2752
OFF	ON	OFF	ON	OFF	ON	OFF	2816
OFF	ON	OFF	ON	OFF	ON	ON	2880
OFF	ON	OFF	ON	ON	OFF	OFF	2944
OFF	ON	OFF	ON	ON	OFF	ON	3008
OFF	ON	OFF	ON	ON	ON	OFF	3072
OFF	ON	OFF	ON	ON	ON	ON	3136
OFF	ON	ON	OFF	OFF	OFF	OFF	3200
OFF	ON	ON	OFF	OFF	OFF	ON	3264
OFF	ON	ON	OFF	OFF	ON	OFF	3328

Table 4. S4-2 through S4-8 Data Rate DIP switch settings (Continued)

S4-2	S4-3	S4-4	S4-5	S4-6	S4-7	S4-8	Data Rate (kbps)
OFF	ON	ON	OFF	OFF	ON	ON	3392
OFF	ON	ON	OFF	ON	OFF	OFF	3456
OFF	ON	ON	OFF	ON	OFF	ON	3520
OFF	ON	ON	OFF	ON	ON	OFF	3584
OFF	ON	ON	OFF	ON	ON	ON	3648
OFF	ON	ON	ON	OFF	OFF	OFF	3712
OFF	ON	ON	ON	OFF	OFF	ON	3776
OFF	ON	ON	ON	OFF	ON	OFF	3840
OFF	ON	ON	ON	OFF	ON	ON	3904
OFF	ON	ON	ON	ON	OFF	OFF	3968
OFF	ON	ON	ON	ON	OFF	ON	4032
OFF	ON	ON	ON	ON	ON	OFF	4096
OFF	ON	ON	ON	ON	ON	ON	4160
ON	OFF	OFF	OFF	OFF	OFF	OFF	4224
ON	OFF	OFF	OFF	OFF	OFF	ON	4288
ON	OFF	OFF	OFF	OFF	ON	OFF	4352
ON	OFF	OFF	OFF	OFF	ON	ON	4416
ON	OFF	OFF	OFF	ON	OFF	OFF	4480
ON	OFF	OFF	OFF	ON	OFF	ON	4544
ON	OFF	OFF	OFF	ON	ON	OFF	4608
ON	OFF	OFF	OFF	ON	ON	ON	4672
ON	OFF	OFF	ON	OFF	OFF	OFF	4736
ON	OFF	OFF	ON	OFF	OFF	ON	4800
ON	OFF	OFF	ON	OFF	ON	OFF	4864
ON	OFF	OFF	ON	OFF	ON	ON	4928
ON	OFF	OFF	ON	ON	OFF	OFF	4992
ON	OFF	OFF	ON	ON	OFF	ON	5056
ON	OFF	OFF	ON	ON	ON	OFF	5120
ON	OFF	OFF	ON	ON	ON	ON	5184
ON	OFF	ON	OFF	OFF	OFF	OFF	5248
ON	OFF	ON	OFF	OFF	OFF	ON	5312
ON	OFF	ON	OFF	OFF	ON	OFF	5376
ON	OFF	ON	OFF	OFF	ON	ON	5440
ON	OFF	ON	OFF	ON	OFF	OFF	5504
ON	OFF	ON	OFF	ON	OFF	ON	5568

Table 4. S4-2 through S4-8 Data Rate DIP switch settings (Continued)

S4-2	S4-3	S4-4	S4-5	S4-6	S4-7	S4-8	Data Rate (kbps)
ON	OFF	ON	OFF	ON	ON	OFF	5632
ON	OFF	ON	OFF	ON	ON	ON	5696

DCE/DTE operation

Note This section applies to the following models:

- ME233A-R2 - V.35
- ME232A-R2 - X.21

There are a few things to note about clock modes and the ME231A-R2, ME232A-R2, and ME233A-R2 sync serial interface.

- One model must be set to *Receive-Recover.* The other must be set to either *Internal* or *External*/*Network* clock mode.
- The ME231A-R2, ME232A-R2, or ME233A-R2 that is configured as *Receive-Recover* must be DCE.
- The ME231A-R2, ME232A-R2, or ME233A-R2 that is configured as *Internal* must also be DCE, but if it is an *External*/*Network* clock, then the modem must be configured as DTE.

Table 5. ME231A-R2, ME232A-R2, and ME233A-R2 Clocking

Mode	DTE/DCE	Clock Source
Internal	DCE	ME231A-R2, ME232A-R2, and ME233A-R2 Internal Oscillator
Receive-Recover	DCE	Clock recovered from DSL
External	DTE	Clock from external Interface
External	DCE	Clock from external Interface*

*. For X.21, external DTE must provide clocking on pins 7 & 14.

4.3 ETHERNET MANAGEMENT PORT

The ME231A-R2, ME232A-R2, and ME233A-R2 offers a 10/100 Ethernet port for configuration and management via Telnet sessions. Because the Ethernet port is configured as MDI, a crossover Ethernet cable is required when connecting directly from a local PC or laptop. The Ethernet interface default IP address is 192.168.200.1.

Through the Ethernet management port, the following variables can be configured:

