



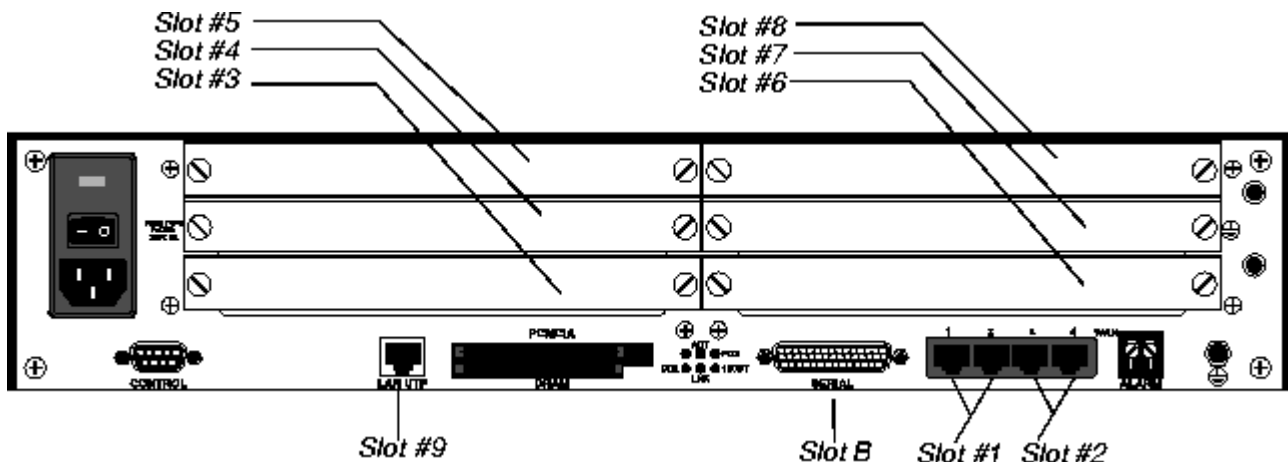
## Configuring the MAX for WAN Access

This chapter covers these topics:

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### Introduction to WAN configuration

The MAX has four built-in T1 or E1 lines and a V.35 serial port for WAN access. It also has eight expansion slots which can support additional bandwidth (BRI lines), AIM ports modules to support videoconferencing, or digital modems to support analog modem connections over digital lines.



**Figure 2-1. Slot and port numbering in the MAX 6000****How the vt100 menus relate to slots and ports**

The numbers in the vt100 menus relate to slot numbers in the MAX unit, which may be an actual expansion slot or a *virtual* slot on the unit's motherboard.

- The system itself is slot number 0 (menu 00-000).

The System menu contains these profiles and submenus, which are all related to systemwide configuration and maintenance:

```
00-000 System
      00-100 Sys Config
      00-200 Sys Diag
      00-300 Security
      00-400 Destinations
      00-500 Dial Plan
```

- The built-in T1 or E1 lines are slot 1 and slot 2 (menus 10-000 and 20-000).

Each of these slots contain two T1 or E1 lines. The organization of the menus for configuring and testing the lines is:

```
10-000 Net/T1 (or Net/E1)
      10-100 Line Config
      10-200 Line Diag

20-000 Net/T1 (or Net/E1)
      20-100 Line Config
      20-200 Line Diag
```

- The six expansion slots are slots 3 through 8 (menus 30-000 through 80-000), with the numbering shown in [Figure 2-1](#).
- The Ethernet is slot 9 (menu 90-000). The Ethernet menu contains submenus and profiles related to the local network, routing and bridging, and WAN connections.
- EtherData is slot A (menu A0-000). For the MAX with built-in Ethernet, this menu is not applicable.
- The serial WAN port is slot B (menu B0-000).

**Phone number assignments**

The MAX receives calls on phone numbers assigned to its T1 or E1 and (if applicable) Net BRI channels. This section describes important issues related to assigning those phone numbers.

In the MAX configuration, there is a limit of 24 characters, which can include the following characters: 1234567890()[]!z-\*#|

**Add-on numbers**

You build multichannel calls (MP, MP+, AIM, BONDING) by specifying add-on numbers. A multichannel call begins as a single-channel connection to one phone number. The calling unit then

requests additional phone numbers it can dial to connect those channels, and stores the add-on numbers it receives from the answering unit. The calling unit must integrate the add-on numbers with the phone number it dialed initially to add channels to the call. Three parameters specify add-on numbers: Ch N#, PRI Num and Sec Num.

Typically, the phone numbers assigned to the channels share a group of leading (leftmost) digits. Enter only the rightmost digits identifying each phone number, excluding the digit(s) that are in common, as in the following example:

- If the add-on number in the called unit is shorter than the phone number dialed by the calling unit, only the rightmost digits are replaced.
  - For example, suppose you dial 777-3300 to reach channel 1 of line 1 and 777-3331, 777-3332, through 777-3348, reaches other channels and other lines. In this case, set Ch1#=30 and the other channels and lines 31, 32, and so forth.
- If the add-on number is longer than the phone number dialed, the extra digits are discarded. For example:
  - Ch1# = 510-655-1212
  - Dial# = 555-1213
  - derived number for channel 1 = 655-1212
- If there is no add-on number, the derived number equals the dialed number.
  - Ch1# = (null)
  - Dial# = 555-1213
  - derived number for channel 1 = 555-1213

The most common reason multichannel calls fail to connect beyond the initial connection is that the answering unit sends the calling unit add-on numbers it cannot use to dial the other channels. The group of channels that make a multichannel call is called a bundle. A 10-channel bundle in which each channel is 64kbps, provides a 640 kbps connection.

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**Note:** AIM and BONDING call bundles should not span dial plans. If you are receiving AIM or BONDING calls and have multiple dial plans, set up each dial plan as a separate trunk group. This also prevents MP and MP+ call bundles from spanning dial plans.

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For example, you have two PRI lines from different service providers. You set the ChN Trnk Grp parameters for the first line to 9 and for the second line to 8. Also, enabling trunk groups on your MAX separates the two dial plans, and prevents the formation of bundles with channels from both PRI lines.

### Hunt groups

A hunt group is a group of channels that has the same phone number. When a call comes in on that number, the MAX uses the first available channel to which the number was assigned. Because channels in a hunt group share a common phone number, the add-on numbers in the profile are the

same.

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**Note:** If all of a line's channels have the same add-on number, you can leave the phone number assignment blank.

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### SPIDS (for Net BRI lines)

The SPIDs assigned to a BRI line operating in multipoint mode are numbers used at the central switch to identify services provisioned for your ISDN line. A SPID is derived from a telephone number and should be supplied by your carrier.

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**Note:** Not all telephone companies include a suffix on their SPIDs. When receiving SPIDs from your telephone company, ask them to verify whether or not suffixes are included. The SPID formats described in the next sections have been agreed upon by most telephone companies.

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For example, for an AT&T switch in multipoint mode, SPIDs have one of these formats:

01nnnnnnn0

01nnnnnnn00

In the AT&T SPID formats, *nnnnnn* is the 7-digit phone number (not including the area code). For example, if the phone number is 555-1212, the SPID will be 0155512120 or 01555121200. For a Northern Telecom switch, SPIDs have one of these formats:

aaannnnnnSS

aaannnnnnSS00

In the Northern Telecom SPID formats, *aaannnnnn* is the 10-digit phone number (including the area code). *SS* is an optional suffix-if specified it is a one or two-digit number differentiating the channels. For example, if the phone numbers are 212-555-1212 and 212-555-1213, the SPIDs may be:

21255512121

21255512132

or:

212555121201

212555121302

or one of the above formats followed by 00 (for example, 21255512130200).

### How the MAX routes inbound and outbound calls

When the MAX receives a call on one of its phone numbers, it routes that call internally to one of its slots or ports. When a digital modem, AIM port, or a host on the local Ethernet port originates a dial-out connection, the MAX routes that call internally to an available WAN channel to place the call.

The channel configuration of a WAN line determines how the channel routes inbound calls and places outbound calls. For details, see [Call routing](#)

## Configuring T1 lines

Each built-in T1 line contains 24 channels, each of which can support one single-channel connection. Depending on the signaling mode used on the line, all 24 channels may be available for user data, or 23 channels may be available for data with the 24th channel reserved for signaling. These are the T1 line configuration parameters:

```
Net/T1
  Line Config
    Name=mytelco
    1st Line=Trunk
    2nd Line=Trunk
    Line N...
      Sig Mode=Inband
      NFAS ID num=N/A
      Rob Ctl=Wink-Start
      Switch Type=N/A
      Framing Mode=D4
      Front End=CSU
      Encoding=AMI
      FDL=N/A
      Length=1-333
      Buildout=N/A
      Clock Source=Yes
      Pbx Type=N/A
      Delete Digits=N/A
      Add Number=N/A
      Call-by-Call=N/A
      T1-PRI:PRI # Type=Unknown
      T1-PRI:NumPlanID=ISDN
      Ans #=N/A
      Ans Service=N/A
      Input Sample count=N/A
      Send Disc=0
      Ch N=Switched
      Ch N #=12
      Ch N Slot=3
      Ch N Prt/Grp=1
      Ch N TrnkGrp=5
```

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**Note:** The Ch N parameters are repeated for each channel in the line (there are 23 channels if you use PRI signaling, and 24 channels for robbed-bit.) For more information on each parameter, see the *MAX Reference Guide*.

---

At the top level, you can assign a name to this line configuration. You can configure several profiles and activate a profile when it is needed.

You can set line 1 and line 2 to trunk service (indicating a standard T1 interface with signaling information) or disabled. For line 2, you can also specify D&I (Drop-and-Insert) service. Drop-and-insert on line 2 specifies that some of line 1's channels will be transparently passed over to line 2. A device (such as a PBX) connected to line 2 assumes it is connected to the WAN switch and is not aware that the channels actually passed through the MAX before going to the WAN.

## Understanding the line interface parameters

This section provides background information on the T1 line interface parameters.

### T1 signaling mode

A T1 line's signaling mode (Sig Mode) may be one of the following:

- Inband, robbed bit signaling. The MAX uses the Rob Ctrl parameter for the Call Control mechanism.
- ISDN signaling. Designate the 24th channel of the T1 line as the D channel.
- ISDN NFAS (Non-Facility Associated Signaling) enables two or more T1 lines to share a D channel. One of the lines must be configured to provide the primary D channel and one as the secondary (backup) D channel.
- PBX (Private Branch Exchange) T1 signaling. The second T1 line can receive calls placed on the first T1 line. The MAX emulates a WAN switch and the PBX (or other device connected to the second T1 line) places and answers calls using the Call Control mechanism.

### Assigning an interface ID to NFAS lines

The NFAS ID num is a different interface ID for each NFAS line. In most cases, the default "1" for the first line and "2" for the second line are correct. If the carrier requires different NFAS interface IDs, type the number they specify.

### Inband, robbed-bit call control mechanism

Rob Ctl is the call control mechanism for robbed-bit signaling. When set to Wink-Start (the default), the switch can seize the trunk by going off hook. The local unit requires the switch to wait for a 200 msec wink when it seizes a trunk.

### Carrier switch type

The Switch Type is the network switch providing ISDN service on a T1 PRI line. The ISDN carrier supplies the information; for example, if your carrier is AT&T, the switch type is AT&T.

- AT&T
- NTI (Northern Telecom)
- NI-2 (National ISDN-2)
- GloBanD
- Japan

### T1 line framing and encoding

The Framing Mode used by the physical layer of the T1 line may be D4 or ESF. D4 format, also known as the superframe format. This format consists of 12 consecutive frames, separated by framing bits. The line cannot be using ISDN signaling with D4 framing; otherwise, false framing and

Yellow Alarm emulation can result. ESF specifies the extended superframe format. This format consists of 24 consecutive frames, separated by framing bits. The ISDN specification advises that you use ESF with ISDN D-channel signaling.

The Encoding parameter sets the layer-1 line encoding used for the physical links, which affects the way the digital signals on the line represent data. Your carrier can tell you which encoding to use. AMI (the default) specifies Alternate Mark Inversion encoding. B8ZS specifies that the encoding is Bipolar with 8-Zero Substitution. None is identical to AMI, but without density enforcement.

### **Channel Service Units (CSU)**

Enable the internal CSU of any TR/PRI port by setting the Net/T1 > Line Config > Line *N* > Front End to CSU. If you use external CSUs, disable the MAX internal CSU by setting Front End to DSX.

### **FDL for monitoring line quality**

The telephone company uses a FDL (facilities data link) protocol to monitor the quality and performance of T1 lines. If your carrier's maintenance devices require regular data-link reports and the line is not configured for D4 framing, you can specify the type of protocol to use (AT&T, ANSI, or Sprint).

You cannot use FDL reporting on a line configured for D4 framing. However, you can obtain D4 and ESF performance statistics in the FDL Stats windows, even if you do not choose a FDL protocol.

### **Cable length and the amount of attenuation required**

The Length parameter is the length of the physical T1 line in feet from the external CSU to the MAX. If you have not enabled the internal CSU for a T1 port in the MAX, it can connect to a T1 line no longer than 655 feet. Anything of greater length requires you to enable the internal CSU. The value should reflect the longest line length you expect (up to a maximum of 655 feet).

The Buildout parameter is the amount of attenuation to apply to the T1 transceiver's internal CSU (channel service unit) to match the cable length from the MAX to the next repeater. Valid values are 0 db (decibels) through 22.5 db.

Attenuation is a measure of the power lost on a transmission line or on a portion of that line. When you specify a value for Buildout, the MAX applies attenuation to the T1 line, causing the line to lose power when the received signal is too strong. Repeaters boost the signal on a T1 line. If the MAX is too close to a repeater, you may need to add some attenuation. Check with your carrier to determine the correct value.

### **Clock source for synchronous transmission**

This determines whether the T1 line can be used as the master clock source for synchronous connections. In synchronous transmission, both the sending device and the receiving device must maintain synchronization in order to determine where one block of data ends and the next begins.

You may need to disable this parameter on one unit if two Ascend units connect to each other by a crossover cable (with optional T1 repeaters) between their network ports.

