



# **MERLIN LEGEND® Communications System**

## **Application Notes**

### **Office-to-Office LAN Access**

**ABSTRACT:**

These application notes describe how to install and configure the Ascend Pipeline™ 50 with a MERLIN LEGEND® Communications System, Release 4.0 or later to connect local area networks (LANs) together with a switched connection. The Pipeline 50 enables Ethernet® LAN nodes to have high-speed access (that is, speeds up to 128 Kbps) to LANs at other locations over a digital facility (NI-BRI, PRI, or RBS/T1) on the MERLIN LEGEND system.

These application notes are intended for Lucent Technologies' internal support personnel. The information in these application notes applies specifically to Release 4.0 or later of MERLIN LEGEND Communications System. These application notes support the Pipeline 50 for this configuration only and should be used in conjunction with the Pipeline 50 documentation.

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## Hardware Requirements

To use the Ascend Pipeline 50 to enable users of a local area network (LAN) to access information or services from a LAN at a remote site, you must have the following hardware:

- a MERLIN LEGEND Communications System, Release 4.0 or later that has NI-BRI, PRI, or RBS/T1 facilities and an available MLX port

**NOTE:**

Using an RBS/T1 facility may cause undesirable user interactions if the access number for the destination LAN is busy often. BRI or PRI facilities are preferred for this application. If RBS/T1 facilities are used, read Problem 4 in the Troubleshooting section.

- an Ethernet LAN

**NOTE:**

This document assumes that the customer is using 10Base-T Ethernet (twisted-pair). However, the Pipeline 50 also supports connection with Thinnet Ethernet. Refer to Chapter 2 of the *Ascend Pipeline 50 User's Guide*.

- PCs (running Windows® 3.x, Windows 95, or Windows NT), Macintosh, or UNIX® workstations that are connected to the LAN

## Software Requirements

The following software must be installed on the users' PCs, Macintosh, or UNIX workstations:

- TCP/IP

**NOTE:**

TCP/IP is automatically provided with the Windows 95 and Windows NT installation CD. (If TCP/IP is not installed already, you must install it.) If you have a PC running Windows 3.x, a Macintosh, or a UNIX workstation, you must install TCP/IP software.

- LAN client software. The PCs, Macintoshes, or UNIX workstations must also have accounts on the LAN at the remote location.

## Pipeline 50 Components

This product consists of the following components:

- a Pipeline 50 that provides an S interface
- a 10Base-T Ethernet crossover cable that connects the Pipeline 50 directly to a PC. (This cable is not used in this application.)

**NOTE:**

You must use a DB-15AUI cable or a 10-BT cable to connect the Pipeline 50 to the Ethernet hub. This cable is not provided with the Pipeline 50.

- an RJ-48C to RJ-11 ISDN cable that connects the Pipeline 50 to the MLX jack on the MERLIN LEGEND system
- a DB-9 to DB-25 serial cable adapter for use when connecting the Control port on the Pipeline 50 to a serial port on a PC. (This cable is used to administer the Pipeline 50.)
- a power supply
- two manuals

