

Lucent Technologies
Bell Labs Innovations



MERLIN LEGEND[®]
Communications System
Release 5.0

Installation

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Notice

Every effort was made to ensure that the information in this book was complete and accurate at the time of printing. However, information is subject to change.

See Appendix A, "Customer Support Information," for important information. It follows *Maintenance and Troubleshooting* in this binder.

Your Responsibility for Your System's Security

Toll fraud is the unauthorized use of your telecommunications system by an unauthorized party, for example, persons other than your company's employees, agents, subcontractors, or persons working on your company's behalf. Note that there may be a risk of toll fraud associated with your telecommunications system, and if toll fraud occurs, it can result in substantial additional charges for your telecommunications services.

You and your system manager are responsible for the security of your system, such as programming and configuring your equipment to prevent unauthorized use. The system manager is also responsible for reading all installation, instruction, and system administration documents provided with this product in order to fully understand the features that can introduce risk of toll fraud and the steps that can be taken to reduce that risk. Lucent Technologies does not warrant that this product is immune from or will prevent unauthorized use of common-carrier telecommunication services or facilities accessed through or connected to it. Lucent Technologies will not be responsible for any charges that result from such unauthorized use. For important information regarding your system and toll fraud, see Appendix A, "Customer Support Information."

Federal Communications Commission Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. For further FCC information, see Appendix A, "Customer Support Information."

Canadian Department of Communications (DOC)**Interference Information**

This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the radio interference regulations of the Canadian Department of Communications.

Le Présent Appareil Numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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IMPORTANT SAFETY INSTRUCTIONS



The exclamation point in an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

When installing telephone equipment, always follow basic safety precautions to reduce the risk of fire, electrical shock, and injury to persons, including:

- Read and understand all instructions.
- Follow all warnings and instructions marked on or packed with the product.
- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone wiring has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

IMPORTANT SAFETY INSTRUCTIONS

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- Use only Lucent Technologies-manufactured MERLIN LEGEND® Communications System circuit modules, carrier assemblies, and power units in the MERLIN LEGEND Communications System control unit.
- Use only Lucent Technologies-recommended/approved MERLIN LEGEND Communications System accessories.
- If equipment connected to the analog extension modules (008, 408, 408 GS/LS) or to the MLX telephone modules (008 MLX, 408 GS/LS-MLX) is to be used for in-range out-of-building (IROB) applications, IROB protectors are required.
- Do not install this product near water, for example, in a wet basement location.
- Do not overload wall outlets, as this can result in the risk of fire or electrical shock.
- The MERLIN LEGEND Communications System is equipped with a 3-wire grounding-type plug with a third (grounding) pin. This plug will fit only into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact an electrician to replace the obsolete outlet. Do not defeat the safety purpose of the grounding plug.
- The MERLIN LEGEND Communications System requires a supplementary ground.
- Do not attach the power supply cord to building surfaces. Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.
- Slots and openings in the module housings are provided for ventilation. To protect this equipment from overheating, do not block these openings.
- Never push objects of any kind into this product through module openings or expansion slots, as they may touch dangerous voltage points or short out parts, which could result in a risk of fire or electrical shock. Never spill liquid of any kind on this product.

- Unplug the product from the wall outlet before cleaning. Use a damp cloth for cleaning. Do not use cleaners or aerosol cleaners.
- Auxiliary equipment includes answering machines, alerts, modems, and fax machines. To connect one of these devices, you must first have a Multi-Function Module (MFM).
- Do not operate telephones if chemical gas leakage is suspected in the area. Use telephones located in some other safe area to report the trouble.

 WARNING:

- *For your personal safety, DO NOT install an MFM yourself.*
- *ONLY an authorized technician or dealer representative shall install, set options, or repair an MFM.*
- *To eliminate the risk of personal injury due to electrical shock, DO NOT attempt to install or remove an MFM from your MLX telephone. Opening or removing the module cover of your telephone may expose you to dangerous voltages.*

SAVE THESE INSTRUCTIONS

New Features and Enhancements

Release 4.1 Enhancements

Release 4.1 includes all Release 4.0 functionality plus the enhancements listed below. There are no hardware changes in Release 4.1.

Coverage Timers Programmed for Individual Extensions

Beginning with Release 4.1, coverage timers which control the duration of the delay before calls are sent to each level of coverage are changed as follows:

- The Group Coverage Ring Delay (1–9 rings) is programmed on individual extensions and replaces the Coverage Delay Interval programmed systemwide in previous releases.
- The Primary Cover Ring Delay (1–6 rings) and Secondary Cover Ring Delay (1–6 rings) programmed on individual extensions replace the Delay Ring Interval programmed systemwide in previous releases.

These enhancements allow the system manager to customize Coverage call delivery to match individual station call-handling requirements.

Night Service with Coverage Control

Beginning with Release 4.1, a system manager can enable the Night Service Coverage Control option to automatically control the status of telephones programmed with Coverage VMS (Voice Mail System) Off buttons, according to Night Service status.

When Coverage Control is enabled and the MERLIN LEGEND Communications System is put into Night Service, all programmed Coverage VMS Off buttons are automatically turned off (LED is unlit) and all eligible outside calls are sent to the assigned voice messaging system calling group with normal ringing delay. When Night Service is deactivated during the day, all programmed Coverage VMS Off buttons are automatically turned on (LED is lit) and voice mail coverage is disabled for outside calls.

Users can override the Coverage VMS Off button status at any time by pressing the programmed Coverage VMS Off button to turn the LED on or off.

Night Service Group Line Assignment

Beginning with Release 4.1, a system manager can assign lines to Night Service groups to control handling of after-hours calls received on individual lines. This capability replaces the automatic Night Service group assignment of only lines that ring on the Night Service operator console. An outside line must be assigned to a Night Service group to receive Night Service treatment.

With this enhancement, Night Service can be activated and deactivated on lines that do not appear on operator consoles (for example, personal lines), and lines appearing at operator positions can be excluded from Night Service.

Forward on Busy

Beginning with Release 4.1, the Forward, Follow Me and Remote Call Forward features are enhanced to remove the requirement that a call must be ringing at an extension before it can be forwarded. With the Forward on Busy enhancement, a call to an extension with no available **SA** (System Access) or **ICOM** (Intercom) buttons is forwarded immediately to the programmed destination, preventing the caller from hearing a busy signal from the intended call recipient's extension.

Maintenance Testing for BRI Facilities That Are Part of Multiline Hunt Groups (MLHGs)

Beginning with Release 4.1, the NI-1 BRI (National Integrated Services Digital Network-1 Basic Rate Interface) Provisioning Test Tool is enhanced to include testing for BRI facilities that are part of Multiline Hunt Groups (MLHGs).

The NI-1 BRI Provisioning Test Tool is used by Lucent Technologies maintenance personnel on MERLIN LEGEND Communications Systems that include a 800 NI-BRI module. Technicians use the tool during system installation and maintenance to test the functionality of the BRI lines and report analyzed results.

Release 4.2 Enhancements

Release 4.2 includes all Release 4.1 functionality plus the enhancements listed below. There are no hardware changes for Release 4.2.

Additional Network Switch Interface and Services Options for ISDN Primary Rate Interface (PRI)

Release 4.2 of the system supports connectivity to MCI® or local exchange carrier (LEC) PRI services and to the following central office switch types (in addition to the 4ESS™ and 5ESS® switch types that are currently available for AT&T Switched Network services):

- Nortel® DMS™-100 BCS 36 for local exchange carrier services
- Nortel DMS-250 generic MC107 serving the MCI network
- Digital Switch Corporation DEX600E generic 500-39.30 serving the MCI network

Beginning with Release 4.2, the following MCI PRI and PRI local exchange carrier (LEC) services (along with the AT&T Switched Network Services), can be provided to users of the MERLIN LEGEND Communications System:

- MCI Toll Services for DMS-250 or DEX600E switch type:
 - MCI Prism® service for domestic outgoing long-distance and international voice calls; for domestic outgoing 56-kbps restricted, 64-kbps unrestricted, and 64-kbps restricted circuit-switched data calls
 - MCI VNet® service for incoming and outgoing, domestic and voice calls; for 56-kbps restricted, 64-kbps restricted, and 64-kbps unrestricted circuit-switched data calls
 - MCI 800 for domestic toll-free incoming voice calls
 - MCI 900 service numbers
- LEC services for DMS-100 switch types:
 - DMS Virtual Private Network service for calls between the MERLIN LEGEND Communications system and another communications system (such as another MERLIN LEGEND Communications System)
 - DMS INWATS (Inward Wide Area Telephone Service) for domestic toll-free incoming voice calls
 - DMS OUTWATS (Outward Wide Area Telephone Service) for domestic outgoing long-distance voice calls
 - DMS FX (foreign exchange) to provide local call rating for calls from the local exchange to the area serviced by the foreign exchange.
 - DMS Tie Trunk to provide private exchange call rating for calls placed on a dedicated central office facility between the MERLIN LEGEND Communications System and another communications system (such as another MERLIN LEGEND Communications System)

Improvements to Station Message Detail Recording (SMDR) and Support for MERLIN LEGEND Reporter Application

The SMDR feature is enhanced to provide more details about calling group agent activities and help system managers assess the effectiveness of call centers, in terms of both agent performance and the adequacy of facilities to handle inbound calls. These improvements apply to calling groups that are programmed as Auto Login or Auto Logout type. The SMDR and MERLIN LEGEND Reporter features listed are administrable:

- **TALK Field.** for Auto Login and Auto Logout calling groups, the TALK field records the amount of time a calling group agent spends on a call.
- **DUR. (DURATION) Field.** For Auto Login and Auto Logout calling groups, call timing begins when a call arrives at MERLIN LEGEND Communications System and not after a preset number of seconds. Call timing ends when the call is disconnected; either the caller or the agent hangs up. This allows the system manager to determine how long a caller waited for an agent's attention.
- **Coding of Calls on Reports.** An asterisk (*) appears in the call record when:
 - a. A call is not answered by an Auto Login or Auto Logout calling group agent and is abandoned while waiting for an agent.
 - b. The call is answered by someone not a member of an Auto Login or Auto Logout calling group.

An exclamation point (!) signal that an Auto Login or Auto Logout agent handled a call that was answered by someone who was not a member of that Auto Login or Auto Logout with Overflow group. An ampersand (&) in the call record indicates that the group's overflow receiver answered the call.

MERLIN LEGEND Reporter

MERLIN LEGEND Reporter provides basic call accounting system reports for all incoming calls to Auto Login or Auto Logout type calling groups. MERLIN LEGEND Reporter assists in determining the effectiveness of calling group agents, assessing the level of service provided to callers, and ascertaining whether adequate incoming phone lines and agents are available to handle peak call load. MERLIN LEGEND Reporter is an administrable option. The default is Off, in which case the Release 4.0 SMDR reports are available. If this options is set to On, the following reports are provided:

- Organization Detail Report
- Organization Summary and Trends Report
- Selection Detail Report
- Account Code Report
- Traffic Report
- Extension Summary Report
- Data Report
- Talk and Queue Time Distribution Report
- Time of Day Report
- ICLID Call Distribution Report
- Facility Grade of Service Report

Maintenance Enhancements

Change to Permanent Error Alarm

Beginning with Release 4.2, the most recent permanent error alarm is not shown on the System Error Log menu screen but is available as an option from that screen. For details, refer to the Maintenance section of the technician guide, *Installation, Programming, and Maintenance*.

Enhanced Extension Information Report

Beginning with Release 4.2, the Extension Information Report includes the Extension Status (ESS) and supervisory mode of each extension.

Release 5.0 Enhancements

Release 5.0 includes all Release 4.2 functionality plus the enhancements listed below.

Computer Telephony Integration (CTI)

Beginning with Release 5.0, a PassageWay® Telephony Services CTI link from the MERLIN LEGEND Communications System to a LAN server running Novell® NetWare® software allows Lucent Technologies-certified telephony applications to control MLX and analog multiline telephone (BIS only). The physical connection for the CTI link is an MLX port on a 008-MLX or 408-MLX module on the MERLIN LEGEND Communications System control unit and an ISDN link interface card plugged into the customer's server. The feature is available for Hybrid/PBX mode systems only.



NOTE:

The NetWare Server software version must be 3.12, 4.1, or 4.11.

The 008-MLX and 408-MLX modules must have firmware vintage other than 29. If the module has firmware 29, programming a CTI link on the module is prevented. An earlier or later vintage firmware is supported.

Basic Call Control

A CTI link application on a user's computer can assume basic call control of the user's analog multiline or MLX telephone's **SA** buttons. Basic call control includes:

- Answering calls arriving on an **SA** button
- Making calls from an **SA** button
- Hanging up calls
- Hold and retrieving a call on hold at the user's extension
- Conference calls from a DLC or QCC operator



NOTE:

Transfer and 3-way conference, when handled through a CTI link application, provide the original caller's calling number information or other information to transfer receiver or new conference participant, if the user has screen-pop capability

Screen Pop

Screen pop occurs when the calling number, called number, or other user-defined identifier (such as account code that a voice-response unit prompts the caller to dial) is used to automatically show a screen at the user's computer that is associated with the calling party. For example, Caller ID services can be used to support screen pop on a system that includes a CTI link; using the calling party number as a database key code, information about a caller automatically appears on the user's computer screen when the call arrives at the extension. Depending on the application, screen pop may be available for calls that arrive on line buttons other than **SA** buttons and/or calls that are answered manually at the telephone rather than by the application.

Screen pop can occur on incoming calls from the following sources:

- Calling group distribution
- ISDN PRI Routing by Dial Plan
- An extension on the MERLIN LEGEND Communications System
- Remote access



NOTE:

In the case of remote access calls, the only information that the application can collect about the caller is the remote telephone number.

- A transfer of a call that was answered by a voice response unit
- A transfer, redirection, or conference of a call that was answered at a DLC or at a QCC



NOTES:

1. DLCs (Direct-Line Consoles) may use CTI applications. If they do, they perform the same way as other extensions. A DLC assigned to use a CTI link application is a *monitored* DLC. When a DLC is used as a regular operator console and not assigned as a CTI link extension, it is *non-monitored*.
2. Calls to a QCC or non-monitored DLC do not initiate screen pop at the operator position, but when an operator directs a call to an extension using a CTI application, caller information does initiate screen pop.
3. Calls transferred from Cover buttons on non-monitored DLCs do not initiate screen pop at the destination extension.

HotLine Feature

The Release 5.0 HotLine feature is designed for retail sales, catalogue sales, and other types of businesses and organizations and is available in all three modes of system operation. It allows a system manager to program a single-line telephone extension connected to an 008_OPT, 012, or 016 module as a HotLine. When a user lifts the handset at the HotLine extension, the telephone automatically dials the inside extension or outside telephone number programmed as the first Personal Speed dial number (code #01) for the extension. The system does not permit calls to be transferred, put on hold, or conferenced. (a user can press the telephone's **Hold** button, if it has one, to put a call on local hold, but the call cannot be redirected in any way. Switchhook flashes are ignored.)

Personal Speed Dial codes can be programmed from the extension prior to HotLine assignment (a system programming function). Alternatively, a Personal Speed Dial code can be programmed from the single-line telephone after HotLine operation is assigned. However, because of security considerations, this is a one-time opportunity. Once the Personal Speed Dial number is programmed, any changes to it or any other extension programming must be performed using centralized telephone programming.

Any type of inside or outside line that is normally available to a single-line telephone can be assigned to a HotLine extension. Generally, the HotLine telephone does not receive calls, and its lines should be set to No Ring.



SECURITY ALERT:

If a Hotline extension accesses a loop-start line, that line should provide reliable disconnect and be programmed for reliable disconnect. Otherwise, a user at the extension may be able to stay on the line after a call is completed and then make a toll call.

Group Calling Enhancements

Release 5.0 and later systems include Group Calling features that enhance call center operations.

Most Idle Hunt Type

In addition to the Circular (factory setting) and Linear hunt types supported in earlier releases, a third hunt type distributes calling group calls in an order based on which agent has waited the longest since transferring or hanging up on an incoming calling group call. For some applications, this hunt type is more efficient than the circular type because it takes into account the varying duration of calls. The system distributes calls based on when an agent last completed a call, not on when he or she last received one. This hunting method ignores non-calling group calls. For example, if an agent transfers a call that arrived on a line not assigned to the calling group, the calling group member's most-idle status is unaffected.

Delay Announcement Devices

The system manager can designate as many as ten primary delay announcement devices per group rather than the single device for each group that is available in Release 4.2 and earlier systems. Furthermore, an additional secondary delay announcement device can be specified, for a total of ten primary device extensions and one secondary device extension per group.

A primary delay announcement device operates in the same fashion as a single delay announcement device, playing once, as soon as it is available, for the caller who has waited the longest for a calling group agent and has not heard a primary delay announcement. If a secondary announcement device is used, it can use the factory setting, which plays the announcement once, or it can be set to repeat the announcement after a certain amount of time. The system manager programs the time (0–900 seconds) between announcements. This setting controls both the interval between primary and secondary announcements and the interval between repetitions of the secondary announcement if it is set to repeat.

The primary and secondary announcement options, when used together, allow an initial message to play for callers, followed by a repeating announcement that, for example, urges callers to stay on the line and wait for a calling group member.

Two or more groups may share an announcement device.

A primary delay announcement device can be administered as a secondary delay announcement device.

Enhanced Calls-in-Queue Alarm

Thresholds

Three Calls-in-Queue Alarm thresholds can be set to more clearly indicate the real-time status of the queue according to the behavior of programmed Calls-in-Queue Alarm buttons. In earlier releases, only one Calls-in-Queue Alarm Threshold setting is available to activate the LEDs at programmed Calls-in-Queue Alarm buttons for a calling group.

Using all three levels, the system manager sets Threshold 1 to the lowest value, Threshold 2 to a middle value, and Threshold 3 to the highest value. A Calls-in-Queue Alarm button indicates the severity of the alarm conditions in the following ways:

- If the number of Waiting calls is less than the value programmed for Threshold 1 or drops below that level, the LED is unlit.
- If the number of waiting calls is greater than or equal to the Threshold 1 value but less than the Threshold 2 value, the LED flashes.
- If the number of waiting calls is greater than or equal to the Threshold 2 value but less than the value for Threshold 3, the LED winks.
- If the number of waiting calls is greater than or equal to the highest value, Threshold 3, the LED lights steadily.



NOTE:

A DSS (Direct Station Selector) button that is used as a Calls-in-Queue Alarm button can only indicate two threshold levels, either by flashing or by lighting steadily. If a calling group must use this type of Calls-in-Queue Alarm button, only two threshold levels should be programmed.

If all three thresholds are set to the same value, the result is one threshold only (steady) with LED state either off or on. If two values are the same, then the result is two alarm levels (flash, steady). The factory setting is one call for all three thresholds with LED states of off, flash, and steady.

An external alert only signals when the number of calls in the queue exceeds the programmed Threshold 3 value.

MLX-5 and MLX-5D Telephones

The MLX-5 nondisplay and the MLX-5D display telephones are compatible with all system releases. The display telephone includes a 2-line by 24-character display, and both telephones come with 5 line buttons. In systems prior to Release 5.0, the MLX-5 and MLX-5D telephones are treated as MLX-10 and MLX-10D telephones respectively. As of Release 5.0, the system recognizes the MLX-5 and MLX-5D telephones as 5-button telephones.

If these telephones are connected to communications system releases prior to 5.0, they are recognized by the communications system as 10 button telephones.

Prior Releases Features and Enhancements

Release 3.1 Enhancements

Release 3.1 includes all Release 3.0 functionality plus the enhancements listed below.

- **Call Restriction checking for star codes**

Beginning with Release 3.1, the system manager can now add star (*) codes to Allowed and Disallowed Lists to help prevent toll fraud. Star codes, typically dialed before an outgoing call, enable telephone users to obtain special services provided by the central office (CO). For example, in many areas, a telephone user can dial *67 before a telephone number to disable central office-supplied caller identification at the receiving party's telephone. (You must contract with your telephone service provider to have these codes activated.)

When users dial star codes, the MERLIN LEGEND system's Calling Restrictions determine whether the codes are allowed. If allowed, the system's Calling Restrictions are reset, and the remaining digits that the users dial are checked against the Calling Restrictions.

■ **Trunk-to-Trunk Transfer on a per-station basis**

This enhancement to the trunk-to-trunk feature enables the system manager to allow or disallow trunk-to-trunk transfer on a per-station basis. Beginning with Release 3.1, the default setting for all stations is restricted.

■ **Programmable Second Dial Tone Timer**

Beginning with Release 3.1, the system manager can now assign a second dial tone timer to lines and trunks to help prevent toll fraud (for example, when star codes are used). After receiving certain digits dialed by a user, the CO may provide a second dialtone, prompting the user to enter more digits. If this second dial tone is delayed, and the user dials digits before the CO provides the second dial tone, there is a risk of toll fraud or misrouting of the call. The second dial tone timer enables the system manager to make sure that the CO is ready to receive more digits from the caller.

■ **A Disallowed List containing numbers frequently associated with toll fraud**

Beginning with Release 3.1, Disallowed List #7 now contains default entries, which are numbers frequently associated with toll fraud. By default, Disallowed List #7 is automatically assigned to both generic and integrated VMI ports used by voice messaging systems. The system manager must manually assign this list to other ports.

■ **Pool Dial-Out Code restriction for all extensions by default**

Beginning with Release 3.1, the default setting for the Pool Dial-Out Code restriction is changed to restricted. No extension or remote-access user with a barrier code has access to pools until the restriction is removed by the system manager.

■ Outward restrictions for VMI ports by default

Beginning with Release 3.1, ports assigned for use by voice messaging systems (generic or integrated VMI ports) are now assigned outward restrictions by default. If a voice messaging system should be allowed to call out (for example, to send calls to a user's home office), the system manager must remove these restrictions.

Before removing restrictions, it is strongly recommended that you read "Appendix A: Customer Support Information."

■ New default Facility Restriction Level (FRL) for VMI ports

Beginning with Release 3.1, the default FRL for VMI ports has changed to 0, restricting all outcalling.

■ New default for the Default Local Route Table

Beginning with Release 3.1, the default FRL has changed to 2 for the Default Local Route Table. Now, system managers can easily change an extension default of 3 to 2 or lower in order to restrict calling. No adjustment to the route FRL is required.

■ New maintenance procedure for testing outgoing trunk problems

A password is now required for technicians to perform trunk tests.

The enhancements in Release 3.1 help increase the security of the MERLIN LEGEND System. To fully utilize these security enhancements, be sure to read and understand the information in these upgrade notes.

Release 4.0 Enhancements

Release 4.0 includes all Release 3.1 functionality plus the enhancements listed below:

- **Support for up to 200 stations**

Release 4.0 has an expanded dial plan that supports up to 200 tip/ring devices.

- **New 016 tip/ring module**

This new module supports the 200 station dial plan by providing 16 ports for tip/ring devices. Applications that use a tip/ring interface can connect to this board. All 16 ports can ring simultaneously. Four touch-tone receivers (TTRs) are included on the module as well. The module's ringing frequency (default 20 Hz) can be changed through programming to 25 Hz for those locations that require it.

- **Support for National ISDN BRI Service**

This service provides a low-cost alternative to loop-start and ground-start trunks for voice and digital data connectivity to the Central Office. Each of the two B (bearer)- channels on a BRI line can carry one voice and one data call at any given time. The data speeds on a B-channel are up to 14.4 kbps for analog data and up to 64 kbps for digital data, which is necessary for video conferencing and other video applications. Release 4.0 supports the IOC Package "S" (basic call handling) service configuration and Multi-Line Hunt service configuration on designated CO switches.

- **New 800 NI-BRI module**

This new module connects NI-BRI trunks to the MERLIN LEGEND system for high-speed data and video transmission.

■ Support for 2B Data applications

Release 4.0 has certified group and desktop video applications that use two B-channels to make video/data calls from endpoints (stations) that are enabled to use 2B Data. The endpoints that support these applications connect to an MLX-port on the MERLIN LEGEND system. 2B Data applications can make use of the NI-1 BRI, PRI, or T1 Switched 56 network interfaces to make outside connections using one or two data channels at a time.

■ Support for T1 digital data transmission

Release 4.0 expands its T1 functionality by providing access to digital data over the public-switched 56 kbps network in addition to data Tie-Trunk services. Users who have T1 facilities for voice services can now use them for video calls at data rates of 56 kbps per channel (112 kbps for video calls using two channels). The Release 4.0 offering also includes point-to-point connectivity over T1 Tie-trunks, allowing customers to connect two MERLIN LEGEND Communications Systems or a MERLIN LEGEND Communications System with a DEFINITY[®] Communications System or DEFINITY Communications Server. The two communications systems can be co-located or off-premises.

■ Delayed Call Forwarding

Each user can program a Forwarding Delay setting for the Forward, Remote Call Forwarding, or Follow Me features. The forwarding delay is the number of times that a call rings at the forwarding extension before the call is sent to the receiver. During the delay period, the user can screen calls by checking the displayed calling number (if it is available). The delay can be set at 0 to 9 rings. The factory setting for Forwarding Delay is 0 rings (no delay).

