9

Configuring the E1 + G.703 and T1 + DSX-1 Modules

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Using an E1- or T1-Carrier Line for Data and Voice

You may be able to lower your data communications and telephone costs by leasing an E1 or T1-carrier line and using some of the bandwidth for data and some of the bandwidth for TDM (or traditional) voice. You will then have an affordable WAN solution or Internet connection, and depending on your existing telephone setup, you may have additional phone lines as well. This solution is particularly attractive for small-to-medium businesses (SMBs).

Drop-and-Insert Modules

If you want to use your E1- or T1-carrier line for both data and voice, you must purchase and install a drop-and-insert module for the ProCurve Secure Router. These modules are called drop-and-insert modules because they pass, or drop, some of the bandwidth from the E1- or T1-carrier line into a private branch exchange (PBX).

Two drop and insert modules are available for the ProCurve Secure Router:

- E1 + G.703 module
- T1 + DSX-1 module

If you live in Europe, South America, Australia, or Asia (except Japan), and can lease an E1-carrier line for your WAN connection, you should purchase and install the E1 + G.703 module. If you live in the United States or Canada, and can lease a T1-carrier line for your WAN connection, you should purchase and install the T1 + DSX-1 module. If you live in Japan, you will need to check with your Public Telephone and Telegraph (PTT) authority because many PTTs in Japan offer T1-carrier lines for data. For voice, however, these PTTs offer J1-carrier lines.

Standards Supported by the Drop-and-Insert Modules

The E1 + G.703 and T1 + DSX-1 modules are standards-based. Specifically, they support the standards listed in Table 9-1.

Table 9-1. Standards Supported by ProCurve Drop-and-Insert Modules

Module	Standard
E1 + G.703	• International Telecommunications Union (ITU) G.703, ITU-T G.704 (CRC-4), ITU-T G.823, and ITU-T G.797 • FCC Part 15 Class A, Norme Europeenne (EN) 55022 Class, EN 55024, EN 61000-3-2, EN 61000-3-3 (EN is also referred to as European Standards.) • ACIF S016, ETSI TBR 12/TBR 13 • EN 60950 and Australian Standard/New Zealand Standard (AS/NZS) 60950
T1 + DSX-1	• T1 Interface: AT&T Pub 62411 • ESF Format Interface: TR 194 • ESF Performance Monitoring: TR 54016, ANSI T1.403 • FCC Part 15 Class A, EN 55022 Class A • ACTA/FCC Part 68, IC CS-03, UL/cUL 60950, IEC 60950

Configuring the E1 + G.703 Module

The E1 + G.703 module has:

- an E1 port
- a G.703 port

The E1 port handles the data communications. The G.703 port receives all the channels from the E1-carrier line that are not mapped for data and drops these channels into a PBX. When you configure an E1 + G.703 module, you must configure it to synchronize the data transfer between the public carrier, the two ports (or interfaces), and the PBX. You must also configure which channels are dropped into the PBX.

Making the Physical Connection

Like other ProCurve Networking E1 modules, the E1 port on E1 + G.703 modules include a built-in Digital Service Unit (DSU). You use unshielded twisted pair (UTP) cabling with RJ-48C connectors to connect the E1 interface to the Channel Service Unit (CSU) provided by your public carrier. (For more information about the DSU or CSU and other public carrier equipment used in an E1 connection, see *Chapter 4: Configuring E1 and T1 Interfaces*.)

You connect the G.703 port to the PBX using crossover UTP cabling with RJ-48C connectors.

Configuring the E1 Interface for Data Communications

The first step in configuring the E1 + G.703 module is to configure the E1 interface that will handle data. Two settings for the E1 interface directly affect the G.703 interface:

- channel assignment
- clock source

Assigning Channels to the E1 Interface

When you configure the E1 interface, you assign the E1 interface a certain number of channels that will be "nailed" to that interface. By default, any channels that you do not assign to the E1 interface are passed to the G.703 interface.

An E1-carrier line includes a total of 32 channels: one channel is used to maintain the connection, the other 31 channels can be used for data or voice. When you divide these channels between the E1 interface and the DSX-1 interface, you must create two groups of contiguous channels. Typically, you will reserve channel 16 and all subsequent channels for the G.703 interface.

You assign the channels to the E1 interface using the **tdm-group** command. The remaining channels are automatically assigned to the G.703 interface.

To assign channels 1–15 to the E1 interface, move to the E1 interface configuration mode context and enter the **tdm-group** command:

Syntax: tdm-group <*number*> timeslots <*range of numbers*>

```
ProCurve(config-e1 1/1)# tdm-group 1 timeslots 1-15
```

If you view the status of the E1 interface (after you bind the physical interface to the logical interface using the **bind** command), you will see that channels 1–15 are "nailed" to that interface, while channels 16–31 are assigned to the G.703 interface. (See Figure 9-1.)