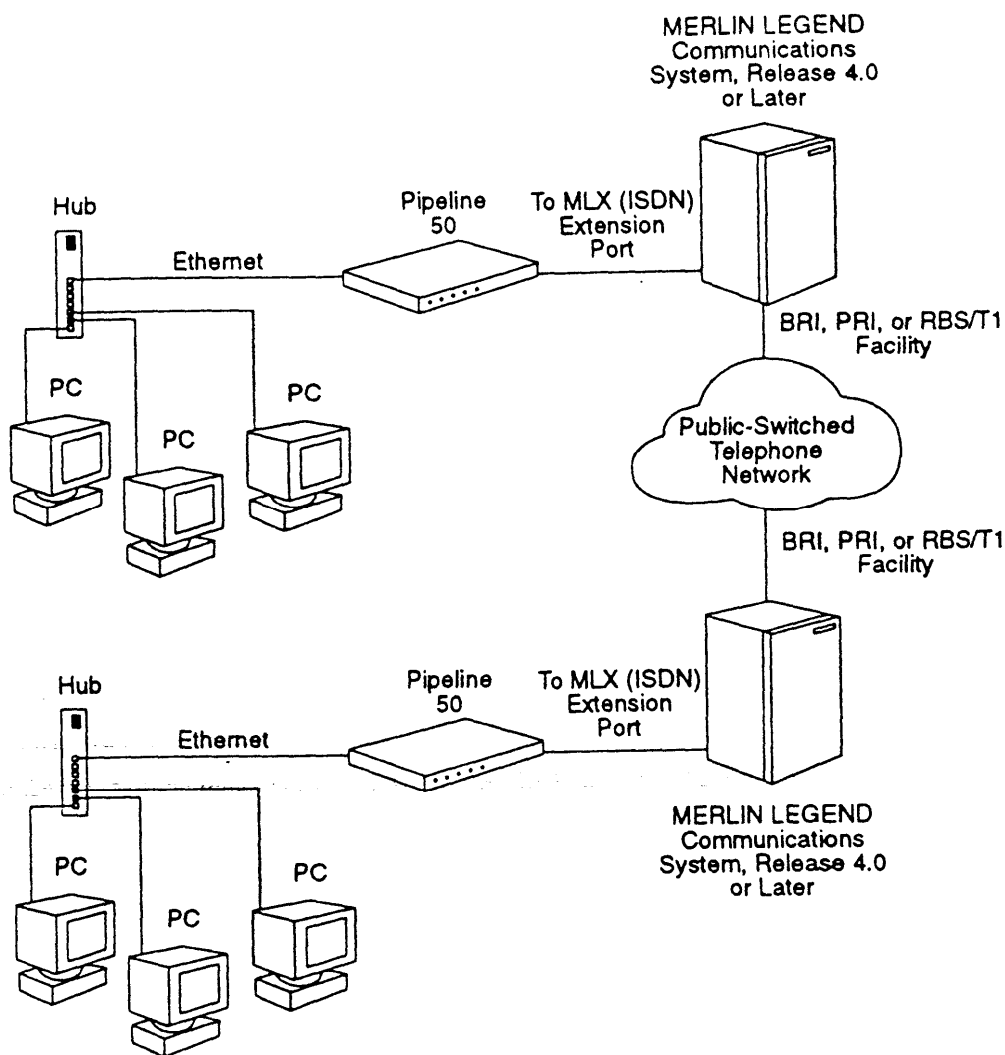
## Overview

The Pipeline 50 allows multiple users on a LAN to connect simultaneously to a LAN at another location using a shared digital facility (that is, ISDN or RBS/T1). This enables users of LANs at different locations to access resources at the other location just as if they were on the same LAN.

The Pipeline 50 is a cost-effective alternative for customers who have branch offices that need to connect to a main corporate site or to other branches or need to allow other branches to connect to them on an occasional basis. These customers do not have enough inter-LAN traffic to warrant a leased-line or frame-relay connection. Since a switched connection is used, the connection can be established when a user tries to access information on the LAN at the other location and then brought down when the interaction is completed. This provides a cost savings over a leased-line or frame-relay connection for low-traffic situations and is really made possible by quick connect times for digital connections.

To support the Pipeline 50, the MERLIN LEGEND system must have a digital facility. If the MERLIN LEGEND system does not have a digital facility, the customer can add a single BRI facility to the MERLIN LEGEND system and use the two "B channels" as lines for both LAN access and regular voice lines. However, customers may want to dedicate a BRI line to this application and not allow it to be shared for voice calls. To add a BRI facility to the MERLIN LEGEND system, the customer must add an ISDN NI-BRI module, which provides eight ports. The BRI facility connects to one port on this module. If the MERLIN LEGEND system already has a PRI or RBS/T1 facility, the customer should be able to use one or two of the channels on the existing facility to the Pipeline 50 rather than adding a BRI facility. (The ability to share digital facilities depends on the type of digital service that is contracted from the local telephone company.)

