

Configuring X.21/V.35 Interfaces

The X.21/V.35 module supports high-speed WAN switching services such as Frame Relay and PPP.

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Overview

X.21 interfaces provide synchronous operation between data communications equipment (DCE) and data terminal equipment (DTE) on public data networks. These interfaces meet standards for connectors, electrical signals, and dialing signals.

V.35 interfaces provide synchronous operation between DCE and DTE for data communication over the telephone network. These interfaces meet standards for electrical signals and connectors. Although the V.35 standard is considered obsolete and is no longer supported by ITU-T, many V.35 connections still exist in telephone networks.

Figure 8-1 shows an example of a customer connecting to an ERX system via V.35 interfaces. A similar configuration, with X.21 connections replacing V.35 connections, would exist for a data network.

The customer has a V.35 connection that connects to a T1/E1 interface on a hardware device known as a channel service unit/ data service unit (CSU/DSU). The CSU/DSU connects via a leased T1/E1 line to another CSU/DSU at the service provider's location. The second CSU/DSU connects to the ERX system via a V.35 interface. One CSU/DSU will act as DCE and the other as DTE.

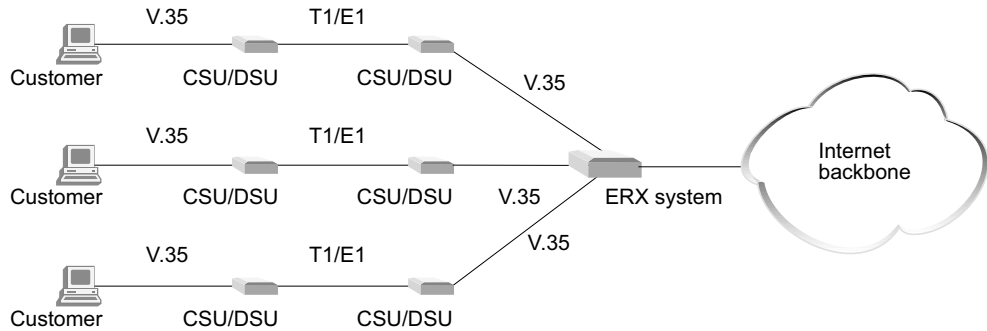


Figure 8-1 V.35 Connections in the ERX System

ERX Models

The ERX-700 series and the ERX-1410 system support the X.21/V.35 line module and I/O module. The ERX-1440 system does not support the X.21/V.35 line module and I/O module.

Features

X.21/V.35 module support the following:

- DCE or DTE operation
- Maximum data rate of 10 Mbps per port, 50 Mbps across all ports
- Up to 16 connections

The type of cable used determines whether a connection is X.21 or V.35 and DCE or DTE. There are two cable connections on the X.21/V.35 line module: One covers ports 0 to 7, and the other covers ports 8 to 15. Consequently, ports 0 to 7 will all be of the same type, and ports 8 to 15 will all be of the same type. However, ports 0 to 7 can be of a different type from ports 8 to 15.

In DCE mode, the line module generates a clock for the interfaces, and you can configure a data rate for each interface. In DTE mode, the interface will receive the clock from the network; different interfaces can receive different timing rates. The typical data rate for X.21 interfaces is 2.048 Mbps and for V.35 interfaces is 1.5 Mbps. In the case of loopback testing, the DCE provides a source clock for the interface.

Interface Stack

The X.21/V.35 interface comprises an HDLC layer. You can configure other protocols over this HDLC layer.

Higher-Level Protocols

See the *Release Notes* for information about the higher-level protocols that X.21/V.35 interfaces support.

References

X.21 interfaces meet the following specification:

- ITU-T X.21: Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data networks (September 1992)

V.35 interfaces meet the following specification:

- ITU-T V.35: Data transmission at 48 kbit/s using 60-108 kHz group band circuits (October 1984 - now obsolete)

Numbering Scheme

When configuring or managing an interface, you must know the numbering scheme for identifying an interface. Interfaces are numbered using *slot/port* format, where:

- *slot* – number of the slot in which the line module resides. In the ERX-700 series, module slots are numbered 2–6. In the ERX-1410 system, module slots are numbered 0–5 and 8–13.
- *port* – number of the physical port on the I/O module in the range 0–15

Figure 8-2 and Figure 8-3 show the physical slots and ports on the ERX-700 series and the ERX-1410 system.