### **Supporting a PBX**

The PBX Type is the signaling to use with the PBX on line 2. When set to Voice, the PBX that

connects to line 2 views the MAX as a switch. A switch is the device that connects the calling party to the answering party. The MAX switches an incoming call on line 1 to line 2 only if it is a voice-service call.

To allow a PBX one line 2 to dial out through the MAX, specify a number of digits to delete from the dialed number (Delete Digits). The MAX deletes the digits, and then (if applicable) adds numbers to the beginning of a dialed number (Add Number). It can add any digits required by the T1 PRI switch, or it can be used to specify a trunk group that is used in the current T1 profile.

Use the Answer # and Answer Service parameters to route calls to the device terminating the second T1 line when the second line's signal mode is PBX T1. The answer number is one of the MAX unit's phone numbers, and answer service is a data service type (such as voice). See [Call routing](#).

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**Note:** When you use Answer Service to route all voice calls received on line 1 to a PBX on line 2, you can no longer receive modem calls on line 1. All voice calls received on the line will be routed to the PBX, without exception.

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Input Sample Count lets you specify two rather than the default one sample for standard tone durations and other PBXs that use a non-standard tone duration of less than 50ms. Using one sample set seems to work with most PBXs, in most cases, but using two samples is more accurate. Where the tone duration is long (more than 70ms), setting the Input Sample Count to Two is recommended.

### Call-by-Call signaling values

The service provider's call-by-call signaling value for routing calls from a local device through the MAX to the network is specified in the Call-by-Call parameter. The values differ by service provider.

## Understanding the channel configuration parameters

This section provides background information on the T1 channel configuration parameters.

### Specifying how the channel will be used

Each of the 24 channels of a T1 line may be configured for one of the following uses:

- Switched (the default). A switched channel supports switched connections. It may be robbed-bit or a B channel, depending on the line's signal mode.
- Nailed (a clear-channel 64k circuit).
- D channel (the channel used for ISDN D channel signaling). This is assigned automatically to channel number 24 when ISDN signaling is in use.
- NFAS-Prime (the primary D channel for two T1 lines that support NFAS signaling). This will be used as the D channel for both lines, unless it becomes unavailable.
- NFAS-Second (the secondary D channel for two T1 lines that support NFAS signaling). This will be used as the secondary (backup) D channel.
- Drop-and-Insert (pass calls received on this channel through to the second line). The second line must use Drop-and-Insert service. The MAX directs calls on the drop-and-insert channel

to a PBX on the second line.

- Unused (unavailable for use).
- Phone number assignments
- Ch N # is the add-on number associated with each switched channel. See [Add-on numbers](#).

### Associating the channel with a slot/port in the MAX

In the Ch N Slot and Ch N Prt/Grp parameters, you can assign a switched channel to a slot or slot/port combination for a digital modem, AIM port, or Ethernet. This configuration affects both inbound call routing and placing calls. In effect, it reserves the channel for calls to and from the specified slot or port. For details, see [Call routing](#).

If the channel is nailed, Ch N Prt/Grp is a Group number, is referenced in a Connection or Call profile to make use of this nailed connection.

### Assigning the channel to a trunk group

Trunk group numbers 4 through 9 can be assigned to channels to make them available for outbound calls. See [Routing outbound calls](#) for details.

### Example T1 configurations

This section provides some example configurations for T1 lines.

#### Enabling the internal CSU for a T1 port.

Enable the internal CSU for a T1 port, as follows:

1. Open the Net/T1 > Line Config > Line *N* menu.
2. Set Front End to CSU.

Disable the internal CSU by setting Front End to DSX.

3. Exit and save your change.

#### Configuring a line for ISDN PRI service

When configuring ISDN PRI service for your MAX units, you must configure ISDN signaling for the line, and optionally, you can configure the MAX to send either ISDN code 16 (Normal call clearing) or code 17 (User busy) when the PRI switch servicing the MAX triggers the T310 timer.

#### Example of configuring ISDN signaling

This example uses switched channels and ISDN signaling. To configure Line 1 of this T1 module:

1. Open Net/T1 > Line Config and set the 1st Line to Trunk.

```
Net/T1
  Line Config
    Name=
```

```
1st Line=Trunk
2nd Line=Disabled
```

2. Open the Line 1 subprofile and set the signaling mode to ISDN.

```
Line 1...
Sig Mode=ISDN
```

3. Specify the framing and encoding values to ESF and B8ZS, respectively (for example).

```
Framing Mode=ESF
Encoding=B8ZS
```

4. Close the T1 profile.

### Example of configuring Pre-T310 Timer

The ISDN Pre-T310 timer allows users calling into a MAX to get better clarification of call disconnects during the initial set-up of the call. If a call is presented to the MAX, and there is an extended period of delay while the call is being set up, for instance a lot of local Ethernet traffic slowing down RADIUS requests or DNS lookups, then you might want your users to get a different disconnect indication than the generic Normal call clearing.

In compliance with CCITT Specification Q.931, the MAX sends a CALL PROCEEDING message to the network switch for every call it accepts.

The network switch sets its T310 timer as it awaits further messages from the MAX. The switch tears down the call if the T310 timer expires. When this happens, the switch reports ISDN code 16 (Normal call clearing) to the calling device.

The ISDN Pre-T310 timer adds a MAX-specific timer which must be set to a time period less than the T310 timer on the switch. Then, after the MAX-specific timer expires but before the T310 timer expires, the MAX sends ISDN code 17 (User Busy) and clears the call.

---

**Note:** Only calls presented on T1/PRI lines support the Pre-T310 timer feature.

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To configure the Pre-T310 timer:

1. Open the Net/T1 > Line Config > Line menu.
2. Set the Send Disc parameter to a value from 0 to 60 seconds.

This must be set to a value less than the T310 timer value, so that it expires (and the MAX sends its ISDN disconnect) before the T310 timer.

3. Open the Ethernet > Mod Config > Auth menu.
4. Set the Timeout Busy = Yes if you would like User Busy sent when the Send Disc timer expires. Set Timeout Busy = No if you would like Normal call clearing sent.

**Note:** The Timeout Busy parameter replaces the CLID Timeout Busy parameter.

### Configuring robbed-bit signaling

This configuration shows a T1 line using all switched channels and the default inband (*robbed-bit*) signaling mode. To configure a T1 line for robbed-bit:

1. Open Net/T1 > Line Config and set the 2nd Line to Trunk (for example).

```
Net/T1
  Line Config
    Name=
    1st Line=Trunk
    2nd Line=Trunk
```

2. Open the Line 2 subprofile and set the signaling mode to Inband.

```
Line 2...
  Sig Mode=Inband
```

3. Specify the robbed-bit call control mechanism.

```
Rob Ctl=Wink-Start
```

4. Close the T1 profile.

### Using NFAS signaling

When you configure two T1 lines for NFAS signaling, they share a D channel. Configure one line with a primary D channel, and the other with a secondary D channel. Use the secondary D channel only if the primary line goes down or if it receives a signal commanding a change to the other D channel.

---

**Note:** Both lines must reside in the same slot.

---

To configure two T1 lines for NFAS:

1. Open Net/T1 > Line Config and set both lines to Trunk service.

```
Net/T1
  Line Config
    Name=
    1st Line=Trunk
    2nd Line=Trunk
```

2. Open the Line 1 subprofile and set the signaling mode to NFAS.

```
Line 1...
  Sig Mode=ISDN_NFAS
```

3. Leave the default NFAS ID.

```
NFAS ID num=1
```

4. Configure Channel 24 as the primary NFAS D channel.

```
Ch 24=NFAS-Prime
```

5. Close the Line 1 subprofile.
6. Open the Line 2 subprofile and set the signaling mode to NFAS.

```
Line 2...
  Sig Mode=ISDN_NFAS
```

7. Leave the default NFAS ID.

```
NFAS ID num=2
```

8. Configure Channel 24 as the secondary NFAS D channel.

```
Ch 24=NFAS-Second
```

9. Close the T1 profile.

### Enabling a robbed-bit PBX with PRI access lines (PRI-to-T1 Conversion)

Use this section if you have PRI lines from the WAN and need to convert to T1 signaling for support of T1 PBXs. In most cases, you cannot use this feature in combination with digital modems.

The following example configuration uses line 1 to send and receive calls on the WAN and line 2 to handle a PBX for voice service. The MAX emulates a WAN switch, so the PBX on line 2 simulates connection to an AT&T or other carrier switch. For more information on each parameter mentioned below, see the *MAX Reference Guide*.

---

**Note:** The PBX must use 2-state inband with DTMF signaling and must support Senderized (en bloc) digit transmission because the MAX has a preset time limit on received dialing digits. In addition, the called-party number should be available from the switch (DNIS -Dialed Number Identification Service or called-party information element).

---

To configure a pair of T1 lines to support a PBX:

1. Open Net/T1 > Line Config for the second pair of T1 lines on the MAX 6000 (that is, slot 2, or the 20-100 menu).

```
Net/T1
  Line Config
    Name=
    1st Line=Trunk
    2nd Line=Disabled
```

**Note:** The MAX 2000 has only one pair of T1 lines. These steps apply to the Line profile for lines 1 and 2 in slot 1 (the 10-100 menu).

**Note:** On the MAX 1600, PRI-to-T1 conversion is available only if you install the Net/T1 slot card and these steps apply to the Line profile for those lines.

2. Set the 2nd Line parameter to Trunk.

```
2nd Line=Trunk
```

3. Open the Line 1 subprofile and set the Sig Mode parameter to ISDN.

```
Line 1...
  Sig Mode=ISDN
```

On the MAX 1600, this step applies to line #1 of the Net/T1 slot card.

**Note:** On the MAX 4000 and 1600, you can also set the first pair of T1 lines (slot 1) for ISDN (PRI) signaling, in which case they become available for outgoing calls from the PBX and can switch incoming calls to the PBX.

4. Close the Line 1 subprofile.
5. Open the Line 2 subprofile and set the Sig Mode parameter to PBX T1.

```
Line 2...
  Sig Mode=PBX T1
```

On the MAX 1600, this step applies to line #2 of the Net/T1 slot card.

6. Set the Rob Ctl parameter as required by the PBX.

```
Line 2...
  Rob Ctl=Wink-Start
```

7. Set the T1-PRI:PRI # Type parameter as allowed by your PRI lines provider and appropriate to the calls placed by your PBX places.

```
Line 2...
  T1-PRI:PRI # Type=
```

8. Set the T1-PRI:NumPlandID parameter as required by your PRI lines provider.

```
Line 2...
  T1-PRI:NumPlandID=
```

9. The PBX Type parameters tell the MAX what type of service the PBX expects on its T1 line. In most installations the PBX expects Voice service calls with call progress tones. The value Data does not supply call progress tones or information messages to the user.

```
Line 2...
  PBX Type=Voice
```

10. The following two parameters tell the MAX whether or not to convert a call incoming on the PRI line(s) to robbed-bit T1 signaling or to answer the call and perform normal incoming call routing.

Set the Ans Service parameter (Most installations select Voice.)

```
Line 2...
  Ans Service=Voice
```

**Note:** If you set Ans Svc=Voice, incoming voice service calls on PRI line(s) are converted to T1 signaling on the line outgoing to the PBX. Data service calls are routed according to the MAX unit's normal incoming call routing, do not go to the PBX and are not converted.

**Note:** If you set Ans Svc=Voice, you cannot configure the MAX for both digital modem operation and PBX-T1 support because all incoming voice service calls are switched to the PBX and none ever reach the digital modems.

11. Set the Ans # parameter. Most installations leave this parameter blank.

```
Line 2...
    Ans #=
```

12. The following parameters convert the phone number dialed at the PBX to an ISDN PRI format.

Set the Delete Digit parameter.

```
Line 2...
    Delete Digit=
```

13. Set the Add Number parameter.

```
Line 2...
    Add Number=
```

14. The Call-by-Call parameter adds the appropriate ISDN PRI call setup request for calls dialed out from the PBX.

```
Line 2...
    Call-by-Call=
```

15. Close the Line 2 subprofile.

16. Close the T1 profile.

17. If you have not already set the Modem:NumPlanID parameter in the System Profile (Sys Config menu), set it now. It determines the numbering plan on outgoing calls. It applies not only to calls the PBX places, but to all outgoing call the MAX places.

---

**Note:** On MAX models with multiple lines configured for ISDN (that is, PRI), outgoing calls from the PBX use the first available channel on any line configured for ISDN signaling. If you wish to select a PRI line for outgoing calls, the number dialed by the PBX must be prefaced by a dialing prefix set up in the Ch n Trnk Grp Line profile parameter and you must enable trunk groups (by setting the Use Trunk Grps System profile parameter to Yes).

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**Note:** When the MAX forwards an incoming call to the PBX, it does not forward the called-party number.

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### Assigning bandwidth to a nailed link

A nailed link is up permanently. Both ends of the link must assign the same number of channels to the link. However, channel assignments do not have to match; for example Channel 1 may be switched at the local end and nailed at the remote end. To designate certain channels for a nailed line:

1. Open Net/T1 > Line Config > Line 1 (for example).

```

Net/T1
  Line Config
    Name=
    1st Line=Trunk
    2nd Line=Disabled
    Line 1...

```

2. Configure the nailed channels. For example, to assign channels 1-5 to the same nailed connection:

```

Ch 1=Nailed
Ch 1 Prt/Grp=3
Ch 2=Nailed
Ch 2 Prt/Grp=3
Ch 3=Nailed
Ch 3 Prt/Grp=3
Ch 4=Nailed
Ch 4 Prt/Grp=3
Ch 5=Nailed
Ch 5 Prt/Grp=3

```

3. Close the T1 profile.

---

**Note:** A Connection profile can use this permanent link by specifying the nailed channels' group number in the Group parameter. A Frame Relay profile uses a permanent nailed link by specifying the group number in its Nailed Grp parameter.

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## Performing T1 line diagnostics

The MAX provides the following T1 diagnostic commands:

```

Net/T1
  Line Diag
    Line LB1
    Line LB2
    Switch D Chan
    Clr Err1
    Clr Perf1
    Clr Err2
    Clr Perf2

```

You can use these commands to test the line configuration. For more information on each command, see the *MAX Reference Guide*.