Enter **show interface e1 *<slot>/<port>*** at the enable mode context prompt:

```
ProCurve# show interface e1 1/1
```

Note

If you have not yet entered a **bind** command to join the physical interface to the logical interface, the channel assignment will not be displayed correctly.

```
e1 1/1 is UP
  Receiver has no alarms
  E1 coding is HDB3, framing is E1
  Clock source is line
  No network loopbacks
  Last clearing of counters never
    loss of frame  : 0
    loss of signal : 0
    AIS alarm      : 0
    Remote alarm   : 0

  Timeslot Status: 01234567890123456789012345678901
                   FNNNNNNNNNNNNNNNDDDDDDDDDDDDDDDD
  Status Legend: '-' = Timeslot is unallocated
                 'N' = Timeslot is dedicated (nailed)
                 'D' = Timeslot is allocated to G703 drop port
                 'F' = Timeslot is dedicated for framing

  Line Status: -- No Alarms --

  5 minute input rate 120 bits/sec, 0 packets/sec
  5 minute output rate 120 bits/sec, 0 packets/sec
  Current Performance Statistics:
    0 Errored Seconds, 0 Bursty Errored Seconds
    0 Severely Errored Seconds, 0 Severely Errored Frame Seconds
    0 Unavailable Seconds, 0 Path Code Violations
    0 Line Code Violations, 0 Controlled Slip Seconds
    0 Line Errored Seconds, 0 Degraded Minutes

  TDM group 1, line protocol is UP
  Encapsulation PPP (ppp 1)
    74 packets input, 4622 bytes, 0 no buffer
    0 runts, 0 giants, 0 throttles
    66 input errors, 24 CRC, 42 frame
    0 abort, 0 discards, 0 overruns
    127 packets output, 5554 bytes, 0 underruns
```

Channels 1-15 are “nailed” to the E1 interface.

Channels 16-31 are allocated to the G.703 interface.

Figure 9-1. Viewing the Channel Assignments for the E1 and G.703 Interfaces

After you ensure that the channel assignments are correct, you will need to configure the settings for the G.703 interface.

Setting the Clock Source

The other setting that directly affects the G.703 interface is the clock source. Each narrow ProCurve Secure Router module can have only one clock source. For E1 + G.703 modules, you set the clock source on the E1 interface that is used for data. By default, the clock source for this E1 interface is **line**. With this setting, the E1 interface takes its timing from the public carrier's equipment. The G.703 interface, in turn, takes its clock from the E1 interface.

You may want the E1 + G.703 module to take timing from the PBX rather than from the public carrier's equipment. To change the **clock source** setting for the E1 interface to **through**, enter:

```
ProCurve(config-e1 1/1)# clock source through
```

For detailed information about configuring other settings for the E1 interface, see *Chapter 4: Configuring E1 and T1 Interfaces*.

Accessing the G.703 Interface

The ProCurve Secure Router treats the G.703 port as an E1 interface. Because it is the second port of the E1 + G.703 module, you access the G.703 interface by entering the following command from the global configuration mode context:

Syntax: interface e1 <*slot*>/2

For example, if the E1 + G.703 module is installed in slot 1, enter:

```
ProCurve(config)# interface e1 1/2
```

From this configuration mode context, you can begin to configure the G.703 interface.

Configuring Line Coding

You configure the line coding for the G.703 interface just as you would for an E1 interface. The settings you select must match those used by the PBX.

- Alternate mark inversion (AMI)
- High-Density Bipolar order of 3 (HDB3)

AMI uses alternating positive and negative voltage (referred to as alternating polarity, or bipolarity) to represent logical ones, and zero voltage to represent logical zeros. Because AMI uses zero voltage for logical zeros, it can cause synchronization loss between peers at each end of a WAN connection when a data stream contains a long string of logical zeros.

Although HDB3 is based on AMI, HDB3 prevents synchronization loss by limiting the number of consecutive zeros in a data stream to four. HDB3 replaces the zeros with three logical zeros and a violation bit with the same polarity as the last AMI logical one detected.

HDB3 is the most common line-coding scheme used in E1-carrier lines and is the default setting for all E1 interfaces on the ProCurve Secure Router.

To configure the line coding, use the following command:

Syntax: coding [ami | hdb3]

For example, to configure the **coding** option to **ami**, you would enter:

```
ProCurve(config-e1 1/2)# coding ami
```

Because HDB3 is the default setting, you do not have to enter the **coding** command if your PBX uses HDB3.

Configuring Frame Format

E1 interfaces on the ProCurve Secure Router support two frame formats:

- E1
- Cyclic Redundancy Check 4 (CRC4)

In the E1 frame format, a channel (or timeslot) is called a TS, and the 32 channels are numbered TS0 to TS31. Two channels are used to establish and maintain synchronization and signaling; specifically, TS0 is used for synchronization, error detection, and alarms, and TS16 is used for signaling. The other channels are used to transmit data or voice.

CRC4 is based on the E1 frame format but includes additional error detection. A checksum bit is included in all even E1 frames with CRC4 format: frame numbers 0, 2, 4, 6, 8, 10, 12, and 14. A total of 8 checksum bits are used.