The Pipeline 50 connects to the Ethernet hub of a LAN. PCs that are connected to the local LAN and want to access the remote LAN must have accounts on the remote LAN and the appropriate LAN software. The Pipeline 50 connects to an MLX port that can access a digital facility on the MERLIN LEGEND system. Figure 1 shows how the Pipeline 50 connects to the LAN and the MERLIN LEGEND system at a local site and a remote site.



**Figure 1.** Diagram of a Pipeline 50 with a MERLiN LEGEND Communications System at a remote site and a local site.

The maximum speed of the connection between the Pipeline 50 and the other end of the connection depends on the number of B channels used by the MERLIN LEGEND system and the speed of the service provided by your local telephone company. The Pipeline 50 supports one or two B channels. The maximum speed for one B channel on a BRI or PRI facility may be 56 or 64 Kbps depending on the service provided by your local telephone company. The maximum speed for two B channels on a BRI or PRI facility may be 112 or 128 Kbps. For an RBS/T1 facility, the maximum speed is 56 Kbps for one channel and 112 Kbps for two channels.

One Pipeline 50 enables simultaneous access for multiple LAN clients. However, since the users are sharing a single connection to the remote LAN, they will experience slow response times if too many users are accessing the remote LAN at the same time.

For more technical information about the Pipeline 50, see the Ascend WWW home page at [www.ascend.com](http://www.ascend.com).

## Installation and Administration

You must administer the MERLIN LEGEND system, install and administer the Pipeline 50, and configure the PCs that will access the remote LAN.

### Administer the MERLIN LEGEND System

To administer the MERLIN LEGEND system:

1. Program the MLX adjunct port to **2bData**.
2. Assign the digital facilities to the extension to which the Pipeline 50 is connected. These facilities may also be assigned to other extensions to allow for the sharing of lines with voice calls. However, customers may want to dedicate facilities to this application and not allow it to be shared for voice calls.

You can assign access to digital facilities in the following ways:

- direct facility termination

**NOTE:**

You cannot use direct facility terminations (DFTs) if the user wants to access both B channels since Pipeline uses the same dial prefix for each of the two calls made on the two B channels.

- dial access to pools
- Automatic Route Selection (ARS)

**NOTE:**

- Make sure you assign to the extension the appropriate dial access to the pool.
- If ARS is used, either all lines on the MERLIN LEGEND system must be capable of carrying data traffic (for example, all lines are BRI) or ARS is set up to route data calls to data-capable facilities.

3. If PRI facilities are used, administer a data-capable service (for example, SDN or Accunet®) for the lines that the Pipeline 50 will use and make sure the PRI is provisioned for the corresponding service from the local telephone company.
4. If RBS/T1 facilities are used, administer switched 56 digital data service for the lines that the Pipeline 50 will use and make sure the RBS/T1 is provisioned for switched 56 data service from the local telephone company. Also, adequate touch-tone receivers must be available in the MERLIN LEGEND system.
5. Administer the routing for incoming calls to the Pipeline 50. You can route incoming calls to digital facilities in the following ways:
  - Direct Facility Termination Routing (which can be used with BRI, PRI, and RBS/T1 facilities)
  - Dial Plan Routing (which can only be used with PRI and RBS/T1 facilities)



## Install and Administer the Pipeline 50

To install and administer the Pipeline 50:

1. Install the Pipeline 50 as described in the Chapter 2 of the *Ascend Pipeline 50 User's Guide*.

### NOTE:

Be sure to connect the ISDN/BRI connector of the Pipeline 50 to the MLX port of the MERLIN LEGEND system.