## Configuring E1 lines

Each built-in E1 line contains 32 channels, each of which can support one single-channel connection. Depending on the signaling mode used on the line, all 32 channels may be available for user data, or 31 channels may be available for data with the 32nd channel reserved for signaling. These are the E1 line configuration parameters:

```

Net/E1
  Line Config
    Name=myPTT_line1

```

```
1st Line=Trunk
2nd Line=Trunk
Back-to-Back=No
Line 1...
  Sig Mode=DPNSS
  Switch Type=Net 5
  Framing Mode=G.703
  # Complete=N/A
  Grp B Signal=N/A
  Grp II Signal=N/A
  L3 End=X END
  L2 End=B END
  NL Value=64
  LoopAvoidance=7
  Clock Source=Yes
  Ch N=Switched
  Ch N #=1212
  Ch N Slot=3
  Ch N Prt/Grp=1
  Ch N TrnkGrp=5
```

---

**Note:** The Ch N parameters are repeated for each channel in the line (31 channels if PRI signaling is used, and 32 channels for robbed-bit.)

---

At the top level, you can assign a name to this line configuration. You can configure several profiles and activate a profile when it is needed.

You can set line 1 and line 2 to trunk service (indicating a standard E1 interface with signaling information) or disabled.

The ETSI series of standards does not include a specification for how a CPE unit disables a NET5 line. Therefore, if you disable an E1 line, the switch to which your MAX is connected does not take the line out of service when you save the profile. The MAX disables outgoing call requests for a disabled line, but the switch still delivers incoming calls to the MAX. If you need to disable incoming calls, contact your carrier.

---

**Note:** As a workaround to having the carrier manually disable lines, you can set Ethernet > Answer > ID Auth to Required. Provided you have not configured any CLID profiles, the MAX does not accept any incoming calls on *any* E1 line. The MAX does not answer the call (go off-hook), so the caller is not charged for the call.

---

For lines configured with a DPNSS switch type, you can perform a test connection to another DPNSS unit without using an intervening switch by setting Back-to-Back to Yes.

For more information on each parameter, see the *MAX Reference Guide*.

## Understanding the line interface parameters

This section provides background information on the E1 line interface parameters.

### E1 signaling mode

An E1 line's signaling mode (Sig Mode) may be None (leased) or one of the following:

- ISDN signaling using the D channel. The 32nd channel of the E1 line must be designated as the D channel.
- DPNSS indicates that the interface supports DPNSS or DASS 2 signaling.
- R2 indicates R2 signaling.
- Metered indicates metered R2 signaling protocol, for use in Brazil and South Africa.
- Chinese indicates a version of the R2 signaling protocol, for use in China.

---

**Note:** The default bandwidth for data calls across R2 lines is 64 kbps, so set Ethernet > Connections > Any Connection profile > Telco Options > Force 56 to Yes in any Connection profile which should use 56 kbps over R2 lines.

---

### **Carrier switch type**

The Switch Type is the type of network switch providing ISDN service on an E1 PRI line.

- GloBanD (Q.931W GloBanD data service).
- NI-1 (National ISDN-1.)
- Net 5 (Euro ISDN services in Belgium, the Netherlands, Switzerland, Sweden, Denmark, and Singapore).
- Danish (This conforms to the Danish E1-TB91020, July 1991 specification and is a variation of Net5 PRI E1.)
- DASS 2 (U.K. only).
- ISLX (DPNSS switch type).
- ISDX (DPNSS switch type).
- Mercury (DPNSS switch type).
- Australian (Australia only).
- French (VN3 ISDN PRI).
- German (1TR6).
- CAS (New Zealand).

### **E1 framing**

The physical layer of the E1 line uses framing G.703, which is the standard Framing Mode used by most E1 ISDN providers and by DASS 2, or 2DS, a variant of G.703 required by most E1 DPNSS providers in the U.K.

## Specifying digits received on an incoming R2 call

Number Complete specifies how many digits complete number on an incoming call using R2 signaling. You can specify end-of-pulsing to indicate that the MAX should keep on receiving digits until the caller stops sending them, or you can specify a fixed number of digits (up to 10).

## Group signaling

Group B signaling and Group II signaling specify the group signal to send prior to answering a call.

## Required settings when you configure the switch for DASS 2 or DPNSS

L3 and L2 End specify CCITT Layer 2 and CCITT Layer 3. They must be set to their default values when the line connects to a switch configured for DASS 2 or DPNSS.

NL value must be set to 64, its default value, when the line connects to a switch configured for DASS 2 or DPNSS.

Loop avoidance must be set to 7, its default value, when the line connects to a switch configured for DASS 2 or DPNSS.

Contact the carrier for more details. For ISDN, these settings are not applicable.

## Clock source for synchronous transmission

This determines whether the E1 line can be used as the master Clock Source for synchronous connections. In synchronous transmission, both the sending device and the receiving device must maintain synchronization in order to determine where one block of data ends and the next begins.

## Understanding the channel configuration parameters

This section provides background information on the E1 channel configuration parameters.

## Specifying how to use the channel

Each of the 32 channels of an E1 line may be configured for one of the following uses:

- Switched (the default). A switched channel supports switched connections. It may be robbed-bit or a B channel, depending on how the line's signal mode.
- Nailed (a clear-channel 64k circuit).
- D channel (the channel used for ISDN D channel signaling). This is assigned automatically to channel number 16 when ISDN signaling is in use.
- Unused (unavailable for use).

## Phone number assignments

Ch N # is the add-on number associated with each switched channel. See [Add-on numbers](#).

## Associating the channel with a slot/port in the MAX

In the Ch N Slot and Ch N Prt/Grp parameters, you can assign a switched channel to a slot or slot/port combination for a digital modem, AIM port, or Ethernet. This configuration affects both inbound call routing and placing calls. In effect, it reserves the channel for calls to and from the specified slot or port. For details, see [Call routing](#).

If the channel is nailed, Ch N Prt/Grp is a Group number, is referenced in a Connection or Call profile to make use of this nailed connection.

### Assigning the channel to a trunk group

Trunk group numbers 4 through 9 can be assigned to channels to make them available for outbound calls. See [Routing outbound calls](#) for details.

## Example E1 configurations

This section provides some example configurations for E1 lines.

### Using ISDN signaling

To configure an E1 PRI line for ISDN signaling in Belgium, Netherlands, Switzerland, Sweden, Denmark, or Singapore:

1. Open Net/E1 > Line Config > Line 1 and specify ISDN signaling.

```
Net/E1
  Line Config
    Line 1...
      Sig Mode=ISDN
```

2. Set the Switch Type parameter to Net5 (the standard used in these countries).

```
Switch Type=Net 5
```

3. Specify G.703 framing (the standard used by most E1 ISDN providers).

```
Framing Mode=G.703
```

4. Close the E1 profile.

### Using DPNSS signaling

To configure the E1 line for DPNSS signaling:

1. Open Net/E1 > Line Config > Line 1.
2. Set the DPNSS signaling mode and compatible switch type. For example:

```
Net/E1
  Line Config
    Line 1...
      Sig Mode=DPNSS
      Switch Type=Mercury
```

Mercury is a variant of DPNSS.

3. Set the framing mode. For example:

```
Framing Mode=2DS
```

2DS gives a variant of G.703 required by most E1 DPNSS providers in the U.K.

4. When you set the DPNSS signaling mode, the following parameters show the appropriate default value.

```
L3 End=X END
L2 End=B END
NL Value=64
LoopAvoidance=7
```

5. Close the E1 profile.

### Setting up a nailed connection

The number of nailed channels must be the same at both ends of the connection; for example, if there are 5 nailed channels at the local end, there must be 5 nailed channels at the remote end. However, channel assignments do not have to match; for example Channel 1 may be switched at the local end and nailed at the remote end.

---

**Note:** To use nailed channels, a Connection or Call profile references the group number assigned in the channels' Prt/Grp parameter. A total of 64 nailed connections can be defined over nailed channels.

---

1. Open Net/E1 > Line Config > Line 1 (for example).

```
Net/E1
  Line Config
    Name=
    1st Line=Trunk
    2nd Line=Disabled
    Line 1...
```

2. Configure the nailed channels. For example, to assign channels 1-5 to the same nailed connection:

```
Ch 1=Nailed
Ch 1 Prt/Grp=3
Ch 2=Nailed
Ch 2 Prt/Grp=3
Ch 3=Nailed
Ch 3 Prt/Grp=3
Ch 4=Nailed
Ch 4 Prt/Grp=3
Ch 5=Nailed
Ch 5 Prt/Grp=3
```

3. Close the E1 profile.

### Performing E1 line diagnostics

The MAX provides the following E1 diagnostic commands:

```

Net/E1
  Line Diag
    Line LB1
    Line LB2

```

You can use these commands to test the line configuration. For more information on each command, see the *MAX Reference Guide*.

## ISDN call information

If the E1 PRI line switch type is German 1TR6 or Japan NTT, you can display information about ISDN calls by invoking the terminal server command line and using the Show Calls command. For example:

```
ascend% show calls
```

The command displays statistics about current calls, for example:

Call ID	Called Party ID	Calling Party ID	InOctets	OutOctets
3	5104563434	4191234567	0	0
4	4197654321	5108888888	888888	99999

The Call ID column contains an index number specific to the call.

Called Party ID and Calling Party ID show the telephone number of the answering device and calling device, respectively.

InOctets and OutOctets show the number of bytes received by the answering device and transmitted by the calling device, respectively.

---

**Note:** When an ISDN call disconnects from either the German 1TR6 switch or the Japan NTT switch, these switches send call billing information to the call originator as part of the call tear-down process. This information is written to the eventCallCharge (eventEntry 17) SNMP object in the Ascend Enterprise MIB events group (10). An SNMP manager can then read this object to determine the cost of the call. eventCallCharge is a read-only integer and is applicable only if eventType is callCleared (3). Otherwise, 0 is returned.

---

## Configuring the serial WAN port

The MAX has a built-in V.35 serial WAN DB-44 port. A serial WAN port provides a V.35/RS-449 WAN interface that is typically used to connect to a Frame Relay switch. The clock speed received from the link determines the serial WAN data rate. The maximum acceptable clock is 8 Mbit/s. The clock speed at the serial WAN port has no effect on the bandwidth of other WAN interfaces in the MAX.

These are the serial WAN configuration parameters:

```

Serial WAN
  Mod Config
    Module Name=serial
    Nailed Grp=3
    Activation=Static

```

For more information on each parameter, see the *MAX Reference Guide*.

## Understanding the serial WAN parameters

This section provides some background on the serial WAN configuration.

### Assigning a group number to the serial WAN bandwidth

The Nailed Grp parameter assigns a number that can be referenced as the Group in a Connection profile or the Nailed Grp in a Frame Relay profile. If it is specified in a Connection profile, the MAX bridges or routes packets to another unit across that nailed connection. If it is used in a Frame Relay profile, the MAX has a nailed connection to a Frame Relay switch and the DLCI number in each frame determines which frames the MAX sends over the link.

The number you assign must be unique in the MAX configuration. Do not use a group number that is already in use for a nailed connection on another interface.

### Signals to control the serial WAN data flow

The Activation parameter tells the MAX which signals control the data flow through the serial WAN port. The DCE to which the serial WAN port is connected (such as a Frame Relay switch) determines how to set its value. The CTS (Clear To Send) signal handles flow control.

## Example serial WAN configuration

To configure the serial WAN interface to connect to a Frame Relay switch that uses Static data flow:

1. Open Serial WAN > Mod Config.
2. Assign a module name and a group number.
3. Set the Activation parameter to Static.

```
Serial WAN
  Mod Config
    Module Name=wan-serial
    Nailed Grp=3
    Activation=Static
```

4. Close the Serial WAN profile.
5. Configure a Frame Relay profile and specify the Nailed Grp number assigned to this port. For example:

```
Frame Relay
  Name=NNI
  Active=Yes
  Call Type=Nailed
  FR Type=NNI
  LinkUp=Yes
  Nailed Grp=3
  ...
```

See [Chapter 4, Configuring Frame Relay](#).

## Configuring digital modems

A *digital modem* is a device that can communicate over a digital line (such as an ISDN line) with a station that uses a modem connected to an analog line. Incoming modem calls and incoming digital calls come over the same digital line to the MAX unit's integrated digital modem. The MAX can also make an outgoing call over a digital line to a modem on an analog line.

A digital modem accepts an incoming call as a PCM (Pulse Coded Modulation) encoded digital stream, which contains a digitized version of the analog waveform sent by a caller attached to a modem. The digital modem also converts outgoing data to a PCM-encoded digital stream and sends it across the WAN to an analog modem.

For example, these are the digital modem configuration parameters for a V.34 modem slot card installed with 8 digital modems:

```
V.34 Modem
  Mod Config
    Ans 1#=12
    Ans 2#=13
    Ans 3#=14
    Ans 4#=15

V.34 Modem
  Modem Diag
    ModemSlot=enable slot
    Modem #1=enable modem
    Modem #2=enable modem
    Modem #3=enable modem
    Modem #4=enable modem
    Modem #5=enable modem
    Modem #6=enable modem
    Modem #7=enable modem
    Modem #8=enable modem
```

If you have a V.32bis modem installed in your MAX, the interface displays `LAN Modem` instead of `V.34 Modem`. If you have a K56Flex modem installed, the interface displays `K56 Modem`. Also, there can be 8, 12, or 16 modems per modem slot card. The Modem Diag menu displays 8, 12, or 16 `Modem #N` parameters corresponding to the number of modems on the slot card.

For more information on each parameter, see the *MAX Reference Guide*.

### 56k Modem Numbering

K56Flex modem cards are not numbered sequentially. This numbering does not affect functionality.

### 8-MOD modem numbering

Modems in the 8-MOD modem card are numbered 0, 1, 2, 3, 6, 7, 10, 11.