Although E1 interfaces, including those for the G.703 port, support two frame formats, only one option is listed if you enter the following command from the E1 interface configuration mode context:

```
ProCurve(config-e1 1/2)# framing ?
```

Only CRC4 is listed.

By default, the frame format is E1. If your public carrier is using the E1 frame format, you simply accept the default setting; you do not have to enter a **framing** command.

However, if your public carrier is using the CRC4 frame format, enter:

Syntax: framing crc4

```
ProCurve(config-e1 1/2)# framing crc4
```

To return to the E1 frame format, enter:

```
ProCurve(config-e1 1/2)# no framing
```

Enabling TS16

TS16 is used when there is a requirement to pass through "signaling" information in a non-proprietary manner. Two types of signaling are used for E1-carrier lines that carry voice—Channel Associated Signaling (CAS) and Common Channel Signaling (CCS). ProCurve Secure Routers support only CAS. For example, they will "split" an E1-carrier line into channels 1-15 and channels 17-31. Typically, this is not an issue because a vast majority of E1 circuits use CAS rather than CCS. (See Bradley Dunsmore and Toby Skandier, *Telecommunications Technologies Reference* [ISBN 1587050366], p. 155.)

Enter the following command to enable the ProCurve Secure Router to check timeslot 16 for the multiframes it receives on the G.703 interface:

```
ProCurve(config-e1 1/2)# ts16
```

The only time there is a signaling requirement and you do *not* need to configure TS16 is when the signaling is "out-of-band," or out of the E1 circuit. In this situation, the signaling must be handled by a separate circuit or some proprietary method that your PBX devices use. In other words, if a router allows the mapping of channels 18-31 to the PBX and allows for 18 to accomplish signaling, then the PBXs on both side of the E1-carrier line must know they are to communicate on this channel for signaling.

Activating the Interface

All interfaces on the ProCurve Secure Router are administratively down by default and must be activated. From the E1 interface configuration mode context, enter:

```
ProCurve(config-e1 1/2)# no shut
```

Checking the Status of the G.703 Interface

After you assign the correct number of channels to each interface and then configure the G.703 interface, the connection between the G.703 port and your PBX should come up. You can use the **show** commands listed in Table 9-2 to view both the status and the configuration information for the G.703 interface.

Table 9-2. show Commands

Command	Explanation
show interfaces	displays information about all the interfaces—active or inactive—on the ProCurve Secure Router
show interface <interface> <slot>/<port>	displays information about a specific physical
show running-config	displays all of the settings that you have configured for the ProCurve Secure Router
show running-config verbose	displays the entire running-config, including the default settings
show running-config interface <interface ID>	displays the settings that you have configured for a particular interface
show running-config interface <interface ID> verbose	displays the running-config for a particular interface, including the default settings

For example, to check the status of the G.703 interface, enter:

```
ProCurve# show interfaces e1 <slot>/2
```

If you are not in the enable mode context, you can use the **do** command and enter:

Syntax: do show interfaces e1 <*slot*>/2

Figure 9-2 shows the output when you enter this command. The first line reports whether the interface is up or down. The first block of text indicates the current configurations for the interface, such as line coding and framing. It also reports any alarms.

The second block of text under "Current Performance Statistics" displays errors. If the number of errors is steadily incrementing, you should check your configuration.

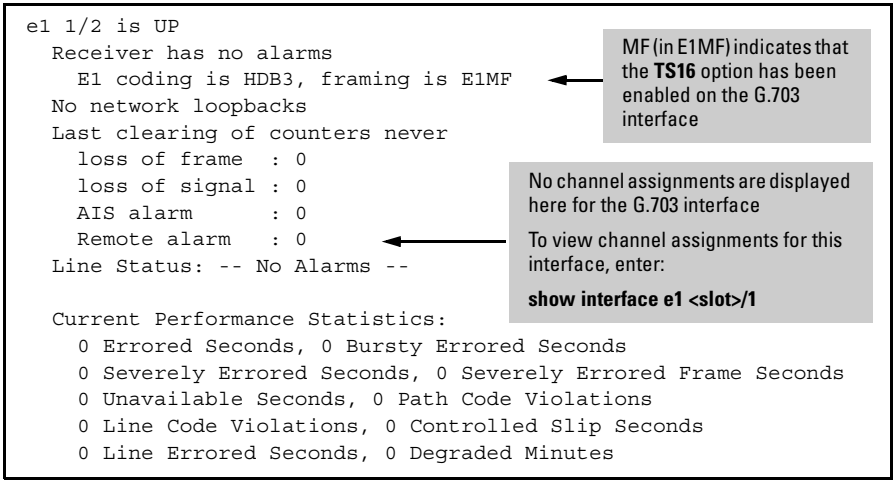

Figure 9-2. show interface e1 Command for the G.703 Port

Viewing Configuration Information

To view the settings that have been entered on the ProCurve Secure Router, enter:

ProCurve# show running-config

Note

Use the **do** command to enter root commands (such as **show** commands) from outside the enable mode context.