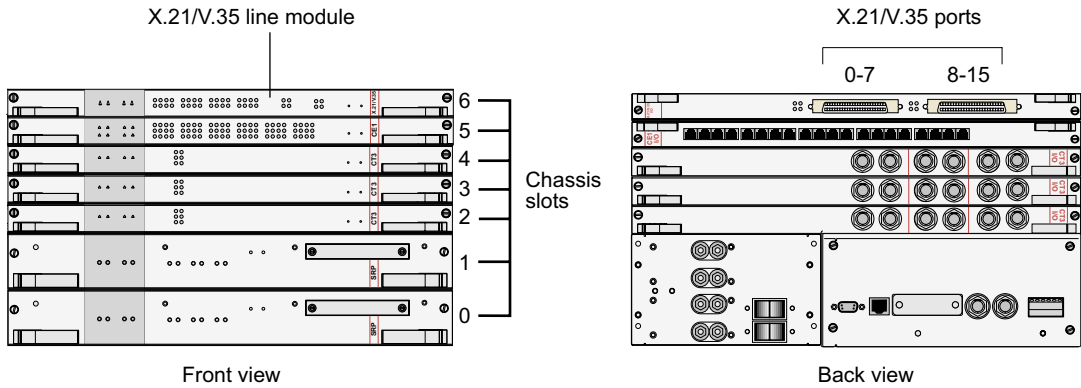


Figure 8-2 X.21/V.35 line modules and I/O modules in ERX-700 series

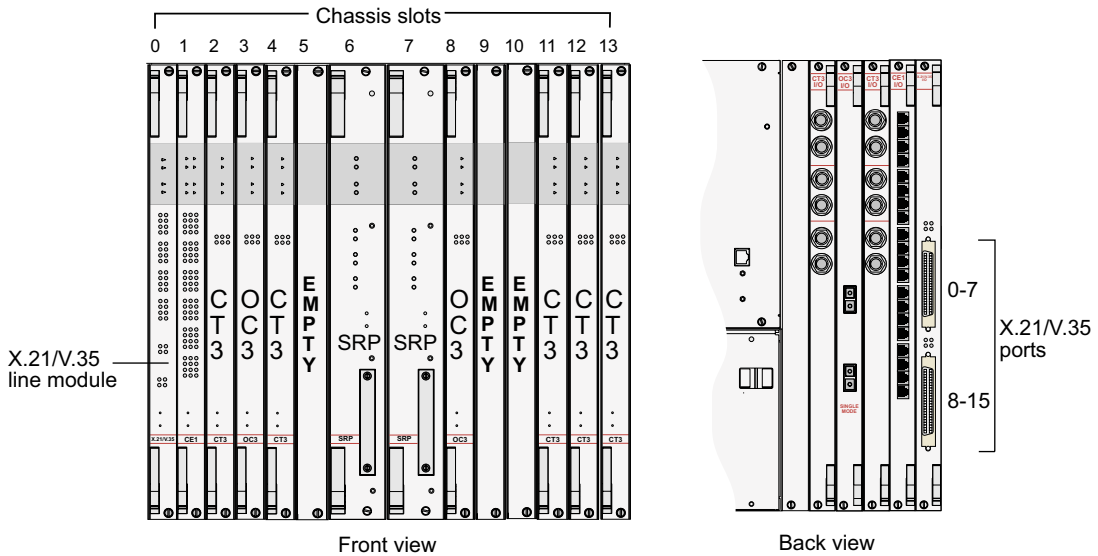


Figure 8-3 X.21/V.35 line modules and I/O modules in ERX-1400 series

Before You Configure an Interface

Before you configure an X.21/V.35 interface, verify the following:

- You have installed the line module and the I/O module correctly.
- You have cabled the I/O module for DCE or DTE operation.
- Each configured line can transmit data to and receive data from your switch connections.

For more information on preconfiguration and hardware diagnostic procedures, see the *ERX Installation and User Guide*.

You should also know the type of cyclic redundancy check (CRC) required for the HDLC data channel.

Configuration Tasks

The type of cable you connect to the port determines whether the interface is an X.21 or a V.35 interface, and whether it will operate in DTE or DCE mode.

Configuring a DTE

To configure parameters for an X.21/V.35 interface acting as DTE:

- 1 Select the serial interface.
- 2 (Optional) Specify the cyclic redundancy check.
- 3 (Optional) Enable data rate inversion.
- 4 (Optional) Enable inversion of the transmit clock.
- 5 (Optional) For V.35 DTE interfaces, specify that the system should use the data set ready (DSR) signal, and not the data carrier detect (DCD) signal, to determine whether the interface is working.
- 6 (Optional) Specify that the system should ignore all link state signals when it determines whether an interface is working.
- 7 (Optional) Specify the time interval at which the system calculates bit and packet rate counters.
- 8 (Optional) Specify the MRU.
- 9 (Optional) Specify the MTU.
- 10 (Optional) Enable nonreturn to zero inverted (NRZI) encoding on the interface.