2. Refer to Chapter 3 of the *Ascend Pipeline 50 User's Guide* and the *Ascend Pipeline 50 Reference Guide* and set the following options on the Pipeline 50. Paths to the options are shown in brackets [].

### Making Call to a LAN at Another Location

To set the Pipeline 50 to call a LAN at another location:

- In Configure profile [Configure -> Configure Profile]:
  - Set the "Switch Type" to AT&T Point to Point (P-T-P).
  - Set "Chan Usage" to Switch/Switch.
  - Set "My Name" to the name of the local site.
  - Set "My Addr" to the IP address and subnet mask of the Pipeline 50 on the local LAN. The subnet mask appears after the fourth set of numbers and is separated by a slash (/).
  - Set "Rem Name" to the name of the remote device to which the Pipeline will make a connection.
  - Set "Rem Addr" to the IP address of the station or router at the remote end of the link.
  - Set "Dial #" to the telephone number the Pipeline 50 must dial to access the remote LAN. If the Pipeline 50 must dial a code to select the digital facility on the MERLIN LEGEND system (that is, a pool access code for pooled lines, a specific line number, or the ARS selection mode), enter the code in front of the telephone number for the remote LAN.
  - Set "Route" to **IP+IPX** if both IP and IPX are routed. Novell LANs use both IP and IPX. If IPX is not routed, set "Route" to **IP**.
  - Set "Send Auth" to **PAP**.
  - Set "Send PW" to the password that the Pipeline must send to the remote LAN.
- In the first Connection Profile [Ethernet -> Connections -> First Connection Profile]:
  - Set "Station" to the name of the remote device to which the Pipeline will make a connection.
  - Set "Encaps" to **MPP**.
  - Set "Dial #" to the telephone number the Pipeline 50 must dial to access the remote LAN. If the Pipeline 50 must dial a code to select the digital facility on the MERLIN LEGEND system (that is, a pool access code for pooled lines, a specific line number, or the ARS selection mode), enter the code in front of the telephone number for the remote LAN.
  - Set "Route IPX" to **Yes** if IPX is routed.

- In Encaps Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Encaps Options]:
  - Set “Send Auth” to **PAP**.
  - Set “Send PW” to the password that the Pipeline must send to the remote LAN.
  - Set “DBA Monitor” to **Transmit-Recv**.
  - Set “Base Ch Count” to **1**.
  - Set “Min Ch Count” to **1**.
  - Set “Max Ch Count” to **2**.
- In Ip Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Ip Options]:
  - Set “LAN Adrs” to the IP address of the station or router at the remote end of the link.
  - Set “Rip” to **Off**.
- In Ipx Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Ipx Options]:
  - Set “IPX Net#” to the network number of the router at the remote end of the connection. This is an 8-digit hexadecimal value.
- In Telco Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Telco Options]:
  - Set “AnsOrig” to the appropriate setting:
    - If the local Pipeline 50 will both make calls to the other destination and answer calls from the other destination, select **Both**. If you select **Both**, you must also perform the procedures in “Answering Calls from a LAN at Another Location,” later in this section.
    - If the local Pipeline 50 will only call the other destination (that is, it will not receive any calls from the other destination), select **Call Only**.
  - Set the “Data Svc” to **56K** or **64K**. (This value depends on the speed of the service available from your local telephone company. For RBS/T1, select 56K.)
  - If you are using RBS/T1, set the “Force 56” to **No**.
- In Static Rtes [Ethernet -> Static Rtes -> Default]:
  - Set “Gateway” to the IP address of the router at the remote end of the link.
  - Set “Metric” to **1**.
  - Set “Preference” to **100**.
  - Set “Private” to **Yes**.