You must then browse through the output to find the G.703 interface. To view only the running-config for the G.703 interface, enter:

Syntax: show running-config interface e1 <*slot*>/2

Figure 9-3 shows the running-config for both the E1 and G.703 interfaces.

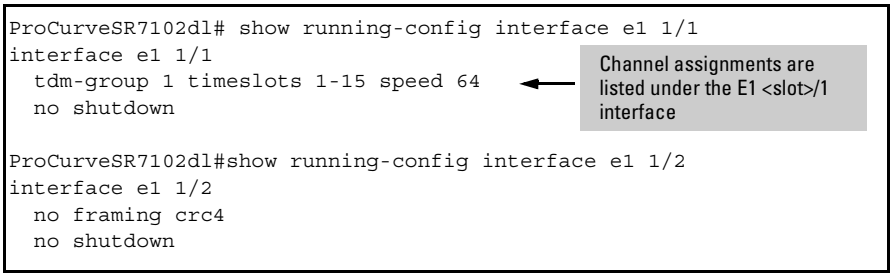

Figure 9-3. show running-config Command for the E1 and G.703 Interfaces

To view all the settings for the E1 or G.703 interfaces, add the **verbose** option to the **show** command:

Syntax: show running-config interface e1 <*slot*>/2 verbose

Troubleshooting the G.703 Interface

If the G.703 interface is down, you should first check your configuration settings and ensure that they match the settings used on your PBX. In particular, check:

- Line coding—Is the PBX using AMI or HDB3?
- Frame format—Is the PBX using E1 or CRC4?
- Channels—Are the channels allocated correctly for the E1 interface and the G.703 interface?

You can use the **show** commands described in the previous section to check the configuration settings for the G.703 interface.

If the settings you have configured match those configured on the PBX, you must isolate the problem. Is the problem with the PBX or the G.703 interface?

Alarms or Errors That Will Not Clear

If you are unable to clear alarms or errors in the ProCurve Secure Router OS, the device at the other end of the connection may be causing the problem. To isolate the problem, disconnect the cable from the PBX and loop the G.703 interface back on itself using an external cable. If the unit goes out of alarm, the PBX is at fault. If the unit stays in alarm, use another cable. If the router now goes out of alarm, the cable is obviously the problem.

Yellow Alarm

A yellow alarm indicates that the G.703 interface is receiving signals from a PBX that is in red alarm. The PBX may not be capable of handling the signal that the interface is sending to it. If this problem occurs, recheck the configuration on the PBX and verify that the cable is good.

Interface Is Accruing Errored Seconds and Clock Slips

If the PBX is not at fault, the problem may be with the synchronization. To detect synchronization problems, view the G.703 interface status using the **show interfaces** command. When you view the status report, you should not see steadily increasing errors. Clock slips indicate that the hosts on either end of the line are unable to properly synchronize their signals.

Check the clock source setting on both the E1 interface and the G.703 interface. Each module can have only one clock source. If the E1 interface is configured to take the clock source from the line, the G.703 interface must have the clock source setting of **through**. If, on the other hand, the G.703 interface is configured to take the clock source from the line—the PBX—the E1 interface should have a clock source setting of **through**.

Configuring the T1 + DSX-1 Module

The T1 + DSX-1 module has:

- a T1 port
- a DSX-1 port

The T1 port handles the data communications. The DSX-1 port receives all the channels from the T1-carrier line that are not mapped for data and drops these channels into a PBX. When you configure a T1 + DSX-1 module, you must configure it to synchronize the data transfer between the public carrier, the two ports (or interfaces), and the PBX. You must also configure which channels are dropped into the PBX.

Making the Physical Connection

The T1 port on the T1 + DSX-1 module includes a built-in CSU/DSU. You use UTP cabling with RJ-48C connectors to connect the T1 interface to the wall jack provided by your public carrier. (For more information about the CSU/DSU and other public carrier equipment used in a T1 connection, see *Chapter 4: Configuring E1 and T1 Interfaces*.) You connect the DSX-1 interface to the PBX, using a crossover cable with an RJ-48C connector.

Configuring the T1 Interface for Data Communications

The first step in configuring the DSX-1 drop-and-insert module is to configure the T1 interface that will handle data. Two settings for the T1 interface directly affect the DSX-1 interface:

- channel assignment
- clock source

Assigning Channels

When you configure the T1 interface, you assign it a certain number of channels that will be “nailed” to that interface. By default, any channels that you do not assign to the T1 interface are passed to the DSX-1 interface.

A T1-carrier line includes a total of 24 channels. When you divide these channels between the T1 interface and the DSX-1 interface, you must create two groups of contiguous channels.

For example, you could assign channels 1-12 to the T1 interface. Channels 13-24 are then automatically assigned to the DSX-1 module. To assign channels to the T1 interface, move to the T1 interface configuration mode context and enter the **tdm-group** command:

Syntax: tdm-group <*number*> timeslots <*range of numbers*>

ProCurve(config-t1 1/1)# tdm-group 1 timeslots 1-12

If you view the status of the T1 interface (after you configure a logical interface and bind it to the T1 interface), you will see that channels 1-12 are marked with an N. This means that they are "nailed," or assigned, to the T1 interface. The channels assigned to the DSX-1 interface are marked with a D. (See Figure 9-4.)