For example, if you have an 8-MOD modem card in slot 8 in a MAX 6000, the `Show Modems` command in the Terminal Server displays the following output:

```
ascend% show modems

slot:item      modem      status
8:0           1         idle
```

```

8:1      2      idle
8:2      3      idle
8:3      4      idle
8:6      5      idle
8:7      6      idle
8:10     7      idle
8:11     8      idle

```

## 12-MOD modem numbering

Modems in the 12-MOD K56Flex modem card are numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13

For example, if you have an 12-MOD K56Flex modem card in slot 8 in a MAX 6000, the Show Modems command in the Terminal Server displays the following output:

```

ascend% show modems

slot:item      modem      status
8:0            1          idle
8:1            2          idle
8:2            3          idle
8:3            4          idle
8:4            5          idle
8:5            6          idle
8:6            7          idle
8:7            8          idle
8:8            9          idle
8:9            10         idle
8:12           11         idle
8:13           12         idle

```

## Understanding the digital modem parameters

To process asynchronous data calls initiated by analog modems requires digital modem processing, so all incoming analog modem calls must be routed first to a digital modem. The Answer numbers are add-on numbers assigned to some of the MAX unit's WAN lines. See [Call routing](#).

After the digital modems process the call, it passes to the MAX unit's terminal server software. If it does not contain PPP encapsulation, it is handled as a login call, which may be routed transparently to a telnet host on the local network. PPP-encapsulated modem calls pass to the bridge/router as regular PPP connections.

See terminal server information in [Chapter 3, Configuring WAN Links](#).

---

**Note:** V.120 terminal adapters such as the BitSurfer (also known as ISDN modems) are asynchronous calls with CCITT V.120 encapsulation. The MAX handles V.120 encapsulation in software, so these calls do not require digital modem processing. See [Configuring V.110 modems](#) for information about processing V.110 calls.

---

## Example configuration

To configure digital modems:

1. Open V.34 Modem > Mod Config (or V.42 Modem > Mod Config).

2. Specify the rightmost unique digits of the phone numbers to be routed to digital modems.

For example:

```
V.34 Modem
  Mod Config
    Ans 1#=12
    Ans 2#=13
    Ans 3#=14
    Ans 4#=15
```

3. Close the Modem profile.

## Quiescing digital modems and returning them to service

A digital modem that has been temporarily disabled without disrupting existing connections is *quiesced*. Active calls are not torn down. When an active call drops, that modem is added to the disabled modem list and is not available for use. If all modems are on the disabled list, incoming callers receive a busy signal until the modems have been restored for service. When you re-enable the quiesced modem, a delay of up to 20 seconds may occur before the modem becomes available for service.

---

**Note:** Booting the MAX restores all quiesced lines, slots, and ports to service.

---

For details, see the *MAX Reference Guide*.

## Configuring V.110 modems

A V.110 card provides eight V.110 modems, each of which enables the MAX to communicate with an asynchronous device over synchronous digital lines. An async device such as an ISDN modem encapsulates its data in V.110.

The V.110 module in the MAX removes the encapsulation and enables an async session (a terminal server session). See terminal server information in [Chapter 3, Configuring WAN Links](#).

These are the V.110 configuration parameters:

```
V.110
  Mod Config
    Ans 1#=12
    Ans 2#=13
    Ans 3#=14
    Ans 4#=15
```

For more information on each parameter, see the *MAX Reference Guide*.

## Understanding the V.110 modem parameters

To process asynchronous data calls that use V.110 encapsulation requires V.110 modem processing, so incoming calls using V.110 must be routed first to a V.110 modem. The Answer numbers are add-on numbers assigned to some of the MAX unit's WAN lines. See [Call routing](#).

After the V.110 modem processes the call, the call passes to the MAX unit's terminal server

software. If it does not contain PPP encapsulation, it is handled as a login call, which may be routed transparently to a telnet host on the local network. PPP-encapsulated modem calls pass to the bridge/router as regular PPP connections

---

**Note:** V.110 terminal adapters are asynchronous calls with CCITT V.110 encapsulation. These calls require V.110 modem processing.

---

## Example V.110 configuration

To configure V.110 modules:

1. Open V.110 > Mod Config.
2. Specify the dial-in phone numbers to be routed to V.110 as a terminal server call.

For example,

```
V.110
  Mod Config
    Ans 1#=12
    Ans 2#=13
    Ans 3#=14
    Ans 4#=15
```

3. Close the V.110 profile.

## Configuring Personal Handy Phone Service

PHS is a mobile phone service currently offered in Japan only. In addition to voice communication, PHS offers data communication at bandwidth up to 32 Kilobits per second. You can use this service for phone calls as well as Internet access.

This feature is available through the addition of a slot card, allowing 16 concurrent PHS users. You can install up to six cards.

You need to enable the software functionality on the MAX, through a hash code upgrade. When you have this hash code, the System Options menu displays PHS Installed; if you do not have this installed, the System Options menu displays PHS Not Installed.

When the MAX is booted with a PHS card in slot 4 and the software enabled, the following is displayed:

```
Main Edit Menu

00-000 System
10-000 Net/T1
20-000 Net/T1
30-000 Empty
40-000 PIAFS-16
```

```

50-000 Empty
60-000 Empty
70-000 Empty
80-000 Empty
90-000 Ethernet
A0-000 Ether Data
B0-000 Serial WAN

```

PIAFS stands for Personal Internet Access Forum Standard. PIAFS is a protocol designed to support connection negotiation, data transfers and error correction. The -16 refers to the slot card's support of 16 concurrent PHS users.

## Configuring ISDN BRI network cards

An ISDN BRI (Basic Rate Interface) network interface card has eight BRI lines. These lines provide lower-cost connections to some sites that do not require or have access to the higher-bandwidth T1 or E1 lines. These are the relevant BRI network configuration parameters.

```

Net/BRI
  Line Config
    Name=bri-net
    Switch Type=AT&T
    BRI Analog Encode=Mu-Law
    Line N...
      Enabled=Yes
      Link Type=P_T_P
      B1 Usage=Switched
      B1 Slot=3
      B2 Prt/Grp=1
      B1 Trnk Grp=5
      B2 Usage=Switched
      B2 Slot=3
      B2 Prt/Grp=2
      B2 Trnk Grp=5
      Pri Num=555-1212
      Pri SPID=01555121200
      Sec Num=555-1213
      Sec SPID=01555121300

```

For more information on each parameter, see the *MAX Reference Guide*.

---

**Note:** After you have configured the line, you may need to configure the card for outbound calls. See [Configuring the Net BRI line for outbound calls](#).

---

## Understanding the Net BRI parameters

This section provides some background information on the Net BRI parameters.

### Assigning a profile name

You can configure several profiles and activate a profile when it is needed. The name should indicate usage.

### **Carrier switch type and how it operates**

The Switch Type is the central network switch that provides ISDN service to the MAX. For details on supported switch types, see the *MAX Reference Guide*.

### **BRI Analog Encode**

If you are going to receive modem calls, this parameter allows you to select the encoding type. For more information on this parameter, see the *MAX Reference Guide*.

### **Link Type**

This parameter specifies whether the switch operates in point-to-point or multipoint mode. In point-to-point mode, MAX requires one phone number and no SPIDs (Service profile Identifiers). In multipoint mode, the MAX requires two phone numbers and two SPIDs. All international switch types except DBP Telecom and all domestic (U.S.A.) switch types except AT&T 5ESS operate in multipoint mode.

### **Using the BRI line for switched or nailed connections**

Each BRI line has two B channels for user data and one D channel for signaling. The B1 and B2 Usage parameters specify how to use the B channels: Switched (the default), Nailed, or Unused (not available for use).

### **Associating the channel with a slot/port in the MAX**

In the B N Slot and B N Prt/Grp parameters, you can assign a switched channel to a slot or slot/port combination for a digital modem, AIM port, or Ethernet. This configuration affects both inbound call routing and placing calls. In effect, it reserves the channel for calls to and from the specified slot or port. For details, see [Call routing](#).

---

**Note:** You cannot control whether an incoming call will ring on the first or second B channel, so the B1 Slot and B2 Slot parameters should be set to identical values.

---

If the channel is nailed, B N Prt/Grp is a Group number, is referenced in a Connection or Call profile to make use of this nailed connection.

### **Assigning the channel to a trunk group**

Trunk group numbers 4 through 9 can be assigned to channels to make them available for outbound calls. You cannot combine PRI channels with BRI channels in the same trunk group. See [Routing outbound calls](#) for details.

### **Phone number and SPID (Service Profile Identifier) assignments**

Pri Num is the primary add-on number for the Net BRI line. If you configure the line for point-to-point service, it is the only number associated with the line.

Sec Num is the secondary add-on number for the Net BRI line. If you configure the line for point-to-

point service, it is not applicable.

Pri SPID and Sec SPID are the SPIDs associated with the Primary and Secondary numbers, respectively. See [SPIDS \(for Net BRI lines\)](#).

## Example Net BRI configurations

This section provides some example configurations for Net BRI lines.

### Configuring incoming switched connections

In this example configuration, configure the BRI lines in multipoint mode with an NI-1 switch. Configure the lines for switched incoming connections.

1. Open Net/BRI > Line Config.
2. Assign a name to the profile and specify the carrier's switch type.

```
Net/BRI
  Line Config
    Name=bri-net
    Switch Type=NI-1
    BRI Analog Encode=Mu-Law
```

3. Open Line 1, enable the line, and specify multipoint mode.

```
Line 1...
  Enabled=Yes
  Link Type=P_T_P
```

4. Configure the B channels for switched usage, and for routing to the local network.

```
B1 Usage=Switched
B1 Slot=9
B2 Prt/Grp=0
B1 Trnk Grp=
B2 Usage=Switched
B2 Slot=9
B2 Prt/Grp=0
B2 Trnk Grp=
```

5. Specify the primary and secondary add-on numbers and their associated SPIDs.

```
Pri Num=555-1212
Pri SPID=01555121200
Sec Num=555-1213
Sec SPID=01555121300
```

6. Close the Line 1 subprofile and proceed to configure the other 7 lines.
7. Close the Net BRI profile.

### Configuring the Net BRI line for outbound calls

In this example Net BRI configuration, the MAX has two T1 or E1 lines and has a Net BRI card installed in slot 5. To enable local users to initiate outbound connections using the BRI lines, the

MAX must be configured for trunk groups. To enable outbound calls using trunk groups:

1. Open System > Sys Config and enable trunk groups systemwide.

```
System
  Sys Config
    Use Trunk Grps=Yes
```

2. Close the System profile.
3. Open Net/BRI > Line Config > Line 1.

```
Net/BRI
  Line Config
    Name=bri-net
    Switch Type=NI-1
    BRI Analog Encode=Mu-Law
    Line 1...
```

4. Assign both of the line's channels to trunk group 6 (for example).

```
B1 Trnk Grp=6
B2 Trnk Grp=6
```

5. Repeat this trunk group setting for the remaining BRI lines (Lines 2-8), so that all BRI lines are in trunk group 6.
6. Close the Net BRI profile.

To specify that outbound calls initiating from the MAX unit's bridge/router use trunk groups:

1. Open Ethernet > Mod Config > WAN Options and set the Dial Plan parameter to Trunk Grp.

```
Ethernet
  Mod Config
    Wan options...
      Dial Plan=Trunk Grp
```

2. Close the Ethernet profile.

To specify that a connection uses a BRI line:

1. Open the Connection profile.
2. Include the Net BRI trunk group number in the Dial # parameter.

For example:

```
Ethernet
  Connections
    Dial #=6-555-1212
```

When the first digit of the Dial # is a trunk group number, the MAX places the call using the channels in that trunk group.

3. Close the Connection profile.

---

**Note:** See [Routing outbound calls](#) for a way to use Destination profiles to specify lines as backup channels if all WAN channels are busy. Instead of explicitly entering the dial number in the Connection profile, you can reference a Destination profile, which can specify up to six different dial-out paths to a particular destination.

---

## Displaying information about BRI calls

If the BRI line switch type is German ITR6, you can display information about ISDN calls by invoking the terminal server command line and using the `Show Calls` command. For example:

```
ascend% show calls
```

The command displays statistics about current calls, for example:

Call ID	Called Party ID	Calling Party ID	InOctets	OutOctets
3	5104563434	4191234567	0	0
4	4197654321	5108888888	888888	99999

The Call ID column contains an index number specific to the call. Called Party ID and Calling Party ID show the telephone number of the answering device and calling device, respectively.

InOctets and OutOctets show the number of bytes received by the answering device and transmitted by the calling device, respectively.

---

**Note:** When an ISDN call disconnects in Germany, the ISDN switch sends call billing information to the call originator as part of the call tear-down process. For lines that use the German ITR6 switch type, you can access ISDN call charges in the Ascend Enterprise MIB via SNMP management utilities.

---

## Configuring Host BRI lines

The Host BRI module provides up to eight local ISDN BRI lines. Devices terminating these local ISDN BRI lines may be a MAX (or any BRI device) on its own local Ethernet segment, or a Desktop video device with its own BRI line and built-in terminal adapter. To the terminating equipment, a Host BRI line, the MAX appears to be an AT&T switch.

TEs on Host BRI lines can call each other, enabling local net-to-net BRI calls. These local calls never go out to the WAN; they make use of the BRI bandwidth internally. They can also send and receive calls from the WAN. To the actual WAN switch, the MAX appears as the call's endpoint. Routing to the Host BRI line is handled internally.

These are the Host BRI configuration parameters.

```
Host BRI
  Line Config
    Name=local
    Line N...
      Enabled=Yes
      Dial Plan=Extended
      Ans 1#=1212
      Ans 2#=
```

For more information on each parameter, see the *MAX Reference Guide*.

## Understanding the Host BRI parameters

This section provides some background information about the Host BRI configuration parameters.

### Assigning a profile name

You can configure several profiles and activate a profile when it is needed. The name should indicate usage.

### Enabling the line

If you set the Enabled parameter to No, the line is not available for use.

### Specifying how the terminating equipment sends and receives calls

Dial Plan specifies how the device terminating a Host BRI line can send and receive calls: by using the extended dial plan or Trunk Groups. For details on dial plans, see [Routing outbound calls](#).

### Routing calls to the terminating equipment on the Host BRI line

Ans 1# and Ans 2# are two of the MAX unit's add-on numbers assigned to a WAN line (a line that may receive inbound calls from the WAN). See [Call routing](#).

## Example Host BRI configurations

This section provides some example configurations for Host BRI lines.

### Routing inbound calls to the terminating device

In this example configuration, the MAX routes inbound WAN calls to the device terminating the Host BRI line. That device does not make outbound calls to the WAN. The caller dials 555-1212 and connects to the terminating equipment that terminates the BRI line 1.