■ Voice Announce on the QCC

The Queued Call Console (QCC) operator can enable the fifth **Call** Button to announce a call on another user's speakerphone if the destination telephone has a Voice Announce-capable **SA** button available. A QCC cannot receive Voice Announce calls; they are received as ringing calls. The factory-set status for the fifth **Call** Button is to have Voice Announce disabled.

■ Time-based option for overflow on Calling Group

Release 4.0 has added a *time* limit for calls in queue in addition to the previous *number* limit. If the Overflow Threshold Time is set to a valid number between 1–900 seconds, calls that remain in the Calling Group Queue for the set time are sent to the Overflow Receiver. If the Overflow Threshold Time is set to 0, Overflow by time is turned off. The factory-set time limit is 0 seconds (Overflow by time off).

■ Downloadable Firmware for the 016 T/R board and the NI-BRI board

The Personal Computer Memory Card International Association (PCMCIA) technology introduced in Release 3.0 continues to support these two new boards in Release 4.0 for installation and upgrade. A Release 3.0 or later processor is required for PCMCIA technology.

■ Single-Line Telephone Enhancements

- **Disable Transfer.** Through centralized telephone programming, the system manager can disable the ability to transfer calls by removing all but one **SA** or **ICOM** button from the telephone.
- **No Transfer Return.** When a handset bounces in its cradle, the MERLIN LEGEND system interprets that as a switchhook flash and attempts to transfer a call. When the transfer attempt period expires, the user's telephone rings. Release 4.0 eliminates this unintended ringing by disconnecting the call in situations where a switchhook flash is followed by an on-hook state when a dial tone is present.

- **Forward Disconnect.** All ports on 012 and 016 modules now send forward disconnect to all devices connected to them when forward disconnect is received from the CO. This enhancement prevents the trunk/line from being kept active when one end disconnects from the call. If an answering machine is connected to the port, it will not record silence, or busy tones, or other useless messages. This is a non-administrable operation.

- **7-digit password for SPM**

Release 4.0 has increased system security by requiring a 7-digit password when using SPM to perform remove administration or when performing the Trunk Test procedure. This password is to be used in addition to the Remote Access barrier codes.

About This Book

The MERLIN LEGEND Communications System is an advanced digital switching system that integrates voice and data communications features. Voice features include traditional telephone features, such as Transfer and Hold, and advanced features, such as Group Coverage and Park. Data features allow both voice and data to be transmitted over the same system wiring.

Intended Audience

This book provides detailed information about system and telephone trouble reports and troubleshooting operations. It is intended for use by qualified field technicians who are responsible for system maintenance and troubleshooting, and as a reference by anyone needing such information, including support personnel, sales representatives, and account executives.

How to Use This Book

This book provides step-by-step procedures for isolating troubles both inside and outside the communications system. Refer to the chapter associated with the reported problem to start the troubleshooting procedure.

Refer to the following documentation for additional information:

- *Equipment and Operations Reference* provides detailed information on system hardware, telephones, and other equipment. (Not updated since Release 3.0.)
- *Feature Reference* provides details on the features of the communications system.
- *System Planning* provides procedures and forms for planning a system for installation.
- *System Programming* gives procedural instructions for programming system features.
- Users' guides and Operators' Guides give procedural instructions for programming and using telephone features.

"Related Documents," later in this section, provides a complete list of system documentation together with ordering information.

In the USA only, Lucent Technologies provides a toll-free customer Helpline (1 800 628-2888) 24 hours a day. Call the Helpline, or your Lucent Technologies representative, if you need assistance when installing, programming, or using your system.

Terms and Conventions Used

In this document, the terms in the following list are used in preference to other, equally acceptable terms for describing communications systems.

Lines, Trunks and Facilities

Facility is a general term that designates a communications path between a telephone system and the telephone company central office. Technically a *trunk* connects a switch to a switch, for example the MERLIN LEGEND Communications System to the central office. Technically, a *line* is a loop-start facility or a communications path that does not connect two switches (for example, an intercom line or a Centrex line). However, in actual usage, the terms *line* and *trunk* are often applied interchangeably. In this book, we use *line/trunk* and *lines/trunks* to refer to facilities in general. Specifically, we refer to *digital facilities*. We also use terms such as personal line, ground-start trunk, Direct Inward Dialing (DID) trunk, and so on. When you talk to your local telephone company central office, ask them which terms they use for the specific facilities they connect to your system.

Some older terms have been replaced with newer terms. The following list shows the old term on the left and the new term on the right:

trunk module	line/trunk module
trunk jack	line/trunk jack
station	extension
station jack	extension jack
analog data station	modem data station
digital data station	terminal adapter
7500B data station	terminal adapter
analog voice and analog data station	analog voice and modem data
digital voice and analog data station	MLX voice and modem data
analog data only station	modem data only station
digital data only station	terminal adapter only station
7500B data only station	terminal adapter only station
digital voice and digital data station	MLX voice and terminal adapter station
MLX voice and 7500B data station	MLX voice and terminal adapter station

Typographical Conventions

Certain type fonts and styles act as visual cues to help you rapidly understand the information presented:

Example	Purpose
It is <i>very</i> important that you follow these steps. You <i>must</i> attach the wristband before touching the connection.	Italics indicate emphasis.
The part of the headset that fits over one or both ears is called a <i>headpiece</i> .	Italics also set off special terms.
If you press the Feature button on an MLX display telephone, the display lists telephone features you can select. A programmed Auto Dial button gives you instant access to an inside or outside number.	The names of fixed-feature, factory-imprinted buttons appear in bold. The names of programmed buttons are printed as regular text.
Choose Ext Prog from the display screen.	Plain constant-width type indicates text that appears on the telephone display or personal computer (PC) screen.
To activate Call Waiting, dial *11.	Constant-width type in italics indicates characters you dial at the telephone or type at the PC.

Product Safety Labels

Throughout these documents, hazardous situations are indicated by an exclamation point inside a triangle and the word **CAUTION** or **WARNING**.



WARNING:

Warning indicates the presence of a hazard that could cause death or severe personal injury if the hazard is not avoided.



CAUTION:

Caution indicates the presence of a hazard that could cause minor personal injury or property damage if the hazard is not avoided.

Security

Certain features of the system can be protected by passwords to prevent unauthorized users from abusing the system. You should assign passwords wherever you can and limit knowledge of such passwords to three or fewer people.

Nondisplaying authorization codes and telephone numbers provide another layer of security. For more information, see Appendix A, "Customer Support Information" following *Maintenance and Troubleshooting*.

Throughout this document, toll fraud security hazards are indicated by an exclamation point inside a triangle and the words **Security Alert**.

Security Alert:

Security Alert indicates the presence of toll fraud security hazard. Toll fraud is the unauthorized use of your telecommunications system by an unauthorized party (for example, persons other than your company's employees, agents, subcontractors, or persons working on your company's behalf). Be sure to read "Your Responsibility for Your System's Security" on the inside front cover of this book and "Security of Your System: Preventing Toll Fraud" in Appendix A, "Customer Support Information."

Related Documents

In addition to this book, the documents listed below are part of the documentation set. Within the continental United States, these documents can be ordered from the Lucent Technologies GBCS Publications Fulfillment Center by calling 1 800 457-1235.

Document No.	Title
	System Documents
555-650-110	<i>Feature Reference</i>
555-650-111	<i>System Programming</i>
555-650-112	<i>System Planning</i>
555-650-113	<i>System Planning Forms</i>
555-650-116	<i>Pocket Reference</i>
555-650-118	<i>System Manager's Guide</i>
	Telephone User Support
555-650-122	<i>MLX-5DTM, MLX-10DTM, MLX-10DPTM, MLX-28DTM, and MLX-20LTM Display Telephones User's Guide</i>
555-630-150	<i>MLX- 5D, MLX-10D and MLX-10DP Display Telephone Tray Cards (5 cards)</i>
555-630-153	<i>MLX-28D and MLX-20L Telephone Tray Cards (5 cards)</i>
555-650-124	<i>MLX-10TM Nondisplay Telephone User's Guide</i>
555-630-151	<i>MLX-5TM and MLX-10 Nondisplay Telephone Tray Cards (6 cards)</i>
555-630-155	<i>MLX-16DP Display Telephone Tray Cards (5 cards)</i>
555-650-120	<i>Analog Multiline Telephones User's Guide</i>
555-650-126	<i>Single-Line Telephones User's Guide</i>
555-650-138	<i>MDC 9000 and MDW 9000 Telephones User's Guide</i>

Document No.	Title
	System Operator Support
555-640-134	MLX Direct-Line Consoles Operator's Guide
555-640-132	Analog Direct-Line Consoles Operator's Guide
555-650-136	MLX Queued Call Console Operator's Guide
	Miscellaneous User Support
555-650-130	<i>Calling Group Supervisor's Guide</i>
555-650-105	<i>Data and Video Reference</i>
555-650-136	MLX Queued Call Console Operator's Guide
	Documentation for Qualified Technicians
555-650-140	<i>Installation, Programming & Maintenance (IP&M) Binder [consists of Installation, System Programming & Maintenance (SPM), Maintenance & Troubleshooting]</i>
	Toll Fraud Security
555-025-600	<i>BCS Products Security Handbook</i>

How to Comment on This Document

We welcome your comments, both positive and negative. Please use the feedback form on the next page to let us know how we can continue to serve you. If the feedback form is missing, write directly to:

Documentation Manager
Lucent Technologies
211 Mount Airy Road
Room 2W226
Basking Ridge, NJ 07920

Introduction

1

Installation of the MERLIN LEGEND Communications System involves the following:

- Installing the control unit
- Installing the telephones
- Connecting system wiring
- Installing optional equipment

This chapter provides an overview of the installation process, which varies from customer to customer.

Installation Sequence

The following is a list of the components that the system can include and shows the order in which you should install them. When installing your customer's system, try to adhere to this order as much as possible:

1. Install the control unit (required).
2. Connect power accessories to the control unit (optional).
3. Install the telephones (required) and adjuncts (optional).
4. Connect the telephones to the control unit (required).

5. Connect the control unit to the network interface (required).
6. Connect the channel service unit (CSU) to the 100D module on the control unit (required only with the 100D module).
7. Connect the printer and PC to the control unit (optional).
8. Connect data equipment to the control unit (optional).
9. Initialize and test the system (required).
10. Install the control unit housing (required).
11. Install applications (optional).

A list of required tools and equipment is given before each installation procedure.

System Forms

Some of the installation procedures in this guide refer to system forms. These forms indicate information that is specific to your customer's system. The forms you need should be included with the system programming disk or memory card, which contains all of the programming specifically for your customer's system.

If you are upgrading an existing system and do not have the required forms for your customer's system, you can load System Programming and Maintenance (SPM) and print out the required forms.

If you find that you do not have a completed set of system forms for your customer's system, contact your technical support organization or the Customer Service Center (CSC). See the inside front cover for telephone numbers.

The system forms that you need are specific for each system, and include some or all of those described in the following sections.

Installing the Control Unit

- **Form 1, System Planning.** Some procedures in [Chapter 2, "Installing the Control Unit"](#), refer to the Control Unit Diagram, which is printed on the reverse side of this form.
- **Form 3c, Incoming Trunks: Tie.** If you install a 400EM module in the control unit, use this form to determine the appropriate switch settings prior to installation.

Installing Telephones (Required) and Adjuncts (Optional)

The following forms indicate the telephones and adjuncts that you must install:

- Form 2a, System Numbering: Extension Jacks
- Form 2b, System Numbering: Digital Adjuncts
- Form 4b, Analog Multiline Telephone
- Form 4d, MLX Telephone
- Form 4e, MFM Adjunct: MLX Telephone
- Form 4f, Tip/Ring Equipment
- Form 5a, Direct-Line Console (DLC): Analog
- Form 5b, Direct-Line Console (DLC): Digital
- Form 5c, MFM Adjunct: DLC
- Form 5d, Queued Call Console (QCC)

Connecting the Network Interface

The following forms indicate the trunks that you must connect to the control unit. Information regarding the channel service unit (CSU) is included on these forms.

- Form 2c, System Numbering: Line/Trunk Jacks
- Form 3a, Incoming Trunks: Remote Access
- Form 3b, Incoming Trunks: DS1 Connectivity (100D Module)
- Form 3d, Incoming Trunks: DID

Connecting Data Equipment

The following forms indicate the data equipment you will need to set up data stations.

- Data Form 1a, Modem Data Station
- Data Form1b, 7500B Data Station
- Data Form 2, Data Hunt Groups

Programming the System

If you have a system programming disk created with SPM or a Translation memory card, you do not need to program the system. Instead, you can use the disk or memory card to restore the system; see [Chapter 7, "Initializing and Testing the System"](#), for instructions. If you did not receive a disk or a memory card and it is your responsibility to program the system, see *System Programming* for instructions.

Upgrading the System

If you are upgrading to Release 5.0 from Release 4.2, 4.1, 3.1, 3.0, 2.1, 2.0, 1.0, 1.1, or from the MERLIN® II Communications System, refer to [Chapter 9, “Upgrading the System”](#), then [Chapter 7, “Initializing and Testing the System”](#), for upgrade instructions.



NOTE:

You cannot retain the programming from the MERLIN II Communications System. You must first upgrade the hardware, then reprogram the system.

Installing the Control Unit

2

If you have not read [Chapter 1, "Introduction"](#), do so before continuing with this chapter.

Overview

Installing the control unit involves the following procedures:

- Preparation requirements
- Installing the backboard
- Meeting the power and grounding requirements
- Checking the total unit load
- Installing the basic carrier
- Installing any expansion carriers
- Installing the power supply
- Installing the processor
- Installing the line/trunk and extension modules
- Connecting the control unit to AC power
- Powering up the system
- Powering down the system

The following sections provide detailed instructions for these installation procedures. Follow the procedures in the order in which they are presented.

Environment

The control unit must be installed on a backboard. The placement of the backboard, and the control unit on it, requires careful consideration. Make sure you install the backboard in an area that meets all of the environmental requirements listed in [Table 2-1](#).

Table 2-1. Environmental Requirements

Operating Temperatures	40°–104°F (4°–40°C) Optimal temperature: 60°F (15.6°C)
Humidity	20%–80%
Airborne Contamination	Do not expose the control unit to moisture, corrosive gases, dust, chemicals, spray paint, or similar material.
Ventilation	Allow at least 1 in. (2.54 cm) on the right and left sides of the control unit and at least 12 in. (30.48 cm) above and below it to prevent overheating. Do not place the control unit near extreme heat sources (for example: furnaces, heaters, attics, or direct sunlight).
Electrical Fields	Do not expose the control unit to devices that generate electrical currents causing interference (such as arc welders or motors).
Heat Dissipation	Basic carrier: 500 Btu/hr Basic carrier: with one expansion carrier 1000 Btu/hr Basic carrier: with two expansion carriers 1500 Btu/hr

WARNING:

Do not install the control unit outdoors.

Electrical Noise/Radio-Frequency Interference

In most cases, electrical noise is introduced into the system through trunk or telephone cables. However, electromagnetic fields near the control unit can also cause noise in the system. Therefore, you should *not* place the control unit and cable runs in areas where a high electromagnetic field strength exists.

Radio transmitters (AM and FM), television stations, induction heaters, motors (with commutators) of 0.25 horsepower (200 watts) or greater, and similar equipment are leading causes of radio-frequency interference (RFI). Small tools with universal motors are generally not a problem when they operate on separate power lines. Motors without commutators generally do not cause interference.

Field strengths below 1.0 volt per meter are unlikely to cause interference. To estimate the field strength produced by radio transmitters, divide the square root ($\sqrt{}$) of the emitted power, in kilowatts, ($\div$) by the distance from the antenna in kilometers which equals ($=$) the field strength in volts per meter.

Example: $\sqrt{49,000 \text{ kw}} = 7,000 \div 10 \text{ km (6.2 miles)} = 0.7 \text{ volts per meter}$

This yields the approximate field strength in volts per meter and is relatively accurate for distances greater than about half a wavelength (492 ft., or 150 m, for a frequency of 1000 Hz). If the result exceeds 1.0 volt per meter, you may have to install shielded cables and/or Z200A filters. See Appendix A, "Customer Support Information," following *Maintenance and Troubleshooting*, for FCC Part 15 radio frequency regulations.

Control Unit Requirements

■ Dimensions

- Basic carrier: 14 in. wide by 23 in. high by 12 in. deep
- Basic carrier and one expansion carrier: 25 in. wide by 23 in. high by 12 in. deep
- Basic carrier and two expansion carriers: 37 in. wide by 23 in. high by 12 in. deep

■ Location

- Within 5 ft. (152 cm) of an AC power outlet that is *not* switch-controlled
- Within 25 ft. (762 cm) of the network interface, or use an Off-Premises Range Extender (OPRE)
- Within 1000 cable ft. (305 m) of telephones, or use an OPRE (for basic telephones)

CAUTION:

The AC outlet for the control unit cannot be switch-controlled. Plugging the control unit into such an outlet invites accidental disconnection of the system.

Hardware Preassembly Process

If an installation is to be preassembled, wired, programmed, and tested on the new lightweight plastic backboard, see [“Installing the Backboard”](#).

Backboard Requirements

The backboard should be wide enough to accommodate the carrier and up to two additional carriers, assuming that system growth is anticipated. There should be enough room on each side of the control unit for the necessary wiring fields.

To accommodate the maximum control unit size, make sure the backboard meets the following requirements:

- **Material**
 - ¾-inch plywood
 - Check with the local building code enforcement agency to see whether fire-retardant material is required.
 - Make sure that the material meets local building codes.
- **Dimensions**
 - With Systimax® wiring: 7 ft. wide by 4 ft. high
 - Without Systimax wiring: 6 ft. wide by 3 ft. high

Installing the Backboard

When you are certain that the backboard meets the requirements indicated above, or is the new lightweight plastic material backboard with preassembled equipment in place, attach the backboard to the wall.

Use the following mounting hardware:

- For a wood mounting surface, use wood screws.
- For brick, cinderblock, or concrete, use masonry anchors.
- For plaster or plasterboard, use toggle bolts.
- For sheet metal, use sheet-metal screws and attach them to the structural members.

 NOTE:

The mounting hardware should resist a combined pullout force of at least 650 pounds (295 kilograms).

AC Power and Grounding

Proper power and grounding are essential for the system to run correctly and safely.

 CAUTION:

If any of the following requirements are not met, the customer must contact a licensed electrician. Do not install the system until all requirements are met.

Verify that all of the following power and grounding requirements are met:

- The load center of appropriate current rating must be equipped with circuit breaker(s) labeled *120 V AC, 15 amps*.
- Each breaker must protect one dedicated quad AC outlet or two dedicated duplex AC outlets.
- All AC outlets must connect to the same load center and the ground wire must connect to the single-point ground bar on the first AC outlet (see [Figure 2-1](#)).
- One outlet must have an attached ground bar connected by a #6 AWG copper wire to an approved ground (see [“Approved Grounds”](#), later in this chapter, for a description of approved grounds). This ground bar is the system’s single-point ground (see [Figure 2-1](#)).
- To prevent someone from accidentally shutting off the power, *do not* connect the control unit to a switch-controlled outlet.
- The AC outlet should be within 5 ft. (152 cm) of the control unit.
- Each carrier requires one AC outlet receptacle.

- Auxiliary equipment requires additional AC outlets.
- If a printer or PC is installed on the system, it must be plugged into the same AC branch as the power supply of the basic carrier.
- If the printer or PC is 50 ft. (15 m) or more from the control unit, or is plugged into a different AC circuit, Asynchronous Data Units (ADUs) must be installed as well. [Chapter 5, "Installing the PC, CAT, or Printer"](#), includes complete installation instructions.
- The AC power requirements indicated in "AC Outlet Tests," on page 2-8, must be met.

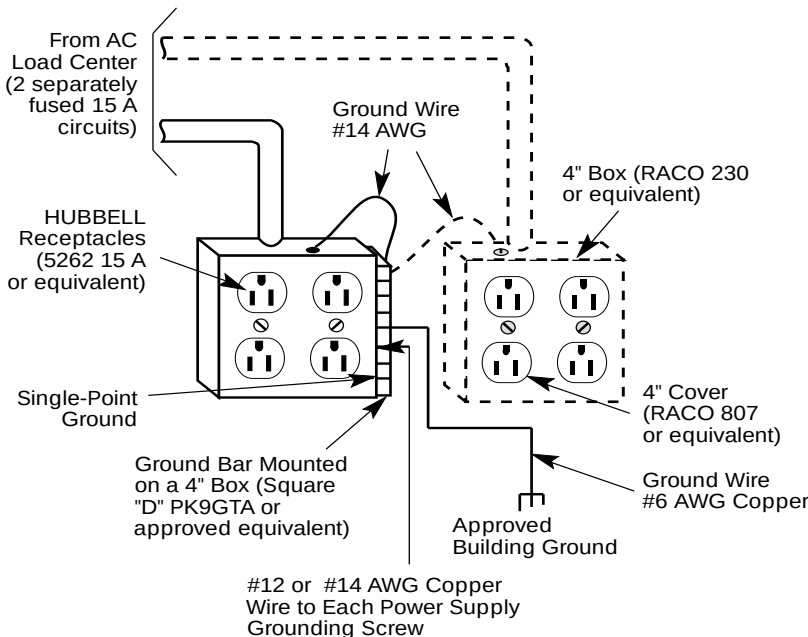


Figure 2-1. AC Grounding Requirements



CAUTION:

The AC outlet for the control unit cannot be switch-controlled. Plugging the control unit into such an outlet invites accidental disconnection of the system. The AC outlet must be properly wired as described in "AC Outlet Tests."

Table 2-2. AC Power Requirements

Parameter	Value
Nominal voltage	117 V AC
Voltage range	110–125 V AC
Frequency	60 Hz +/- 5%
Maximum current	3 amps per power supply
Power consumption	225 watts per power supply

AC Outlet Tests

If the AC outlet tests indicate that any of the power requirements in [Table 2-2](#) are not met, your customer must contact a licensed electrician. *Do not* install the system until all requirements are met.

If the AC outlet tests reveal any of the following conditions, they must be corrected before you install the system:

- Open ground
- Hot and neutral reversed
- Open hot

- Open neutral
- Hot and ground reversed

 WARNING:

Hazardous voltages are present during the following tests. Follow all instructions carefully when working with AC power line voltages.

Using an Ideal 61-035 Circuit Tester (or Equivalent)

- ▶ **1. Plug the circuit tester into the outlet that you want to test.**
If the circuit is properly grounded, the yellow and white lights on the tester turn on.
- ▶ **2. Unplug the circuit tester.**

Using a Volt-Ohm Milliammeter (VOM)

- ▶ **1. Set the VOM to the lowest scale on which you can read 130 V AC.**
- ▶ **2. Measure the AC outlet voltages. See [Figure 2-2](#).**
 - Phase to ground should be 110 to 125 V AC.
 - Neutral to ground should be less than 1 V AC.
 - Phase to neutral should be 110 to 125 V AC.

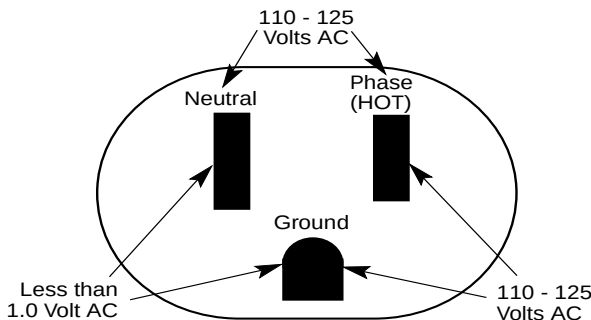


Figure 2-2. Measuring the AC Outlet Voltages



WARNING:

*If the voltage readings do not measure the values required, the AC outlet is improperly wired—**do not install the system**. Advise the customer to have a licensed electrician correct the problem.*

Grounding Requirements

Proper grounding of the installation site safeguards the system by protecting it from the following:

- Lightning
- Power surges
- Power crosses on central office trunks
- Electrostatic discharge (ESD)

When installing the control unit, make sure you meet the following grounding requirements:

- The control unit, the central office trunk protector, and the AC power service panel should be as close to each other as possible.
- Because equipment can be located throughout a building, the National Electrical Code requires that the ground point for the central office trunk protector be bonded to the AC power ground as shown in [Figure 2-3](#).
- The AC outlet and the single-point ground bar must be properly grounded as shown in [Figure 2-1](#) and [Figure 2-3](#).
- Each power supply in the control unit must be connected to the single-point ground bar by a #12 AWG or a #14 AWG solid copper wire. [Figure 2-1](#) and [Figure 2-3](#) show this connection.
- This wire run should be as short as possible, preferably within 5 ft. (152 cm), not to exceed 10 ft. (305 cm). See [“Approved Grounds”](#), later in this chapter, for more information.
- The AC outlet must be connected to the 147A protector with a #12 AWG or a #14 AWG solid copper wire.