- **Password**: The password used to login to the console (1 to 10 characters).
- **Circuit ID**: The circuit ID communicated to other units via EOC (1-64 characters). EOC (Embedded Operations Channel) is an out-of-band channel specified in the G.991.2 standard for SHDSL. We use standard EOC messages for our remote loopback.
- **Clock Mode:** The following options are available:
  - Internal: The internal oscillator in the ME231A-R2, ME232A-R2, and ME233A-R2 provides the clock to both the serial/E1 and DSL interfaces.
  - Network: The E1 interface provides the clock for the DSL interface (E1 only).
  - External: The serial interface provides the clock for the DSL interface (V.35, X.21). X.21 can only be set to DCE if DTE signal element timing is provided to pins 7/14. Otherwise, it must be set to DTE.
  - Receive Recover: The ME231A-R2, ME232A-R2, and ME233A-R2 recovers the clock from the DSL interface and provides it to the serial/E1 interface.
- **Data Rate**: Both the serial/E1 and DSL data rates are set by specifying the number of 64k timeslots.
- **Pass Framing:** For E1, the entire TS0 time slot is passed. When E1 is configured for CAS (Multiframe), the entire TS0 time slot and all of TS16 are both passed.
- **Pass Alarms**: When Passed Framing is enabled, the alarms are always passed, even if Pass Alarms is disabled. When Passed Framing is disabled, you can pass alarms by enabling *Pass Alarms*.
- **Rx Equalizer:** This can be enabled to remove distortion introduced in the E1 cable.
- **Line Type**: The following framing formats are available:
  - E1-Unframed: G.703 Clear Channel
  - E1-Fractional: G.703/G.704 fractional.
  - E1-CRC: Includes CRC multiframe.
  - E1-Multiframe: Includes channel associated signaling (CAS).
  - E1-CRC & Multiframe: Includes CRC and CAS multiframe.
- **Line Code**: The following line codes are available:
  - AMI: Alternate Mark Inversion.
  - HDB3: High Density Bipolar 3 (E1 only).

- **Line Build Out**: The following line build outs are available:
  - Pulse-75 (E1 only)
  - Pulse-120 (E1 only)
- **Annex**: Either G.991.2 Annex A or Annex B.

The following status information is available through the command line interface:

- **Configuration Mode**: Whether the ME231A-R2, ME232A-R2, and ME233A-R2 is configured by DIP switches or software.
- **DSL Link State**: *In Progress*, *Success*, *Deactivated*, or *Idle*.
- **DSL Sync State**: *Out of Sync*, *Acquiring Sync*, *In Sync*, or *Losing Sync*.

Note **DSL Link State vs. DSL Sync State**—The DSL link state describes whether the DSL is training (in progress), linked (success), deactivated (we don't have an option to deactivate the modem, so the user should not see this), or idle.The DSL sync state describes whether no sync words have been found (out of sync), there are no sync word errors (in sync), or whether we are transitioning from out of sync to in sync (acquiring sync) or vice versa (losing sync). Typically, when the link is training, the sync state goes from out of sync to acquiring sync to in sync.

- **DSL Actual Rate**: The actual rate at which the DSL link is running (minus DSL overhead).
- **DSL Line Condition**: *Good* or *Poor*.
- **Noise Margin Ratio**: the maximum tolerable increase in external noise power that still allows for BER of less than $1x\ 10^{-7}$.
- **DSL Error Counters**: The following error counters are available:
  - CRC
  - LOSW (Loss of Sync Word)
- **E1 Loss of Signal**: Active or Inactive.
- **E1 Frame Sync**: Searching or Found.
- **E1 Frame Errors**: Yes or No.
- **E1 Buffer Slips**: Yes or No.
- **Alarms: RED, YELLOW, BLUE.** Active or Inactive.

- **E1 Error Counters:** The following error counters are available:
  - Line Code Violations
  - Path Code Violations
  - Errored Seconds
  - Severely Errored Seconds
  - Severely Errored Frame Seconds
  - Unavailable Seconds
  - Controlled Slip Seconds
  - Line Errored Seconds
  - Bursty Errored Seconds
  - Degraded Minutes

Help Commands

The following commands are provided to help the user find the correct command:

- **help:** Lists all the commands that the console recognizes.
- **system help:** Lists all the commands that start with **system** that the console recognizes.
- **system set help:** Lists all the commands that start with **system set** that the console recognizes.
- **system show help:** Lists all the commands that start with **system show** that the console recognizes.
- **dsl help:** Lists all the commands that start with **dsl** that the console recognizes.
- **dsl set help:** Lists all the commands that start with **dsl set** that the console recognizes.
- **dsl show help:** Lists all the commands that start with **dsl show** that the console recognizes.
- **dsl show errcntr help:** Lists all the commands that start with **dsl show errcntr** that the console recognizes.
- **e1 help**: Lists all the commands that start with **e1** that the console recognizes.
- **e1 set help:** Lists all the commands that start with **e1 set** that the console recognizes.
- **e1 show help**: Lists all the commands that start with **e1 show** that the console recognizes.

System Configuration Commands

The following commands allow the user to configure the system:

- **system set password** <password>**:** Sets the system password (1-10 characters).
- **system set devicetype** <dte|dce>**:** Sets the serial device type as DTE or DCE. Only valid in CO mode.
- **system set circuitid** <circuitid>**:** Sets the circuit ID (1-64 characters).
- **system set clockmode** <internal|external|receiverecover>**:** Sets the clock mode. Internal clock mode means the ME231A-R2, ME232A-R2, and ME233A-R2 provides the clock to both the DSL and the serial/E1 interface. External clock mode means the ME231A-R2, ME232A-R2, and ME233A-R2 uses the serial/E1 transmit clock as its DSL transmit clock. Receive recover clock mode means that the ME231A-R2, ME232A-R2, and ME233A-R2 uses the DSL receive clock as its DSL transmit clock and as the serial/E1 receive clock.

The following command enables the user to view the current system configuration:

- **system show config**: Shows the configuration of the entire system, including DSL and serial/E1 lines.

Any changes to the system configuration or the DSL configuration will be lost on the next power cycle unless the changes are saved. The command **system save config** is used to save the changes.

System Status Commands

The following commands show system status:

- **system show status**: Shows the following system status information: LEDs, DSL test mode, front panel switch settings, DSL link state, and configuration mode.

DSL Configuration Commands

The following commands are used to configure the DSL:

- **dsl set timeslots** <1–32 (e1) | 89 (v.35, x.21) | 4 (rs-232)>: Sets the number of timeslots. For E1 NTUs, the number of E1 timeslots is set simultaneously. The E1 timeslot mapping will be set to the default. The data rate is calculated by the equation: d*ata-rate = #timeslots x 64k*.
- **dsl set annex** <a|b>**:** Set the annex.
- **dsl set lineprobe** <enabled|disabled>**:** Enable or disable line probe.
- **dsl set loopback** <off|lal|rdl>**:** Start or stop loopbacks.

- **dsl set pattern** <off|511|511e>: Start or stop PRBS generator and BER meter.
- **dsl set mode** <co|cpe>: Set the CPE as local (CO) or remote (CPE).