Configuring a DCE

To configure an X.21/V.35 interface as DCE:

- 1 Select the serial interface.
- 2 (Optional) Specify the clock rate or accept the default, 2.048 MHz.
- 3 Follow steps 2–10 above to configure optional parameters.

Disabling an X.21/V.35 Interface

To disable an X.21/V.35 interface:

- 1 Select the X.21/V.35 interface.
- 2 Disable the X.21/V.35 interface.

X.21/V.35 Commands

Use the following commands for X.21/V.35 configuration.

clock rate

- Use to set the rate of the internal clock in Hz.
- The system supports a number of specific values in the range 1200 Hz to 8192000 Hz. If you enter an unsupported value, the software uses the closest supported value.
- Example

```
host1(config-if)#clock rate 1536000
```
- Use the **no** version to restore the default, 2048000 Hz.

crc

- Use to configure the size of the CRC.
- The CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data.
- Specify the size of the CRC in bits (16 or 32). Both the sender and receiver must use the same setting.
- Use a 32-bit CRC to protect longer streams at faster rates and, therefore, provide better ongoing error detection.
- Example

```
host1(config-if)#crc 32
```
- Use the **no** version to restore the default, 16 bits per frame.

ignore dcd

- Use to specify that the system should use the DSR signal, and not the DCD signal, to determine whether the interface is working.
- Example

```
host1(config-if)#ignore dcd
```
- Use the **no** version to allow the system to use the DCD signal to determine whether a V.35 DTE interface is working.

ignore link-state-signals

- Use to prevent the system from using any link state signals when it determines whether a V.35/X.21 interface is working.
 - › For a V.35 DCE interface, the system ignores DTR signals.
 - › For a V.35 DTE interface, the system ignores DCD and DSR signals.
 - › For an X.21 DCE interface, the system ignores (request to send) RTS signals.
 - › For an X.21 DTE interface, the system ignores clear to send (CTS) signals.
- Use this command if the line is noisy or if the equipment at the remote end does not support the signals that the system expects by default.
- Example

```
host1(config-if)#ignore link-state-signals
```
- Use the **no** version to allow the system to use link state signals when determining whether a V.35/X.21 interface is working.

interface serial

- Use to select an X.21/V.35 interface.
- Example

```
host1(config)#interface serial 3/1
```
- Use the **no** version to disable the interface.

invert data

- Use to enable data stream inversion for the interface.
- Enable data stream inversion only if it is turned on at the other end of the line.
- Example

```
host1(config-if)#invert data
```
- Use the **no** version to disable the feature.

load-interval

- Use to set the time interval at which the system calculates bit and packet rate counters.
- Specify a multiple of 30 seconds in the range 30–300 seconds.
- Example

```
host1(config-if)#load-interval 100
```
- Use the **no** version to restore the default, 300 seconds.

mr

- Use to configure the MRU size for the interface.
- Coordinate this value with the network administrator for the device on the other end of the line.
- If you set the MRU for another protocol, such as IP, the system uses the lower value. This inconsistency could produce unexpected behavior in your network.
- Example

```
host1(config-if)#mr 800
```
- Use the **no** version to restore the default, 1600 bytes.

mtu

- Use to configure the MTU size for the interface.
- Coordinate this value with the network administrator for the device on the other end of the line.
- If you set the MTU for another protocol, such as IP, the system uses the lower value. This inconsistency could produce unexpected behavior in your network.
- Example

```
host1(config-if)#mtu 1500
```
- Use the **no** version to restore the default, 1600 bytes.

nrzi-encoding

- Use to enable NRZI encoding.
- Example

```
host1(config-if)#nrzi-encoding
```
- Use the **no** version to restore the default situation, in which nonreturn to zero (NRZ) encoding rather than NRZI is enabled.

shutdown

- Use to disable an interface.
- X.21/V.35 interfaces are enabled by default.
- Example

```
host1(config-if)#shutdown
```
- Use the **no** version to restart a disabled interface.

Configuration Example

The following example shows how to configure an X.21/V.35 interface.

```
host1(config)#interface serial 3/0
host1(config-if)#clock rate 1000000
# Warning: clock rate entered: 1000000
# Warning: closest clock rate: 1024000
host1(config-if)#crc 32
host1(config-if)#mtu 1200
host1(config-if)#nrzi-coding
```

Testing Interfaces

Testing interfaces allows you to troubleshoot problems and to check the quality of links between an X.21/V.35 interface and a remote device. You can issue the **loopback** command to specify a known loop for packets, and then issue the ping command to send packets via that loop. If the packets do not return to the source, there is a problem with the connections or devices in the loop.

loopback

- Use to configure loopback on an interface; the type of loopback depends on the cable that is connected to the interface.
- If no cable is connected to the network, the interface can send local loopback requests.
- If an X.21 DCE cable is connected to the interface, the interface can send loopback tests to the network.
- If an X.21 DTE cable is connected to the interface, the **loopback** command has no effect.
- If a V.35 DCE cable is attached, the interface can accept remote loopback requests.
- If a V.35 DTE cable is attached, the interface requests that the remote end enter into a network line loopback.

```
host1(config-if)#loopback
```

- Use the **no** version of the command to restore the default situation, in which there is no loopback.