Installing the Control Unit
AC Power and Grounding

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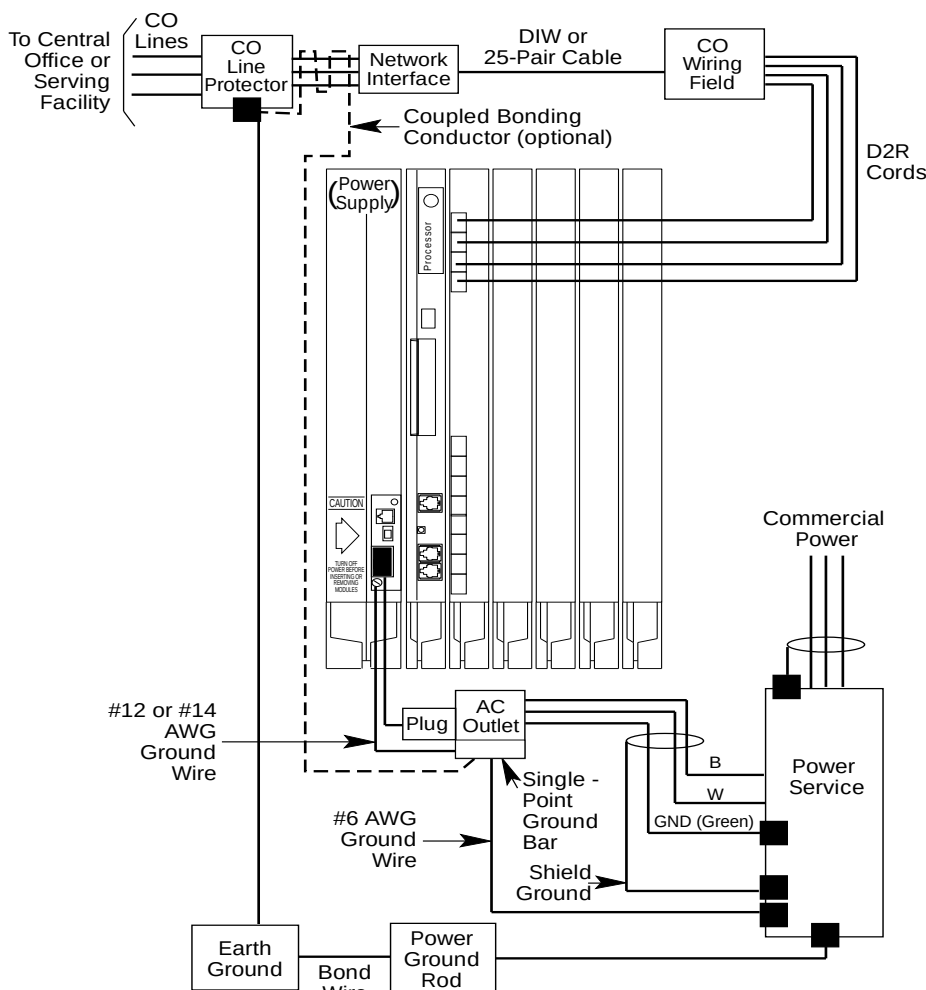


Figure 2-3. Central Office and AC Grounds



WARNING:

An improper ground can cause equipment failures, service outages, and electrical shock. Verify that the AC power uses an approved ground for its primary ground, that all voltage-limiting devices are grounded to an approved ground, and that the ground is one of the approved grounds listed below.

Approved Grounds

Approved grounds are listed below, in order of preference:

- **Building Steel.** The most preferred ground.
- **Acceptable Water Pipe.** Must be a metal, *not plastic or vinyl*, underground water pipe at least $\frac{1}{2}$ in. (1.27 cm) in diameter, and in direct contact with the earth for at least 10 ft. (3 m).

It must be electrically continuous so that the protector ground is uninterrupted. (Check for insulated joints, plastic pipe, and plastic water meters that might interrupt electrical continuity.)

A metallic underground water pipe must be supplemented by the metal frame of the building, a concrete-encased ground, or a ground ring. If these grounds are not available, the water pipe ground can be supplemented by one of the following types of grounds:

- Other local metal underground systems or structures, such as tanks and piping systems, *but not gas pipes*
- Rod and pipe electrodes, a $\frac{5}{8}$ -in. (1.58-cm) solid rod or $\frac{1}{4}$ -in. (0.63-cm) conduit or pipe electrode driven to a minimum depth of 8 ft. (244 cm)
- Plate electrode, a minimum of 2 square ft. (61 square cm) of metallic surface exposed to the exterior soil

- **Concrete-Encased Ground.** Must be an electrode, consisting of one of the following:
 - At least 20 ft. (6.1 m) of one or more steel reinforcing rods, each at least ½ in. (1.27 cm) in diameter
 - 20 ft. (6.1 m) of bare copper conductor not smaller than #4 AWG, encased in 2 in. (5 cm) of concrete
 - This electrode must be located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth
 - Ground ring, consisting of at least 20 ft. (6.1 m) of bare copper conductor (not smaller than #2 AWG) encircling the building. The ground ring must be in direct contact with the earth and buried at least 2.5 ft. (77 cm) below the earth's surface.

 WARNING:

Do not use a metal underground gas piping system—this is a safety risk.

Central Office Trunk Protection

The local telephone company is responsible for providing the following protection of central office (CO) trunks at the entrance to the site:

- Carbon blocks or gas discharge tubes connected to an approved ground
- Adequate bonding of the central office trunk protector ground and the power company ground

 CAUTION:

*Check these requirements with a simple, visual inspection. If you cannot verify that the central office grounding requirements are met, contact the central office. **Do not** connect the control unit to the central office trunks until you are certain that these requirements are met.*

Heavy Lightning Protection

For most surges, adequate protection is provided by meeting the previously listed requirements. Additional protection is required when the customer is located in a heavy lightning area.

Connect a 147A protector to the system to limit surges from the AC lines and up to four CO trunks.

For systems with more than four CO trunks, do the following:

- Connect a 146A protector to the 147A protector, providing protection for an additional four trunks.
- Connect up to three (maximum) 146A protectors to a 147A protector, allowing a maximum of 16 trunks on one 147A protector.
- For more than 16 trunks, add another 147A protector and continue adding 146A protectors as needed. See [Table 2-3](#) for various configurations and [Figure 2-4](#) for a typical 147A protector installation.

Table 2-3. Heavy Lightning Protection

Number of CO Trunks	Required Protectors
1–4	147A
5–8	147A and one 146A
9–12	147A and two 146As
13–16	147A and three 146As
17–20	Second 147A
21–24	Second 147A and one 146A

NOTE:

When you use the second 147A, you can connect the 146As in any combination, up to a maximum of three 146As per 147A.

For detailed installation instructions, see the documentation packaged with the protectors.

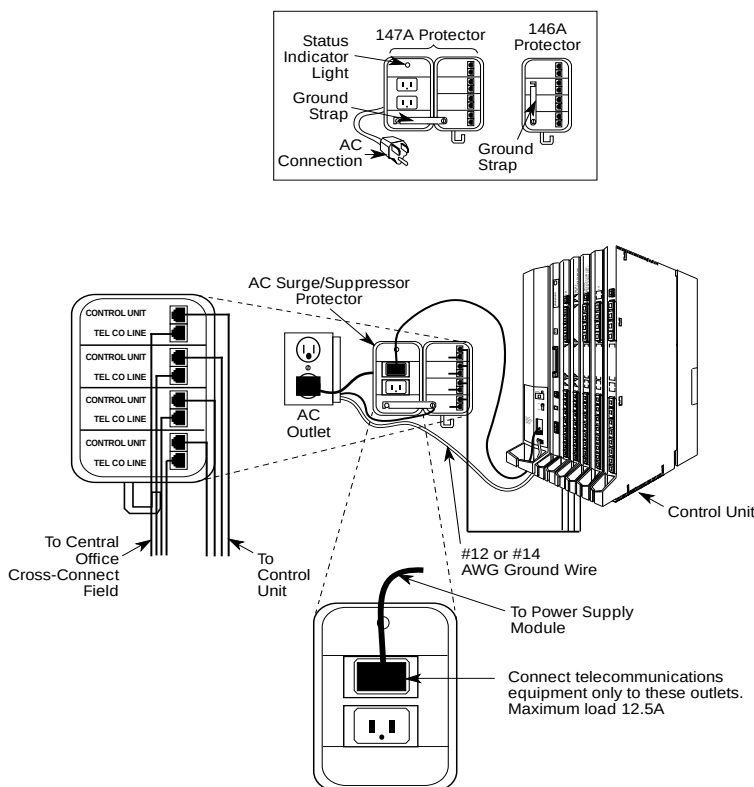


Figure 2-4. Installing 146A and 147A Protectors

Unit Loads

A unit load is a measure of power (1.9 watts) that you use to determine the electrical load that the components listed below place on the control unit's power supply.

- Telephones and adjuncts
- 800 DID modules

Only the telephones and adjuncts that connect to the analog and digital extension jacks (ports) on the control unit require unit load calculation. When calculating unit load, do not include any equipment with its own power supply.

Checking Unit Loads

In the event of maintenance or equipment changes, recalculate the unit loads for each carrier where there is a new configuration. Use the worksheet in [Appendix B, "Unit Load Calculation Worksheet"](#).

As a general rule, if you can distribute the 800 DID modules and telephone modules equally across the carriers, you prevent unnecessary drain on any one carrier. However, the rule varies depending on the system's mode. The next two sections provide the rules for calculating unit loads in various modes.

Unit Loads for Hybrid/PBX Mode

Older power supplies (models 391A1 or 391A2) generally support six modules of any type in Hybrid/PBX mode, without requiring an upgrade to a newer power supply (model 391A3). If the following conditions are true, however, the unit loads on a carrier can exceed the 54-unit maximum and, therefore, require a newer power supply (model 391A3):

- All six carrier slots are occupied by MLX telephone or analog multiline telephone modules.
- The carrier has a total of more than 45 MLX-20L telephones or 34-button analog multiline telephones installed.

Unit Loads for Key or Behind Switch Mode

In a Key or Behind Switch system with four or fewer modules, no calculation is needed. The older power supplies (models 391A1 or 391A2) generally support four modules of any type. With more than four modules, a newer power supply (model 391A3) may be needed.

Installing the Basic Carrier

Continue with this procedure only if you have met all of the requirements discussed earlier in this chapter.

NOTE:

When you mount the basic carrier onto the backboard, leave 29 in. (73.66 cm) of backboard to the right. This allows you to easily install and remove the control unit cover, and also allows enough room for system expansion to the right for a total length of up to three carriers.

To install the basic carrier, follow the steps below:

- ▶ 1. **Mark the screw-hole locations on the backboard, using the basic carrier or the template supplied with the plastic preassembled backboard as a guide. See [Figure 2-5](#).**
Make sure the carrier is level before marking the holes.
- ▶ 2. **Drill a pilot hole in the center of each of the four screw-hole marks.**
- ▶ 3. **Anchor the screws approximately halfway into the backboard.**
- ▶ 4. **Position the carrier on the screws and slide the carrier to the left.**
- ▶ 5. **Tighten the screws.**

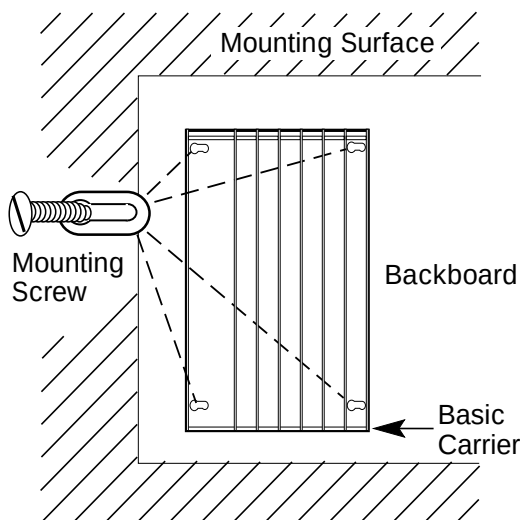


Figure 2-5. Marking the Basic Carrier Screw Holes

Installing the Power Supply



WARNING:

Do not attach any cables or power cords to the power supply until it is installed in the carrier.

Do not power up the control unit until all of the modules and power equipment are installed. Once they are installed, refer to [“Powering Up the System”](#), later in this chapter. Failure to comply with this procedure can result in shock hazard and/or damage to the equipment.

If you are upgrading an older system and a ring generator is specified in the system forms (Control Unit Diagram), install it in the power supply before putting the power supply in the carrier. The procedure is detailed in Maintenance and Troubleshooting.

For expansion carriers with older power supply modules only, a copper shield must be installed on the power supply before installing it in the carrier. The procedure is explained in [“Installing a Copper Shield”](#), later in this chapter.

Before touching leads, connectors, pins, and other components, use a properly grounded wrist strap, to prevent damage from electrostatic discharge (ESD).

Remove the protective cover from the gold-finger connector (on the back of the power supply) before inserting it into the carrier.

Installing the power supply can involve as many as four procedures, depending on the system configuration. The procedures are:

- Turning off all power to the control unit
- Installing a copper shield [for older power supply modules (391A1, 391A2, 391B1) only]
- Installing the ferrite cores

⇒ NOTE:

It is not necessary to install ring generators in a new system with new 012 (apparatus code 517G13 or later) or new 008 (apparatus code 517D28 or later letter) modules. If you are upgrading or using older modules, see *Maintenance and Troubleshooting*.

Turning Off the Power

- ▶ 1. Turn off *each* power supply.
- ▶ 2. Disconnect *all* power cords and auxiliary units.

Installing a Copper Shield

The added power supply in each expansion carrier can cause excessive noise in the module occupying the next slot. To eliminate this noise, a copper-foil shield is installed over the power supply. These shields and their labels are packaged in the power unit shielding kit included with the expansion carrier.

⇒ NOTE:

The 391A3 and 391B2 power supply modules do not require copper shielding. Perform this procedure for older power supply modules (391A1, 391A2, and 391B1) only.

To install a copper shield, follow the steps below. Refer to [Figure 2-6](#) throughout the procedure.

- ▶ 1. Make sure all power is off.
- ▶ 2. Place the power supply on a flat surface with the right side up (as viewed from the front edge).
- ▶ 3. Wipe the module free of any dust or dirt.
- ▶ 4. Peel the backing paper from the smaller copper-foil shield to expose the adhesive.

Check the positioning of the foil shields before sticking them to the side of the module. Once in place, the foil is difficult to remove.

- ▶ 5. Position the foil on the upper part of the module and work out any air bubbles as you press the foil firmly in place.
- ▶ 6. Peel the backing paper from the larger copper-foil shield to expose its adhesive.
- ▶ 7. Position the foil on the lower part of the module.
 - a. The shields *must* meet.
 - b. They should *not* overlap or have *any space* between them.

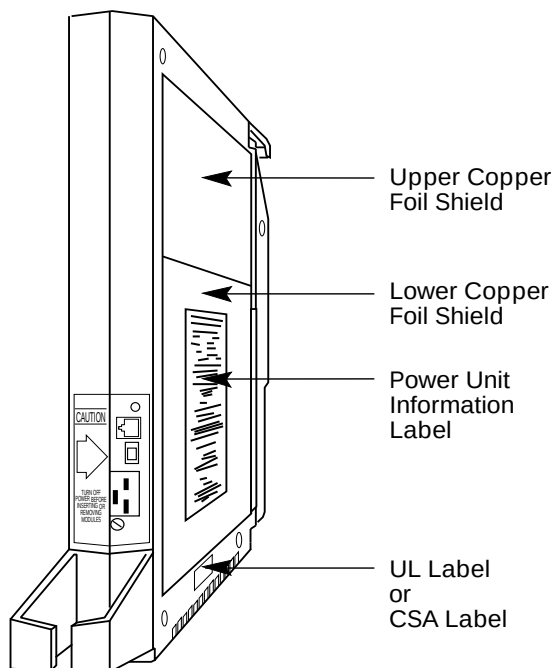


Figure 2-6. Installing a Copper Shield in the Power Supply

- ▶ 8. Tuck the foil shield tightly along the ledge (or crease) of the housing and work out any air bubbles as you press the foil firmly in place.
- ▶ 9. With the copper-foil shield in place, put the power unit information label on the lower piece of foil.
- ▶ 10. Attach the UL or CSA label on the power supply below the copper-foil shield.

Installing the Power Supply Module in the Carrier

- ▶ 1. Lower the power supply module hook onto the rod on top of the carrier.
- ▶ 2. Make sure the connector on the module mates properly with the connector on the carrier.
- ▶ 3. Push the module into the carrier until it locks into place.

Installing the Ferrite Cores

At this point, the power supply should have been installed in the carrier, but no cables or power cords should be attached to the power supply module.

NOTE:

If you are upgrading a system, unplug the AC power cord and remove the ground wire attached to the grounding screw on the front of the power supply.

Follow these steps to install the ferrite cores:

- ▶ 1. Feed the AC power and ground wire through the wire manager (refer to [Figure 2-7](#)).
- ▶ 2. Open the ferrite cores by unsnapping the plastic case.
- ▶ 3. Attach a ferrite core around the AC power cord and the ground wire by snapping the plastic case shut.
- ▶ 4. Attach the second ferrite core adjacent to the first ferrite core by repeating Steps 2 and 3.
- ▶ 5. Slide the ferrite cores between the wire manager and the power supply module (refer to [Figure 2-7](#)).
- ▶ 6. Attach the ground wire to the grounding screw on the power supply module.

- 7. Check that the other end of the ground wire is connected to the terminals of the single-point ground bar on the AC outlet box.



CAUTION:

Do not connect the power cord until the entire control unit is assembled.

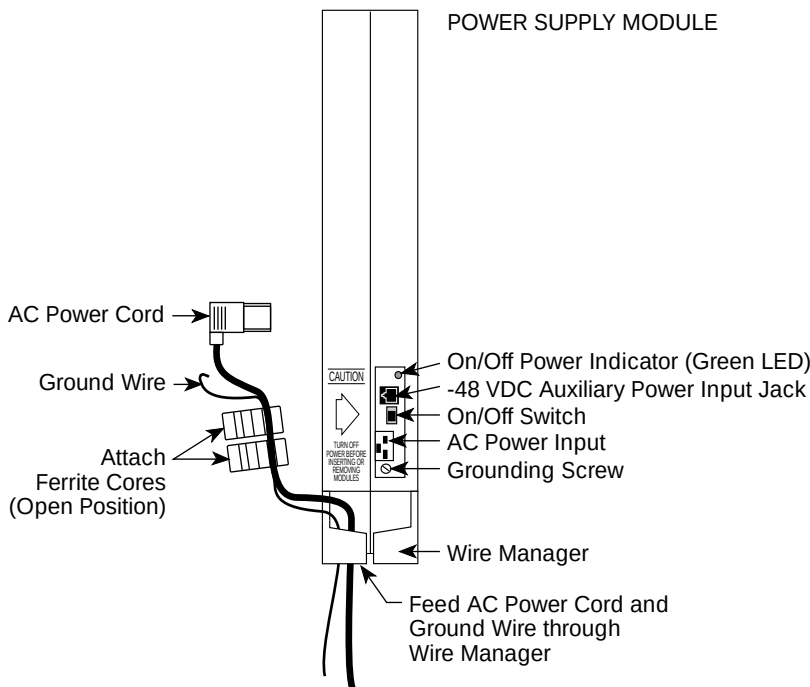


Figure 2-7. Installing the Ferrite Cores

Installing the Auxiliary Power Unit

The Control Unit Diagram on the back of Form 1, System Planning, indicates whether an auxiliary power unit is required for the carrier that you are installing.

NOTE:

Use the 9024 auxiliary power unit for new installations. You can continue to use a previously installed 335A auxiliary power unit, as long as no new telephones or modules are added to the carrier.

To install an auxiliary power unit, follow the steps below. Refer to [Figure 2-8](#) throughout this procedure.

- ▶ 1. Turn off the switch on the power supply.
- ▶ 2. Mount the auxiliary power unit on a surface (preferably the backboard) within 2 ft. (61 cm) of the control unit.
- ▶ 3. Plug the power unit line cord into the AUX POWER INPUT jack on the power supply.
- ▶ 4. Plug the other end of the line cord into the AUX POWER jack on the auxiliary power unit.

CAUTION:

Do not plug the power supply or the auxiliary power unit into the AC outlet until you are ready to turn on the system, as described in [“Powering Up the System”](#) later in this chapter.

If the system is backed up by an Uninterruptible Power Supply (UPS), connect the auxiliary power to the UPS.

Do not attach the power cord(s) to any building surfaces.

Use only the power unit line cord supplied with the auxiliary power

unit. An incorrect cord will damage the power supply and may damage modules.

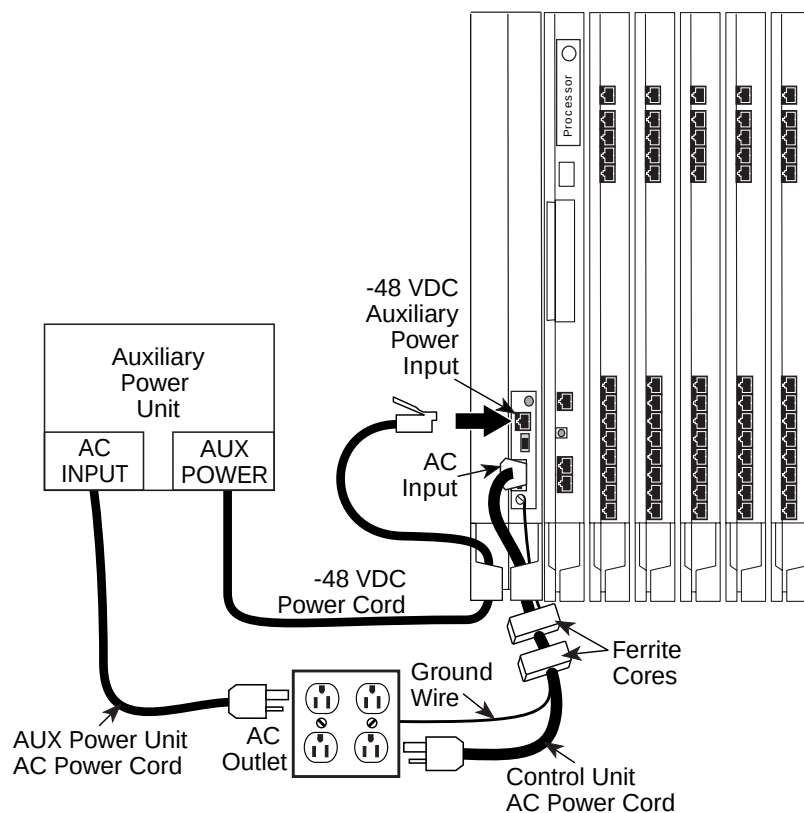


Figure 2-8. Installing an Auxiliary Power Unit

Installing Expansion Carriers

If you are adding an expansion carrier to an existing system, see [“Upgrading the Control Unit”](#) in [Chapter 9](#) before continuing.

If you are to install one or more expansion carriers, follow the steps below to mount each one. Refer to [Figure 2-9](#) and [Figure 2-5](#) throughout the procedure.

- ▶ 1. **Locate the breakaway plastic tab on the right side of the previously mounted carrier. Using a flat-blade screwdriver, gently pry the tab open to expose the card extender.**
- ▶ 2. **Align the connector of the expansion carrier with the card extender on the previously mounted carrier and slide the connector onto the extender.**
- ▶ 3. **Mark the screw-hole locations on the backboard, using the expansion carrier or the template that comes with the preassembled plastic backboard as a guide.**

Make sure the carrier is level before marking the holes.

- ▶ 4. **Disconnect the expansion carrier connector from the previously mounted carrier and put the expansion carrier aside.**
- ▶ 5. **Drill a pilot hole in the center of each of the four screw-hole marks.**
- ▶ 6. **Anchor the screws approximately halfway into the backboard.**
- ▶ 7. **If housing clips are to be installed on the housing and this is the last carrier in the control unit, place the housing clips around the right-hand molding for the screws on the back of the carrier.**

If not, go to Step 8.