- In IPX Routes [Ethernet -> IPX Routes -> First Route]:
  - Set “Server Name” to the name of the IPX server.
  - Set “Network” to the unique internal network number assigned to the NetWare server.
  - Set “Node” to the node number of the NetWare server.
  - Set “Socket” to the socket number of the NetWare server.
  - Set “Server Type” to **0004**.
  - Set “Hop count” to **2**.
  - Set “Connection #” to the number of the Connection Profile through which you can reach the NetWare server connected by the static route.
- In Ether options [Ethernet -> Mod Config -> Ether Options]:
  - Set “IP Adrs” to the IP address and subnet mask of the Pipeline 50 on the local LAN.  
The subnet mask appears after the fourth set of numbers and is separated by a slash (/).
  - Set “RIP” to **Off**.
  - Set “Ignore Def Rt” to **Yes**.
  - Set “Proxy Mode” to **Always**.
  - Set “IPX Frame” to the appropriate setting for your local LAN. This setting specifies the Ethernet frame type to use for IPX on the Ethernet interface. If you do not specify an Ethernet frame type, the Pipeline cannot route IPX or perform watchdog spoofing for its IPX clients.
  - Set “IPX Enet#” to a unique IPX network number for the Ethernet interface, The Pipeline assigns an address to a workstation when it connects to the Pipeline 50; it derives the address from the network number. The number you specify must be unique within your wide-area IPX network and must match the configuration of other routers on the local Ethernet network.
  - Set “Handle IPX Type 20” to **No**.
- In Route Pref [Ethernet -> Mod Config -> Route Pref]:
  - Set the “Static Pref” to **100**.
  - Set the “Rip Preference” to **100**.

### Answering Calls from a LAN at Another Location

To set the Pipeline 50 to answer calls from a LAN at another location:

- In Configure profile [Configure -> Configure Profile]:
  - Set the “Switch Type” to AT&T Point to Point (P-T-P).
  - Set “Chan Usage” to Switch/Switch.
  - Set “My Name” to the name of the local site.
  - Set “My Addr” to the IP address and subnet mask of the Pipeline 50 on the local LAN.  
The subnet mask appears after the fourth set of numbers and is separated by a slash (/).
  - Set “Rem Name” to the name of the remote device to which the Pipeline will make a connection.
  - Set “Rem Addr” to the IP address of the station or router at the remote end of the link.
  - Set “Route” to **IP+IPX** if both IP and IPX are routed. Novell LANs use both IP and IPX. If IPX is not routed, set “Route” to **IP**.
  - Set “Recv Auth” to **PAP**.
  - Set “Recv PW” to the password that the Pipeline must receive from the remote LAN.
- In the first Connection Profile [Ethernet -> Connections -> First Connection Profile]:
  - Set “Station” to the name of the remote device to which the Pipeline will make a connection.
  - Set “EnCaps” to **MPP**.
  - Set “Route IPX” to **Yes** if IPX is routed.
- In Encaps Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Encaps Options]:
  - Set “Send Auth” to **NONE**.
  - Set “Recv PW” to the password that the Pipeline must receive from the remote LAN.
  - Set “DBA Monitor” to **Transmit-Recv**.
  - Set “Base Ch Count” to **1**.
  - Set “Min Ch Count” to **1**.
  - Set “Max Ch Count” to **2**.
- In Ip Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Ip Options]:
  - Set “LAN Adrs” to the IP address of the station or router at the remote end of the link.
  - Set “RIP” to **Off**.
- In Ipx Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Ipx Options]:
  - Set “NetWare t/o” to **600**. This specifies the length of time, in minutes, that the Pipeline 50 performs watchdog spoofing for NetWare connections. NetWare t/o applies when the Pipeline 50 is on a LAN containing a NetWare server.