Note

If you have not yet entered a **bind** command to bind the T1 interface to a logical interface, the channel assignments will not be displayed correctly.

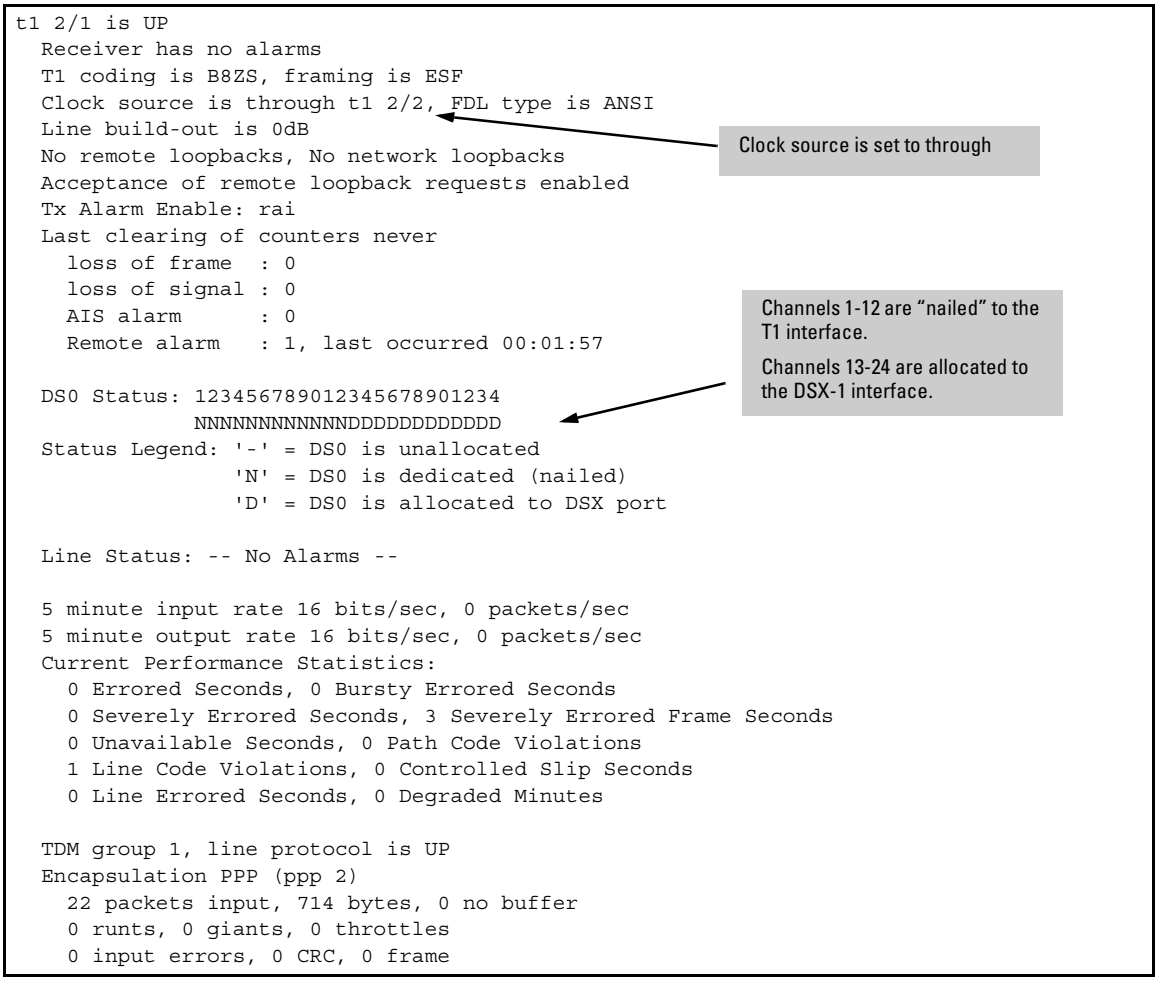

Figure 9-4. Viewing the Channel Assignments for the T1 and DSX-1 Interfaces

Setting the Clock Source

Each narrow ProCurve Secure Router module can have only one clock source. For T1 + DSX-1 modules, you configure the clock source on the line that is used for data. By default, the clock source for this T1 interface is line. With this setting, the T1 interface takes its timing from the public carrier's equipment. The DSX-1 interface, in turn, takes its clock from the T1 interface.

You may want the T1 + DSX-1 module to take its timing from the PBX rather than from the public carrier's equipment. To change the clock source for the T1 interface to **through**, enter:

```
ProCurve(config-t1 1/1)# clock source through
```

For detailed information about configuring T1 interfaces, see *Chapter 4: Configuring E1 and T1 Interfaces*.