- ▶ 8. **Position the expansion carrier on the screws and slide it to the left, to reconnect the expansion carrier card extender to the previous carrier's connector.**
- ▶ 9. **Make sure the connection is secure.**
- ▶ 10. **Make sure the carrier is level and the housing clips extend as far as possible from the right side of the carrier.**
- ▶ 11. **Tighten the screws.**

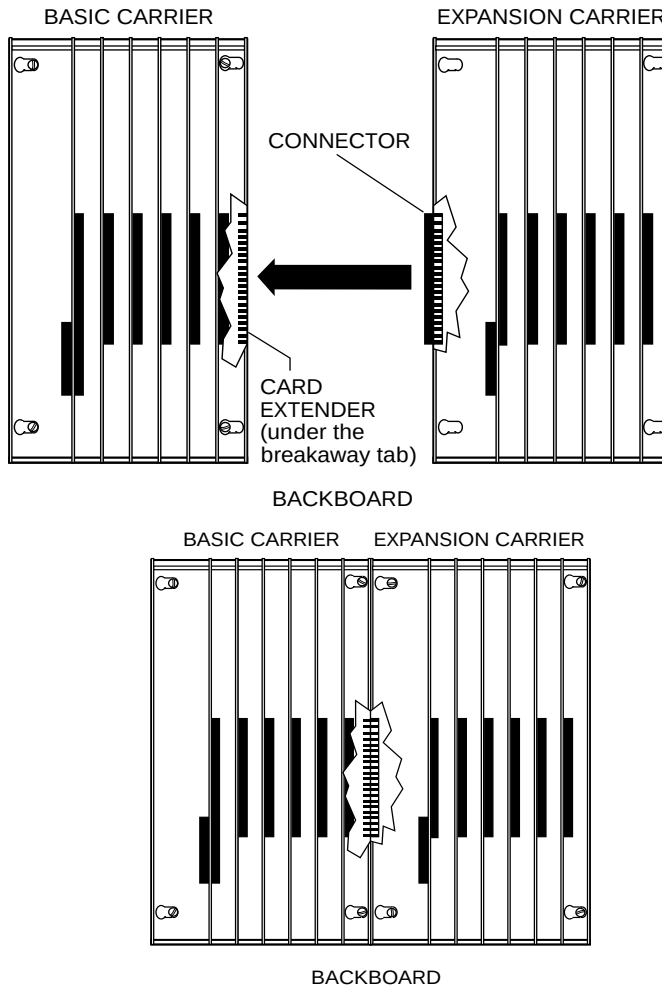


Figure 2-9. Connecting the Carriers

Installing the Processor

Installing the processor includes the following procedures:

- If *both* of the following conditions are true, follow the procedures in [Chapter 9, “Modifying the Processor for Key Mode”](#).
 - Form 1, System Planning, indicates Permanent Key mode.
 - Form 2c, System Numbering: Line/Trunk Jacks, indicates no GS (ground-start) trunks in the Incoming Trunk Type column.
- Insert the processor into the carrier as indicated in [“Installing the Processor in the Carrier”](#), later in this chapter.



NOTE:

If the system is programmed for Permanent Key mode, check the switch setting. Refer to [Chapter 9, “Modifying the Processor for Key Mode”](#) for detailed procedures. If the switch is set to Permanent Key-only operation, all trunks revert to loop-start. If the switch is not set, any programmed designation for ground-start trunks is retained.

The ground-start pool never has trunks assigned to it automatically, but must be programmed after the ground-start ports are designated. Ground-start trunks are assigned to the ground-start pool on initialization, except in a system switched for Permanent Key mode operation. (In Release 1.0, ground-start and loop-start trunks automatically defaulted to loop-start.)

Beginning with Release 3.0, the feature module required for Release 2.1 and earlier is no longer needed. The Release 3.0 processor module contains a PCMCIA memory card interface capable of accommodating a 4-MB memory card. This card is used to install or upgrade system software and perform firmware upgrades on circuit modules. It can be used to back up and restore system programming.

 CAUTION:

Before touching leads, connectors, pins, and other components when handling the circuit board, use a properly grounded wrist strap to prevent damage from electrostatic discharge (ESD).

Installing the Processor in the Carrier

To install the processor in the carrier, follow the steps below. Refer to [Figure 2-10](#).

- ▶ **1. Remove the protective cover from the gold-finger connector on the back of the processor.**
- ▶ **2. Lower the hook on top of the processor module onto the rod on top of the carrier in Slot 0, the first slot next to the power supply.**
- ▶ **3. Make sure that the connector on the module mates properly with the connector on the carrier as you swing the processor down into place.**

 CAUTION:

To avoid damage, do not force the module. If the module does not insert easily, press the bottom rear locking tab, remove the module, and inspect the module and carrier for damage or obstruction. The bottom-rear locking tab is shown in [Figure 2-10](#). This tab is used on all modules.

If there is no damage and no obstruction, reinsert the module.

A damaged carrier or module must be replaced.

- ▶ **4. Push firmly until the processor snaps into place.**
The processor should be securely attached to the carrier and locked in place by the locking tab on the bottom rear of the processor.

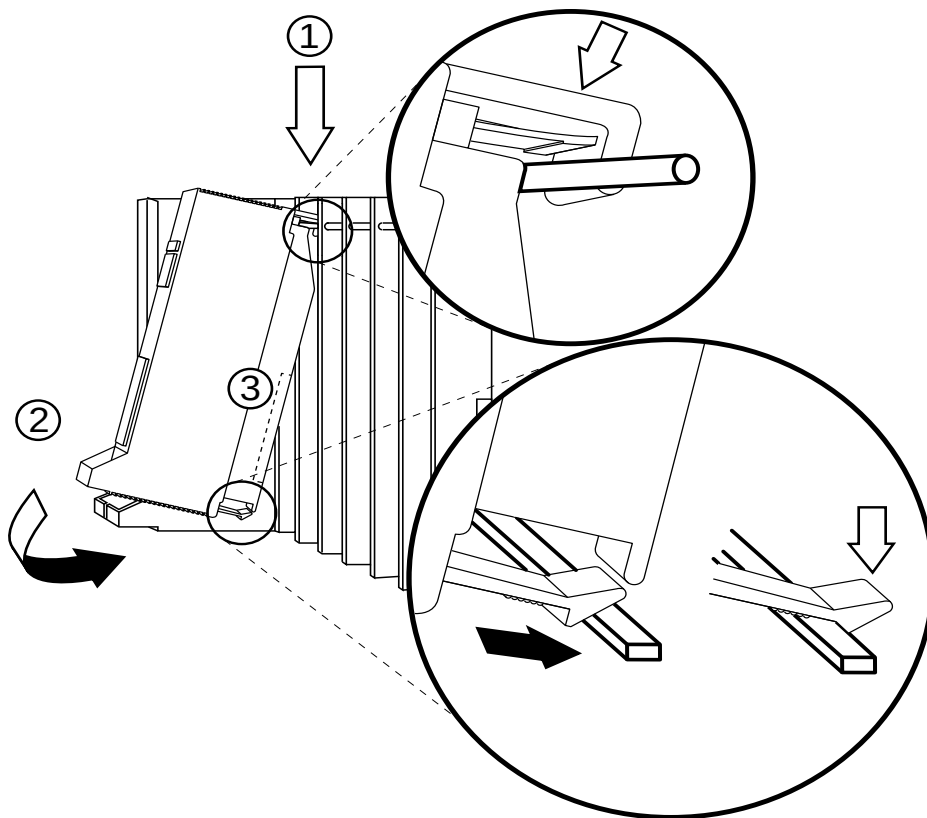


Figure 2-10. Installing the Processor into the Carrier

Installing the Modules

CAUTION:

When installing the modules, use a properly grounded wrist strap to prevent damage from electrostatic discharge (ESD) , and avoid touching leads, connectors pins, and other components.

Guidelines

Follow these guidelines when you install modules, as indicated on the Control Unit Diagram of Form 1, System Planning:

- Do not leave empty slots between modules. The system ignores modules installed beyond any empty slot.
- If a phantom module (a programmed empty slot) is indicated on the Control Unit Diagram, make sure the slot remains empty and do not install any modules to the right of it. The system ignores any modules installed to the right of a programmed empty slot.
- Make sure you install each module in its assigned slot. If you install a module in the wrong slot, the system will not function properly.
- Be sure to place all 012 modules and all 008 OPT modules without built-in ring generators in carriers with modules that have ring generators so that the modules without ring generators can be supported.



NOTE:

All 016 modules and some 012 modules (apparatus code 517G13 or later) have built-in ring generators.

- Once you have installed the power supply and the processor in the basic carrier, use the remaining slots for the modules as follows:
 - Basic carrier: slots 1 through 5
 - First expansion carrier: slots 6 through 11
 - Second expansion carrier: slots 12 through 17

Installing Modules

To install modules starting from slot 1 (the first open slot next to the processor), follow the steps below:

- ▶ 1. For each 400EM tie line/trunk module, for jacks numbered 1 through 4 in [Figure 2-11](#), check Form 3c, Incoming Trunks: Tie, for E&M signaling type.

Set the dual in-line packaging (DIP) switches on the front of the 400EM Tie Trunk module according to the E&M signaling type settings listed in [Table 2-4](#) and [Table 2-5](#) and shown in [Figure 2-11](#). The default E&M signal does not require any adjustments in the DIP switches.

- ▶ 2. Remove the protective cover from each module's gold-finger connector.
- ▶ 3. Lower the hook on top of the module onto the rod on the top of the carrier in the appropriate slot. See [Figure 2-10](#).
- ▶ 4. Make sure the connector on the module mates properly with the connector on the carrier.
- ▶ 5. Swing the module into the slot and firmly push the module into the carrier until it locks into place.



CAUTION:

To avoid damage, do not force the module. If the module does not insert easily, press the bottom rear locking tab, remove the module, and inspect the module and carrier for damage or obstruction.

If there is no damage and no obstruction, reinsert the module. A damaged carrier or module must be replaced.

- ▶ 6. Repeat Steps 1 through 5 for each module you want to install.

Tie Trunks

Tie trunks connect two separate PBX communications systems either directly or through one or more central offices, as if they were one system at the same location. In the MERLIN LEGEND Communications System, the 400EM module is the originating and terminating unit for tie trunk operation.

Tie Trunk Signaling

The 400EM (tie trunk) module can transmit signals in three different formats. Each format is made up of a specific signaling mode and a specific signaling type. The DIP switches on the 400EM module allow you to select the signaling mode for tie trunk transmission. The signaling type is selected through system programming.

Signaling Modes

There are two signaling modes:

- **E&M.** This is a standard interface. The E&M signaling leads are separate from the transmission leads, requiring a 3-pair wire interface.
- **Simplex.** In Simplex, the two signaling leads are superimposed onto the analog transmission leads, providing a 2-pair wire interface for connecting two local systems at minimal cost.

Protected or Unprotected

Depending on the type of tie trunk installation, protective resistance may be installed to protect the circuit from outside interference from high-voltage transients or voltage fluctuations. In Simplex mode, the circuit always requires protective resistance. The E&M mode can be either protected or unprotected, depending upon the location of the distant PBX.

Signaling Types

Three different signaling types combine with the signaling modes. Together, these create the proper signaling format for each system. Signaling types in each mode are as follows:

■ E&M Mode

- **Type 1 Standard** (default factory setting). This setting is used to connect two systems through local telephone company facilities.
- **Type 1 Compatible**. This setting connects two systems directly (without using local telephone company facilities).

■ Simplex Mode

- —**Type 5**. This setting is used on 4-wire (2-pair) circuits.

400EM (Tie Trunk) Module DIP Switches

During installation of 400EM (Tie Trunk) modules, refer to [Table 2-4](#) and [Table 2-5](#), and to [Figure 2-11](#) for the correct DIP switch settings for varying signaling protocols.

Table 2-4. Setting the 400EM (Tie Trunk) Module DIP Switches

Ports (as numbered in Figure 2-11)		DIP Switch Position	Signaling Type		
			1S (Default) and 1C Unprotected E&M Mode	1C and 1S Protected E&M Mode	5 Simplex Mode
2	4	1	ON	OFF	OFF or ON
		2	ON	OFF	OFF or ON
		3	OFF	OFF	ON
		4	OFF	OFF	ON
		5	OFF	OFF	ON
1	3	6	ON	OFF	OFF or ON
		7	ON	OFF	OFF or ON
		8	OFF	OFF	ON
		9	OFF	OFF	ON
		10	OFF	OFF	ON

 NOTE:

DIP switches 1, 2, 6, and 7 determine whether the tie trunks are protected or unprotected. DIP switches 3, 4, 5, 8, 9, and 10 determine the mode. Simplex mode is *always* protected. Therefore the Protected/Unprotected settings for DIP switches 1, 2, 6, and 7 have no effect.

The successful implementation of a tie trunk format is dependent upon matching the characteristics of both PBX systems it connects. The preferred signaling formats for a tie trunk originating in the system are shown in [Table 2-5](#) below.

Table 2-5. Signaling Formats for the 400EM (Tie Trunk) Module

Installation Situation		Preferred Signaling Format			
From System		System		Distant Location	
To	Distant Location	Signaling Mode/Type	Protected or Unprotected	Signaling Mode/Type	Protected or Unprotected
MERLIN II	Same site co-located	Type 5 Simplex	N/A	Type 5 Simplex	N/A
System 25/75/85 or DEFINITY	Same site co-located	Type 5 Simplex	N/A	Type 5 Simplex	N/A
System 25/75/85 or DEFINITY	Inter-office	Type 5 Simplex	N/A	Type 5 Simplex	N/A
Dimension PBX	Same site co-located	E&M Type 1C (Compatible)	Unprotected	E&M Type 1S (Standard)	Unprotected
Dimension PBX	Inter-office	E&M Type 1C (Compatible)	Protected	E&M Type 1S (Standard)	Protected
Other Systems	Same site co-located	E&M Type 1C (Compatible)	Unprotected	E&M Type 1S (Standard)	Unprotected
Other Systems	Inter-office	E&M Type 1C (Compatible)	Unprotected	E&M Type 1S (Standard)	Requires a protection unit
MERLIN LEGEND	Same site co-located or inter-office	Type 5 Simplex	N/A	Type 5 Simplex	N/A

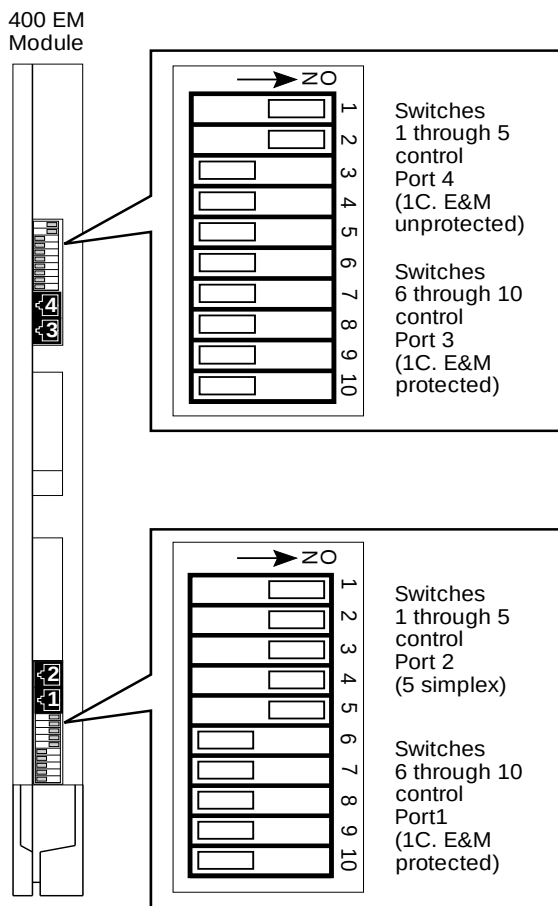


Figure 2-11. 400EM Module Sample Dip Switch Settings for Signaling Types 1C and 5

Labeling

- ▶ 1. After all modules have been installed, label all jacks using the numbered labels provided with the feature module.
 - Line/trunk labels have green numbers on off-white background.
 - Telephone labels have blue numbers on off-white background.

See [Figure 2-12](#) for the locations of line/trunk jacks and telephone jacks on each module, and label them as described next.

- ▶ 2. Label each line/trunk jack on the modules sequentially, 1 through 80. Begin with the module in slot 1, numbering from bottom to top on each module and working from left to right across the carrier(s).

The 100D module has 24 numbers assigned to the line/trunk jack.

- ▶ 3. Label each telephone jack sequentially, 1 through 144. Begin with the module in slot 1, numbering from bottom to top on each module and working from left to right across the carrier(s).



CAUTION:

The 008 OPT module is assigned 12 logical IDs, and the last four numbers are not assigned to jacks. For example, if the previous module (on the left) is labeled with logical IDs 1 through 8, label the 008 OPT jacks with logical IDs 9 through 16. Skip numbers 17 through 20. When you label the next module (on the right), label the first jack as logical ID 21.



Replacing a Module

CAUTION:

This section does not apply to the processor or power supply.

Although the system allows you to remove and replace modules without affecting call processing, partially inserting and removing a module can cause a cold start.

To add a 100D module or change any of its DS1 parameters, the system must be idle.

When you replace a module, use the same module type. For example, do not put a 008 MLX module in place of a 400 GS/LS/TTR module. If a module is replaced with another type of module, or if a module is added to the system without powering down the system first, a cold start (System Reset) occurs.

If you move any module to a different slot, be sure to renumber the modules by selecting Board Renumber from system programming. See System Programming for information about board renumbering.

NOTE:

You can remove and replace line/trunk and extension modules with the system power on, without affecting normal call processing.

To remove and replace a module, follow the steps below. Refer to [Figure 2-13](#).

- ▶ 1. **Busy-out or reset the module. (Busy-out is recommended.)**
- ▶ 2. **Label all cords (if they are not labeled already) and then unplug them from the module.**
For information about labeling trunk and extension cords, see [Chapter 3, "Installing Telephones and Adjuncts"](#), and [Chapter 4, "Connecting the Control Unit to the Network Interface"](#). For instructions on checking unlabeled wiring, see "Checking Unlabeled Wiring" in Chapter 3 of the *Main-tenance and Troubleshooting* guide.
- ▶ 3. **Run a demand test by entering the test mode.**
- ▶ 4. **Power down the system, if required. See ["Powering Down the System"](#), later in this chapter, for instructions.**
- ▶ 5. **Remove the module by pushing up firmly on the tab at the bottom rear of the module.**
- ▶ 6. **While holding up the tab, swing the bottom of the module towards you and away from the carrier.**
- ▶ 7. **Lift up the module to disengage it from the rod on the top of the carrier.**
- ▶ 8. **Inspect the module for visible damage.**
- ▶ 9. **Insert the new module. See [Figure 2-10](#).**
- ▶ 10. **Restore the module. Refer to [Chapter 7, "Initializing and Testing the System"](#), for instructions.**
- ▶ 11. **Connect the trunk and extension cords.**
- ▶ 12. **Attach a tag, error printout, and any information that will help identify any visible problems or failure symptoms.**

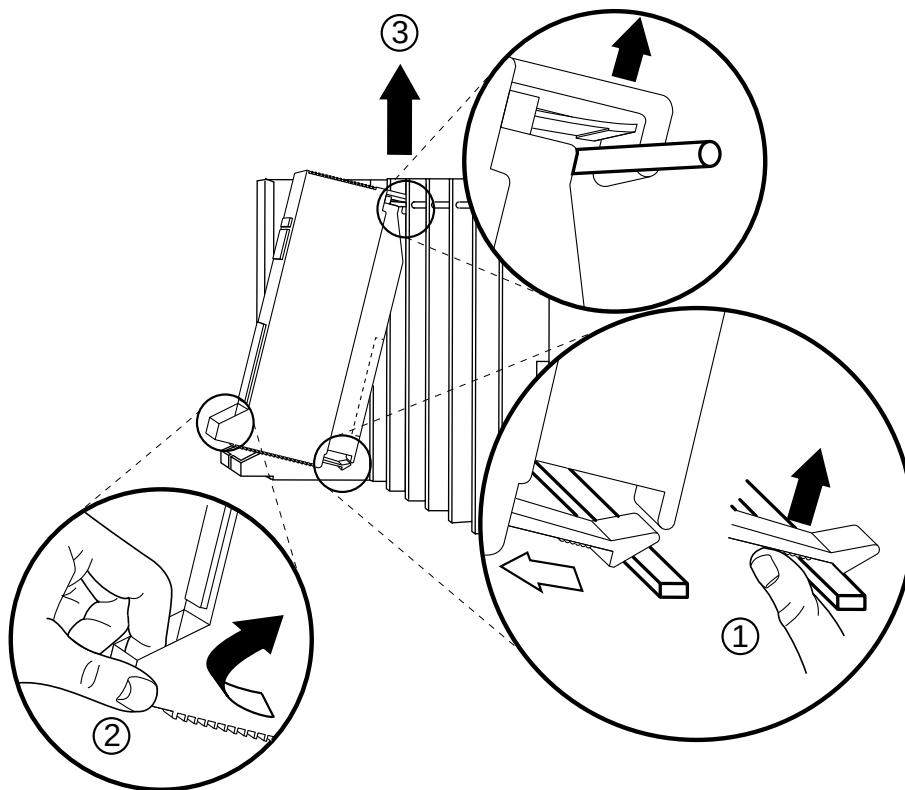


Figure 2-13. Removing Modules from the Carrier

Connecting the Control Unit to an AC Outlet



CAUTION:

Make sure the AC outlet has been tested for proper grounding. The outlet should be 117-V AC, 60-Hz, 3-wire (phase, neutral, ground). See [“AC Outlet Tests”](#), earlier in this chapter, for instructions.

To prevent someone from accidentally shutting off the power, do not connect the control unit to a switch-controlled outlet. The AC outlet should be within 5 ft. (152 cm) of the control unit.

To connect the control unit to a dedicated AC outlet, follow the steps below.

- ▶ 1. Turn the basic carrier's power supply switch to the OFF position.
- ▶ 2. Turn off the power supply switches on the expansion carriers.
- ▶ 3. Unplug the power cords from any auxiliary power units.
- ▶ 4. Plug one end of the power cord into the AC INPUT connector located just below the power switch on the front of the basic carrier's power supply.
- ▶ 5. Plug the other end of the power cord into the AC outlet, allowing at least 1 ft. (30.4 cm) of slack in the cord.
- ▶ 6. Repeat Steps 4 and 5 for each expansion carrier.



CAUTION:

Do not attach the power cord(s) to any building surfaces.

Powering Up the System

CAUTION:

Follow the procedure below to power up the system only if the system is completely installed. Failure to comply with this procedure can result in shock hazard or damage to the equipment.

- ▶ 1. **Turn on the power switch for each expansion carrier: start with the power supply in the *rightmost* carrier.**

The green power lights on each expansion carrier power supply should turn on.

- ▶ 2. **Turn on the power switch on the basic carrier power supply.**
 - The dot on the one-character display LED flashes.
 - The green light on the power supply should turn on.
 - The red light on the processor should turn on for 15 to 45 seconds and then turn off.
 - All indicators on the 100D and 400EM line/trunk modules (if present) should turn on and then off. They remain off when the modules are idle.
- ▶ 3. **If any of these conditions are not met, refer to *Maintenance and Troubleshooting*.**

Powering Down the System

You may need to power down the system for troubleshooting during installation, or to add new equipment to the carrier.



CAUTION:

Follow these steps in the exact sequence.

To power down the system, follow the steps below.

- ▶ **1. Turn off the power supply on the basic carrier.**
- ▶ **2. Turn off the power supplies on the expansion carriers.**
- ▶ **3. Unplug any auxiliary power units.**

Because the power supplies are already off, the sequence for removing auxiliary power cords is not important.

- ▶ **4. Unplug the system from the AC outlet.**

Installing Telephones and Adjuncts

3

The control unit supports the MLX-5, MLX-5D, MLX-10, MLX-10D, MLX-10DP, MLX-16DP, MLX-20L, and MLX-28D telephones, with or without Direct Station Selectors (DSSs), as well as analog multiline and single-line telephones. It also supports various adjuncts which may require Multi-Function Modules (MFMs) or other adapters for installation.

This chapter provides installation instructions for the following procedures:

- Installing Multi-Function Modules
- Installing adjuncts
- Installing Direct Station Selectors
- Assembling MLX telephones
- Connecting telephones to the control unit

To connect data equipment to the system, see [Chapter 6, “Connecting Data Equipment”](#). To connect the MERLIN PFC, see [Chapter 8, “Installing Applications”](#).

Installing Multi-Function Modules

The Multi-Function Module (MFM) is an optional adapter that provides a modular jack connection to MLX telephones for the two classes of adjuncts listed below:

- Tip/ring (T/R) devices such as single-line telephones, fax machines, modems, and credit card verification terminals. Once connected, the MLX telephone and adjunct work independently of each other. This means they can send and receive calls at the same time. The MFM is the only T/R adapter you can use with MLX telephones.
- Supplemental alerts such as bells, chimes, horns, and strobes. These alerts notify people in noisy areas of incoming calls.

Considerations

Review the following items before you begin the procedure.