1. Open Host/BRI > Line Config and assign a name to it.

```
Host/BRI
  Line Config
    Name=local
```

2. Open the Line 1 subprofile, enable the line, and assign an answer number.

```
Line 1...
  Enabled=Yes
  Dial Plan=Trunk Grp
  Ans 1#=1212
```

3. Close the Host BRI profile.

### Enabling the device to make outbound calls

In this example configuration, the terminating equipment on line 1 can make an outbound call using Trunk Group 5 and Dial Plan profile 2. With this configuration, the caller at the Host BRI

terminating equipment dials 502-408-555-1212 and connects to the device whose telephone number is 408-555-1212 (Trunk group 5, Dial Plan 2).

To enable outbound calls using trunk groups:

1. Open System > Sys Config and enable trunk groups systemwide.

```
System
  Sys Config
    Use Trunk Grps=Yes
```

2. Close the System profile.
3. Open a Net/T1 (or Net/E1) profile and make sure that some of the line's channels are assigned to trunk group 5. Then, close the profile.
4. Open Dial Plan 02.
5. Specify the Inherit setting for the Data Service and PRI # Type parameters. For example,

```
Dial Plan
  Name=Boston
  Call-by-Call=6
  Data Svc=Inherit
  PRI # Type=Inherit
```

**Note:** See [Routing outbound calls](#) for details.

6. Close the Dial Plan profile.

To configure the Host BRI module for outbound calls using this Dial Plan:

1. Open Host/BRI > Line Config > Line 1.
2. Set Dial Plan to Extended

```
Host/BRI
  Line Config
    Name=local
    Line 1...
      Enabled=Yes
      Dial Plan=Extended
      Ans 1#=1212
      Ans 2#=#
```

3. Close the Host BRI profile.

### Configuring a local BRI-to-BRI call

In this example configuration, the terminating equipment on one Host BRI line can connect to the terminating equipment on another Host BRI using a Dial Plan profile and going out on line 5, slot 4. To make the connection the caller will dial:

345

This number references a Dial Plan profile, using a special 3-digit format. The first digit, called the

dialing prefix, is 3. The second digit, 4, represents expansion slot 4, and the third digit is the host port on that card.

To enable outbound calls using trunk groups:

1. Open System > Sys Config and enable trunk groups systemwide.

```
System
  Sys Config
    Use Trunk Grps=Yes
```

2. Close the System profile.

To configure line 3 a local BRI-to-BRI call that is never seen by the telephone company:

1. Open Host/BRI > Line Config and specify the use of trunk groups.

```
Host/BRI
  Line Config
    Line 3...
      Enabled=Yes
      Dial Plan=Trunk Grp
```

2. Close the Host BRI profile.

## Configuring BRI/LT lines

These are the BRI/LT configuration parameters.

```
BRI/LT
  Line Config
    Name=idsl
    Line N...
      Enabled=Yes
      Dial Plan=N/A
      B1 Usage=Switched
      B1 Prt/Grp=N/A
      B1 Trnk Grp=0
      B2 Usage=Switched
      B2 Prt/Grp=N/A
      B2 Trnk Grp=0
      Ans 1#=1212
      Ans 2#=
```

For more information on each parameter, see the *MAX Reference Guide*.

## Understanding the BRI/LT parameters

This section provides some background information on the Net BRI parameters.

### Assigning a profile name

You can configure several profiles and activate a profile when it is needed. The name should indicate usage.

### Enabling the line

If you set the Enabled parameter to No, the line is not available for use.

### **Specifying how the terminating equipment sends and receives calls**

Dial Plan specifies how the device terminating a BRI/LT line can send and receive calls: by using the extended dial plan or Trunk Groups. For details on dial plans, see [Routing outbound calls](#).

### **Using the BRI line for switched or nailed connections**

Each BRI line has two B channels for user data and one D channel for signaling. The B1 and B2 Usage parameters specify how to use the B channels: Switched (the default), Nailed, or Unused (not available for use).

### **Associating the channel with a slot/port in the MAX**

In the B N Slot and B N Prt/Grp parameters, you can assign a switched channel to a slot or slot/port combination for a digital modem, AIM port, or Ethernet. This configuration affects both inbound call routing and placing calls. In effect, it reserves the channel for calls to and from the specified slot or port. For details, see [Call routing](#).

---

**Note:** You cannot control whether an incoming call rings on the first or second B channel, so the B1 Slot and B2 Slot parameters should be set to identical values.

---

If the channel is nailed, B N Prt/Grp is a Group number, is referenced in a Connection or Call profile to make use of this nailed connection.

### **Assigning the channel to a trunk group**

Trunk group numbers 4 through 9 can be assigned to channels to make them available for outbound calls. You cannot combine PRI channels with BRI channels in the same trunk group. See [Routing outbound calls](#) for details.

### **Phone number and SPID (Service Profile Identifier) assignments**

Pri Num is the primary add-on number for the Net BRI line. If you configure the line for point-to-point service, it is the only number associated with the line.

Sec Num is the secondary add-on number for the Net BRI line. If you configure the line for point-to-point service, it is not applicable.

Pri SPID and Sec SPID are the SPIDs associated with the Primary and Secondary numbers, respectively. See [SPIDS \(for Net BRI lines\)](#).

### **Routing calls to the terminating equipment on the BRI/LT line**

Ans 1# and Ans 2# are two of the MAX unit's add-on numbers assigned to a WAN line (a line that may receive inbound calls from the WAN). See [Call routing](#).

### **Example BRI/LT configuration**

This section provides an example configuration for a BRI/LT line. In this example configuration, the

MAX routes calls received on the phone number 555-1212 to the device terminating the BRI/LT line.

1. Open BRI/LT > Line Config and assign a name to it.

```
Host/BRI
  Line Config
    Name=idsl
```

2. Open the Line 1 subprofile, enable the line, and assign an answer number.

```
Line 1...
  Enabled=Yes
  Dial Plan=Trunk Grp
  Ans 1#=1212
```

3. Close the BRI/LT profile.

## BRI/LT diagnostics

The MAX provides the following BRI/LT diagnostics:

```
BRI/LT
  Line Diag
    Line N...
      EOC Address=
      Line LoopBack
      Corrupt CRC
      UnCorrupt CRC
      Rq Corrupt CRC
      UnRq Corrupt CRC
      Clr NEBE
      Clr FEBE
      Sealing Current
```

For more information on each parameter, the *MAX Reference Guide*.

## Configuring ISDL voice call support

Ascend's ISDN Digital Subscriber Line (ISDL) card supports incoming and outgoing voice calls. To support outgoing voice calls, the connected TE (Terminal Equipment) must send digits to the MAX using Q.931 en-bloc dialing (sends all dialed digits to the MAX in one block (the ISDN Call Setup message) rather than one digit at a time).

The MAX receives outgoing call requests from attached ISDN TE and routes voice calls to the PSTN (Public Switched Telephone Network) over a T1 line or ISDN PRI line. The MAX receives incoming voice calls and routes them to TEs connected to ISDL cards based on DNIS (Dialed Number Identification Service).

### Configuring the MAX ISDL card for outgoing voice calls

To configure the MAX to accept voice calls from ISDN TEs connected to the ISDL slot card and route them to the PSTN network:

1. Open the System > Sys Config menu.

2. Set Use Trunk Groups to Yes.
3. Exit and save the System profile.

Use the following steps if you want voice call requests routed to a T1/PRI line:

1. Open the Net/T1 > Line Config > Line *n* menu.
2. Set Ch *n* TrnkGrp to a value from 4 to 9.

where *n* specifies the channel of the T1/PRI line you want to make available to the IDSL card.

You must prepend this value to the phone number the TE dials. When the MAX receives a voice call request from the TE, the MAX will use the trunk group number to route the call to a T1 channel with a matching trunk group number. If trunk groups are not used, the call request will terminate at the MAX and not be forwarded to the PSTN.

3. Exit and save Line profile.

For details on configuring your T1/PRI line, see [Configuring T1 lines](#).

## Configuring the MAX IDSL card for incoming voice calls

To configure the MAX to accept voice calls from the PSTN network and route them to TEs connected to the IDSL slot cards, select one of the following methods

The following instructs the MAX to route calls to the IDSL card on the basis of the called number:

1. Open the BRI/LT > Line Config > Line *n* menu.
2. Set Ans 1#, Ans 2#, or both to the called number that is dialed to reach the end user's TE.

The Central Office (CO) switch must support DNIS since the MAX matches the DNIS number of the incoming call to configured numbers in Ans *n*#.

The following instructs the MAX to route calls to the IDSL card on the basis of the T1 channel on which the calls are received:

1. Open the Net/T1 > Line Config > Line *n* menu.
2. If a MAX should route calls received on a specific channel to the IDSL card, set the appropriate Ch *n* Slot parameter to the IDSL card's slot number.

For example, if the MAX is to route all calls received on channel 1 to an IDSL card in slot 7, set Ch 1 Slot to 7.

## Configuring a MAX for outgoing voice calls over IDSL

Use the following steps to configure a MAX to support outgoing voice calls when connected to a MAX IDSL slot card for routing to PSTN network:

---

**Note:** If you use a TE other than a Pipeline, it must support en-bloc dialing.

1. Open Ethernet > Answer > PPP Options menu
2. Set Encaps to MPP.

MPP supports data call preemption. See note below.

3. Open the Configure menu.
4. Set Switch Type to IDSL.

The IDSL selection is an AT&T 5ESS Point-to-Point configuration with en-bloc dialing support.

When you dial out from a phone connected to the analog port of the MAX or TE, you must prepend the Trunk group number (configured on the MAX) to the phone number you dial. This is similar to dialing from an ISDN Centrex System, where you are required to prepend the phone number you dial with an additional digit to get an outside line.

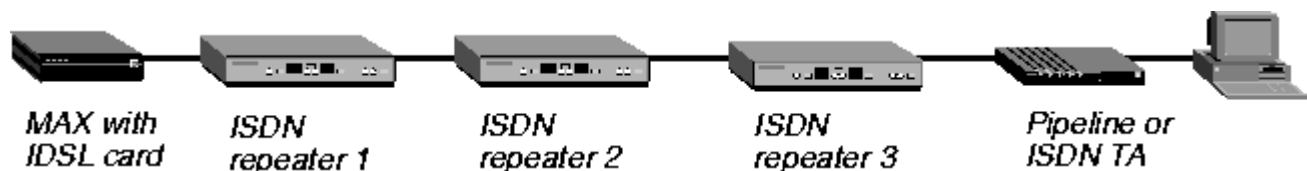
For example, if the MAX is configured with Trunk Group set to 9 and you are dialing 555-5555, dial 9-555-5555 to instruct the MAX to dial 555-5555 on the channels (T1 or PRI) that are configured with a Trunk Group set to 9.

If you omit the trunk group, the call terminates at the MAX. It is not routed to the PSTN.

**Note:** This feature also supports data call preemption. If you use two channels for a single MPP data call, and dial your analog phone, one channel will be reallocated to the voice call, leaving one channel for the data call. When you hang up, the channel will be reallocated to the data call if throughput load warrants it.

### Performing loopback diagnostics for IDSL

The MAX supports loopback tests from itself to any device on the IDSL connection. For example, you can loop back the signal from the IDSL card to the remote TA or Pipeline, or from the IDSL card to any intermediate repeater (see [Figure 2-2](#)).



**Figure 2-2.** IDSL connection with repeaters

In [Figure 2-2](#), you could set up a loopback test from the MAX to any of the ISDN repeaters, or from the MAX all the way to the remote ISDN at the end of the connection. This allows you to isolate trouble over the entire connection.

To configure a loopback test on the BRI lines provided by the IDSL slot card:

1. Select BRI/LT > Line Diag > Line *N*, where *N* is the number of the line you want to loopback.

2. Specify the EOC Address of the device that is the terminating point for the loopback test.
  - o 0 specifies the remote TA or MAX
  - o 1 specifies the repeater nearest the MAX
  - o 7 specifies all devices

3. Select Line Loopback and press Enter.

4. In the confirmation dialog that appears, select 1=Line *N* LB.

While the line loops back, normal data transfer is disrupted.

5. Press Escape to cancel the loopback.

For details, see the *MAX Reference Guide*. In a local loopback test, data originating at the local site loops back to its originating port without going out over the WAN. It is as though a *data mirror* were held up to the data at the WAN interface, and the data reflected back to the originator. The WAN interface is the port on the MAX that connects to a WAN line.

#### New status messages

When you enable the Loop Sealing Current, the following message appears in the Edit window:

Message #242

```
Loop Sealing Current
      now ON
```

When you disable the Loop Sealing Current, the following message appears in the Edit window:

Message #243

```
Loop Sealing Current
now OFF
```

## Configuring Host/6 (Host/Dual) AIM ports

You can connect a videoconferencing codec (coder/decoder) to a MAX AIM port to communicate over a point-to-point link. An AIM *port* is the V.35, RS-499, or X.21 port on the MAX. Typically, inverse-multiplex mode uses these calls between video codecs and other devices that might need high bandwidth serial data over the WAN.

An AIM port uses pins for controlling the data flow through the port. A device sends a signal through a pin and over the line to another device; the signal being sent determines the control-line state. For example, a device can send a signal to another party, indicating that it has data to send; in this case, the control-line state is RTS (Request to Send). The other device can send a signal to indicate that it is ready to receive data; in this case, the control-line state is DTR (Data Transmit Ready). The process of sending these synchronization signals between AIM ports is called *handshaking*.

---

**Note:** When you install an AIM port card in the MAX, the AIM ports become the default route for

inbound data calls, taking precedence over the bridge/router software. This means you must specify call routing for calls to reach the local Ethernet. See [Call routing](#).

---

An AIM port requires three levels of configuration:

- The Port profile, to configure the AIM port itself
- The Host interface profile, to configure the interface to the codec
- The Call profile, to configure WAN connections on the port

## Configuring the AIM port

The Port profile sets protocol and routing parameters for the port itself. The Port profile contains these parameters:

```
Host/6 (or Host/Dual)
  PortN Menu
    Port Config
      Port Name=Port1
      Dial Plan=Trunk Grp
      Ans 1#=1212
      Ans 2#=1213
      Ans 3#=
      Ans 4#=
      Idle=None
      Dial=Terminal
      Answer=Auto
      Clear=Terminal
      Port Password=Ascend
      Term Timing=No
      RS-366 Esc=N/A
      Early CD=None
      DS0 Min Rst=Off
      MAX DS0 Mins=N/A
      MAX Call Mins=0
```

For more information on each parameter, see the *MAX Reference Guide*.