- In Telco Options under the first Connection Profile [Ethernet -> Connections -> First Connection Profile -> Telco Options]:
  - Set “AnsOrig” to the appropriate setting:
    - If the local Pipeline 50 will both make calls to the other destination and answer calls from the other destination, select **Both**. If you select **Both**, you must also perform the procedures in “Making Calls to a LAN at Another Location,” earlier in this section.
    - If the local Pipeline 50 will only answer calls from the other destination (that is, it will not make any calls to the other destination), select **Ans Only**.
  - Set “Data Svc” to **56K** or **64K**. (This value depends on the speed of the service available from your local telephone company. For RBS/T1, select 56K.)
  - If you are using RBS/T1, set “Force 56” to **No**.
- In Static Rtes [Ethernet -> Static Rtes -> Default]:
  - Set “Gateway” to the IP address of the router at the remote end of the link.
  - Set “Metric” to **1**.
  - Set “Preference” to **100**.
  - Set “Private” to **Yes**.
- In Answer [Ethernet -> Answer]:
  - Set “Profile Req’d” to **Yes**.
- In PPP Options [Ethernet -> Answer -> PPP Options ]:
  - Set “Route IPX” to **Yes**.
  - Set “Recv Auth” to **PAP**.
- In Session Options [Ethernet -> Answer -> Session Options ]:
  - Set “Rip” to **Off**.
- In Ether options [Ethernet -> Mod Config -> Ether Options]:
  - Set “IP Adrs” to the IP address and subnet mask of the Pipeline 50 on the local LAN.  
The subnet mask appears after the fourth set of numbers and is separated by a slash (/).
  - Set “RIP” to **Off**.
  - Set “Ignore Def Rt” to **Yes**.
  - Set “Proxy Mode” to **Always**.
  - Set “IPX Frame” to the appropriate setting for your local LAN. This setting specifies the Ethernet frame type to use for IPX on the Ethernet interface. If you do not specify an Ethernet frame type, the Pipeline cannot route IPX or perform watchdog spoofing for its IPX clients.
  - Set “IPX Enet#” to a unique IPX network number for the Ethernet interface. The Pipeline assigns an address to a workstation when it connects to the Pipeline 50; it derives the address from the network number. The number you specify must be unique within your wide-area IPX network and must match the configuration of other routers on the local Ethernet network.

## Configure the LAN Clients

Once you determine which PCs on the local LAN will have access to the other LAN (that is, these PCs will have accounts on the LAN at the other location), you must configure each of those PCs.

**NOTE:**

This section assumes that you have a single LAN segment (that is, there are no routers on your network).

To configure the PCs:

1. Administer TCP/IP on the PC. You must administer the following TCP/IP settings:
  - Set the IP address. For each PC, the IP address must be unique. The IP address of each PC must be different from the IP address assigned to the Pipeline 50. If these PCs are also accessing the Internet, you should take these addresses into account.
  - Assuming that you have a single LAN segment, set the subnet mask to 255.255.255.0 for all PCs.

**NOTE:**

If you have multiple segments connected by routers, set the subnet masks appropriately on each segment.

- Set the Gateway to the IP address of the Pipeline 50. (The Pipeline 50 acts as the Gateway to the other LAN.) This address is the same address that you specified for "My Addr" when you administered the Pipeline 50.

**NOTE:**

If you have multiple segments connected by routers, set the Gateways appropriately on each segment.

- Enter the DNS information for the LAN at the other location.
2. Make sure the PCs are clients of the LAN at the other location.

## Troubleshooting

### **Problem 1: You cannot connect to the other LAN.**

You may be experiencing dial network busy or trunk busy at the other site.

Check the WAN light on the front of the Pipeline 50 to monitor the existence of a dialed connection. The WAN light comes on when the Pipeline 50 attempts to dial a call. If the call connects successfully, the WAN light stays on until the call is disconnected. If the call fails to complete, the light goes out when the call attempt is abandoned. When the call failed to complete because of a dial network busy or trunk port busy at the other site, the length of time that the WAN light was on was approximately 5 seconds or less.

The WAN LED remaining on briefly (5 seconds or less) indicates that there are redial attempts, which are probably caused by either a dial network busy or a trunk busy at the other site. The WAN LED remaining on (20 seconds or more) indicates a working dialed connection to the remote LAN.