DSL Status Command

The **dsl show status** command shows the following DSL status information: link state, sync state, link speed, error counters, line condition, noise margin, and test mode status.

DSL Clear Errcntrs Command

The **dsl clear errcntrs** command clears the error counters.

E1 Configuration Commands

e1 set linetype <e1-unframed|e1-fractional|e1-crc|e1-multiframe|e1-crc-multiframe>
Select the E1 framing format to use.

e1 set linecode <ami|hdb3|b8zs>
Select the line code to use. HDB3 can only be used for E1 line types.

e1 set lbo <75ohm|120ohm>
Select the line build out.

e1 set ts_map <tsmap>
Specify the E1 timeslots to map to DSL timeslots. This is a string that can contain ranges (-) and groups (,). For example, the string *2-4,8-9* will select timeslots 2, 3, 4, 8, and 9.

e1 set rxeq <enabled|disabled>
Enable or disable the Rx equalizer. This is usually only enabled for long haul applications.

e1 set passalarms <enabled|disabled>
Specify whether to generate alarms on the remote unit when detected on the local unit.

E1 Status Commands

e1 show status: Shows the active E1 configuration, loss-of-signal and framing errors, alarms, and performance statistics.

4.4 REMOTE CONSOLE

Provided that there is a DSL link to a second ME231A-R2, ME232A-R2, and ME233A-R2, a user may login to the first ME231A-R2, ME232A-R2, and ME233A-R2's console and enter the remote console command to access the second ME231A-R2, ME232A-R2, and ME233A-R2's console. Using this remote console feature, the user can configure and query the status of the second ME231A-R2, ME232A-R2, and ME233A-R2

from a remote location. When the user is finished with the remote console, the logout command can be used to return to the local console.

Example Command Line Interface Session

```
ME231A-R2 Command Shell
Password:
ME231A-R2> system show config
clocking
  clock mode:            receive-recover
  dsl timeslots:         31
system
  circuit id:           ME231A-R2
interface
  timeslot map:          fffffffe
  line type:             e1-fractional
  line coding:           hdb3
  line build out:        75ohm
  rx equalizer:          inactive
  pass alarms:           inactive
  pass framing:          inactive
g.shdsl
  annex:                 b
  mode:                  cpe
dsl test modes
  loopback:              off
  pattern:               off
ME231A-R2, ME232A-R2, and ME233A-R2> dsl show status
configuration:
  dsl mode:              cpe
  dsl timeslots:         31
  annex:                 b
status:
  actual rate:           0
  loss of signal:        signal found
  noise margin:          0
  sync state:            out of sync
  link state:            idle
test modes:
  loopback:              off
  pattern:               off
```

```
  errors:                0
error counters:
  crc:                   0
  losw:                  0
ME231A-R2> system set help
Usage: system set <options>

password ...    Set the login password.
circuitid ...   Change the circuit ID
clockmode ...   Change the clocking mode
ipaddress ...   Set the IP address of the console port
ME231A-R2> system set circuitid "ME231A-R2 Circuit ID"
ME231A-R2> system save config
ME231A-R2> system show config
clocking
  clock mode:            receive-recover
  dsl timeslots:         31
system
  circuit id:            ME231A-R2
interface
  timeslot map:          fffffffe
  line type:             e1-fractional
  line coding:           hdb3
  line build out:        75ohm
  rx equalizer:          inactive
  pass alarms:           inactive
  pass framing:          inactive
g.shdsl
  annex:                 b
  mode:                  cpe
dsl test modes
  loopback:              off
  pattern:               off
ME231A-R2> exit
```

5. INSTALLATION

Once the Model ME231A-R2, ME232A-R2, and ME233A-R2 is properly configured, it is ready to connect to the twisted pair interface, to the serial port, and to the power source. This section tells you how to make these connections.

5.1 CONNECTING THE TWISTED PAIR INTERFACE

The Model ME231A-R2, ME232A-R2, and ME233A-R2 supports communication between two DTE devices as follows:

Using 24 AWG (0.5 mm) wire up to:

- 21,500 feet (6.5 km) at 192 kbps
- 10,000 feet (3.0 km) at 2560 kbps

Two things are essential:

- These units work in pairs. Both units at the end of the twisted pair DSL span must be set for the same DTE rate—one unit set as CO, the other as CP.
- To function properly, the Model ME231A-R2, ME232A-R2, and ME233A-R2 needs one twisted pair of metallic wire. This twisted pair must be unconditioned, dry, metallic wire, between 19 (0.9mm) and 26 AWG (0.4mm) (the higher number gauges will limit distance). Standard dial-up telephone circuits, or leased circuits that run through signal equalization equipment, or standard, flat modular telephone type cable, are not acceptable.

The RJ-45 **Line** connector on the Model ME231A-R2, ME232A-R2, and ME233A-R2's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships are shown in Figure 5.

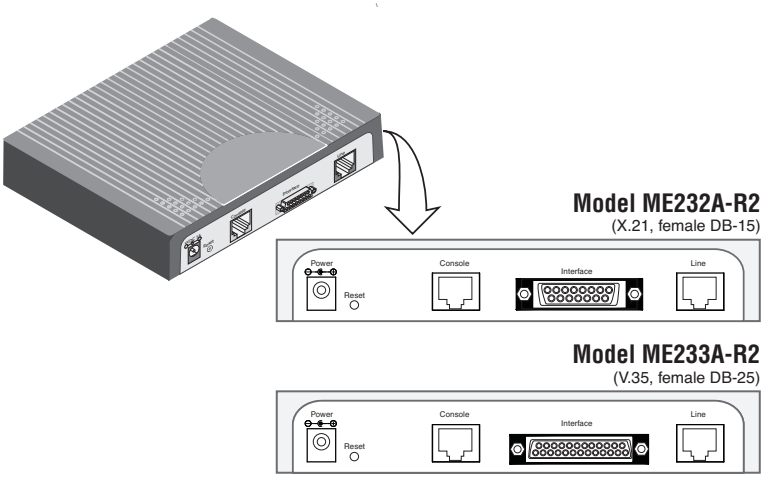


Figure 5. Model ME231A-R2, ME232A-R2, and ME233A-R2 Sync Serial interfaces

5.2 CONNECTING THE MODEL ME231A-R2, ME232A-R2, AND ME233A-R2 SERIAL INTERFACE

This section describes how to connect the serial ports to your serial equipment.