- If you install an MFM, do so *before* you assemble the MLX telephone.
- You *must* connect the KS 22911 power supply to an electrical outlet within 50 ft. (15 m) of cord length of the MLX telephone.
- If you connect an MFM and two DSSs to a telephone, you *must* install a 406743419 power unit.
- If a wall jack is more than 7 ft. (213 cm) from an MLX telephone, you must use a longer D8W cord.
- The MFM uses one of the two channels when it is active. This means that when an adjunct, such as a fax machine, and the MLX telephone are in use at the same time, Voice Announce to Busy is not possible. (Voice Announce to Busy is a feature that allows users to be paged on the speakerphone even if they are on a call.)
- The MFM has two jumper blocks that are factory-set for T/R operation. The MFM is packaged with the following items, shown in [Figure 3-1](#):
 - KS22911 power supply
 - 400B or 400B2 adapter
 - D6AP cord

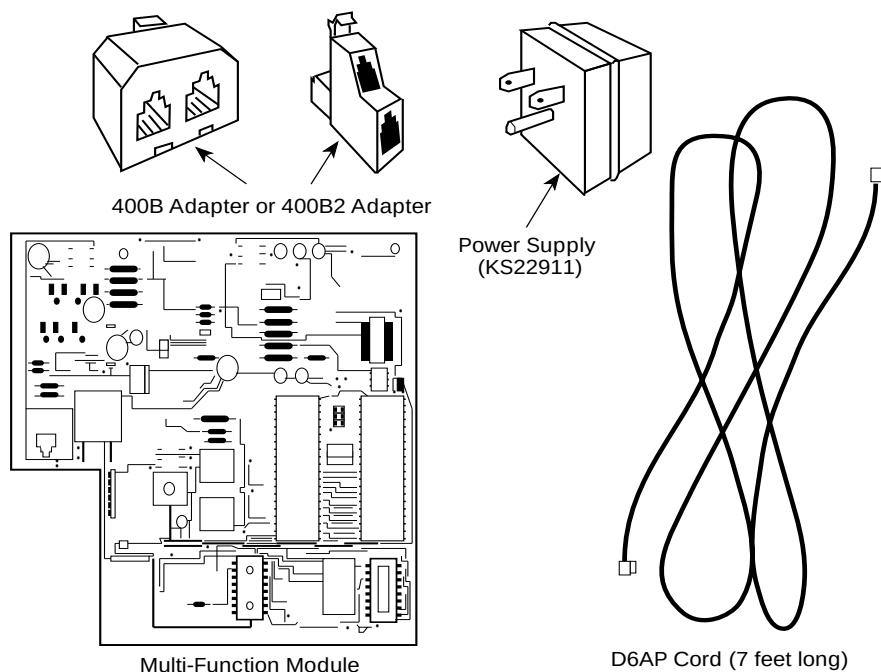


Figure 3-1. Multi-Function Module Packing List



RISK OF ELECTRICAL SHOCK: Follow all warnings and cautions.



WARNING:

Only a qualified technician should install, repair, or set options for an MFM.

Do not touch the circuitry on the MFM. Touching the circuitry may result in component damage from electrostatic discharge.

Before installing an MFM, disconnect all trunk and/or power cords that are attached to the MLX telephone. This is to ensure that no hazardous voltages are present during installation. Ringing voltage from the MFM attached to the MLX telephone can cause electrical shock if adjustments are made while the cords are connected.

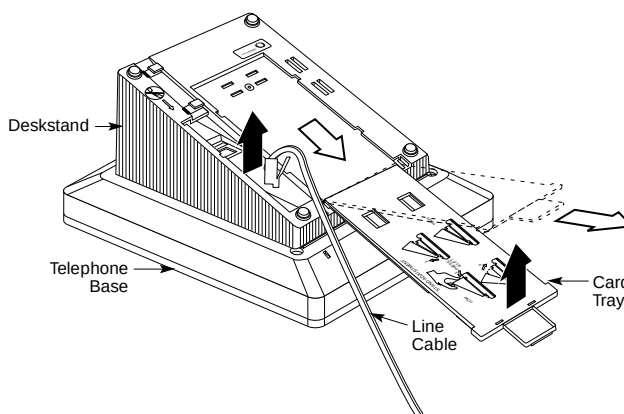


Figure 3-2. Removing the User Card Tray and Line Cable

To install or replace an MFM and change its pin settings, follow these steps.

NOTE:

If you are installing or replacing an MFM in a wall-mounted MLX-10, MLX-10D, or an MLX-10DP telephone, start at Step 3.

- ▶ 1. Place the telephone face down on a flat surface; remove the user card tray and line cable from the bottom of the deskstand. See [Figure 3-2](#).
-

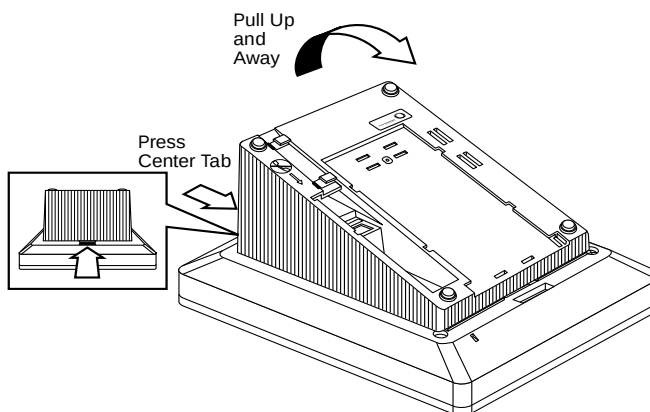


Figure 3-3. Releasing the Deskstand

- ▶ 2. Release and remove the deskstand from the telephone. See [Figure 3-3](#) and [Figure 3-4](#).
 - a. Press on the top rear center of the deskstand to release the tab.
 - b. Pull the deskstand up toward you and swing away from the telephone.

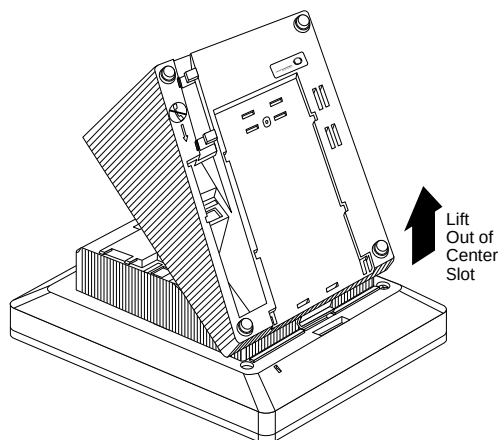


Figure 3-4. Removing the Deskstand

- c. Lift the deskstand out of the locating slot in the telephone base and place to one side.

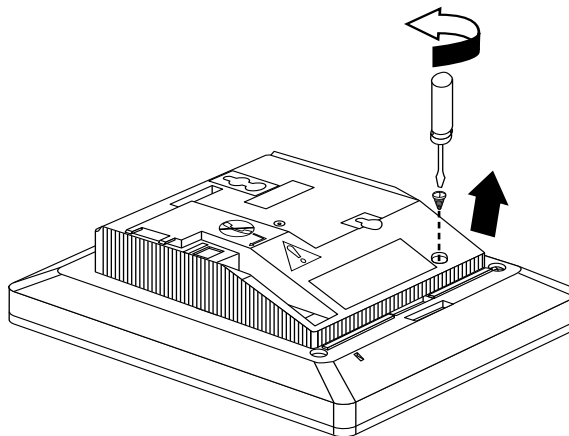


Figure 3-5. Releasing the Module Cover Screw

- ▶ 3. Release and remove the module cover. See [Figure 3-5](#), [Figure 3-6](#), and [Figure 3-7](#).
 - a. Use a screwdriver to remove the screw in the lower right-hand corner of the module cover.

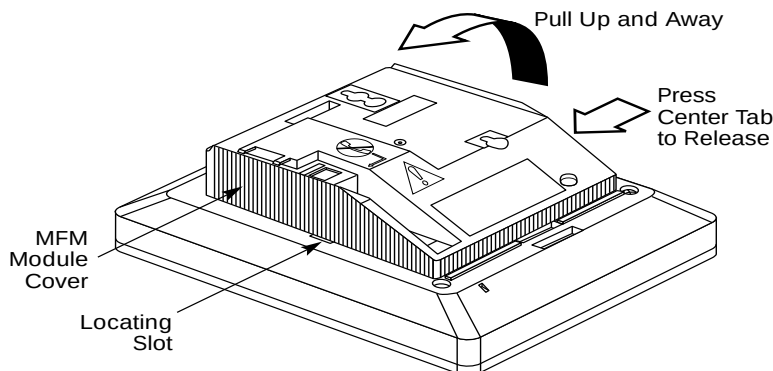


Figure 3-6. Releasing the Module Cover

- b. Press the center of the right side of the module cover with one hand to release the locking tab.
- c. Swing open the module cover to release it from the left side locating slot.

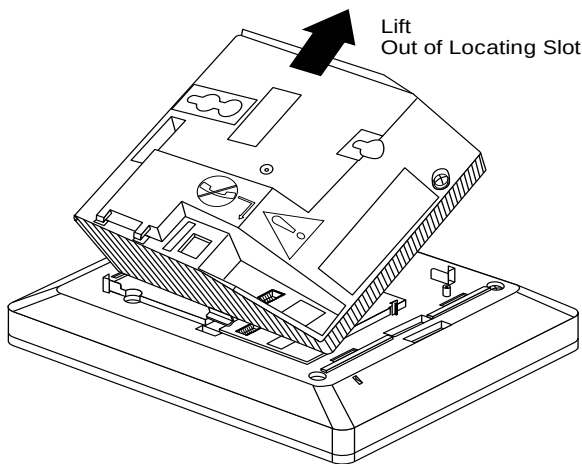


Figure 3-7. Removing the Module Cover

- d. Lift module cover out of locating slot and set aside.

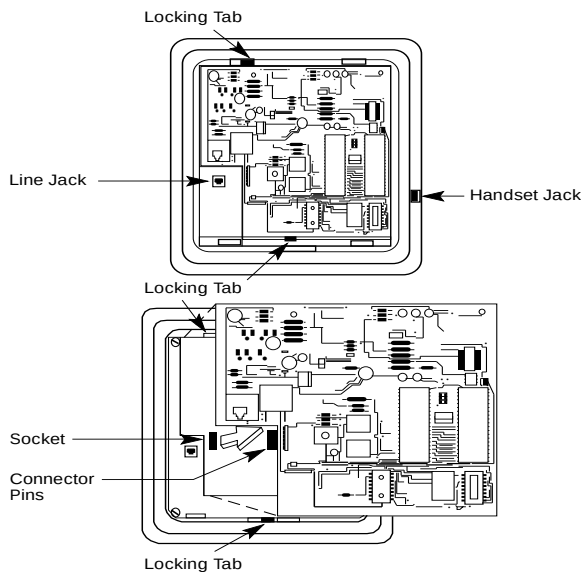


Figure 3-8. Removing an MFM Module

- 4. To install a new MFM, go to Step 5. To reset jumpers on an existing MFM, go to Step 6. To remove an existing MFM, continue (see [Figure 3-8](#)).
- Disconnect any cords attached to the phone and note the connections so that you can reconnect the cords to the appropriate jacks later.
 - Locate the MFM locking tabs on the top and bottom of the telephone base, then spread the tabs apart to release the MFM.
 - Grasp the MFM by the edges and pull it up to free the connector pins. *Do not touch the connector pins.*
 - Set the MFM aside on a clean surface.

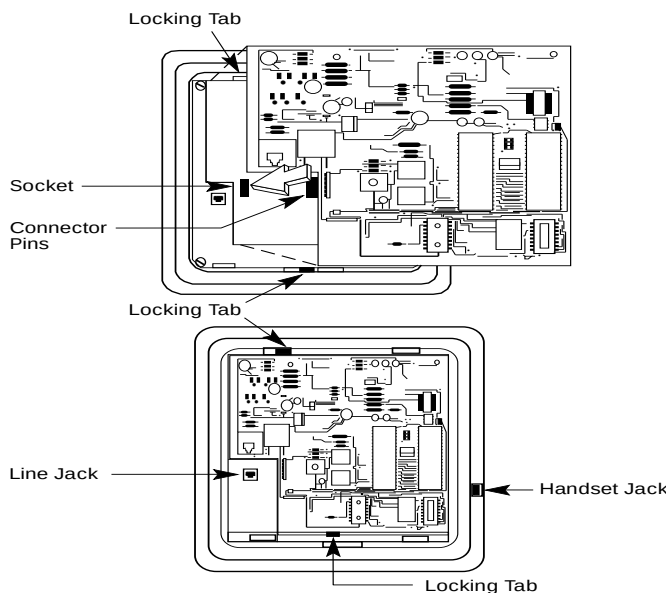


Figure 3-9. Installing an MFM Module

- 5. Install the new MFM. See [Figure 3-9](#).
 - a. Hold the MFM circuit board by the edges with the long connector pins facing the socket. Take care not to touch the connector pins.
 - b. Lower the MFM to insert the pins into the socket in the telephone base.
 - c. Press firmly on the MFM board to snap the locking tabs into place. *The connector pins and tabs must be secure.*

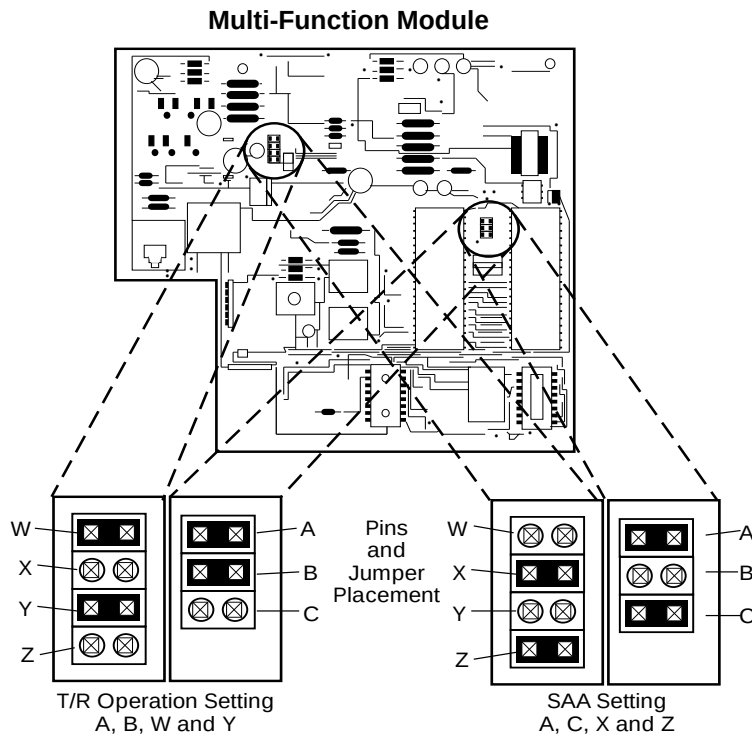


Figure 3-10. Setting and Adjusting the MFM Jumpers

- ▶ 6. Set or adjust the MFM jumpers for either a T/R device or a supplemental alert device. See [Figure 3-10](#).
 - a. Pull the four connectors off the MFM module.
 - b. Place the connectors over the appropriate pins for the required operation and push down to secure into place.

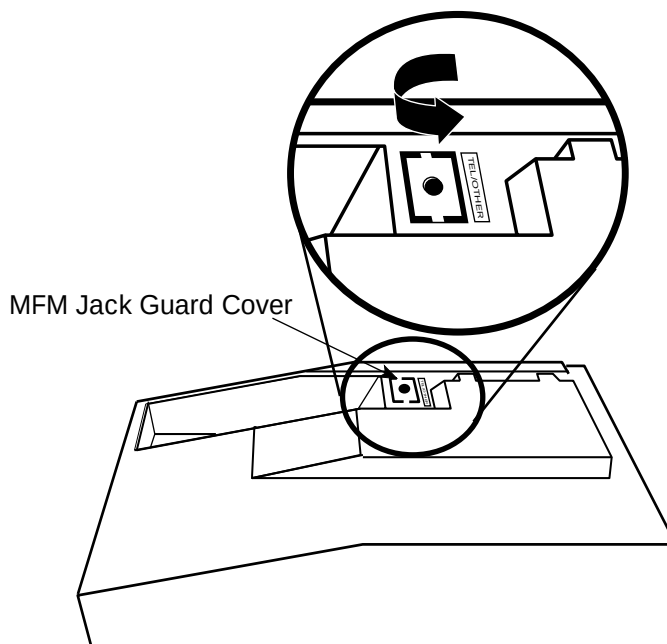


Figure 3-11. Removing the Jack Guard

- 7. To remove the jack guard, see [Figure 3-11](#).
 - a. If the module cover has a square jack guard that protects the TEL/OTHER jack area, grasp and twist the guard to remove it.

Save the jack guard if you are wall-mounting an MLX-10 or MLX-10D telephone.

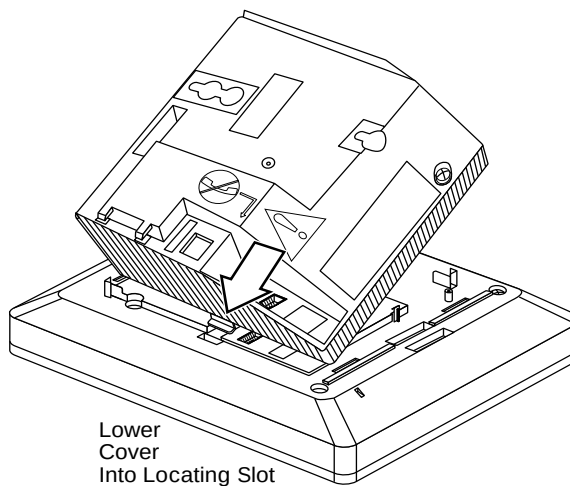


Figure 3-12. Placing the Module Cover into the Locating Slot

- ▶ 8. To replace the module cover, see [Figure 3-12](#), [Figure 3-13](#), and [Figure 3-14](#).
 - a. Place the locking tab on the module cover into the slot on the left side of the telephone.

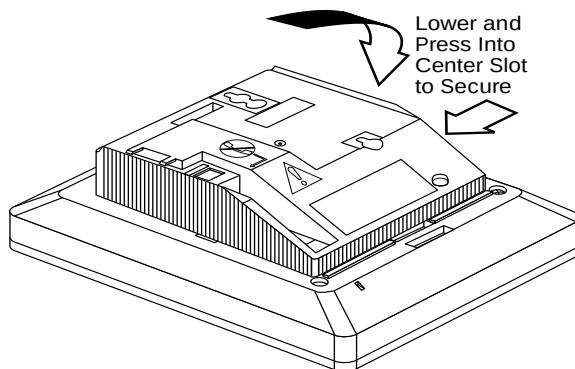


Figure 3-13. Lowering and Locking the Module Cover

- b. Lower the cover to the right and press firmly into the center slot to lock the tab in place. *The tab must be secure.*

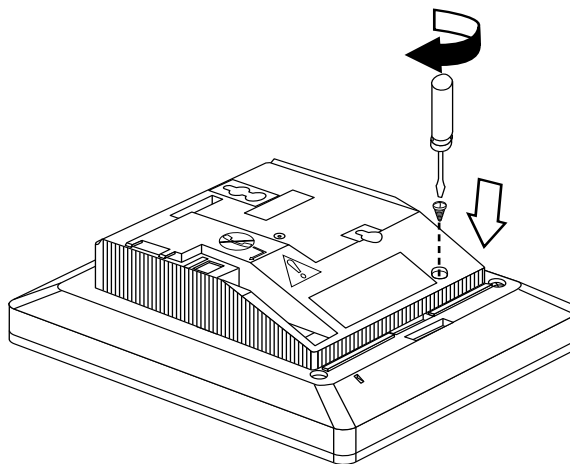


Figure 3-14. Replacing and Tightening the Module Cover Screw

- c. Replace and tighten the module cover screw that you removed in Step 3.

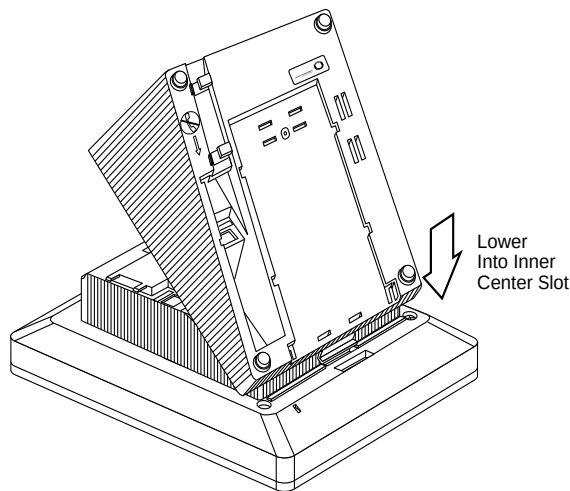


Figure 3-15. Replacing the Deskstand

- **9. Replace the deskstand.** If you are wall-mounting an MLX-10, MLX 10D, or MLX-10DP telephone, go to Step 11; otherwise, continue with Step 9a.
 - a. Place the tab on the narrow edge of the deskstand, into the locating slot on the telephone base.

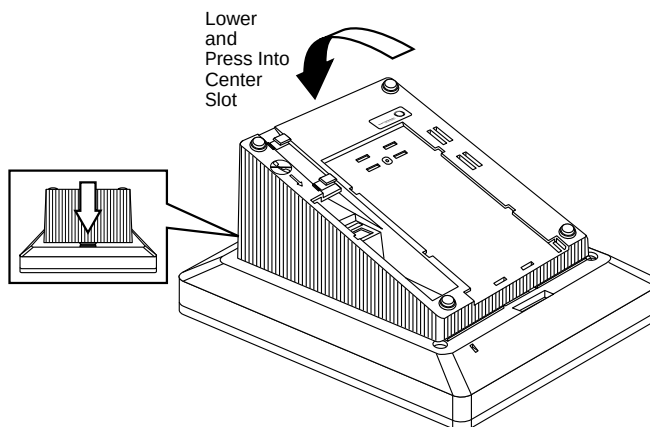


Figure 3-16. Lowering the Deskstand and Locking into Place

- b. Lower the deskstand and lock into place.

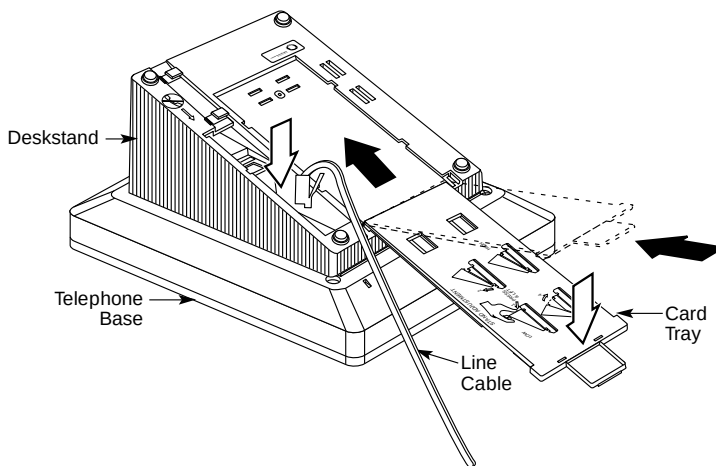


Figure 3-17. Replacing the User Card Tray and Line Cable

- 10. Replace the user card tray and line cable. See [Figure 3-17](#).
 - a. Insert the user card tray at an angle, then lower and slide into the deskstand.
 - b. Replace the line cable into the line jack in the deskstand.

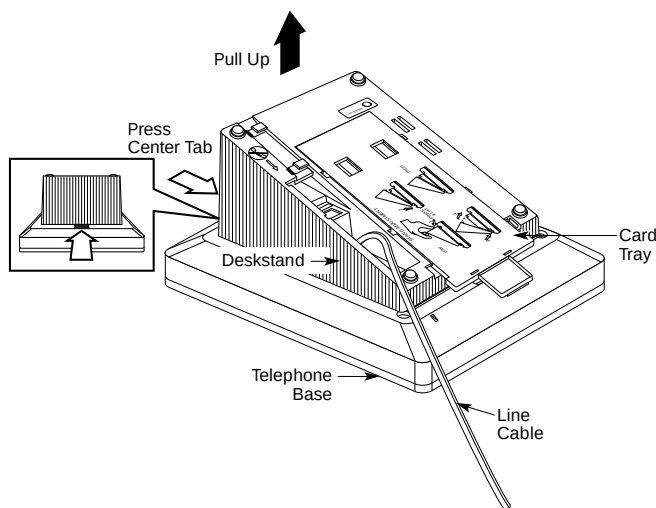


Figure 3-18. Adjusting the Deskstand Height

► **11. Adjust the deskstand height. See [Figure 3-18](#).**

- To change the deskstand's height from low to high, press the top rear center of the deskstand to release the tab.
- Pull the deskstand up and insert the tab into the slot in the module cover.
- To readjust the stand, see the instructions on the bottom of the card tray.

► **12. Power up the telephone. See [Figure 3-19](#).**

- Plug the D8W cord from the telephone into the 8-conductor (large) modular jack of the 400B or 400B2 adapter.