Accessing the T1 Interface for the DSX-1 Port

The ProCurve Secure Router treats the DSX-1 port as a T1 interface. Because it is the second port of the T1 + DSX-1 module, you access the DSX-1 interface by entering the following command from the global configuration mode context:

Syntax: interface t1 <*slot*>/2

For example, if the T1 + DSX-1 module is in slot 1, enter:

```
ProCurve(config)# interface t1 1/2
```

You will need to configure the DSX-1 interface to match the settings used by the PBX to which it connects. Both ends of the connection must use the same methods of coding data and dividing it into frames.

As with any T1 interface, you will also need to set the transmit signal level. This setting depends on the distance between the interface and the equipment to which it connects. Properly configuring the signal level compensates for attenuation across distant connections and keeps the signal from becoming "too hot" across short cables.

Finally, you will need to set the signaling mode to determine how the ProCurve Secure Router carries signaling information for the DS0 channels.

Configuring Line Coding

You must configure the DSX-1 interface to use the same line coding that your PBX uses:

- Alternate Mark Inversion (AMI)
- Bipolar 8-Zero Substitution (B8ZS)

In AMI, zero voltage represents logical zeros, and alternating positive and negative voltage represent logical ones, thus maintaining a net zero voltage across the line. AMI has at least one drawback: a long string of logical zeros can result in hosts losing synchronization.

When eight or more consecutive logical zeros are received, B8ZS addresses the synchronization problem by inserting two bipolar violations in the fourth and seventh positions of the 8-bit string, which creates a timing mark. Because B8ZS eliminates the synchronization problems, it has become the standard line coding used on T1-carrier lines. Consequently, B8ZS is the default setting on the ProCurve Secure Router, although the router supports both AMI and B8ZS.

To configure the line coding, enter the following command from the T1 configuration mode context:

Syntax: coding [ami | b8zs]

For example, to configure the T1 interface to use AMI, enter:

```
ProCurve(config-t1 1/2)# coding ami
```

Configuring Frame Format

You must also configure the T1 interface to use the same frame format as that used by the PBX:

- D4
- ESF

D4 framing combines 12 DS0 frames into a single superframe. The ESF standard multiplexes 24 DS0 frames into an extended superframe.

The ESF format has essentially replaced the D4 framing standard because it frees up bits that can be used to maintain the connection. Due to its popularity, ESF is the default setting for T1 modules on the ProCurve Secure Router.

To configure the frame format, enter the following command from the T1 configuration mode context:

Syntax: framing [d4 | esf]

For example, to configure the T1 interface to use D4, enter:

```
ProCurve(config-t1 1/2)# framing d4
```

Setting the Line Length

The ProCurve Secure Router uses transmission line length to determine which voltage to use for data transfer. The greater the distance between equipment, the stronger the signal must be to counteract attenuation. You configure how long the cable is, and the Secure Router OS establishes the proper signal level. Enter:

Syntax: line-length [<0-655> | -7.5]

You can specify the length of the cable up to 655 feet, or you can fix the signal output at -7.5 dB. Use the -7.5 setting to prevent the line becoming too hot.

Use the **no** command to return the line-length setting to its default setting of 0 db.

Configuring Signaling Mode

Use the **signaling-mode** commands to control how the ProCurve Secure Router transmits signaling information for traffic carried on the DSX-1 interface. You use the following command to set the signaling mode:

Syntax: signaling-mode [message-oriented | none | robbed-bit]

Message-oriented signaling sets only channel 24 to clear channel signaling. In other words, one channel is reserved for signaling data, and the other 23 carry voice applications. Use this mode for QSIG installations. Enter:

```
ProCurve(config-t1 1/2)# signaling-mode message-oriented
```

Set the signaling-mode to **none** to configure all channels as clear channels. Use this signaling-mode for data-only transmissions or for PBXs that use Integrated Services Digital Network (ISDN) telephone equipment. To configure the DSX-1 interface to use all channels as clear channels, enter:

```
ProCurve(config-t1 1/2)# signaling-mode none
```

The **signaling-mode none** command is different from the **no signaling-mode** command, which returns the interface to the default setting of robbed-bit signaling.

Robbed-bit signaling takes a bit from the extended frame to use for transmitting signaling information. You should use this signaling mode when you want to use your DSX-1 line for voice-over applications. Enter:

```
ProCurve(config-t1 1/2)# signaling-mode robbed-bit
```

Activating the DSX-1 Interface

By default, all interfaces on the ProCurve Secure Router are administratively down. To activate the interface, enter:

```
ProCurve(config-t1 1/2)# no shutdown
```

Checking the Status of the DSX-1 Interface

To check the status of the DSX-1 interface, enter the following command from the enable mode context:

Syntax: show interfaces t1 <*slot*>/2

Figure 9-5 shows the output for a sample DSX-1 interface.

```
t1 2/2 is UP
  Receiver has no alarms
  T1 coding is B8ZS, framing is ESF
  Line length is 55 feet
  Signaling mode: robbed bit
  No remote loopbacks, No network loopbacks
  Tx Alarm Enable: rai
  Last clearing of counters never
    loss of frame  : 0
    loss of signal : 0
    AIS alarm      : 0
    Remote alarm   : 0
  Line Status: -- No Alarms --

  Current Performance Statistics:
    5 Errored Seconds, 0 Bursty Errored Seconds
    5 Severely Errored Seconds, 5 Severely Errored Frame Seconds
    0 Unavailable Seconds, 0 Path Code Violations
    1 Line Code Violations, 0 Controlled Slip Seconds
    0 Line Errored Seconds, 0 Degraded Minutes
```

No channel assignments are displayed here for the DSX-1 interface

To view channel assignments for this interface, enter:

show interface t1 <slot>/1

Figure 9-5. show interface t1 Command for the DSX-1 Port

The first line in the output tells you whether the interface is up or down. The first block of text indicates the current configurations for the interface, including line length and signaling mode, as well as line coding and framing.

The second block of text, headed “Current Performance Statistics,” displays errors. Steadily incrementing errors indicate that you need to resolve problems with the configuration.

Viewing Configuration Information

To view the settings that have been entered on the ProCurve Secure Router, enter:

ProCurve# show running-config

You must then browse through the output to find the DSX-1 interface. To view only the running-config for the DSX-1 interface, enter:

ProCurve# show running-config interface t1 <*slot*>/2

Figure 9-6 shows the running-config for both the T1 and DSX-1 interfaces.

```
ProCurveSR7102dl# show running-config interface t1 2/1
interface t1 2/1
  clock source through
  tdm-group 1 timeslots 1-12 speed 64
  no shutdown

ProCurveSR7102dl#show running-config interface t1 2/2
interface t1 2/2
  signaling-mode none
  no shutdown
```

Channel assignment is listed under the E1 <slot>/1 interface

Figure 9-6. show running-config Command for the T1 and DSX-1 Interfaces

To view all the settings (including default settings) for the T1 interface or DSX-1 interface, add the **verbose** option to the **show** command:

ProCurve# show running-config interface t1 <*slot*>/2 verbose

Troubleshooting the DSX-1 Interface

To troubleshoot a DSX-1 interface, you must first isolate the problem. Is the problem with the PBX? With the DSX-1 interface? With the T1 interface? Or is the problem with the public carrier's equipment?

Alarms or Errors That Will Not Clear

When you are unable to clear alarms or errors in the Secure Router OS, the device at the other end of the cable is often at fault. To isolate the problem, disconnect the cable from the PBX and loop the DSX-1 interface back on itself using an external cable. If the unit goes out of alarm, you know that the PBX is at fault.

If the unit stays in alarm, change the cable. If the router now goes out of alarm, again, you know that the cable, and not the interface, is the problem.

Troubleshoot connections between the T1 interface and the wall jack in the same way.

Yellow Alarm

A yellow alarm indicates that although the DSX-1 is receiving signals, the PBX is in red alarm. The PBX may not be capable of handling the signal that the interface is sending to it. Try lowering the signal output, either by setting a shorter line length or by configuring the signal at -7.5 decibels.

Interface Is Accruing Errored Seconds and Clock Slips

If, on the other hand, the PBX or CSU is not at fault, you might have a problem with synchronization. You can detect this problem by using the **show interfaces** command to view the DSX-1 interface status. When you view the output, you should not see steadily increasing errors. Clock slips indicate that the ends of the line are unable to properly synchronize their signals.

Check the clock source setting for both interfaces on the T1 + DSX-1 module. If the DSX-1 interface is taking the clock from the PBX, change the clock source to the **through** option for the T1 interface that controls port 1 on the T1 + DSX-1 module.

Quick Start

This section provides the commands you must enter to quickly configure a G.703 interface or a DSX-1 interface on the ProCurve Secure Router. Only a minimal explanation is provided.

If you need additional information about any of these options, see "Contents" on page 9-1 to locate the section and page number that contains the explanation you need.

Configuring the E1 + G.703 Module

Making the Physical Connection

1. Use unshielded twisted pair (UTP) cabling with RJ-48C connectors to connect the E1 interface to the CSU provided by your Public Telephone and Telegraph (PTT) authority.
2. Use crossover UTP cabling with RJ-48C connectors to connect the G.703 interface to the PBX.

Configuring the E1 Interface

When you configure a G.703 module, you first configure the E1 interface to handle data communications. As part of this configuration, you assign the number of channels that you will use for data to the E1 interface, and the remaining channels are automatically assigned to the G.703 interface.

In addition, you can configure the clock source (rather than simply accepting the default setting of **line**). For an E1 + G.703 module, the clock source is set only on the E1 interface.

To assign the channels to the E1 interface, complete these steps:

1. From the global configuration mode context, enter the following command:

   Syntax: interface e1 <*slot*>/1

   Replace <*slot*> with the slot number in which the module is installed. For example, if the module is in slot one, enter:

   ```
   ProCurve(config)# interface e1 1/1
   ```

2. Use the following command to create a TDM group and assign it the number of channels used for data.

   Syntax: tdm-group <*number*> timeslots <*range of numbers*>

   When you divide channels between the E1 interface and the G.703 interface, you must create two groups of contiguous channels. Typically, you will reserve channel 16 and all subsequent channels for the G.703 interface. Enter:

   ```
   ProCurve(config-e1 1/1)# tdm-group 1 timeslots 1-15
   ```

   The remaining channels—in this case, channels 16-31—are automatically assigned to the G.703 interface.