CAUTION

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

The Model ME231A-R2, ME232A-R2, and ME233A-R2 versions listed below provide the following types of built-in serial interfaces:

- Model ME233A-R2 provides a **V.35** interface on a DB-25 female connector.
- Model ME232A-R2 provides an **X.21** interface on a DB-15 female connector.

Connecting the Model ME231A-R2, ME232A-R2, and ME233A-R2 to a "DCE" or "DTE" device

The Models ME233A-R2 and ME232A-R2 provide serial interfaces for connecting to a DCE or DTE device. The serial interface default configuration is DCE for connection to DTE (data terminal equipment) such as a router. However, the serial interface on the ME231A-R2 may be configured as DTE (data terminal equipment) for connection to DCE such as a modem or multiplexer. When the ME231A-R2, ME232A-R2, and ME233A-R2 is set as CO, the internal serial interface is always configured as DCE. When the CO is set to external, the serial interface is configured as DTE.

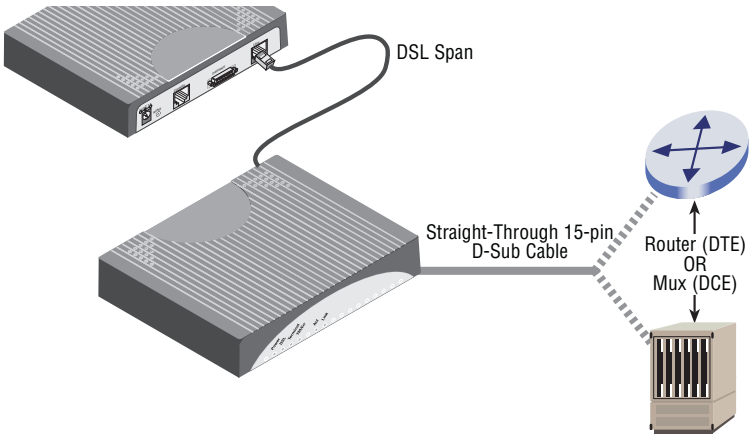


Figure 6. Connecting the Model ME232A-R2 to X.21 DTE or DCE

You may change the DCE/DTE orientation from the default position (DCE) by turning DIP switch S1-5 to the ON position (refer to Table 3 on page 20).

5.3 CONNECTING THE MODEL ME231A-R2 SERIAL INTERFACE

The Model ME231A-R2 provides an **E1** (G.703/G.704) interface on dual BNC connectors and an RJ-48C receptacle.

CAUTION

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

Connecting the Model ME231A-R2 to an E1 Network

The Model ME231A-R2 supports E1 network connections. This section describes how to connect the network to your Model ME231A-R2.

5.4 CONNECT TWISTED PAIR (120 OHM) TO E1 NETWORK

The Model ME231A-R2 is equipped with a single RJ-48C jack for connections to a 120 ohm twisted pair E1 network interface. If your E1 network terminates via RJ-48C, use the diagram below and the table following it to make the proper connections. The connector pin-out and signals are shown in Figure 7.

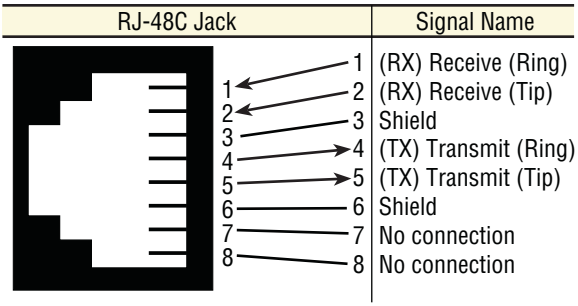


Figure 7. 120 Ohm RJ-48C E1 interface

Use the following connection diagram to connect the 120-ohm E1 network channel.

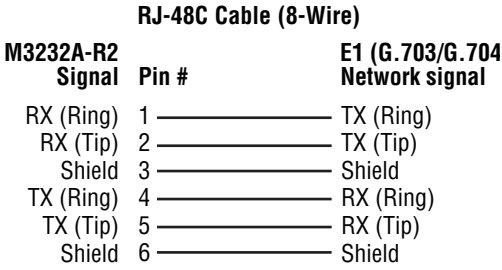


Figure 8. RJ-45 cable diagram for E1 connection

5.5 CONNECTING DUAL COAXIAL CABLE (75 OHM) TO E1 NETWORK

The Model ME231A-R2, ME232A-R2, and ME233A-R2/K is also equipped with dual female BNCs (TX and RX) for connection to a 75 ohm dual coax E1 network interface. If your E1 network terminates via dual coaxial cable, use Figure 9 to make the proper connections.

CAUTION

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

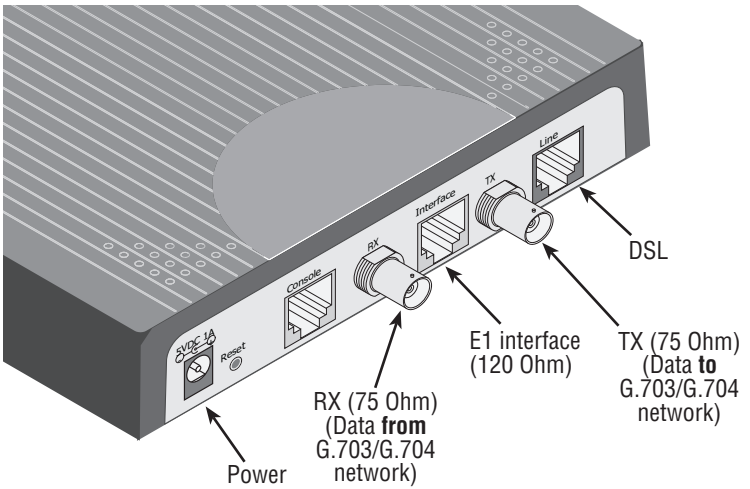


Figure 9. Model ME231A-R2 rear panel

5.6 CONNECTING POWER

The Model ME231A-R2, ME232A-R2, and ME233A-R2 use an external AC universal power supply.