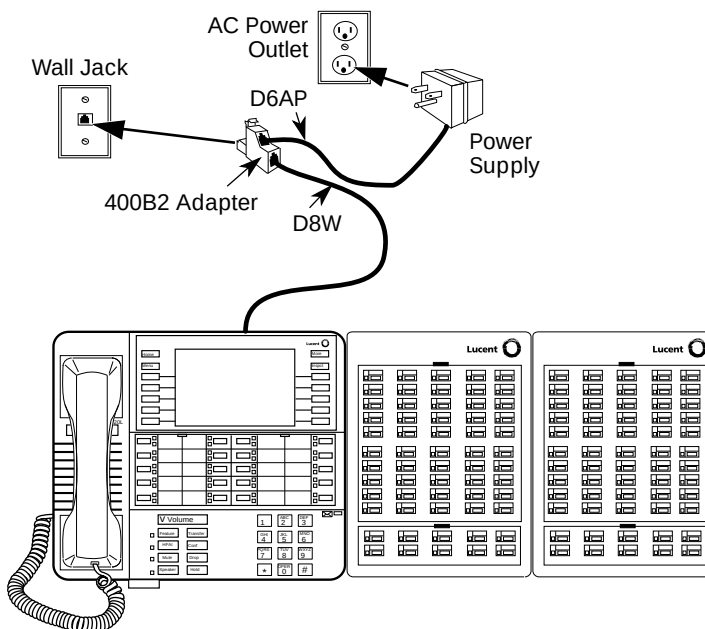


Figure 3-19. Powering Up the Telephone after Installing the MFM

- b. Connect one end of the D6AP cord to the 2-conductor (small) modular jack on the 400B or 400B2 adapter, and plug the other end into the modular jack of the 406943837 power supply. *The total length of the cords connecting the power supply to the MLX telephone must be less than or equal to 50 ft. (15 m).*



CAUTION:

Do not plug the D6AP cord into the 8-conductor (large) modular jack on the 400B or 400B2 adapter; doing so can cause electrical damage to the control unit and to the telephone.

- c. Plug the power supply into a 117-V AC outlet that is not controlled by a wall switch.
- d. Insert the plug end of the 400B or 400B2 adapter into the wall jack.

► **13. Test the MFM for T/R operation.**

See “Testing MLX Telephones with MFMs” in [Chapter 7](#).

► **14. Attach the adjunct to the MFM. See “Installing Adjuncts.”**

Installing Adjuncts

This section provides general instructions for connecting most adjuncts.

 NOTE:

If you need to connect the adjuncts differently from the instructions on the system forms, record each jack and adjunct change on the appropriate system numbering form. See [Appendix A, “System Numbering Forms”](#).

► **1. Connect one end of the cord packaged with the adjunct (usually a D4BU cord) to the adjunct.**

See the documentation packaged with the adjunct for instructions.

► **2. Check the system form for the adjunct you want to connect. Then refer to the appropriate step below.**

- To connect an adjunct to an MLX telephone, go to Step 3.
- To connect an adjunct to a single-line telephone, go to Step 4.
- To connect an adjunct to an analog multiline telephone, go to Step 5.
- To connect an adjunct to a 012 Or 016 module, go to Step 6.

When you connect adjuncts to telephones, make sure you route the adjunct and D8W telephone cords through the cord channel. See [Figure 3-20](#).

- **3. Insert the other end of the adjunct cord into the TEL/OTHER jack on the back of the MLX telephone. Go to Step 7.**
-

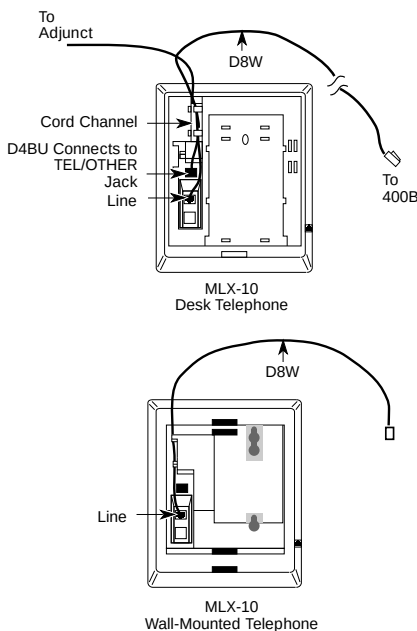


Figure 3-20. Routing the Cord(s) Through the Cord Channel

- **4. To connect an adjunct to a single-line telephone:**
- Connect a 26A2 bridging adapter to the telephone.
 - Connect the cord from the adjunct to the bridging adapter.
 - Reconnect the cord from the control unit to the bridging adapter.
 - Go to Step 7.

- ▶ **5. To connect an adjunct to an analog multiline telephone:**
 - a. Connect a 4-pair cord to the OTHER jack on the telephone.
 - b. Connect the other end to the VT jack on a General Purpose Adapter (GPA).
 - c. Connect the cord from the adjunct to the TEL/EQUIP jack on the GPA.
 - d. Go to Step 7.

Refer to [“General Purpose Adapter”](#) below for additional information.

- ▶ **6. Insert the other end of the adjunct cord directly into the port for the logical ID on the 012 or 016 module as indicated on the system form. Go to Step 7.**
- ▶ **7. Test the adjunct by dialing its associated extension.**

General Purpose Adapter

A General Purpose Adapter (GPA) lets you connect a T/R device—such as a single-line telephone or modem—to an analog multiline telephone. The device must be touch-tone, not rotary.

NOTE:

The GPA is intended for answer-only service, unless the telephone has direct access to a line. It does not have touch-tone receivers or pulse dial detectors; therefore, the associated analog multiline telephone must dial calls.

The GPA cannot be used with a MERLIN II System Display Console.

When the system forms indicate a GPA for installation of an adjunct, follow the steps below.

- ▶ **1. Plug one end of a 4-pair adjunct D8AC cord into the VT jack on the back of the GPA.**
- ▶ **2. Plug the other end into the OTHER jack on the underside of the analog multiline telephone.**

- ▶ 3. **Plug the cord from the adjunct into the TEL EQUIP jack on the GPA.**
- ▶ 4. **Slide the switch on the back of the GPA to the setting that provides the required service.**
 - **Basic.** This setting is used to dial and answer calls from an analog multiline telephone or to attach a T/R adjunct such as a single-line telephone or answering machine. Incoming calls ring only on the analog multiline telephone. This setting also allows the user to originate and receive calls on the telephone while using a computer with a modem attached to the GPA. However, if this setting is used, data calls cannot be answered automatically.
 - **Join.** This setting is used to add a recording device or a single-line telephone to a call that is in progress on the telephone. You cannot originate or answer calls on this setting.
 - **Automatic.** Use this setting when a GPA connects a modem to an analog multiline telephone for answering calls or answering machine.

Dial Dictation Devices

You can connect a dial dictation device to one of the following, as described earlier in this chapter:

- 012 module
- 016 module
- MLX telephone with an MFM
- GPA and analog multiline telephone

You can also connect a dial dictation device through a commercially available trunk adapter or a Universal Paging Access Module (UPAM) on a loop-start line/trunk jack with an external power supply unit.

NOTE:

Using any of the devices listed above, you cannot connect dial dictation devices that require contact closure. You *can*, however, connect such

equipment through a UPAM, since it provides contact closure for the device.

Fax Machines

You can connect a fax machine to one of the following, as described earlier in this chapter:

- 012 module
- 016 module
- MLX telephone with an MFM

The fax machine can send and receive fax calls independently of the telephone. Dial calls either from the fax machine's dialpad or from an associated single-line telephone.

Do not use a GPA to connect a fax machine to the system because the fax machine cannot dial out through the GPA.

Group Calling Delay Announcement Devices

You can connect a group calling delay announcement device to one of the following, as described earlier in this chapter:

- 012 module
- 016 module
- MLX telephone with an MFM
- GPA and analog multiline telephone

An industry-standard announcement device, such as a Digital Announcer Unit, provides Night Service information or announces to a caller that calling groups are busy.

Credit Card Verification Terminals

You can connect a credit card verification terminal to one of the following, as described earlier in this chapter:

- 012 module
- 016 module
- MLX telephone with an MFM

If you connect a credit card verification terminal to an MFM, the terminal can place and receive calls independently of the MLX telephone.

Do not use a GPA to connect a credit card verification terminal to the system because the terminal cannot dial out through the GPA.

Headsets

Headsets are designed for hands-free telephone use and consist of several components, depending upon whether manual or one-touch operation is used. Any Lucent Technologies headpiece works in either mode.

Headpieces

Six different headpieces are available. Each is light, comfortable, and uses a transparent voice tube to eliminate a cumbersome large microphone. Each comes with a 10-ft. (305-cm) coiled cord and a quick-disconnect latch.

- **Mirage®.** This is a small, almost unnoticeable, monaural headset that uses a disk-shaped receiver. It can be worn on either ear, instead of a headband or ear tip. This headset is not useful in noisy environments.
- **StarSet®.** This monaural headset is worn without a headband. It uses a soft, pliable ear tip that provides high-quality sound yet allows you to hear other conversations or instructions in the workplace.

- **Supra® Monaural.** This monaural headset has an adjustable headband. It offers a soft, comfortable ear cushion that reduces surrounding noise, making it easier to understand the caller.
- **Supra Monaural Noise-Canceling (NC).** Same as above with noise-canceling microphone to reduce background noise by up to 75 percent.
- **Supra Binaural.** Sound in both ears with soft ear cushion and adjustable headband.
- **Supra Binaural Noise-Canceling (NC).** Same as above with noise-canceling microphone on flexible boom features windscreen and reduces background noise transmission by up to 75 percent.

Manual Operation (Analog Multiline Telephones Only)

Manual operation is appropriate when a headset is used occasionally. You pick up the handset to answer a call and replace it to hang up. The headset consists of the headpiece and a modular base unit. The headpiece plugs into the modular base unit, and the modular base unit connects to the telephone through the HANDSET jack on the side of the telephone. The telephone handset is plugged into the modular base unit. The modular base unit allows you to adjust the incoming volume, switch between the headset and handset as needed, and temporarily mute the line. (See [Figure 3-21.](#))

One-Touch Operation (All Telephones)

One-touch operation allows you to touch a button to answer a call. On analog multiline telephones, use a headpiece with a plug prong base unit and an adapter (502C). The headpiece connects to the plug prong base unit, which in turn connects to the adapter. The adapter plugs into the OTHER jack on the underside of the telephone. The plug prong unit provides switchhook control for answering calls by pressing a button. You can also adjust the incoming volume. On MLX telephones, the headpiece is attached to a modular base unit, which is

attached to the telephone. The handset is also attached to the modular base unit. (See [Figure 3-21](#).)

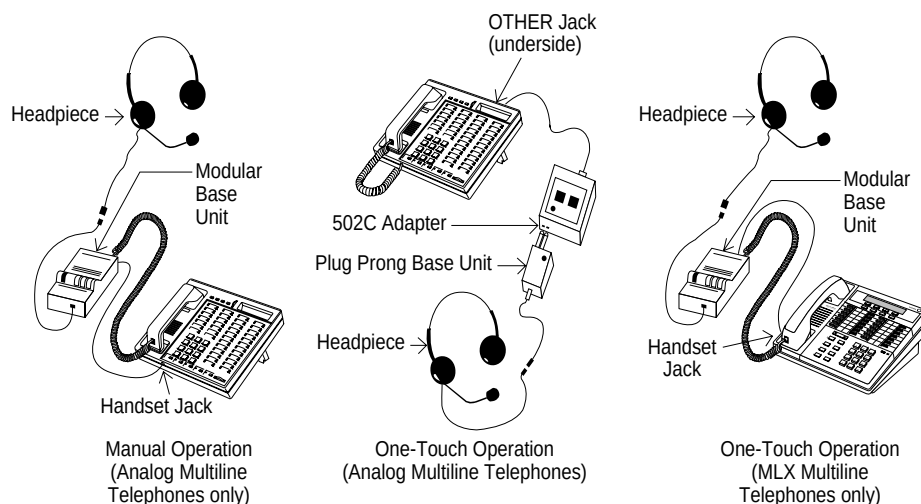


Figure 3-21. Manual and One-Touch Headset Operation

Loudspeaker Paging Systems

Use a loudspeaker paging system to page co-workers and make announcements. You connect the paging system to the jack of an LS or GS line/trunk that is programmed for paging.

Figures 3-22, 3-23, and 3-24 show various configurations for single-zone paging. Figures 3-25 and 3-26, later in this chapter, show single-zone and

multi-zone paging configurations that include background music through a Magic on Hold audio source. Bidirectional paging, also called *talk-back*, is shown in [Figure 3-26](#).

Dual-Tone Multifrequency (DTMF) Signaling

You can connect external paging systems that use dual-tone multifrequency (DTMF) signaling, such as PagePac® Plus with Zone Expansion Unit paging systems, to an LS or GS line/trunk jack programmed for paging operation, including bidirectional paging operation (talk-back). PagePac Plus does not require an adapter.

Zone paging systems, such as the PagePac series, require one LS or GS jack. You can use any zone once the paging jack is activated.

You must use a Universal Paging Access Module (UPAM), or PagePal (for PagePac series systems other than PagePac Plus) to connect a paging system that requires contact closure, an impedance-matching transformer, or both.

Use a Loop Start Trunk Adapter when a customer-supplied paging system does not require contact closure.

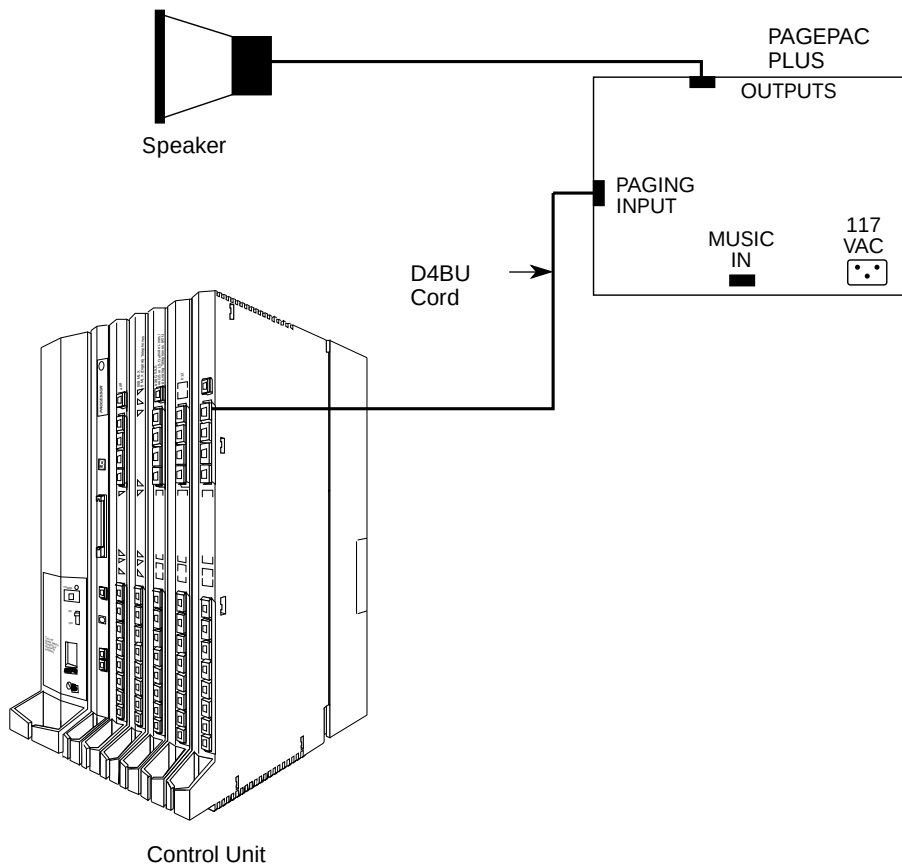
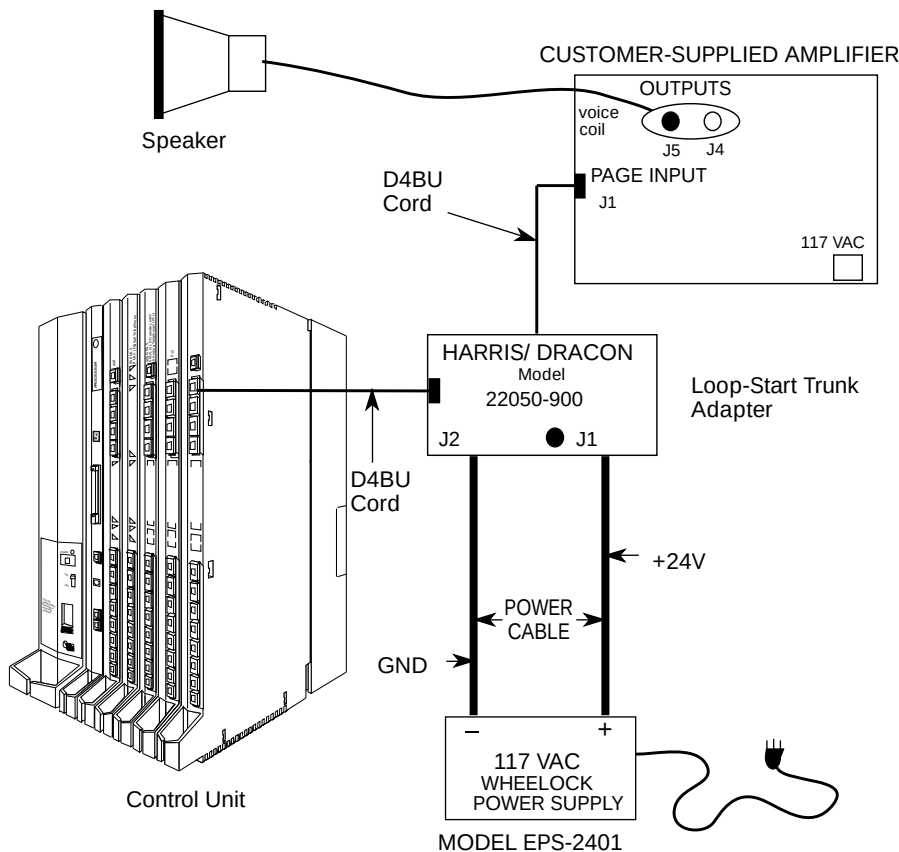


Figure 3-22. Single-Zone Paging with PagePac Plus



WARNING! The black wire from the LS trunk adapter power cable must be connected to the + (positive) input of the Wheelock PS. The grey on black wire must be connected to the - (negative) input.

Figure 3-23. Single-Zone Paging with Customer-Supplied Amplifier

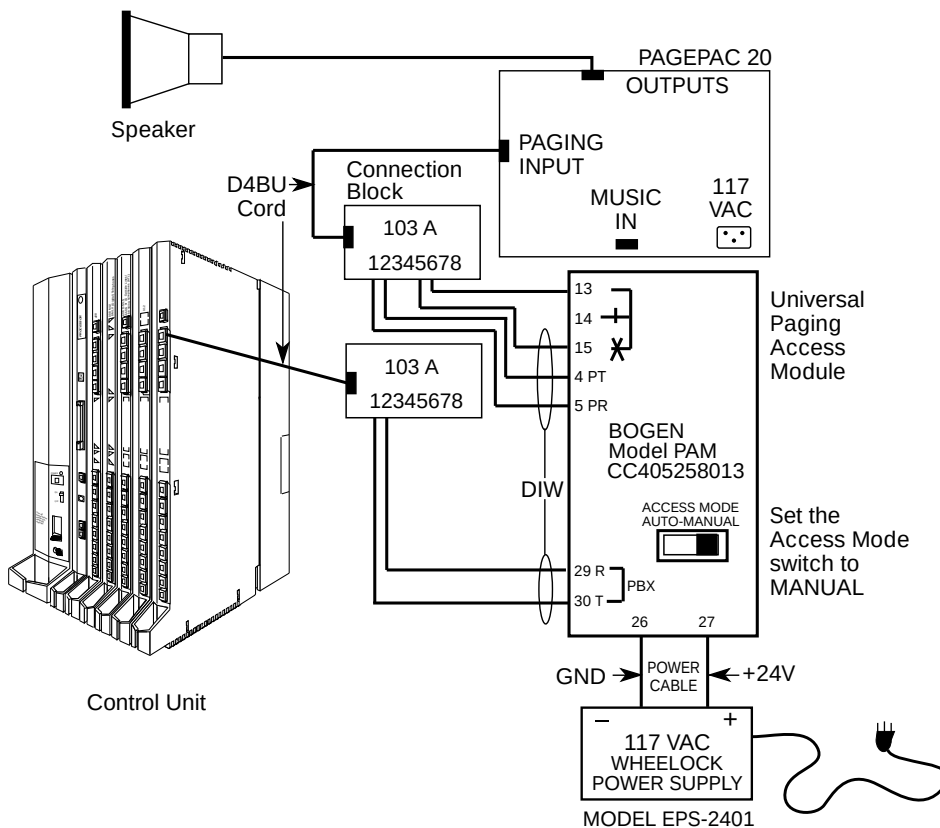


Figure 3-24. Single-Zone Paging with UPAM

MERLIN Identifier

MERLIN Identifier™ allows the use of local telephone company caller identification services to receive, store, and use calling party number information. Before installation, verify that this service provided by the Central Office is available on the lines to be connected. Each MERLIN Identifier consists of the following:

- A control unit, which must be located near the MERLIN LEGEND control unit
- Up to four individual display units, which can be mounted on analog multiline telephones or wall-mounted for both analog and MLX telephones
- An administrative keyboard

Optional equipment includes an administrative display, a PC, and a serial printer.

For detailed instructions, see *MERLIN Identifier Installation and Administration*.

When MERLIN Identifier is used with MLX telephones, a pair of installer-wired 104A termination outlets is required for each MLX set that is connected to a MERLIN Identifier display unit.

Modems

You can connect a modem to one of the following:

- Single-line telephone
- MLX telephone with an MFM
- GPA and analog multiline telephone

 NOTE:

When a modem is connected to the TEL/OTHER jack on the MLX telephone equipped with an MFM, data calls can be made from the modem independently of the MLX telephone. Users dial data calls from the data terminal keyboard.

See [Chapter 6, "Connecting Data Equipment"](#), for complete information on connecting data equipment.

Music On Hold® and Magic on Hold

You can connect a Music On Hold device to an LS or GS line/trunk jack programmed for Music On Hold. The system supports one such connection, either Magic on Hold or a customer-owned music source. The external music coupler (PEC 61398) uses an 8-ohm music source and two attenuation controls for setting the music level.

 NOTE:

PagePac Plus equipment can be used with a loudspeaker system to provide music. Or it can provide paging without a music coupler.

If the equipment uses rebroadcasted music or other copyrighted materials, the customer is required to obtain a copyright release and may also require a copyright license from, and pay license fees to, a third party, such as the American Society of Composers, Artists, and Producers (ASCAP), or Broadcast Music Incorporated (BMI). To bypass the release and license requirement, the customer can purchase a Magic on Hold system from Lucent Technologies, which does not require such a license.

Figures 3–25 and 3–26 show different background music configurations with single-zone and multizone paging.