Monitoring Interfaces

You can monitor X.21/V.35 interfaces using the **show interfaces serial** command. You can use the output filtering feature of the **show** command to include or exclude lines of output based on a text string you specify. Refer to *ERX System Basics Configuration Guide, Chapter 2, Command Line Interface*, for details.

You can set a statistics baseline for serial interfaces using the **baseline interface serial** command. Use the **delta** keyword with the **show** commands to display statistics with the baseline subtracted.

baseline interface serial

- Use to set a statistics baseline for serial interfaces.
- The system implements the baseline by reading and storing the statistics at the time the baseline is set and subtracting this baseline whenever baseline-relative statistics are retrieved.
- Use the optional **delta** keyword with the **show interface serial** commands to view the baseline statistics.
- Example

```
host1#baseline interface serial 2/0:1/1
```
- There is no **no** version.

show interfaces serial

- Use to display information about the serial interfaces you specify.
- Field descriptions
 - › ifOperStatus – administrative status of the interface
 - ifOperUp – interface is functioning
 - ifOperTesting – interface is being tested
 - ifOperNotPresent – module has been removed from the chassis
 - ifOperDown – interface is not functioning
 - › snmp trap link-status – enabled or disabled
 - › Crc type checking – size of the CRC
 - › HdLc mru – current size of the MRU
 - › HdLc mtu – current size of the MTU
 - › HdLc interface speed – current line speed of the interface
 - › Invert data disabled – status of the data inversion feature
 - › Interface type – type of interface: X.21 or V.35
 - › Interface mode – mode of interface: DCE or DTE

- › Loopback – type of loopback configured on the interface
 - None
 - Receiving Remote Network Line (V.35 only)
 - Sending Remote Network Line (V.35 only)
 - Network Line
- › CTS – status of clear to send signal: up or down
- › RTS – status of request to send signal: up or down
- › DCD – status of data carrier detect signal: up or down (V.35 only)
- › DSR – status of data set ready signal: up or down (V.35 only)
- › DTR – status of data terminal ready signal: up or down (V.35 only)
- › 5 minute input rate – data rates based on the traffic received in the last five minutes
- › 5 minute output rate – data rates based on the traffic sent in the last five minutes
- › Interface statistics
 - Packets received – number of packets received on the interface
 - Bytes received – number of bytes received on the interface
 - Errored packets received – number of packets with errors received on the interface
 - Packets sent – number of packets sent on the interface
 - Bytes sent – number of bytes sent on the interface
- › Errored packets sent – number of packets with errors sent from the interface
- Example

```
host1#show interface serial 2/0
Serial Interface at 2/0
ifOperStatus = ifOperUp
snmp trap link-status = disabled
Crc type checking - CRC16
Hdlc mru = 1600
Hdlc mtu = 1600
Hdlc interface speed = 0
Invert data disabled

Interface type = V.35
Interface mode = DCE
Loopback = None
CTS = up, RTS = up, DCD = up, DSR = up, DTR = up
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
```

```
Interface statistics
Packets received          689
Bytes received            10988
Errored packets received  5527
Packets sent              692
Bytes send                11036
Errored packets sent      0
host1#show interface serial 2/0 brief
Serial Interface at 2/0
ifOperStatus = ifOperUp
snmp trap link-status = disabled
Crc type checking - CRC16
Hdlc mru = 1600
Hdlc mtu = 1600
Hdlc interface speed = 0
Invert data disabled,
```

```
Interface type = V.35
Interface mode = DCE
Loopback = None
CTS = up, RTS = up, DCD = up, DSR = up, DTR = up
host1#show interface serial 2/8
Serial Interface at 2/8
ifOperStatus = ifOperUp
snmp trap link-status = disabled
Crc type checking - CRC16
Hdlc mru = 1600
Hdlc mtu = 1600
Hdlc interface speed = 2048000
Invert data disabled,
```

```
Interface type = X.21
Interface mode = DTE
Loopback = None
CTS = up, RTS = up
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
```

```
Interface statistics
Packets received          1139
Bytes received            18188
Errored packets received  388
Packets sent              1141
Bytes send                18224
Errored packets sent      0
```