1. Connect the power cord from the AC socket to the IEC-320 power entry connector on the universal input power supply.

The external AC adapter shall be a listed limited power source that incorporates a disconnect device and shall be positioned within easy reach of the operator. Ensure that the AC power cable meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground.

2. Connect the barrel plug to the *Power* connector on the Model ME231A-R2, ME232A-R2, and ME233A-R2.

Note The Model ME231A-R2, ME232A-R2, and ME233A-R2 powers up as soon as it is plugged into an AC outlet—there is no power switch.

There are no user-serviceable parts in the power supply section of the Model ME231A-R2, ME232A-R2, and ME233A-R2. Fuse replacement should only be performed by qualified service personnel.

6. OPERATION

Once the Model ME231A-R2, ME232A-R2, and ME233A-R2 is properly configured and installed, it should operate transparently. The following sections describe power-up, reading the LED status monitors, and using the built-in loopback test modes.

6.1 POWER-UP

To apply power to the Model ME231A-R2, ME232A-R2, and ME233A-R2, first be sure that you have read section “Power input connector” on page 13, and that the unit is connected to the appropriate power source. Power up the unit.

6.2 LED STATUS MONITORS

There are six LEDs that provide feedback on the state of the unit. Figure 10 shows the location of the front panel LEDs. Following Figure 10 is a description of each LED's function.

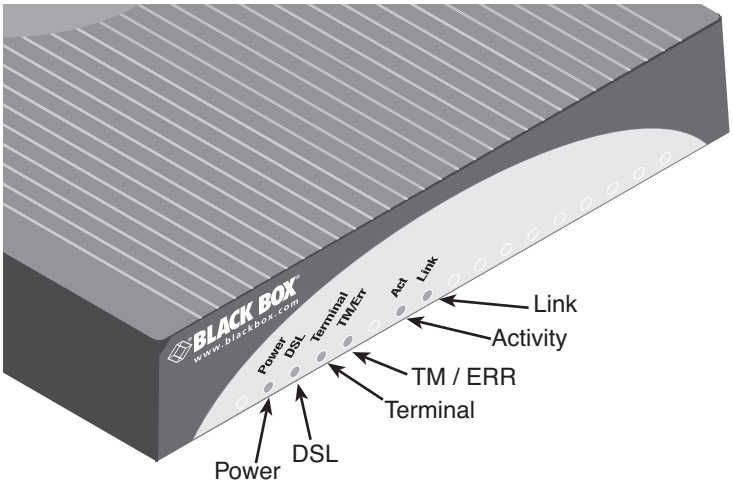


Figure 10. Model ME231A-R2, ME232A-R2, and ME233A-R2 front panel

Power (Green)

The Power LED glows solid during normal operation. At startup, during the POST, the LED blinks once every second. If the POST fails, the unit does not enter normal operation, and the LED blinks once every 0.4 seconds.

DSL (Green)

The DSL LED glows solid while a DSL link is established. While the DSL link is training it blinks once every second.

Link (Green) (Model ME231A-R2)

The Link LED indicates the status of the E1 link. It is dark when it detects no signal. It blinks once per second when it detects signal, but not valid framing. It glows solid when it detects valid framing.

Terminal (Green)

The Terminal LED glows solid under the following circumstances:

- **ME233A-R2/CA with V.35 interface:** if the serial interface has asserted DTR
- ME232A-R2 with the X.21 interface:
  - **Configured as DCE**: Indicates that the “Control” signals have been asserted.
  - **Configured as DTE**: Indicates that the “Indication” signals have been asserted

TM/ER (Yellow)

The TM/ER LED is used to indicate that a test mode is in progress or an error has been detected. It blinks once every second while a test mode is starting. It glows solid while a test mode is in progress. It blinks once if an error is detected either during a test mode, or in normal DSL operation.

LOS (Red) [Model ME231A-R2]

The LOS LED blinks once per second to indicate either framing errors or clock slips. Clock slips are often caused by a mis-configured clock mode.

Link (Green)

The Link LED shows that there is an active physical connection to the Console.

Activity (Green)

The Activity LED shows that there is data being transferred through the Console connection. During a software upgrade procedure, if the Activity LED is on for an unusually long time, there is a problem with the upgrade, and the device should be restarted. The TFTP server should be checked (normal upgrades take about 10 seconds on a 100mbit link).

6.3 TEST MODES

The ME231A-R2, ME232A-R2, and ME233A-R2 offers test modes in the form of loopbacks, PRBS pattern generators, and combinations of both. This section discusses how the test modes work.

Figure 11 is a block diagram of the Model ME231A-R2, ME232A-R2, and ME233A-R2 with respect to test modes.

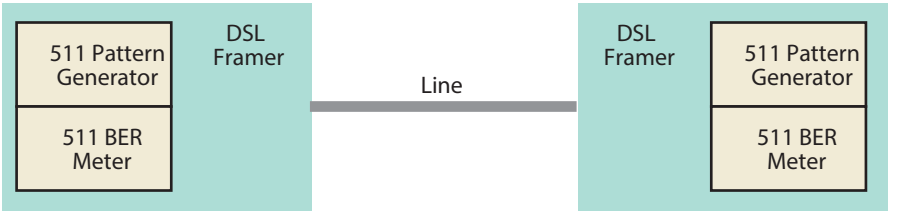


Figure 11. Model ME231A-R2, ME232A-R2, and ME233A-R2 Block Diagram

Loopbacks

The ME231A-R2, ME232A-R2, and ME233A-R2 supports both Local Analog Loopbacks (LAL) and Remote Digital Loopbacks (RDL). These can be initiated either from the optional front panel switches or by the console command dsl set loopback <off|lal|rdl>. The data path for the LAL is shown in Figure 12.