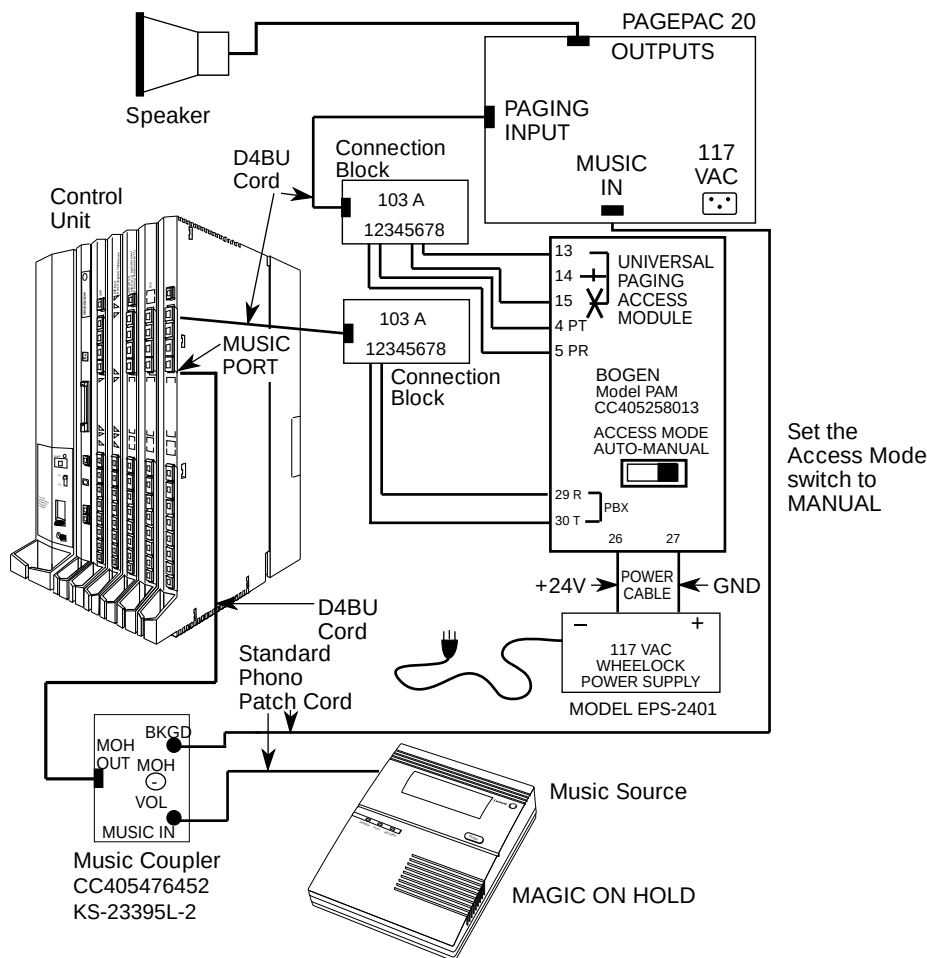


Figure 3-25. Single-Zone Paging with Background Music and Magic on Hold

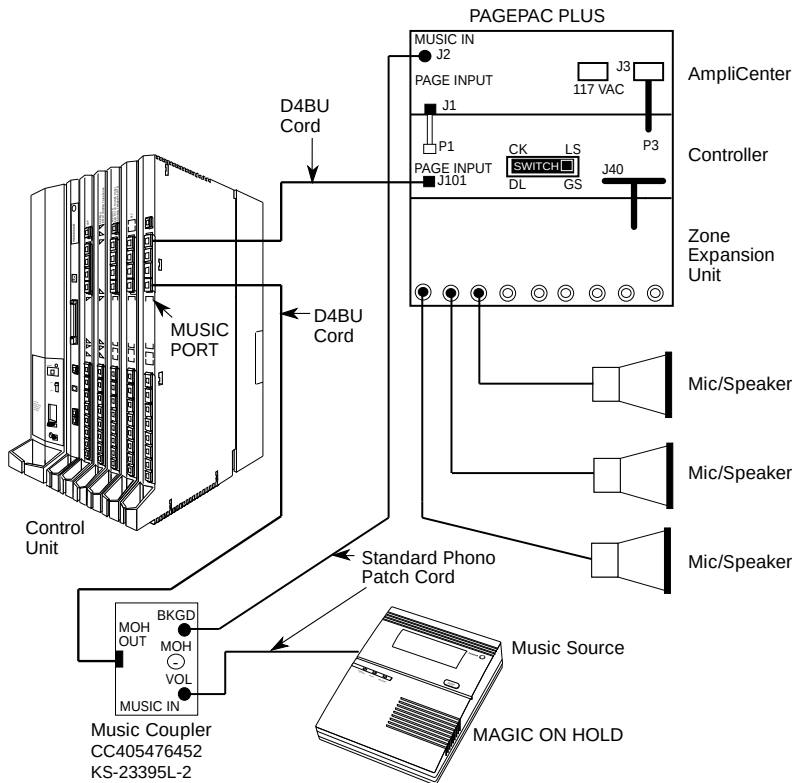


Figure 3-26. Multizone Paging with Background Music, Magic on Hold, and Bidirectional Paging (Talk-Back)

Supplemental Alerts

Alerting devices notify people working in noisy areas of outside, transferred, and intercom calls. Connect an alert to one of the following:

- Single-line telephone
- MLX telephone with an MFM
- Supplemental Alert Adapter (SAA) and analog multiline telephone

Alerts compatible with the SAA include horns, bells, chimes, and strobes. See ["Supplemental Alert Adapter"](#) for installation instructions.

NOTE:

The MFM in SAA mode and SAA support devices operate on 48 V DC.

You can connect alerts operating on 20 through 30 Hz to either an MFM in tip/ring mode or a single-line telephone jack.

Supplemental Alert Adapter

If the system forms indicate a bell, horn, chime, or strobe with an analog multiline telephone, follow the steps below to install an SAA. See [Figure 3-27](#).

- ▶ 1. Plug the telephone cord into the TELEPHONE jack on the SAA.
- ▶ 2. Plug the cord from the alert device into the ALERTER jack on the SAA.
- ▶ 3. Plug the cord from the telephone wall jack into the CONTROL UNIT jack on the SAA.

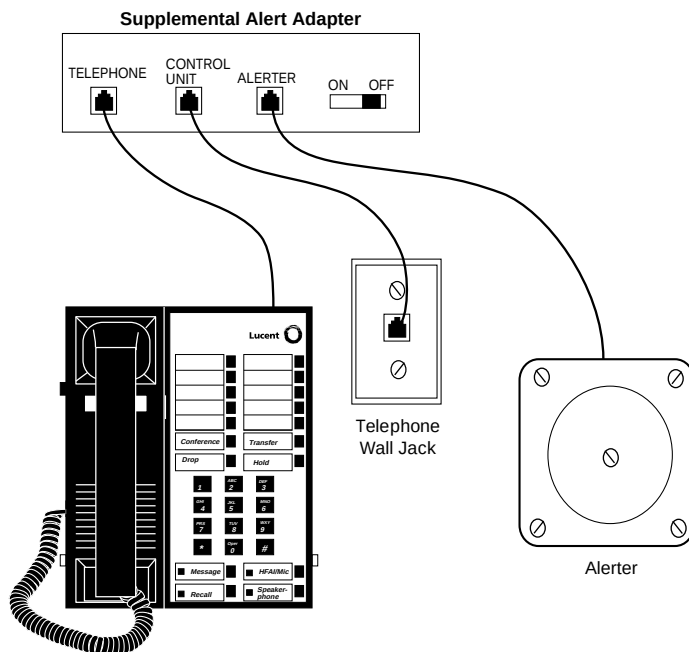


Figure 3-27. Installing the Supplemental Alert Adapter

Unsupported Telephones, Adjuncts, and Adapter

Do not connect the following analog telephone adjuncts and adapters to the system. Doing so may cause damage to the device or the system.

- Basic Telephone and Modem Interface (BTMI)
- Basic Telephone and Modem Interface 2 (BTMI-2)
- ATR Interface (ATRI)

- MTR Interface (MTRI)
- Off-Premises Extension Unit (OPX)
- System 25 Direct Extension Selector (DXS)

See [Table 3-1](#) for additional notes on unsupported telephones and adjuncts.

Table 3-1. Unsupported Telephones and Adjuncts

Model	Notes
510D Personal Terminals	Digital Communications Protocol (DCP)
DCP telephones	7400 telephones and adjuncts (asynchronous data units and multiple asynchronous data units) that use DCP and are supported on the MERLIN II Communications System
MET telephones	Multibutton electronic telephones (METs) and adjuncts used with the Dimension PBX and Horizon systems
Single-line telephones (with neon message-waiting lights)	Message light does not work
Analog telephone adjuncts	Basic telephone modem interface (BTMI); BTMI-2; off-premises extension (OPX) unit; System 25 Direct Extension Selector (DXS); DSS attached to a 34-button Deluxe membrane

Single-Line Telephones

Releases prior to Release 3.0 system support the single-line telephones listed in [Table 3-2](#).

Table 3-2. Single-Line Telephones

Model	Description
2500MMGB	Basic desk telephone
2554MMGJ	Basic wall telephone
2500YMGK ¹	Basic desk telephone with Message light and Recall button; Recall button used instead of switchhook for features that require a switchhook flash.
2500SM	Basic desk telephone used with 4A speakerphone
2514BMW	Basic desk telephone with built-in headset jack
2526BMG	Outdoor telephone used with weatherproof enclosure
7101A [*]	Basic desk telephone with Message light and Recall and Disconnect buttons. No adjuncts supported.
7102A	Basic desk telephone with Message light lamp and Recall button. The 101 and 201 speakerphones and the 500 headsets are supported. Can be used for power-failure transfer (PFT) extensions.
CS6402UO1A [*]	Basic desk telephone, Feature Phone Model 420. Has built-in speakerphone, memory, and redial.
2500MMGJ	Basic desk telephone
2500MMGK	Basic desk telephone with Recall button; Recall button used instead of switchhook for features that require switchhook flash.
8102 ²	Basic desk telephone with jack to support headset adapters and speakerphone adjuncts.
8110	Basic desk telephone with a built-in speakerphone with volume control and Mute button with LED indicator.
500MM 554BMPA 500SM	Basic telephones equipped with rotary dials so no system features requiring * and # can be used. Telephones with neon Message lights are not supported.

1. Vintage telephone, no longer available for sale or lease
2. Although the 8102 can be connected to a speakerphone and the 8110 has a speakerphone, they cannot be used for group paging (not supported on single-line telephones). The auto answer function on the 8110 must be disabled.

Single-Line Telephones in Release 3.0 and Later

In Release 3.0 and later, only single-line telephones with positive disconnect are fully supported as system telephones (any single-line telephones, equipped with a ground-start button if necessary, can be used as PFT telephones). Older single-line telephones can be used with Release 3.0, but their operation is slightly different. [Table 3-3](#) lists the single-line telephones supported in Release 3.0 and later.

Table 3-3. Single-Line Telephones Supported by Release 3.0 and Later

Model	Description
2500 YMGL	Basic desk telephone with Message light and Flash button; Flash button is used instead of the switchhook for features that require a switchhook flash, such as Transfer and Hold
8101	Basic desk telephone with Message light and Flash button; Flash button is used instead of the switchhook for features that require a switchhook flash, such as Transfer and Hold
VideoPhone 2500	Provides interactive, small-screen video when both parties use one
Picasso Still-Image Phone	Allows 2 parties with Picasso Still-Image Phones to transmit and simultaneously discuss full-color images when they view over customer-supplied TV monitor or flat-panel LCD (liquid crystal display) monitor
3129-WTWA	Touch-tone outdoor telephone equipped with cast aluminum housing, armored handset cord with bell ringers
3129-WRWA	Rotary dial outdoor telephone equipped with cast aluminum housing, armored handset cord with bell ringers
3129-WAWA	Auto dial outdoor telephone equipped with cast aluminum housing, armored handset cord with bell ringers
3129-WNWA	Non-dial, automatic ringing on dedicated circuit outdoor telephone equipped with cast aluminum housing, armored handset cord with bell ringers

Installing Direct Station Selectors

The Direct Station Selector (DSS) is an optional piece of telephone equipment. You can connect up to two DSSs to an MLX-28D or MLX-20L telephone that is programmed as an operator console.

Considerations

Review the following items before you begin the installation procedure.

- Connect the DSSs before you assemble the MLX telephones.
- Auxiliary power is required under the following circumstances:
 - An MLX telephone with an MFM and two DSSs requires a 406743419 power unit.
 - An MLX telephone without an MFM, but with two DSSs, requires a 406943837 power unit, 400B adapter, and the D6AP cord provided with the MFM.
 - An MLX telephone with one DSS and an MFM requires a 406943837 power unit, 400B adapter, and the D6AP cord provided with the MFM.
 - If one carrier has three or more MLX telephones, each with a DSS attached, use a 406943837 power unit, 400B adapter, and D6AP cord for each MLX telephone and DSS after the first two.
- The total length of cords between the KS22911-L2 or 406743419 power supply and the MLX telephone must not be more than 50 ft. (15 m).
- Do not replace the 2-ft. (61-cm) D8AC cord (packaged with the DSS) with a longer cord. Improper operation may result.
- Connect each KS22911-L2 power supply to an AC outlet that is not controlled by a wall switch.

To connect a DSS, follow the steps below. If you are connecting two DSSs to the telephone, unpack the second DSS before you start.

► **1. Adjust the angle of the DSS.**

- The DSS is packed fully assembled with the deskstand in the low position. If you prefer the low position, go to Step 2.
- To adjust the angle of the DSS to the high position:
 - a. Place the DSS face down on a flat surface.
 - b. Press on the top rear center of the stand to release the tab, then pull the stand toward you and away from the DSS.
 - c. Insert the tab at the bottom of the stand into the other slot.
 - d. Lower the stand and press the tab at the top into the corresponding slot on the DSS.

► **2. Install the D8AC cord on the DSS.**

- a. Plug one end of the D8AC cord into the IN jack on the DSS.
- b. Route the D8AC cord through the cord channel on the left side of the DSS.
- c. If you are installing only one DSS, go to Step 4.
If you are installing two DSSs, repeat Steps 1 and 2 for the second DSS, then go to Step 3.

► **3. Wire the two DSSs. See [Figure 3-28](#).**

- a. Place the two DSSs side by side and face down.
- b. Route the D8AC cord from the IN jack on the second DSS (DSS2) through the cord channel on the first DSS (DSS1).
- c. Plug this D8AC cord into the OUT jack on DSS1.

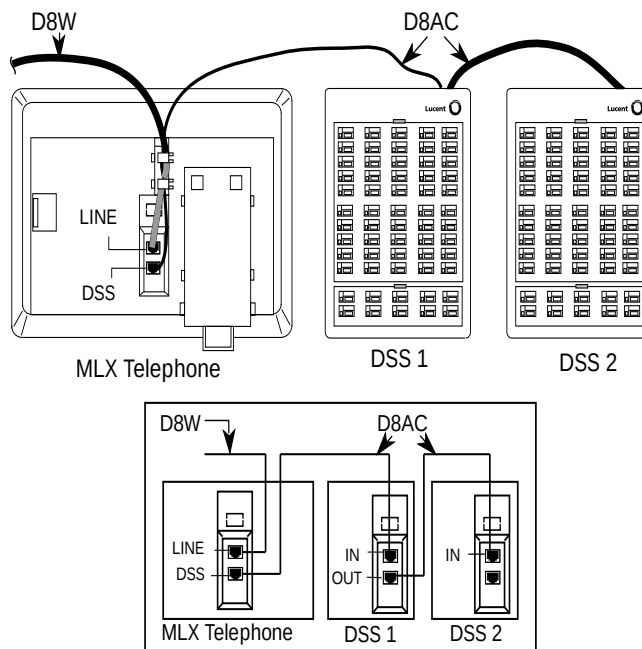


Figure 3-28. Connecting One or More DSSs

► **4. Wire the telephone to the DSS unit(s). See [Figure 3-28](#).**

- Remove the handset from the telephone, then place the telephone face down on a flat surface to the right of the upside-down DSS unit(s).
- Plug the D8AC cord from the IN jack on the DSS1 into the DSS jack on the telephone; then route the cord through the cord channel.
- Plug the D8W line cord into the LINE jack on the MLX telephone. The D8AC and D8W cords share the cord channel on the telephone.

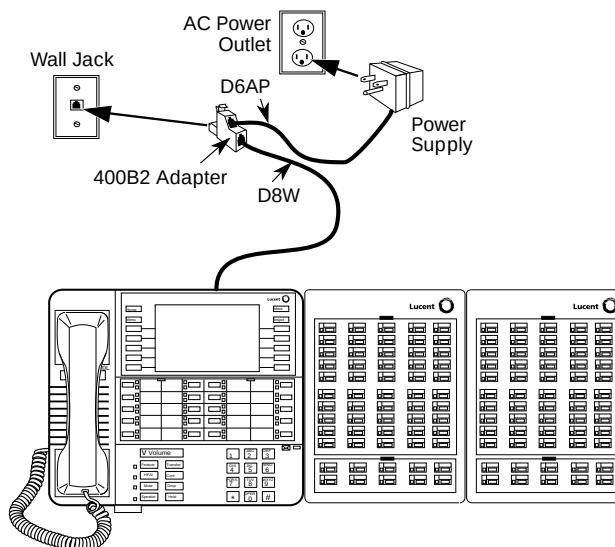


Figure 3-29. Wiring for Auxiliary Power

- ▶ 5. Turn the telephone and the DDS unit(s) face up with the telephone now to the left of the DDS unit(s). See [Figure 3-29](#).
- ▶ 6. Insert one end of the coiled H4DU handset cord into the handset and the other end into the jack on the side of the telephone.
- ▶ 7. If auxiliary power is *not* required, plug the D8W cord into the wall jack and then go to Step 9.
- ▶ 8. If auxiliary power is required, refer to the following steps and [Figure 3-29](#). The combined total length of the D6AP and D8W cords you use must not be more than 50 ft. (15 m).
 - a. Plug the D8W cord from the telephone into the 8-conductor modular jack of the 400B or 400B2 adapter.

- b. Connect one end of the D6AP cord to the 2-conductor (small) modular jack on the 400B or 400B2 adapter, and plug the other end of the D6AP cord into the modular jack of the 406943837 or 406743419 power supply.



CAUTION:

Do not plug the D6AP cord into the 8-conductor (large) modular jack of the 400B or 400B2 adapter. Doing so can cause electrical damage to the control unit and to the telephone.

- c. Insert the plug end of the 400B or 400B2 adapter into the wall jack.
- d. Plug the power supply into a 117-V AC outlet.

► **9. Label the DSS designation cards.**

- a. Pull the tab at the top of the large plastic cover and rotate the cover towards you.
- b. Remove the cover and the large designation card.
- c. Write or type the button assignments on the card. (For DSS1, use the side that is labeled 00–49; for DSS2, use the side labeled 50–99.)

The button assignments on the designation card should be by dial plan extension number, not by logical ID port number.

- d. Replace the card and the plastic cover; make sure the coated side of the cover is facing up.
- e. Repeat this step to remove the small plastic cover and to label the small designation card.



NOTE:

If the MLX telephone attached to the DSS is unplugged from the control unit and then plugged in again, the display on the telephone may disappear. Press the **Home** button to bring back the display.

Assembling MLX Telephones

You will need to assemble an MLX telephone before connecting it to the control unit. For all other telephones, skip to "Connecting Telephones to the Control Unit."

Considerations

Review the following items before you begin the procedure:

- MLX telephones are packed with the deskstand in the low position. You can use the deskstand as is, raise it to a higher angle, or remove it. To adjust or remove the stand, see Step 1 of the following instructions. (The diagram on the bottom of the user card tray also shows how to adjust the stand.)
- You cannot wall-mount MLX-20L and MLX-28D telephones.
- If you wish to wall-mount an MLX-5, MLX-5D, MLX-10, MLX-10D, MLX-10DP, or MLX-16 DP telephone, you must remove the deskstand first. (Wall-mounting an MLX-5D, MLX-10D, MLX-10DP, or MLX-16DP telephone can make the display hard to read.)
- A 630B Phonemount (not included) is also required to mount an MLX-10, MLX-10D, or MLX-10DP telephone on the wall.
- To connect an adjunct (such as an alert, modem, or fax machine) to an MLX telephone, the telephone must have an MFM installed in it. If you have not already done so, refer to ["Installing Multi-Function Modules"](#), earlier in this chapter.

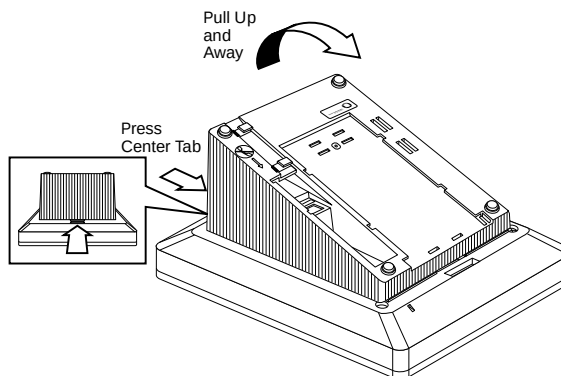


Figure 3-30. Adjusting or Removing the Deskstand

To assemble an MLX telephone, follow the steps below.

- ▶ **1. Remove or adjust the deskstand. See [Figure 3-30](#).**
 - If you want to leave the deskstand in the low position, go to Step 2.
 - If you want to adjust the angle of the deskstand, or remove it in order to wall-mount the telephone:
 - a. Place the telephone face down on a flat surface.
 - b. Press on the top rear center of the deskstand to release the tab, then pull it up towards you.
 - c. Insert the tab into the slot in the module cover to adjust the height.
 - d. To remove the deskstand, continue to pull it up and away from the telephone.
 - e. Release the deskstand from the front slot.

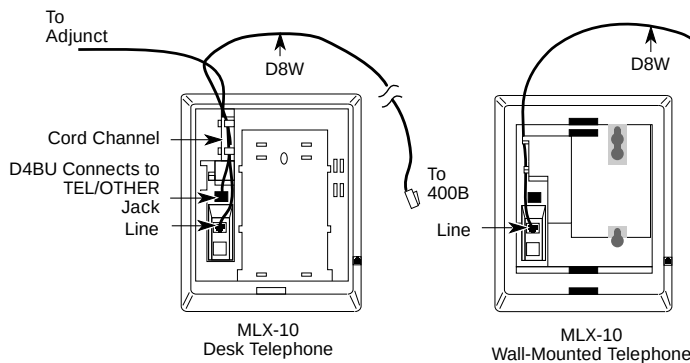


Figure 3-31. Connecting the Line Cords

► **2. Connect the line cords. See [Figure 3-31](#).**

- Plug one end of the D8W cord into the LINE jack on the bottom of the phone.
- Route the D8W cord through the cord channel on the back of the telephone.
- If the telephone is for desktop use, turn it face up and plug the D8W cord into the wall jack.
- Insert the other end of the coiled H4DU handset cord into the jack on the side of the telephone.

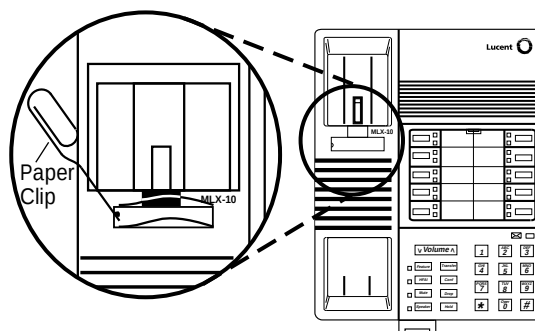


Figure 3-32. Removing the Extension Label

► **3. Connect the handset.**

Insert one end of the coiled H4DU handset cord into the handset.

► **4. Label the extension identification card.**

- a. Insert a straightened paper clip into the hole on the side of the plastic cover while holding your finger on the opposite edge; use the paper clip to push and lift the cover. See [Figure 3-32](#).

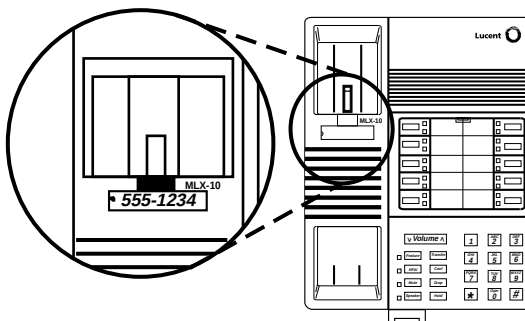


Figure 3-33. Labeling the Extension

- b. Type or write the assigned extension number on the card. See [Figure 3-33](#).
- c. If you are wall-mounting an MLX-10, MLX-10D, or MLX-10DP telephone, go to Step 5. If you are assembling a desk telephone, go to Step 6.

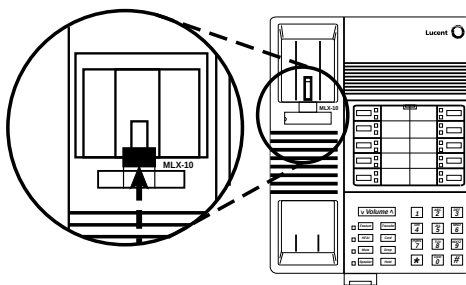


Figure 3-34. Removing the Handset Holder

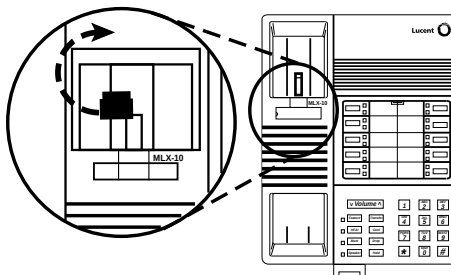


Figure 3-35. Rotating the Handset Holder

- **5. Prepare the handset holder for wall-mounting.**
 - a. Remove the handset holder by pushing it up and pulling it out.
See [Figure 3-34](#).
 - b. Rotate the handset holder 180 degrees and replace it in its slot.
See [Figure 3-35](#).

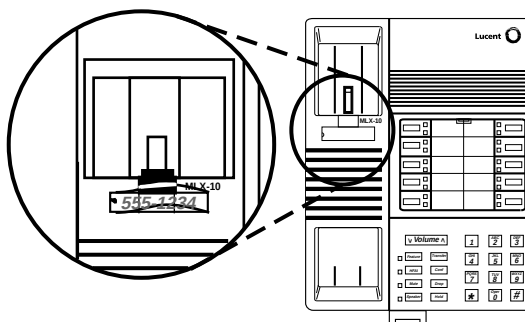


Figure 3-36. Replacing the Extension Label

► **6. Replace the extension label and plastic cover.**

- a. Insert one end into the slot and snap the other end into place. See [Figure 3-36](#).
- b. If you are mounting an MLX-10, MLX-10D, or MLX-10DP wall telephone, go to Step 7. If you are assembling a desk telephone, go to Step 8.