### **Problem 2: Calls to the remote LAN drop frequently and take a long time to re-establish.**

Try increasing the “Idle” setting (Ethernet -> Connections -> First Connection Profile -> Session Options) in the Pipeline 50 to more than the default setting of 120 seconds. For example, set “Idle” to 300 or 600 seconds.) The “Idle” setting determines the length of time the connection to the remote LAN remains “up” when there is no activity (that is, there is no traffic on the connection with the remote LAN). In normal traffic situations, the call is re-established automatically (and is transparent to the user) when new traffic is present. If it takes a long time to establish a call to the remote LAN (that is, you encounter frequent dial network busy conditions), you should increase the “Idle” setting so the line does not drop as frequently.

### **Problem 3: The call completes for a few seconds and then disconnects.**

Verify the settings for “Send Auth” and “Send PW” on the Pipeline 50.

### **Problem 4: Using RBS/T1 with a busy remote LAN.**

With NI-BRI and PRI facilities, if a busy line is reached, the Pipeline 50 drops the call as soon as the busy state is detected. This allows the Pipeline 50 to immediately redial the number.

With RBS/T1, the Pipeline 50 cannot detect the busy state and thus will remain in the “dialing” state until the far end abandons, which is usually 50 to 60 seconds. As a result, the redial attempts take a much greater amount of time. If you are using an RBS/T1 facility, you can determine whether there is a busy state by accessing the Pipeline 50's VT100 interface via telnet from any client PC. From the VT100 interface of the Pipeline 50, dial a call to the remote LAN (using control-d commands) and monitor the existence of the dialed connection. If “d” remains for more than 20 seconds in the status window 10-100, the ports for the remote LAN are busy. Refer to the *Ascend Pipeline 50 User's Guide* and the *Ascend Pipeline 50 Reference Guide* for information on the VT100 interface and the control-d commands.

#### **NOTE:**

From the VT100 interface of the Pipeline 50, users can change any configurable parameter on the Pipeline 50. Users who access this interface must be extremely careful. The telnet access of this interface can be protected by a password (the Telnet PW parameter) in the Pipeline 50.

The Pipeline 50 is designed to disconnect calls after a set period of time in which no traffic is present on the line and to reconnect the call when new traffic is generated. This feature minimizes the customer's access charges and connect time. If a busy line is encountered after an idle period, the user may

experience a long delay on an RBS/T1 line and possibly receive error messages. In very busy situations, it may be impossible to establish a connection with such infrequent redial attempts.

Here are some suggestions for alleviating this problem:

- Increase the “Idle” setting on the Pipeline 50. This will cause the connection to remain “up” for longer idle periods and avoid the need to re-establish the connection. However, the connect times and access charges will be higher.
- Upgrade the RBS/T1 facility to PRI, if available.



## Glossary

**Domain Name Server** - A server on the Internet used to map host names, such as *www.lucent.com*, to host IP addresses, such as 135.3.64.7. A lookup in the server is required each time a new host is accessed.

**IP Address** - A numerical address that uniquely identifies each computer on the Internet. The IP address consists of four numbers (between 0 and 255) separated by periods.

**LAN Client Software** - Software that enables access to files and printers shared on other local area network computers.

**MP** - Multichannel PPP.

**Multichannel PPP** - A variation of PPP that allows connections using multiple B channels as a single, larger channel.

**Point-to-Point Protocol** - A protocol for TCP/IP routers and PCs to communicate over dial-up and leased-line WAN connections using TCP/IP connections.

**PPP** - Point-to-Point Protocol.

**Subnet Mask** - To facilitate intra-network routing, a single IP network can be divided into many subnets by using some of the MS bits of the host address portion of the IP address as a subnet ID.

**TCP/IP** - A communications protocol used to internetwork computers. This is the protocol used on the Internet and in many enterprise networks.