Note Local loopback causes bit errors on the remote end if the link is up.

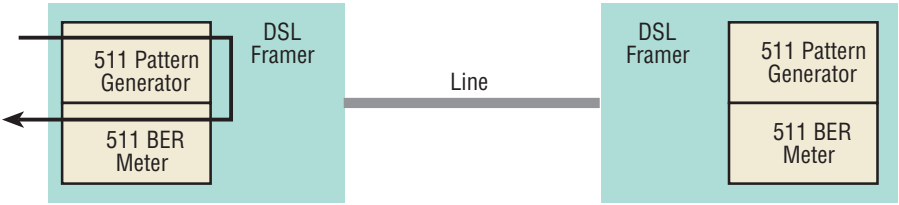


Figure 12. Local Analog Loopback diagram

The data received from the serial interface is looped back before going out on the DSL line. Note that this loopback occurs after the pattern generator/BER meter. This means that running a 511 pattern in conjunction with an LAL should result in no error detected by the meter.

The data path for the RDL is shown in Figure 13.

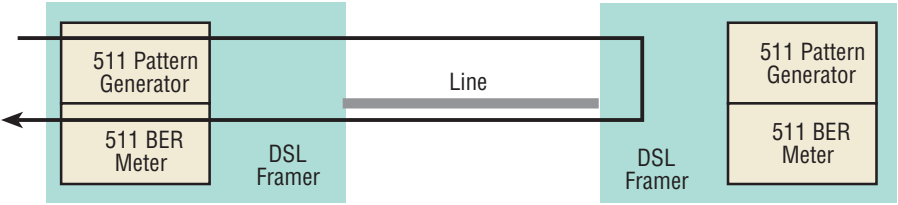


Figure 13. Remote Digital Loopback diagram

The RDL causes the remote unit to loop the data received from the DSL line back tow the DSL line.

Patterns

The ME231A-R2, ME232A-R2, and ME233A-R2 can generate and detect 511 patterns. These can be initiated either by the middle DIP switch or by the console command dsl set pattern <off|511>. When the pattern is started, the DSL framer uses its internal 511 pattern generator for its DSL TX data instead of the data received from the serial interface. Also, the framer's internal BER Meter tries to detect a 511 pattern in the DSL RX Data.

Because the BER Meter always runs when the pattern generator runs, the meter will detect errors if either the pattern is not either looped back or the remote unit is not transmitting a 511 pattern.

7. REMOTE CONSOLE OPERATION

The PC user (near-end) may configure and verify status of the remote ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) via a Remote Console session. The PC user must log onto the ME231A-R2, ME232A-R2, and ME233A-R2 (near-end) unit to establish a remote console session. Once done, the remote ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) appears as a unit which is locally connected through the console port. All commands are transmitted over the G.SHDSL link in the EOC channel.

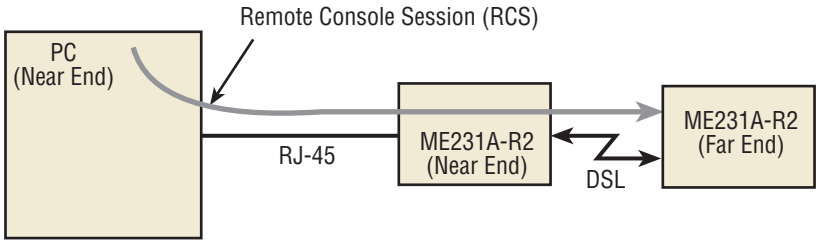


Figure 14. Remote control session diagram

7.1 ESTABLISHING A REMOTE CONSOLE SESSION

How to Connect

The following steps are to establish a connection to the remote ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) via Remote Console Session (RCS):

1. Connect to the console port of the ME231A-R2, ME232A-R2, and ME233A-R2 (near-end) via Telnet session.

2. At the password prompt, log in to the near-end Model ME231A-R2, ME232A-R2, and ME233A-R2.
3. Ensure that a DSL link is established. You can verify an established DSL link by using the system show status command or by checking that the DSL LED is solid green. Upon executing the **show status** command, the **dsl link state** is shown as *success* if the DSL link is established.
4. At the command prompt, enter the command **remote console**.
5. Wait for the message *Console: Remote console connection established*. If a DSL link is not established, or for some other reason the ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) does not respond in a reasonable amount of time, the following message appears: *Console: Remote console timed out trying to connect*. Enter the command remote console again.
6. If ME231A-R2, ME232A-R2, and ME233A-R2 (Far End) already has an active remote console session open, you will see the message *Console: Remote console connection request rejected*. This can also happen if the remote ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) has an established remote console session with the local ME231A-R2, ME232A-R2, and ME233A-R2 (near-end) which has timed out.
7. Enter the password at the password prompt for the remote console session.

   Note The passwords for a local console session of the ME231A-R2, ME232A-R2, and ME233A-R2 (near-end) and the remote console session of the ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) should be different for the purpose of security.

8. You should now be logged into the remote ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) via the remote console session. The communication with the remote ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) is essentially the same as having a local console connection.

   Note The local or remote ME231A-R2, ME232A-R2, and ME233A-R2 may be CO or CPE, as long as there is one of each. Either the CO or CPE unit may accept a remote console connection.

   Note With a remote console session open, a user at PC (far-end) is blocked from using the local console. Upon typing anything, the ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) sends a message to the PC (far-end) stating *Console: Remote console connection is open*.

How to Disconnect

The remote console session ends under any of the following conditions:

- The user enters the command **logout**
- A timeout period of 5 minutes elapses since the user has entered a command to the console.
- The DSL link drops.

The response upon logging out of the remote console session with the command **logout** is *Console: Remote console connection lost*. The following is what is displayed upon a user's logging out of a remote console session after logging in.

```
> remote console
>
Console: Remote console connection established.

password: ******
> logout
Console: Remote console connection lost.

>
```

The timeout period is a fixed, non-configurable parameter of 5 minutes. If the remote ME231A-R2, ME232A-R2, and ME233A-R2 (far-end) has received no command within 5 minutes, it automatically terminates the RCS. Once the RCS is terminated, the PC (far-end) can establish a local console session if desired. However if the PC (near-end) wishes to re-establish a RCS, it is able to do so whether or not the PC (far-end) is in an active local session, because the RCS has priority over a local console session. If the PC (near-end) establishes an RCS while the PC (far-end) is on a local session, the PC (far-end) is kicked off.