3. If you want the E1 + G.703 module to take its clock source from the PBX, enter:

   ```
   ProCurve(config-e1 1/1)# clock source through
   ```

   This chapter includes only the steps for configuring the E1 interface that directly affects the G.703 interface. After you enter the **tdm-group** command, you must configure the other settings for the E1-carrier line: you must then configure the Data Link Layer protocol and bind the physical interface to the logical interface. For detailed information about configuring the E1 interface for data communications, see *Chapter 4: Configuring E1 and T1 Interfaces*.

Configuring the G.703 Interface

1. Access the E1 interface for the G.703 port:

   Syntax: interface e1 <*slot*>/2

   For example, if the E1 + G.703 module is in slot 1, enter

   ```
   ProCurve(config)# interface e1 1/2
   ```

2. Configure the line coding. You should match the line coding used on your PBX:

   Syntax: coding [ami | hdb3]

   The default setting is HDB3.

   For example, to configure the line coding as AMI, enter:

   ```
   ProCurve(config-e1 1/2)# coding ami
   ```

3. Configure frame format. If your PBX uses the E1 frame format, you do not need to enter any commands because this is the default setting. If your PBX uses the CRC4 frame format, enter:

   Syntax: framing crc4

   ProCurve(config-e1 1/2)# framing crc4

4. Configure TS16 signaling.

   ProCurve(config-e1 1/2)# ts16

5. Activate the G.703 interface.

   ProCurve(config-e1 1/2)# no shutdown

Configuring the T1 + DSX-1 Module

Making the Physical Connection

1. Use UTP cabling with RJ-48C connectors to connect the T1 interface to the wall jack provided by your public carrier.
2. Use crossover UTP cabling with RJ-48C connectors to connect the DSX-1 interface to the PBX.

Assigning the Channels to the T1 Interface

When you configure a DSX-1 interface, you first configure the T1 interface to handle the data communications. As part of this configuration, you assign the number of channels that you will use for data to the T1 interface, and the remainder of the channels are automatically passed to the DSX-1 module.

In addition, you can configure the clock source (rather than simply accepting the default setting of line). For a T1 + DSX-1 module, the clock source is set only on the T1 interface.

To assign the channels to the T1 interface, complete these steps:

1. From T1 interface configuration mode context, enter the following command:

   Syntax: interface t1 <*slot*>/1

   Replace <*slot*> with the slot number where the T1 module is housed. For example, if the T1 module is in slot 1, enter:

   ProCurve(config)# interface t1 1/1

2. When you divide channels between the T1 interface and the DSX-1 interface, you must create two groups of contiguous channels. Use the following command to create a TDM group and assign it the number of channels used for data.

   Syntax: tdm-group <*number*> timeslots <*range of numbers*>

   For example, if you want to use channels 1-12 for data, enter:

   ```
   ProCurve(config-t1 1/1)# tdm-group 1 timeslots 1-12
   ```

3. Configure the clock source for the interface. By default the clock source for the interface is **through**. To configure the T1 + DSX-1 interface to take the timing from the PBX, enter:

   ```
   ProCurve(config-t1 1/2)# clock source line
   ```

This chapter includes only the T1 configuration steps that directly affect the DSX-1 interface. You must configure the other settings for the T1-carrier line, configure the Data Link Layer protocol, and bind the physical interface to the logical interface. For detailed information about configuring the T1 interface for data communications, see *Chapter 4: Configuring E1 and T1 Interfaces*.

Configuring the DSX-1 Interface

1. Access the T1 interface for the DSX-1 module:

   Syntax: interface t1 <*slot*>/2

   For example, if the T1 + DSX-1 module is in slot 1, enter

   ```
   ProCurve(config)# interface t1 1/2
   ```

2. Configure the line coding to match the coding used by the PBX. The default setting is B8ZS.

   Syntax: coding [ami | b8zs]

   For example, to configure the T1 interface to use the **coding ami** option, enter:

   ```
   ProCurve(config-t1 1/2)# coding ami
   ```

3. Configure the frame format. The default setting is ESF.

   Syntax: framing [d4 | esf]

   For example, to configure the T1 interface to use D4, enter:

   ```
   ProCurve(config-t1 1/2)# framing d4
   ```

4. Enter the cable length setting so that the Secure Router OS can establish the proper signal level. Enter:

   Syntax: line-length <*cable length*>

   Replace <*cable length*> with **-7.5** or the length of the cable in feet, up to 655 feet.

5. Configure the signaling mode:

   Syntax: signaling-mode [message-oriented | none | robbed-bit]

6. Activate the interface

   ProCurve(config-t1 1/2)# no shutdown