## Understanding the Port profile parameters

This section provides some background information about the AIM port configuration.

### Specifying the dial plan

The Dial Plan parameter specifies how to place calls from this port, by using trunk groups or the extended dial plan. See [Routing outbound calls](#).

### Routing inbound calls to the codec

Answer numbers specify add-on numbers assigned to a WAN line. This is one way of routing inbound calls received on those numbers to the AIM port. See [Call routing](#).

### What happens when you turn on the power

Idle specifies the action the port takes when you turn on the power, or if no call is active. You can specify None (the port waits for a user to establish a call), or Call (the port dials the call).

### **How the codec dials out**

Dial specifies how the codec dials an outbound call:

- Terminal (dial manually by using DO DIAL).
- DTR Active (dial only if DTR is asserted at the port, indicating that the codec is ready to send data).
- RS-366 ext1 (dial through an RS-366 dialing service).
- RS-366 ext2 (same as RS-366 but using different message protocols).
- V.25bis (dial direct according to V.25 bis hardware handshaking).
- V.25bis-C (same as V.25bis, but the CTS signal cannot change state during a call).
- X.21 ext1 (dial as described in the CCITT Blue Book Rec. X.21).
- X.21 ext2 (same as X.21 ext1, but using different message protocols).
- X.21 ext1-P (same as X.21 ext1, but used for a PictureTel X.21 dialer).

### **How the codec answers calls**

Answer specifies how the codec answers a call:

- Terminal (answer manually by using DO ANSWER).
- DTR Active (answer only if DTR is asserted at the port, indicating that the codec is ready to receive data).
- DTR+Ring (answer after one ring if DTR is asserted at the port, for codecs configured to answer manually).
- P-Tel Man (same as DTR+Ring, but used for a Picture Tel codec configured to answer calls manually).
- V.25bis (answer according to V.25 bis hardware handshaking).
- V.25bis-C (same as V.25bis, but the CTS signal cannot change state during a call).
- X.21 (answer according to X.21 hardware handshaking).
- Auto (answer every call automatically, regardless of the control-line state).
- None (use the port for outgoing calls only).

### **Clearing calls on this port**

Clear specifies whether the control-line state determines when the MAX clears a call.

### Host session authentication

The receiving unit uses Port Password to compare the Call Password the caller sends upon initial connection of the first channel of an AIM or BONDING call. If the password matches the Port Password, the session establishes normally for the remainder of the call. If it does not match, the authenticating unit sends a message back to the originator and drops the session. The port status screen indicates that the call failed authentication. If the Port profile does not specify a Port Password, the units connect without authentication, even though the originating unit may have sent a password.

Note that the MAX only authenticates AIM and BONDING calls; the MAX does not authenticate dual-port calls. See [Understanding the Call profile parameters](#).

### Clocking data from the codec

Terminal Timing is a clock signal that compensates for the phase difference between Send Data and Send Timing. If the codec uses this signal, set the Term Timing parameter to yes; otherwise, it uses the Send Timing signal from the codec.

### Setting an escape character for RS-366 dialing

When Dial specifies RS-366 ext2, the default escape character is #. You can use RS-366 Esc to set a different escape character if you wish.

### Preventing timeouts while waiting for a carrier detect signal

By default, the MAX raises Carrier Detect (CD) after the completion of handshaking and an additional short delay. If the local or remote codec times out waiting for CD, you can set Early CD to raise CD without waiting for handshaking.

### Controlling port usage

A DS0 minute is the online usage of a single 56-kbps or 64-kbps switched channel for one minute. When the usage exceeds the maximum (MAX DS0 Mins), the MAX cannot place any more calls, and takes any existing calls offline. The DS0 Min Rst parameter resets accumulated DS0 minutes to zero after a specified time, or disables the timer.

### Example Port profile configuration

To configure the port for RS-366 dialing:

1. Open Host/6 > Port 1 Menu > Port Config.
2. Assign the profile a name, and configure call routing; for example,

```
Host/6
  Port 1 Menu
    Port Config
      Port Name=Port1
      Dial Plan=Trunk Grp
      Ans 1#=1212
      Ans 2#=1213
      Ans 3#=1214
```

Ans 4#=1215

3. Set the dial, answer, and clear parameters appropriately for the codec; for example:

```
Dial=RS-366 ext1.
Answer=Auto
Clear=Terminal
```

4. Leave the default values for the remaining parameters, or modify them as needed.
5. Close the Port profile.

### Performing port diagnostics

After configuring the port, you can perform a loopback test to verify the configuration. The Port Diagnostics menu contains only the loopback command:

```
Host/6
  Port N Menu
    Port Diag
      Local LB
```

For more information on each parameter, see the *MAX Reference Guide*. In a local loopback test, data originating at the local site loops back to its originating port without going out over the WAN. It is as though a *data mirror* were held up to the data at the WAN interface, and the data reflects back to the originator. The WAN interface is the port on the MAX connects to a WAN line. The AIM port on the MAX must be idle when you run the local loopback test; it can have no calls online.

### Configuring the host interface

A Host interface profile defines how the port or pair of ports interfaces with the codec. These are the related host interface parameters:

```
Host/6
  Mod Config
    Module Name=dualport
    Port 1/2 Dual=Yes
    Port 3/4 Dual=Yes
    Port 5/6 Dual=No
    Palmtop=Full
    Palmtop Port #=N/A
    Palmtop Menus=Standard

Host/Dual
  Mod Config
    Module Name=nodual
    Dual Ports=No Dual
    Palmtop=Full
    Palmtop Port #=N/A
    Palmtop Menus=Standard
```

For more information on each parameter, see the *MAX Reference Guide*.

### Understanding the host interface parameters

This section provides some background information about configuring the interface to the codec.

## Pairing ports for dual-port calls

If you are configuring the interface to an older model codec that does not support AIM, you can use the pair two AIM ports to provide double the bandwidth for the videoconferencing call. A dual-port call requires that the codec has a dual-port interface.

In a dual-port call, the codec performs its own inverse multiplexing on two channels so that a call can achieve twice the bandwidth of a single channel. A pair of AIM ports on the MAX connects to the codec. The pair includes a primary and secondary port. Because the MAX places the two calls in tandem and clears the calls in tandem, it considers them a single call.

Creating a dual-port configuration does not prevent you from dialing any other type of call from the primary host port of the pair, or from using either port for receiving any call type. Pairing ports does not disable RS-366 dialing at the secondary port.

## Restricting access to the AIM port from the Palmtop Controller

You can prevent Palmtop operators from accessing the port, or restrict their level of access.

## Enabling dual-port calls

This configuration pairs the first two AIM ports in a Host 6 card:

1. Open Host/6 > Mod Config.
2. Assign a name (optional).
3. Use the Dual Port parameter to pair two ports. For example:

```
Host/6
  Mod Config
    Module Name=pair-one
    Port 1/2 Dual=Yes
    Port 3/4 Dual=No
    Port 5/6 Dual=No
```

4. Close the Host interface profile.

See [Configuring a two-channel dual-port call](#).

## Configuring WAN connections between serial hosts

A Call profile defines a WAN connection on the AIM port. These are the Call profile parameters:

```
Host/6 (or Host/Dual)
  PortN Menu
    Directory
      Name=bonding
      Dial #=212-555-1212
      Call Type=BONDING
      Call Mgm=Mode 1
      Data Svc=56K
      Force 56=No
      Base Ch Count=3
      Inc Ch Count=2
      Dec Ch Count=1
```

```
Bill #=212-555-1213
Auto-BERT=120
Bit Inversion=No
Fail Action=Disc
PRI # Type=Intl
Transit #=222
Group=N/A
FT1 Caller=N/A
B&O Restore=N/A
Flag Idle=Yes
Dyn Alg=N/A
Sec History=N/A
Add Pers=N/A
Sub Pers=N/A
Call Password=Ascend
Time Period N...
    Activ=N/A
    Beg Time=N/A
    Min Ch Cnt=2
    MAX Ch Cnt=12
    Target Util=N/A
```

For more information on each parameter, see the *MAX Reference Guide*.

## Understanding the Call profile parameters

This section provides some background information on Call profile parameters.

### Dialing out to the remote codec

The dial number specifies the far-end number and can specify the method of placing the call. It can include up to 24 characters. On a two channel call, it can contain up to 49 characters, or two phone numbers containing up to 24 characters each and separated by an exclamation point. See [Routing outbound calls](#) for details about specifying the method of placing the call.

---

**Note:** The V.25bis protocol implementation in the MAX includes extensions that enable specification of a phone number using the V.25bis CRS command. You can specify a BONDING or other profile in the CRS command, followed by a phone number, which is stored in this parameter. For this usage, the phone number has a limit of 20 characters.

---

### Defining the type of connection and how to manage bandwidth.

Call type specifies the type of connection between the local and remote codecs.

- 1 Chnl (single channel call)
- 2 Chnl (dual-port call)
- FT1-B&O (provides automatic backup and overflow protection of nailed-up circuits).
- FT1 (fractional T1 nailed channels)
- AIM (uses Ascend Inverse Multiplexing to combine channels).
- FT1-AIM (combines nailed and switched channels using the AIM protocol).

- BONDING (uses the Bandwidth On Demand Interoperability Group September 1992 1.0 specification).

When you select an AIM or BONDING call type, you must also specify a management method (Call Mgm). For more complete information, see the *MAX Reference Guide*.

### **Bandwidth issues**

The Base Ch Count parameter specifies the base number of channels to use when setting up the call. The Inc Ch Count and Dec Ch Count specify the number of channels it can add and subtract at one time, respectively.

Data Service affects how much bandwidth is available for a particular connection, and how channels may be allocated to the call. For example, if the data service is 384K, then the channel count parameters such as Dec Ch Count should be divisible by 6 (namely, 6, 12, 18, or 24), since 384 kbps is 6x64 kbps. Operational problems can result if you do not specify a multiple of 6. The Inc Ch Count parameter should equal the number of B channels in the service or a integer multiple of that service's B channels.

Similarly, if the data service is MultiRate or GloBanD (a multiple of 64 kbps), then be sure to make Inc Ch Count and Dec Ch Count divisible by the same multiple. Again, the Inc Ch Count parameter should equal the number of B channels in the service or a integer multiple of that service's B channels.

### **What the MAX does when it cannot establish a base channels of a connection**

Fail Action specifies whether the MAX disconnects, reduces the bandwidth request, or establishes a lower bandwidth call and retries for the additional bandwidth when it cannot establish a call with the number of channels specified by the Base Ch Count parameter.

### **Telco options**

You can configure a set of Telco options for the call, including a billing number, automatic byte-error test (Auto-BERT), PRI # Type, Transit #, a trunk group or nailed group number, and FT1 caller (whether the local codec originates the call).

### **Supporting configuration for certain call types or management methods**

When the call type is FT1-B&O, B&O Restore specifies the number of seconds to wait before restoring a nailed channel that has been dropped due to quality problems.

When the call management type is Dynamic, Flag Idle specifies whether the port looks for a flag pattern (01111110) or a mark pattern (11111111) as the idle indicator.

### **Dynamic bandwidth allocation issues**

For calls that have AIM or BONDING-compatible equipment on both ends, the MAX can use its proprietary dynamic bandwidth allocation algorithms.

The MAX connects to the remote end over a single channel and then dials multiple channels to the same destination based on the total amount of bandwidth requested. When adding bandwidth, the MAX adds the number of channels specified in the Inc Ch Count parameter. When subtracting bandwidth, it subtracts the number of channels specified in the Dec Ch Count parameter.

- Dyn Alg specifies which algorithm to use for calculating ALU during the time period specified by the Sec History parameter.
- Sec History specifies a number of seconds to be used as the basis for calculating average line utilization (ALU), which is compared to a target percentage threshold (Target Util). When the ALU exceeds the threshold for a specified time period, the MAX attempts to add channels. When ALU falls below the threshold for a specified time period, the MAX attempts to remove channels.
- Add Pers specifies the number of seconds the ALU must exceed the Target Util before the MAX adds bandwidth.
- Sub Pers specifies the number of seconds the ALU must fall below the Target Util before the MAX subtracts bandwidth.
- Time period N

You can divide an AIM call that specifies Dynamic call management into time periods, each characterized by separate Activ, Beg Time, Max Ch Cnt, Min Ch Cnt, and Target Util parameters.

### Host session authentication

The calling unit sends the Call Password when the base channel of the call connects. The receiving unit compares the value to its Port Password. If the password received matches the stored password, the session establishes normally for the remainder of the call. If there is no match, the authenticating unit sends a message back to the originator and drops the session. The Port Status screen indicates that the call failed authentication with the message *Password Mismatch*.

See [Understanding the Port profile parameters](#).

### Example AIM call configuration

To configure an AIM call that uses dynamic bandwidth allocation algorithms to manage the call dynamically:

1. Open Host/6 > Port 1 Menu > Directory.
2. Specify the dial number to reach the remote device and set the call type to AIM.

```
Host/6
  Port 1 Menu
    Directory
      Name=aim
      Dial #=6-212-555-1212
      Call Type=AIM
```

3. Specify Dynamic call management.

```
Call Mgm=Dynamic
```

4. Set the base channels and the number of channels to be added or subtracted when bandwidth requirements change.

```
Base Ch Count=3
```

```
Inc Ch Count=2
Dec Ch Count=1
```

5. Specify the DBA parameters.

```
Dyn Alg=Quadratic
Sec History=60
Add Pers=20
Sub Pers=20
Time Period 1...
  Activ=Enabled
  Beg Time=00:00:00
  Min Ch Cnt=1
  MAX Ch Cnt=12
  Target Util=70
```

6. Close the Call profile.

### Example FT1-B&O call configuration

FT1 calls contain nailed channels, while FT1-AIM and FT1-B&O calls can combine switched channels with nailed channels. For FT1-B&O calls, you must also specify B&O Restore.