Differences in Local and Remote Control Session Behavior

Since the remote console session communication occurs over the G.SHDSL link's EOC channel, some commands via the RCS have unusual effects.

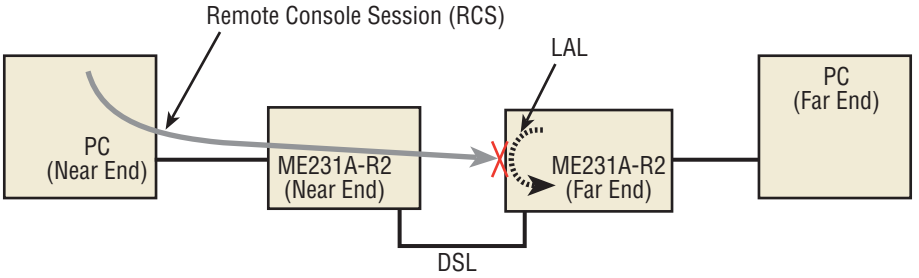


Figure 15. Remote control session with LAL diagram

- **dsl set loopback lal**: Do not issue this command over the RCS to the far-end ME231A-R2, ME232A-R2, and ME233A-R2. If the far-end goes into Local Analog Loopback (LAL), the near-end and far-end ME231A-R2, ME232A-R2, and ME233A-R2 NTUs can no longer communicate over the RCS.

Do not issue this command to a far-end unit. If you were to do so, the near-end ME231A-R2, ME232A-R2, and ME233A-R2 would no longer be able to communicate with the far-end ME231A-R2, ME232A-R2, and ME233A-R2.

8. SOFTWARE UPGRADE

The software upgrade feature is available through BOOTP/TFTP. The software upgrade takes approximately 2 to 3 minutes to complete. To upgrade the software:

1. Connect to the Model ME231A-R2, ME232A-R2, and ME233A-R2 via the Ethernet management port and a Telnet session.
2. Enter the **system show info** command to view the unit's MAC address.
3. Configure a BOOTP/TFTP server and enter the **system upgrade** / **yes** command to begin the upgrade.
4. Alternatively, you may enter the **system upgrade *<TFTP server IP address>:/<filename>*** command to begin the upgrade.

After approximately 2 to 3 minutes, the ME231A-R2, ME232A-R2, and ME233A-R2 will operate with the upgraded software.

9. RESET CONFIGURATION TO FACTORY DEFAULTS

The configuration can be reset to factory defaults using DIP switch *S1*. A factory reset allows a user to recover from a forgotten password. To reset to the configuration:

1. Turn the Model ME231A-R2, ME232A-R2, and ME233A-R2 off.
2. Turn the S1-1 switch to the *ON* position.
3. Turn the Model ME231A-R2, ME232A-R2, and ME233A-R2 on.
4. Turn the S1-1 switch to the *OFF* position.

A. COMPLIANCE

A.1 EMC

- FCC Part 15, Class A
- EN55022, Class A
- EN55024

A.2 LOW VOLTAGE DIRECTIVE (SAFETY)

- UL 60950-1/CSA C22.2 N0. 60950-1
- IEC/EN60950-1 2nd edition
- AS/NZS 60950-1

A.3 RADIO AND TV INTERFERENCE (FCC PART 15)

This device 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 device 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 device 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).

A.4 CE DECLARATION OF CONFORMITY

Black Box, Corporation declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2004/108/EC relating to electromagnetic compatibility and Directive 2006/95/EC relating to electrical equipment designed for use within certain voltage limits. The Declaration of Conformity can be requested from **ROHS@blackbox.com**.

The safety advice in the documentation accompanying this device shall be obeyed. The conformity to the above directive is indicated by CE mark on the device.

B. BLACK BOX G.SHDSL NTU ME231A-R2. ME232A-R2, ME233A-R2 SPECIFICATIONS

B.1 CLOCKING MODES

Internal, external, or receive recovered

B.2 DTE RATE

All 64k steps from 64 to 5696 kbps

B.3 SERIAL INTERFACE

V.35 (ME233A-R2), DCE/DTE selectable

X.21 (ME232A-R2), DCE/DTE selectable

E1 (ME231A-R2) presents G.703/G.704 interface. Either 75 Ohms (unbalanced) or 120 Ohms (balanced). Pins 1 & 2 are Receive. Pins 4 & 5 are Transmit.

B.4 SERIAL CONNECTOR

D-Sub-25 Female (ME233A-R2)

D-Sub-15 Female (ME232A-R2)

Dual BNC and RJ48C (ME231A-R2), strap selectable

B.5 DIAGNOSTICS

V.52 compliant (511) pattern generator and 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.

B.6 STATUS LEDS

Power (Green)

The Power LED glows solid during normal operation. At startup, during the POST, the LED blinks once every second. If the POST fails, the unit does not enter normal operation, and the LED blinks once every 0.4 seconds.

DSL (Green)

The DSL LED glows solid while a DSL link is established. While the DSL link is training it blinks once every second.

Link (Green) (E1 only)

Solid green indicates valid E1 framing. Flashing indicates signal being received, but the link has not yet been established.

Terminal (Green)

The Terminal LED glows solid under the following circumstances:

- ME233A-R2 **with V.35 interface:** if the serial interface has asserted DTR
- ME232A-R2 with the X.21 interface
  - **Configured as DCE**: Indicates that the “Control” signals have been asserted.
  - **Configured as DTE**: Indicates that the “Indication” signals have been asserted

TM/ER (Yellow)

The Test Mode/Error (TM/ER) LED is used to indicate that a test mode is in progress or an error has been detected. It blinks once every second while a test mode is starting. It glows solid while a test mode is in progress. It blinks once if an error is detected either during a test mode, or in normal DSL operation.

LOS (Red) [ME231A-R2]

The LOS LED blinks once per second to indicate either framing errors or clock slips. Clock slips are often caused by a mis-configured clock mode.

Link (Green)

The Link LED shows that there is an active physical connection to the Console.

Activity (Green)

The Activity LED shows that there is data being transferred through the Console connection. During a software upgrade procedure, if the Activity LED is on for an unusually long time, there is a problem with the upgrade, and the device should be restarted. The TFTP server should be checked (normal upgrades take about 10 seconds on a 100mbit link).

B.7 CONFIGURATION

Configuration is done with either externally accessible DIP switches, CLI.

B.8 POWER AND POWER SUPPLY SPECIFICATIONS

The CPE comes with either an AC power supply:

- The supply's connection to the CPE is a 2.5 mm barrel receptacle with the center conductor positive.
- There is one fuse in the equipment rated at 250V, 500 mA, 2 sec.
- Rated voltage: 5 VDC
- Rated current: 1 A DC

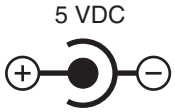


Figure 16. Power connection barrel receptacle 5 VDC diagram

B.9 EXTERNAL AC UNIVERSAL POWER SUPPLY

CAUTION

The external AC adapter shall be a listed limited power source that incorporates a disconnect device and shall be positioned within easy reach of the operator. Ensure that the AC power cable meets all applicable standards for the country in which it is to be installed, and that it is connected to a wall outlet which has earth ground.

- Output from power supply: 5 VDC, 2A
- Input to power supply: universal input 100–240 VAC 50/60 Hz 0.3A

B.10 TRANSMISSION LINE

Single Twisted Pair

B.11 LINE CODING

TC-PAM (Trellis Coded Pulse Amplitude Modulation)

B.12 LINE RATES (DSL LINE)

All nx64 rates from 192kbps up to 5.696 Mbps

B.13 LINE INTERFACE

Transformer coupled, 2500 VRMS isolation

B.14 G.SHDSL PHYSICAL CONNECTION

RJ-45, 2-wire polarity insensitive pins 4 and 5

B.15 ENVIRONMENT

Operating temp: 32–122°F (0–50°C)

Humidity: 5–95% non-condensing

Altitude: 0–15,000 feet (0–4,600 meters)

B.16 THIRD PARTY SOFTWARE LICENSES

Note The ME231A-R2 includes software developed under third party licenses.

C. FACTORY DEFAULT VALUES FOR SOFTWARE-CONFIGURABLE PARAMETERS

Note The default management IP address is **192.168.200.1**.

Note The default logout timer value is set for 300 seconds (5 minutes).

Table 6. ME233A-R2 and ME232A-R2

Parameter	Default value
Clock Mode	Receive-Recover
DSL Timeslots	89
Tx Clock	Normal
Circuit ID	ME232A-R2
Password	superuser
Annex	B
Loopback	Off
Pattern	Off
DSL Mode	CPE
Device Type	DCE

Table 7. ME231A-R2

Parameter	Default value
Clock Mode	Receive-Recover
DSL Timeslots	31
E1 Timeslots	31
E1 Timeslot Map	1-31
E1 Line Type	E1 - Fractional
E1 Line Code	HDB3
E1 Line Build Out	75 Ohm
E1 Rx Equalizer	Disabled
E1 Pass Framing	Disabled
E1 Pass Alarms	Disabled
Circuit ID	ME231A-R2
Password	superuser
Annex	B
Loopback	Off
Pattern	Off

D. INTERFACE PIN-OUTS

D.1 LINE PORT

RJ-45 connector

Pin #	Signal
1	No connection
2	No connection
3	No connection
4	Tip
5	Ring
6	No connection
7	No connection
8	No connection

D.2 V.35 INTERFACE

DB-25 female connector (DTE/DCE orientation)

Pin #	Signal	Pin #	Signal
1	Frame Ground	12	TxC-b (DTE Source)
2	TxD-a (DTE Source)	14	TxD-b (DTE Source)
3	RxD-a (DCE Source)	15	TxC-a (DCE Source)
4	RTS (DTE Source)	16	RxD-b (DCE Source)
5	CTS (DCE Source)	17	RxC-a (DCE Source)
6	DSR (DCE Source)	18	LL (DTE Source)
7	Signal Ground	20	DTR
8	CD (DCE Source)	21	RL
9	RxC-b (DCE Source)	24	ExtC-a (DTE Source)
11	ExtC-b (DTE Source)	25	TM (DCE Source)

D.3 E1 INTERFACE

RJ-48C female connector

Pin #	Signal
1	Receive (Ring)
2	Receive (Tip)
3	Shield
4	Transmit (Ring)
5	Transmit (Tip)
6	Shield
7	No connection
8	No connection

D.4 X.21 INTERFACE

D-sub-15 female connector (DTE/DCE orientation)

Pin #	Signal
1	Frame Ground
2	T - Transmit Data-A (DTE Source)
3	C - Control-A (DTE Source)

Pin #	Signal
4	R - Receive Data-A (DCE Source)
5	I - Indication-A (DCE Source)
6	S - Signal Element Timing-A (DCE Source)
7	BT - Byte Timing-A (DCE Source) X - DTE Signal Element Timing - A (DTE source)
8	SGND - Signal Ground
9	T/ - Transmit Data-B (DTE Source)
10	C/ - Control-B (DTE Source)
11	R/ - Receive Data-B (DCE Source)
12	I/ Indication-B (DCE Source)
13	S/ Signal Element Timing-B (DCE Source)
14	BT/ - Byte Timing-B (DCE Source) X/ - DTE Signal Element Timing - B (DTE source)

D.5 ETHERNET CONSOLE PORT

Table 8. RJ45 socket 10/100Base-T

Pin	Signal
1	TX+
2	TX-
3	RX+
6	RX-

Note Pins not listed are not used.

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BLACK BOX®

About Black Box

Black Box provides an extensive range of networking and infrastructure products. You'll find everything from cabinets and racks and power and surge protection products to media converters and Ethernet switches all supported by free, live 24/7 Tech support available in 60 seconds or less.