---

**Note:** For FT1-AIM or FT1-B&O, you must set the Idle and Dial parameters in the Port profile at both the local and remote ends of the call. For the MAX to connect the switched channels when you switch it on, choose Idle=Call and Dial=Terminal. For the MAX to connect the switched channels when the host equipment at both ends sets DTR active, set Idle=None and Dial=DTR. In this latter configuration, the hosts at both ends of the connection must establish DTR active to make the MAX connect the switched channels.

---

To configure an FT1-B&O call:

1. Open Host/6 > Port 1 Menu > Directory.
2. Set the call type to FT1-B&O.

```
Host/6
  Port 1 Menu
    Directory
      Name=ft1-bo
      Call Type=FT1-B&O
```

3. Set call management to Dynamic. This is required in the device that initiates the FT1-B&O call.

```
Call Mgm=Dynamic
```

4. Specify the Group number for the nailed channels.

```
Group=3
```

5. Specify that the MAX initiates the call.

```
FT1 Caller=Yes
```

If the other end of the link initiates the call, set this parameter to No. Only one side of the link can initiate the call for FT1-AIM or FT1-B&O calls.

6. Close the Call profile.
7. Open Host/6 > Port 1 Menu > Port Config.
8. Specify how the switched channels will connect. For example:

```
Host/6
  Port 1 Menu
    Port Config
      Idle=None
      Dial=DTR
```

This setting must be the same in the devices at both ends of the link. The setting shown above connects the switched channels when the host equipment at both ends sets DTR active. As an alternative, the following settings connect the channels at power-up:

```
Host/6
  Port 2 Menu
    Port Config
      Idle=Call
      Dial=Terminal
```

9. Close the Port profile.

### Configuring a single-channel call

This example configures a connection between two terminal adaptors connected to two AIM ports in the MAX. A call between AIM ports on the same MAX remains entirely local; the MAX does not use any WAN channels. To configure a single-channel port-to-port call:

1. Open Host/6 > Port 3 Menu > Directory.
2. Set the Dial # parameter using a special 3-digit format

```
Host/6
  Port 3 Menu
    Directory
      Name=terminal-adaptors
      Dial #=241
```

See [Routing outbound calls](#).

3. Specify a single-channel call type.

```
Call Type=1 Chnl
```

4. Close the Call profile.

### Configuring a two-channel dual-port call

In a dual-port call, two AIM ports on the MAX connect a dual-port call to the serial host; these ports are the primary port and the secondary port. The MAX places the two calls in tandem and clears the calls in tandem, so it considers them a single call. These restrictions apply for dual-port connections:

- The selected data service must be available end-to-end.
- The dialing method cannot be V.25 bis.
- The Answer number must be the same for both ports.
- If trunk groups are in use, both channels of the call must be in the same trunk group.

In this example, the Host interface profile must enable port pairing for dual-port calls. See [Enabling dual-port calls](#). In addition, a T1 or E1 line has two of its channels configured with the phone number 1212 (a hunt group). To route the call answered on the 1212 hunt group to the paired ports for a dual-port call:

1. Open Host/Dual > Port 1 Menu > Port Config.

This is the Port profile for the primary port (Port 1).

2. Specify the hunt group answer number. For example:

```
Host/Dual
  Port 1 Menu
    Port Config
      Port Name=Port1
      Ans 1#=1212
```

**Note:** Do not set the Ans # parameter for the secondary host port (Port 2).

3. Close the Port profile.

To configure the dual-port call:

1. Open Host/Dual > Port 1 Menu > Directory.
2. This is the Call profile for the primary port (Port 1).
3. Specify the dial number of the remote codec. For example:

```
Host/Dual
  Port 1 Menu
    Directory
      Name=hunt-groups
      Dial #=6-201-555-7878
```

If the dual-port call requires two dial numbers, specify both numbers separated by an exclamation mark. For example

```
Dial #=6-201-555-7878!6-201-555-7879
```

4. Set Call Type to 2 Chnl

```
Call Type=2 Chnl
```

5. Close the Call profile.

## Call routing

This section describes how you set up the MAX to configure incoming and outgoing call routing. If you have a mixed incoming calls, such as mixed modem and digital, this section answers questions on routing those calls to the proper modules in the MAX. This section also includes a state diagram illustrating incoming call routing. The last part of this section describes how the MAX handles outbound calls.

### Routing inbound calls

When the MAX receives a call on a WAN line, it performs CLID or DNIS authentication (if appropriate), answers the call, and determines which slot should receive the call. It then finds the caller's profile, authenticates the call, builds a session, and passes the data stream to the appropriate module or host. When a call routes to the Ethernet port, the bridge/router software forwards it to a host or hosts according to packet addresses.

These are the topics related to routing inbound switched calls:

#### Setting up ISDN subaddressing

The MAX first checks for an ISDN subaddress in the dialed number. If it finds one, it uses that to route the call; if not, it goes on to the next comparison.

#### Specifying answer numbers for destination host ports

The MAX then checks for answer number specifications. If it finds a matching answer number, it uses that to route the call; if not, it goes on to the next comparison.

#### Specifying host ports' slot and port numbers in WAN channel configurations

The MAX then checks for slot and port number specifications. If it finds a matching slot number, it uses that to route the call. (If it also finds a port number, it routes to that specific port on the slot number.) If not, it goes on to the next comparison.

#### Exclusive port routing

Unless you turn on exclusive port routing, if the call comes in on an ISDN line, the MAX can route the call using bearer service information if it finds no explicit call-routing information.

#### Setting up ISDN subaddressing

These are the parameters for setting up ISDN subaddressing:

```
System
  Sys Config
    Sub-Adr=Routing
    Serial=1
    LAN=2
    DM=3
    V.110=4
```

A single-digit number is assigned to the AIM ports (Serial), Ethernet (LAN), digital modems (DM), and V.110 slots. When you use ISDN subaddressing in routing mode, incoming calls include a subaddress number as part of the phone number. For example, with the configuration shown above,

the caller would dial 510-555-1212,3 to reach the digital modems. The subaddress "3" follows the dialed number and is separated from it by a comma.

### Specifying answer numbers for destination host ports

Each host port can specify one or more answer numbers. In effect, these settings say "route all calls received on this number to me." When the MAX receives an inbound call and no subaddress is in use, it matches the called number to these answer numbers and routes the call to the port with the matching number. These are the related parameters:

```
V.34 Modem (or V.42 Modem)
```

```
  Mod Config
    Ans 1#=1213
    Ans 2#=1214
    Ans 3#=1215
    Ans 4#=1216
```

```
V.110
```

```
  Mod Config
    Ans 1#=1217
    Ans 2#=1218
    Ans 3#=1219
    Ans 4#=1220
```

```
Host/BRI
```

```
  Line Config
    Line N...
      Ans 1#=1230
      Ans 2#=1231
```

```
BRI/LT
```

```
  Line Config
    Line N...
      Ans 1#=1240
      Ans 2#=1241
```

```
Port N Menu
```

```
  Port Config
    Ans 1#=1232
    Ans 2#=1233
    Ans 3#=1234
    Ans 4#=1235
```

```
Ethernet
```

```
  Mod Config
    WAN options...
      Ans 1#=1236
      Ans 2#=1237
      Ans 3#=1238
      Ans 4#=1239
```

**Note:** When a MAX has more than one digital modem slot card installed, the cards and modems form a pool, and any modem can answer a call routed to any digital modem slot.

### Slot and port specifications

In the config4(e, itQG 1203 Tm0.00115.02 66rete)4.8w(m slot card installur.8( )of )TJI -1s, 4(e, it matches the

AIM slot card, you can assign channels to a port on the card. This channel configuration affects both inbound call routing and placing calls. In effect, it reserves the channel for calls to and from the specified slot or port.

Configure slot and port routing only when answer number and ISDN subaddress routing are not specified. These are the related parameters:

```

Net/T1
  Line Config
    Line N...
      Ch N=Switched
      Ch N Slot=3
      Ch N Prt/Grp=1

Net/E1
  Line Config
    Line N...
      Ch N=Switched
      Ch N Slot=3
      Ch N Prt/Grp=1

Net/BRI
  Line Config
    Line N...
      BN Usage=Switched
      BN Slot=3
      BN Prt/Grp=1

```

When the MAX receives an inbound call and no subaddress is in use or matching answer number is found, it evaluates the slot and port specifications and routes the call to the specified destination. In the MAX 6000 model, these are the valid slot specifications:

- 0 (Zero, the default). Zero means this parameter is not used to route incoming calls.
- 1 and 2 are invalid settings, because they represent the built-in slots containing T1 or E1 lines.
- 3 through 8 represent expansion slots. When looking at the back panel of the MAX unit, slot 3 is the bottom slot in the left bank of slots, followed by 4 and 5 in ascending order. slot 6 is the bottom right slot, followed by 7 and 8 in ascending order.
- 9 represents the LAN. Calls are routed to the bridge/router module.

---

**Note:** When a MAX has more than one digital modem slot card installed, the cards and modems form a pool, and any modem can answer a call routed to any digital modem slot.

---

### Exclusive port routing

If you set Excl Routing to No (which it is by default), the MAX routes the call based on bearer service. Voice calls are routed to a digital modem, V.110 calls are routed to a V.110 module, and data calls are routed to an AIM port, or if no AIM ports are available, to the bridge/router. If you set Excl Routing to Yes and none of the previous call-routing comparisons were successful, the MAX drops the call. This is the parameter for turning on exclusive port routing:

```

System
  Sys Config

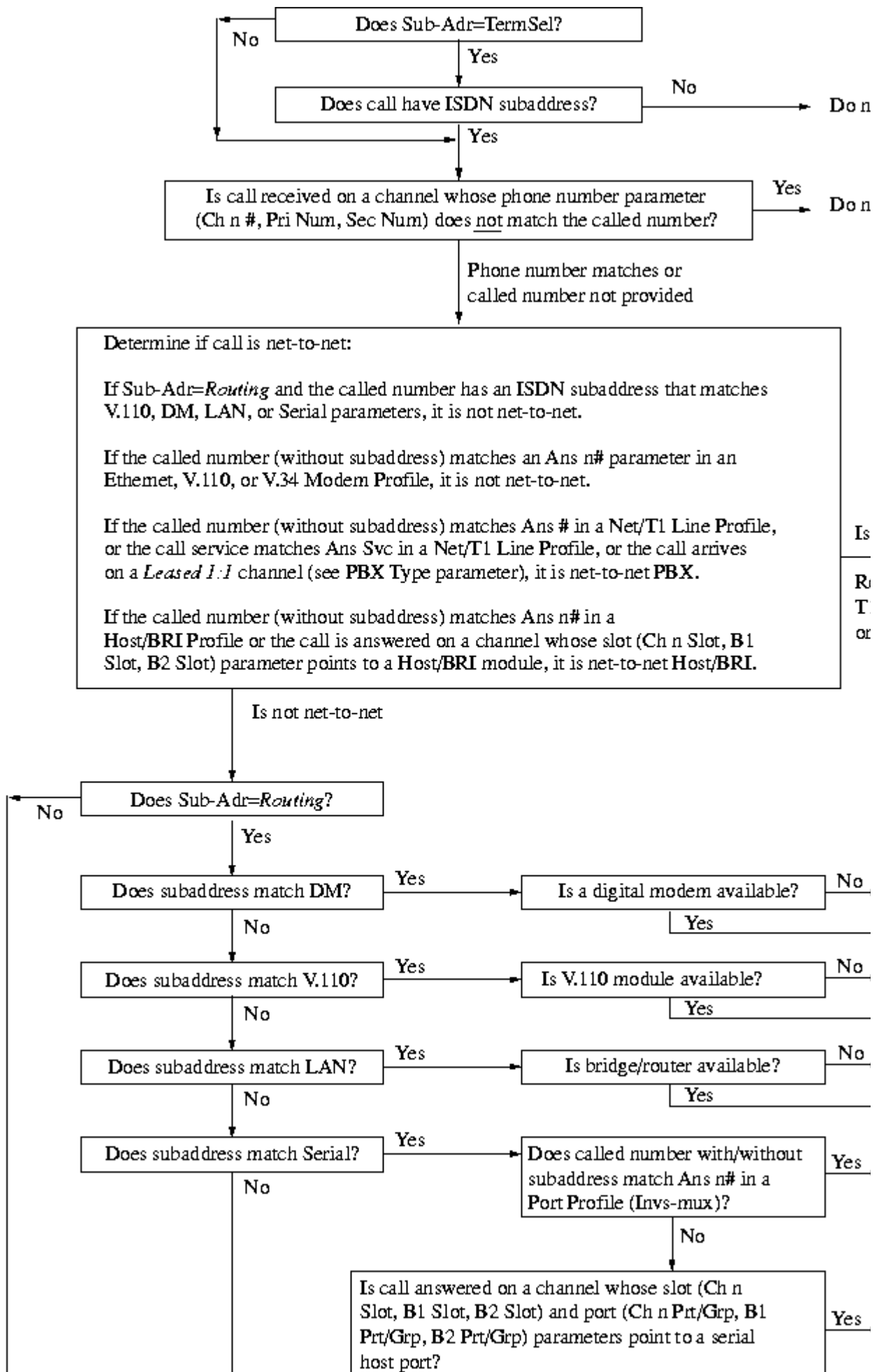
```

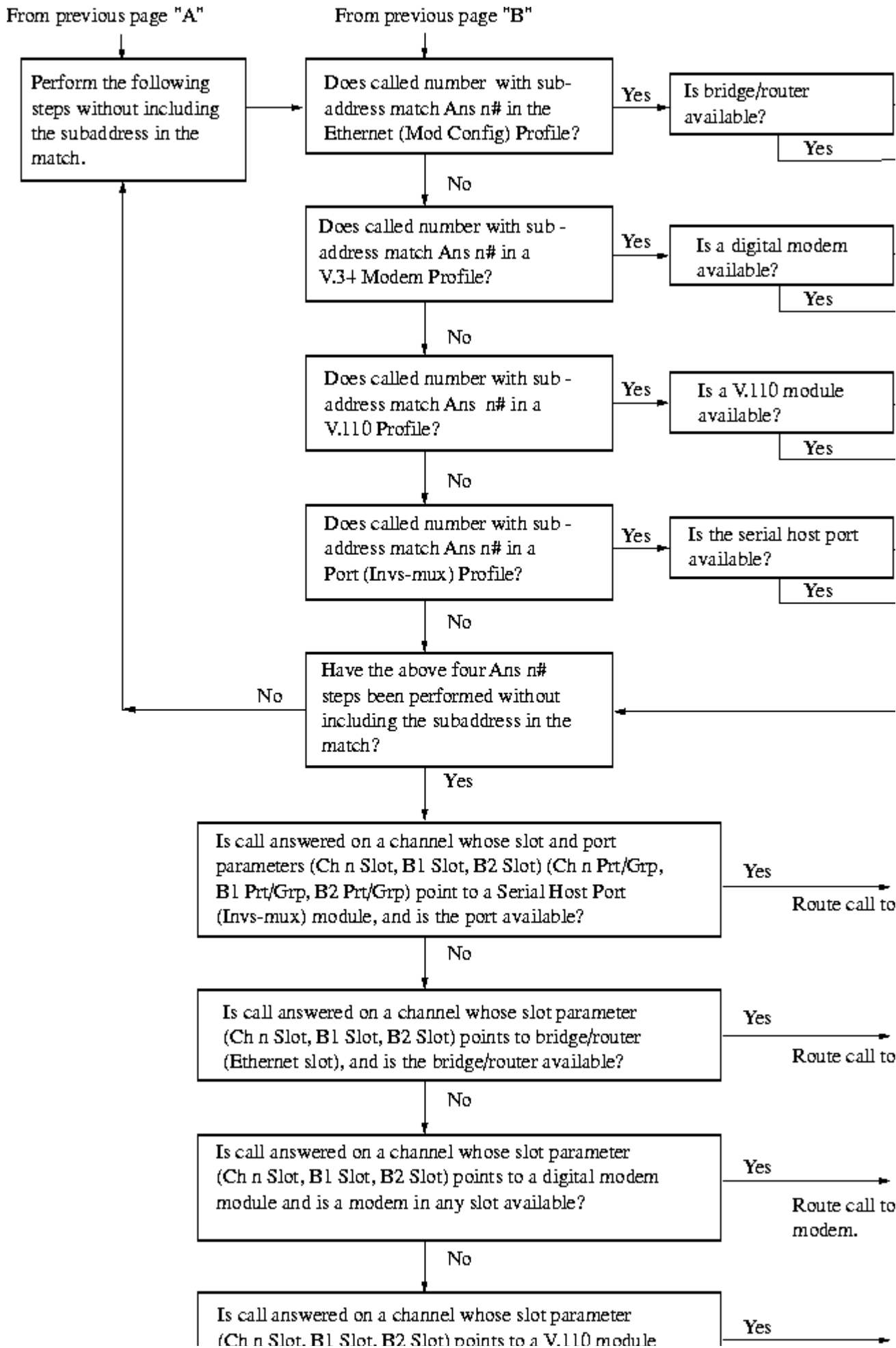
Excl Routing=No

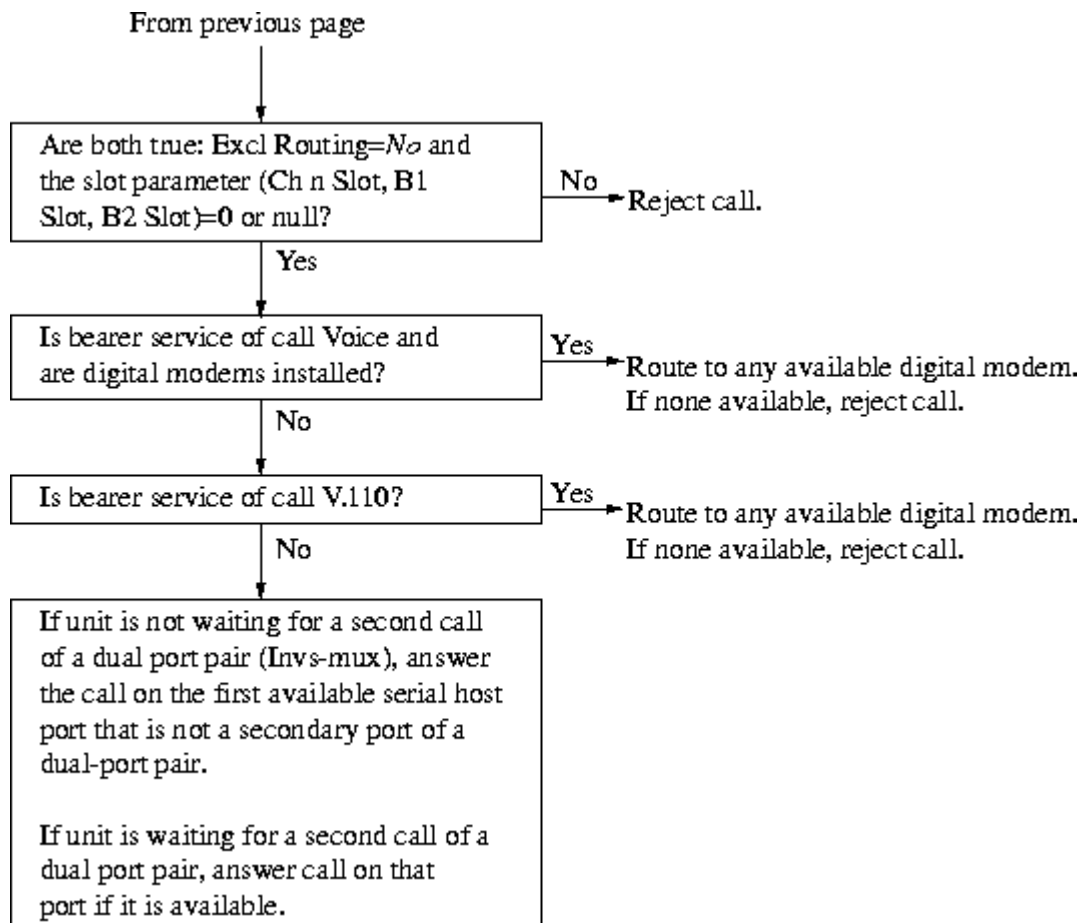
Exclusive port routing prevents the MAX from accepting calls for which it has no explicit routing destination.

### **Incoming call routing state diagram**

The following pages show detailed state information about inbound call routing in the MAX. To understand these charts, you should be familiar with the parameters referenced in many of the steps.







## Routing outbound calls

When the MAX dials out, it routes the outbound call from the originating slot to a WAN channel to place the call. It first looks for channels associated with the trunk group specified in the Dial # (if any) and the port that originated the call, based on the channel configuration parameters. If no trunks have available channels, the call is not placed.

---

**Note:** An available channel within the trunk group is one that is not assigned to any port (its slot/port numbers are zero) or is assigned to the port that originated the call. Channels assigned to another port are not available.

---

These are the topics related to routing outbound calls:

### Enabling trunk groups

If trunk groups are enabled, dial-out numbers must include a trunk group number as a dialing prefix, and all switched channels must be assigned to a trunk group to be available for outbound calls.

### Dialing using trunk group 2 (local port-to-port calls)

Trunk group 2 is used for port-to-port calls within the MAX system. Trunk group 2 is the first digit in a 3-digit dialing prefix in which the next 2 digits are interpreted as the slot and port number of the called port.

### Dialing using trunk group 3 (Destination profiles)

Trunk group 3 is the first digit in a 3-digit dialing prefix in which the next 2 digits are interpreted as the number of a Destination profile.

### Dialing using trunk groups 4 through 9

Trunk groups 4 through 9 reference specific groups of WAN channels to use for placing the call. If that group has no available channels, the call is not placed.

### Dialing using the extended dial plan

When the extended dial plan is specified for a particular port, the trunk group number is the first digit in a 3-digit dialing prefix in which the next 2 digits are interpreted as the number of a Dial Plan profile.

### Matching slot and port specifications (reserved channels)

Whether or not trunk groups are enabled, the MAX relies on slot/port specifications to place outbound calls, if any slot/port numbers are specified. When a channel configuration specifies a slot or slot/port combination, it effectively reserves the channel for calls to and from the specified slot or port. Calls originating from a different slot or port will not find the channel available.

### Enabling trunk groups

A trunk group is a group of channels that has been assigned a number. Once you have enabled trunk groups, all switched channels must be assigned a trunk group number to be available for outbound calls. This is the related parameter:

```
System
  Sys Config
    Use Trunk Grps=Yes
```

---

**Note:** Trunk group numbers 2 and 3 have special meaning, as described in the next two sections. Only trunk groups 4 through 9 are available for assignment to channels.

---

### Dialing using trunk group 2 (local port-to-port calls)

When 2 is the first digit in a three-digit dial number, the MAX places a call to the slot and port specified in the next two digits. These are the related parameters:

```
Host/6 (or Host/Dual)
  PortN Menu
    Directory
      Name=bonding
      Dial #=241
```

With the dial number 241, the MAX places a call to the first port of a Host 6 or Host Dual card in slot 4. The second digit can be 0 (zero) or any number between 3 and 8. If it is zero, the call goes to any available AIM port (the third digit is ignored in this case). If it is between 3 and 8, it represents an expansion slot number and the third digit is the host port on that card.

### Dialing using trunk group 3 (Destination profiles)

When 3 is the first digit in a three-digit dialing prefix, the MAX interprets the next two digits as the

number of a Destination profile. These are the related parameters:

```

Destinations
  Name=outdial-1
  Option=1st Avail
  Dial 1#=4-212-555-1212
Dial Plan
  Call-by-Call 1=1
  Dial 2#=5-212-555-1212
  PRI # Type=National
  Transit #=
  Bill #=

Host/6 (or Host/Dual)
  Port N Menu
    Directory
      Dial #=312

Ethernet
  Connections
    Dial #=312

```

With the dial number 312, the MAX reads Destination profile 12. Destination profiles let you instruct the MAX to use the first available channels to place the call, or to try one trunk group first, followed by another if the first is unavailable. For example, if the Destination profile sets Option=1st Avail, the MAX takes the first available channels for the call. If the dial numbers specify different trunk groups, the MAX can use bandwidth from one switch as backup for another; for example, trunk group 4 may contain channels serviced by Sprint and trunk group 5 may be serviced by AT&T.

### Dialing using trunk groups 4 through 9

Trunk group numbers 4 through 9 can be assigned to WAN channels to group those channels. Trunk group assignments limit the number of channels available to multichannel calls, because only channels within the same trunk group can be aggregated. Trunk group assignments are also used to group the channels from different types of lines; for example, when the MAX lines are serviced by more than one carrier, you might assign trunk group 4 to a line serviced by one carrier and trunk group 5 to a line serviced by another.

---

**Note:** A trunk group cannot include both BRI and PRI channels.

---

These are the related parameters:

```

Net/T1
  Line Config
    Line N...
      Ch N=Switched
      Ch N TrnkGrp=4
      ...

Net/E1
  Line Config
    Line N...
      Ch N=Switched
      Ch N TrnkGrp=4
      ...

```

```

Net/BRI
  Line Config
    Line N...
      BN Usage=Switched
      BN TrnkGrp=5

Ethernet
  Mod Config
    WAN options...
      Dial Plan=Trnk Grp

Ethernet
  Connections
    Dial #=5-555-1212

Host/6 (or Host/Dual)
  Port N Menu
    Directory
      Dial Plan=Trunk Grp
      Dial #=4-555-1217

Host/BRI
  Line Config
    Line N...
      Dial Plan=Trnk Grp

```

If Dial Plan=Trunk Grp and a single-digit dialing prefix between 4 and 9, the MAX places the call using channels in that trunk group.

### Dialing using the extended dial plan

The extended dial plan relates only to PRI lines. It uses a specified trunk group, but accesses a Dial Plan profile to obtain PRI parameters for the outbound call. The extended dial plan is typically used to route calls from a terminating device on a Host BRI line out to the WAN using PRI channels. However, it can also be used to set up the PRI parameters for other outbound calls. These are the related parameters:

```

Dial Plan
  Name=host1
  Call-by-Call=8
  Data Svc=56KR
  PRI # Type=National
  Transit #=222
  Bill #=

Host/BRI
  Line Config
    Line N...
      Dial Plan=Extended

```

To use the extended dial plan from an AIM port or Ethernet:

```

Host/6 (or Host/Dual)
  Port N Menu
    Port Config
      Dial Plan=Extended
      Dial #=806-212-555-1217

Ethernet
  Mod Config

```

```

WAN options...
    Dial Plan=Extended

Ethernet
Connections
    Dial #=806-212-555-1212

```

With the dialing prefix 806, the first digit is a trunk group number and the next two digits instruct the MAX to read Dial Plan profile 6. The call will be placed using channels in trunk group 8 and the PRI settings in that Dial Plan profile.

### Slot and port specifications (reserved channels)

Specifying a slot and port number in a channel configuration reserves the channel for calls to and from the specified slot or port. These are the related parameters:

```

Net/T1
  Line Config
    Line N...
      Ch N=Switched
      Ch N Slot=3
      Ch N Prt/Grp=1

Net/E1
  Line Config
    Line N...
      Ch N=Switched
      Ch N Slot=3
      Ch N Prt/Grp=1

Net/BRI
  Line Config
    Line N...
      BN Usage=Switched
      BN Slot=3
      BN Prt/Grp=1

```

If the outbound call originates from a host on Ethernet, the destination address in the packets brings up a Connection profile or RADIUS user profile that dials the call. If the call does not go out through a digital modem, it originates from slot 9.

If the outbound call originates from a device connected to an AIM port, the Call profile associated with that port dials the call. This type of call originates from the slot and port of the AIM card.

If the outbound call originates from a terminal adapter connected to a Host/BRI or BRI/LT port, the call originates from the slot and port of the Host/BRI or BRI/LT card.

If the outbound call originates from a terminal-server user dialing out through a digital modem, the digital modem slot is the source of the call. (No matter where the call originates, if it goes out through a digital modem, the digital modem slot is the source of the call.)

When the MAX receives an outbound call, it evaluates the slot and port specifications as part of determining which channels are available for placing the call.

- If the slot and port specifications for a channel are set to zero (the default), the channel is available for all outbound calls that specify the right trunk group.

- If the slot is non-zero and the port is zero, the channel is available to outbound calls originating on that slot.
- If both the slot and port numbers are non-zero, the channel is available only to outbound calls originating on that port.

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