► **7. Wall mounting an MLX-10, MLX-10DP, or MLX-10D telephone.**

- a. Turn over the telephone and remove the jack guard from the TEL/OTHER jack area; set the telephone aside.
- b. Unpack the 630B Phonemount and remove the modular jack from the backplate.
- c. Route the D8W cord (or DIW cable) through the hole in the backplate and have it exit at the top of the backplate; leave 10 in. (25 cm) of cord to connect the telephone. See [Figure 3-37](#).

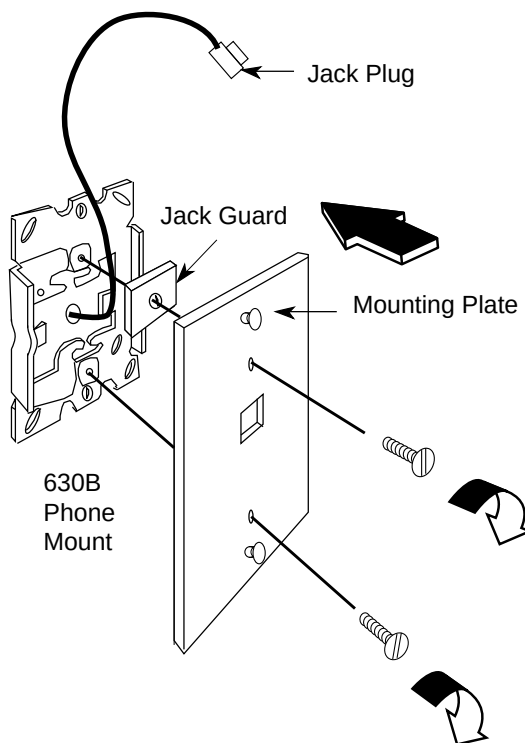


Figure 3-37. Mounting the Backplate

- d. Attach the backplate to the wall; see the instructions provided with the 630B Phonemount.
- e. Insert the two short screws provided with the Phonemount into the mounting plate. Be sure to thread the upper screw through the jack guard. See [Figure 3-37](#).

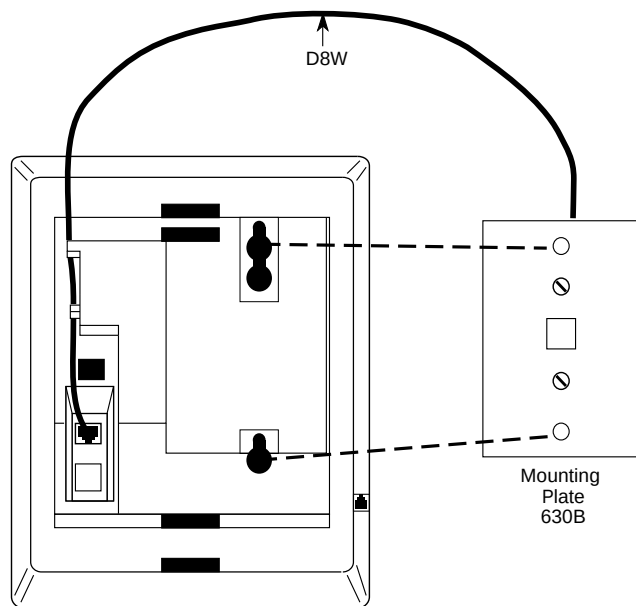


Figure 3-38. Routing the Cord Through the Backplate

- f. Plug the free end of the cord into the LINE jack on the back of the telephone. Route the cord through the cord channel above the jack. See [Figure 3-38](#).
- g. Position the telephone on the mounting plate studs and then slide the telephone down to lock it in place. To remove the telephone, slide it up and off.

► **8. Label the button assignment card.**

- a. Pull the tab at the top of the plastic cover toward you.

- b. Type or write the button assignments on the card.
- c. Insert the card and replace the plastic cover. Be sure the textured side of the cover is facing you.

► **9. Adjust the contrast on the telephone's display.**

- For an MLX-20L telephone, slide the lever on the top of the telephone.
- For an MLX-10D, MLX 10DP, or MLX-28D telephone, press the **Menu** button and select **Cntrst**; follow the display prompts.

Installing Cordless or Cordless/Wireless Telephones

The sections below describe the ways you can connect MDC 9000 cordless or MDW 9000 cordless and wireless telephones to the system.

MDC 9000 Cordless Telephone

You can connect the base unit of the MDC 9000 to an analog extension jack.

MDW 9000 Cordless/Wireless Telephones

The following is a brief overview of procedures and considerations for installation of the MDW 9000 telephone. For more detailed information, see the installation guide that comes with the telephone.

- If possible, place the radio module of a wireless telephone in the same room and on the same wall as the MERLIN LEGEND Communications System control unit.

A minimum distance of 3 ft. is required between the radio base and the control unit. The radio module must be within 24 ft. of a properly grounded 3-prong AC outlet that is *not* controlled by a wall switch and connects to the control unit through an analog multiline jack with a line connector.

- The charging base station requires only a three-prong AC outlet that is *not* connected to a wall switch.
- The telephone handset must be within range of the radio base. The indoor range is 400 through 600 ft. and the outdoor range is up to 1000 ft.
- Except while charging, the handset does not need to be located near the charging base.

Connecting Telephones to the Control Unit

The way you connect telephones to the control unit depends on the number of telephones you are connecting. For 24 telephones or less, use a direct connection. For 25 telephones or more, use cross-connect fields.

For building cross-connect fields, use one of the following wiring kits:

- **Interconnect Wire.** This complete wiring kit contains 110 jack-panel blocks, a template, wiring troughs, D-rings, and D8W cords.
- **Systimax.** This complete wiring kit contains 110 termination blocks with modular jacks, a 110A field-termination block, a template, wiring troughs, D-rings, and patch cords.

Considerations

Review the following items before you begin the procedure:

- If the way you connect the telephones differs from the instructions on the system forms, record each jack and telephone change on Form 2a, System Numbering: Extension Jacks. See [Appendix A, "System Numbering Forms"](#).
- If you use staples to attach the cords to walls or baseboards, make sure you do not pierce the cords.

- If an MLX telephone or analog multiline telephone is in a different building from the control unit, and *is within 1000 ft. (305 m)* of the control unit, connect the telephone to the control unit, using two In-Range Out-of-Building (IROB) protectors.

Make sure you use an MLX-specific IROB protector for an MLX telephone, and an analog multiline-specific IROB protector for an analog multiline telephone.

See the documentation packaged with the IROB protector for complete installation instructions.

- If the single-line or T/R telephone is 1000 ft. (305 m) or further from the control unit, connect the telephone to the control unit using an Off-Premises Range Extender (OPRE).

See the documentation packaged with the OPRE for complete installation instructions.



CAUTION:

Take extreme care to make sure that you connect MLX phones only to MLX modules; a mismatch could damage the ports and cause them to stop functioning.

Incorrect wiring can result in users not being able to place outgoing calls. Make sure you use the proper cord. For all GS/LS modules:

- *Use a D2R cable from an RJ11 jack.*
- *Do not use the Brand-Rex Quad cable from an E66 block.*

If you cannot avoid using the Brand-Rex Quad cable, reverse the tip and ring leads at the E66 block to correct the mismatch.

- *To avoid introducing power supply noise into system wiring, allow at least 3 in. (7.62 cm) of clearance between the basic carrier's power supply and any wiring or termination hardware located to the left of the control unit.*



WARNING:

National and local building codes specify the type of cable required for telecommunication wiring. For example, indoor wiring (DIW cable) cannot be used inside or on top of air plenums or ducts, along hot pipes, or across walkways.

Consult your local ordinances and regulations for proper cable selection.

Wiring a Telephone for Two Voice Pairs

If an analog telephone requires either the Voice Announce to Busy feature or voice and data operating independently, use a bridging adapter to assign two adjacent odd/even telephone jacks (for example, 01 and 02, 13 and 14) on an analog telephone module to that telephone. This provides the telephone with the two voice pairs needed to use these features. See [Figure 3-39](#).



NOTE:

The numbers of these telephone jacks are boxed on the system forms. In [Figure 3-39](#), the label on the bridging adapter refers to the default dial plan extension number, not the telephone port number.

The even jack on the bridging adapter should be connected to the odd-numbered telephone port, and the odd jack on the bridging adapter should be connected to the even-numbered telephone port.

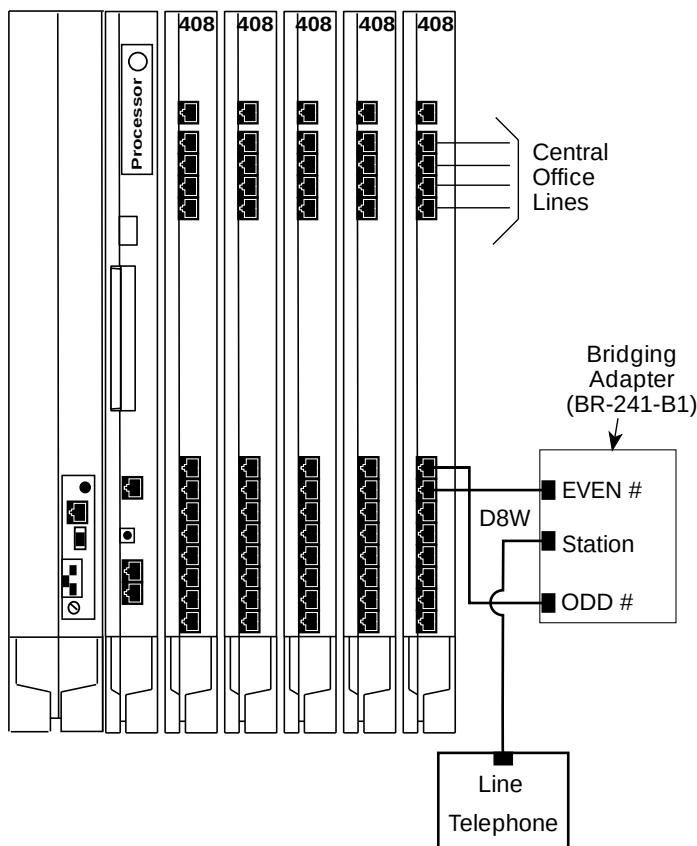


Figure 3-39. Connecting Two Voice Pairs to a Telephone Using a Bridging Adapter (BR-241-B1)

Removing Damaged Connecting Blocks

In some cases, a connecting block becomes damaged and must be removed.

To remove a damaged connecting block, follow the steps below:

- ▶ **1. Remove the wires or the patch cord from the connecting block.**
 - If you have Interconnect Wiring, use long-nosed pliers to remove the telephone wires, and tag the wires with tape to identify their positions.
 - If you have Systimax wiring, pull off the patch cord.
- ▶ **2. Place a 788K1 retainer tool against the conductor pairs beneath the connecting block to be removed. See [Figure 3-40](#).**
- ▶ **3. Use pliers to grip the connecting block in the center. See [Figure 3-40](#).**
- ▶ **4. Move the block gently up and down and pull it out.**
- ▶ **5. If a conductor wire is accidentally pulled from a block, pull it with the long-nosed pliers to get some slack.**

Use your fingers to lay the conductor wire back in its slot in the index strip, and then reseal it with the D-impact tool.

- ▶ **6. Seat the new connecting block by using the 788J1 impact tool.**
- ▶ **7. Replace the telephone wire onto the connecting block.**
 - If you have Interconnect Wiring, remove the tag from the telephone wires and use the D-impact tool to reseal the wires.
 - If you have Systimax wiring, attach the patch cord to the connecting block.

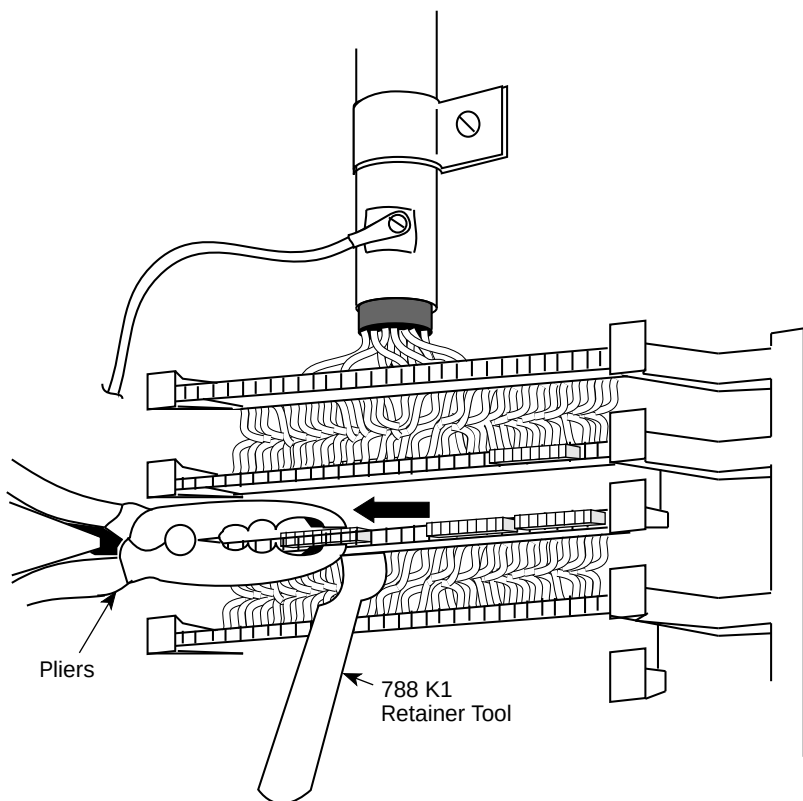


Figure 3-40. Removing the Connecting Block

Connecting the Control Unit to the Network Interface

4

The way you connect the control unit to the network interface depends on the type of network interface that is installed. While there are many ways you can do this, the methods discussed in this chapter are usually best.



CAUTION:

The local telephone company is responsible for providing appropriate protection for central office trunks. Do not connect the central office trunks until you are certain that they are properly protected. See ["Central Office Trunk Protection"](#) in [Chapter 2](#) for details.

To avoid coupling power supply noise onto system wiring, allow at least 3 in. (7.62 cm) of clearance between the basic carrier's power supply and any wiring or termination hardware located to the left of the control unit.

If the network interface is greater than 25 ft. (7.62 m) from the control unit, connect the control unit to the network interface, using an Off-Premises Range Extender (OPRE). See the documentation packaged with the OPRE for complete installation instructions.

If you use staples to attach the cords to walls or baseboards, make sure you do not pierce the cords.

National and local building codes specify the type of cable required for telecommunications wiring. For example, you cannot use indoor wiring (DIW) cable inside or on top of air plenums or ducts, along hot pipes, or across walkways. Consult your local ordinances and regulations for proper cable selection.

Wiring

The local telephone company should have installed the network interface (the central office trunks) already. Before you install the system, verify that the network interface is the proper type and that it is within 25 ft. (7.6 m) of the control unit. If the network interface is more than 25 ft. (7.6 m) from the control unit, make sure you have an OPRE.

The adapter you need to connect the central office trunks to the control unit depends on the type of network interface installed, as shown in [Table 4-1](#).

Table 4-1. Network Interfaces

Network Interface	Description	Adapter
RJ11	Connects one outside ground-start (GS), loop-start (LS), or Direct Inward Dial (DID) trunk to one modular jack.	
RJ14	Connects two outside trunks to one modular jack (GS, LS, or DID).	2-line adapter (267C-type)
RJ21X	50-pin connector connects 25 110AB1 jack-panel block to outside trunks (GS, LS or DID).	110AB1 jack-panel block
RJ2GX	50-pin connector for up to eight tie trunks.	356A for eight or fewer tie trunks; 259A for one tie trunk
RJ48C/X	Connects DS1 facilities to a four-pair jack (two active pairs).	Z601A if modular cords are used

After installing the adapter, label each jack that connects a central office trunk to the control unit with the trunk's number. Use the list provided by the local telephone company or System Form 2c, System Numbering: Line/Trunk Jacks for outside trunks as a reference.

 NOTE:

If you need to connect the trunk cords differently from the instructions on the system forms, record each change on Form 2c, System Numbering: Line/Trunk Jacks. See [Appendix A, "System Numbering Forms"](#).

Also, you may need to know the interface codes for network facilities. These codes are shown in [Table 4-2](#), by trunk type and adapter type.

Table 4-2. Central Office Network Interface Codes

Trunk Type	Federal Interface Code for Trunk	Network Interface
LS central office trunk	02LS2	RJ11C, RJ14C, RJ21
GS central office trunk	02GS2	RJ11C, RJ14C, RJ21
DID	02RV2-T	RJ11C, RJ14C, RJ21
OPS	OL13C	RJ11C
Tie trunk	TL31M	RJ2GX
BRI	02B1Q	RJ11C, RJ14C, RJ21
DS1	04DU9-B	RJ48C/X
	04DU9-C	See note below.

 NOTE:

The preferred network interface is the RJ48X. If a customer's site uses the RJ48X interface and the customer's equipment does not provide connection, the T1 trunk's receive pair is looped back to the transmit pair. This simplifies troubleshooting the T1 trunk from the central office.

In most installations, the network interface is connected through a cross-connect field to the control unit. However, for systems with fewer than 24 extensions, you can connect the trunk wires directly to the control unit.

When constructing wiring fields between the network interface and the control unit, you must order hardware as individual parts. Do not use Interconnect Wiring or Systimax wiring kits.

RJ21X Interface

The RJ21X network interface has a female 50-pin (25-pair) amphenol connector, as shown in [Figure 4-1](#).

To connect the RJ21X interface to the control unit, you must build a wiring field between the RJ21X interface and the control unit using a 66-type block (RJ21). This field converts the female amphenol connector to sets of four 1-pair modular jacks.

Connecting the Control Unit to the Network Interface
 Wiring

Page 4-5

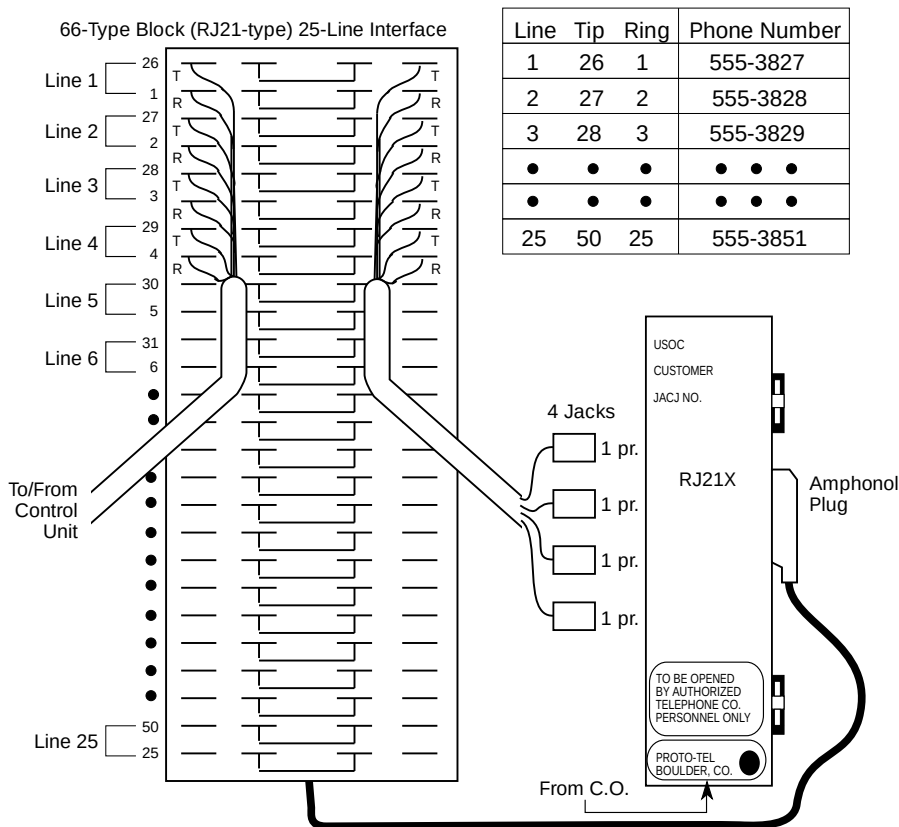


Figure 4-1. RJ21X Network Interface Connector

Building the Wiring Field

Build the wiring field between the network interface and the control unit using 110AB1-100JP12 termination blocks with modular jacks and associated hardware. [Figure 4-2](#) shows the hardware you need, including 110AB1-100JP12 termination blocks with modular jacks, 110A1 wire troughs, D-rings, and D2R cords.

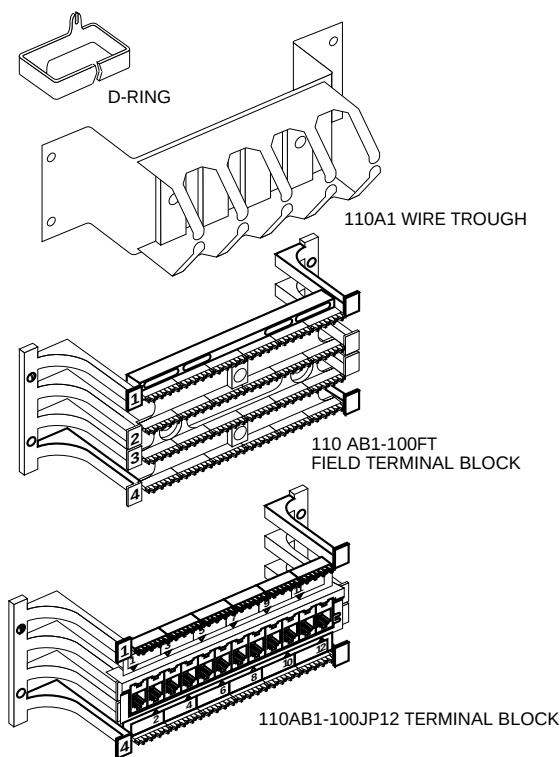


Figure 4-2. RJ21X Wiring Field Hardware

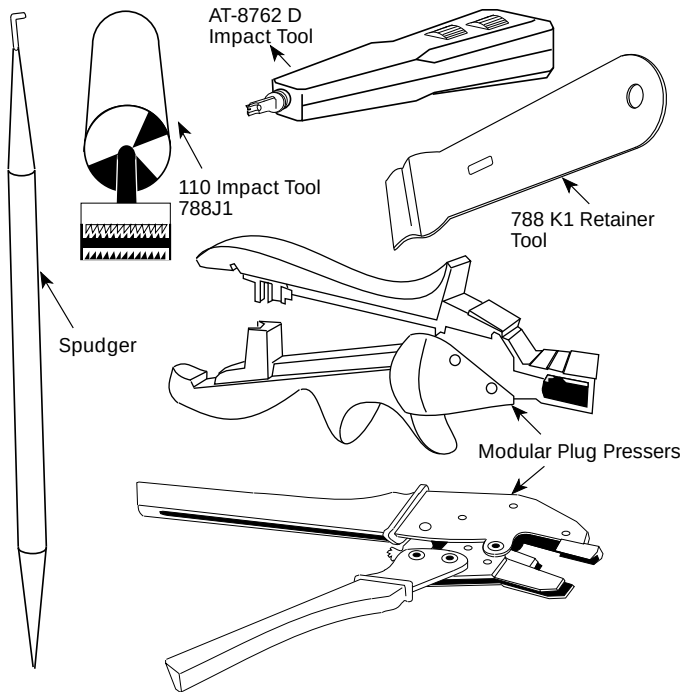


Figure 4-3. RJ21X Wiring Field Tools

To connect the RJ21X network interface to the control unit, follow the steps below. [Figure 4-3](#) shows the tools you need.

- ▶ **1. For each piece of hardware, drill two diagonally opposite holes into the backboard, allowing for a 1/16-inch (1.6 mm) space between each piece of hardware.**
- ▶ **2. Mount the wire troughs and the termination blocks.**
There is a wire trough above and below each termination block.

- ▶ **3. If necessary, repeat Steps 1 and 2 for a second column.**
- ▶ **4. Run the 25-pair amphenol cable on the RJ21X interface to the termination blocks.**
If more length is needed, use an A25D male-connector, single-ended, 25-pair, nonplenum cable.
- ▶ **5. Mount the D-rings to properly dress the wires, as needed.**
- ▶ **6. Cut off the amphenol connector nearest to the cross-connect field and strip the wires for each of the 25 pairs.**
- ▶ **7. Punch down the 25-pair wires to the termination block.**
 - a. Route the wires through the fanning slots on the termination block.
 - b. Insert the conductors into the designated 110 connecting blocks already on the termination block.
 - c. Use the D-impact tool to seat the conductors. See [Figure 4-4](#).
 - d. Remove any insulation fragments with a spudger.

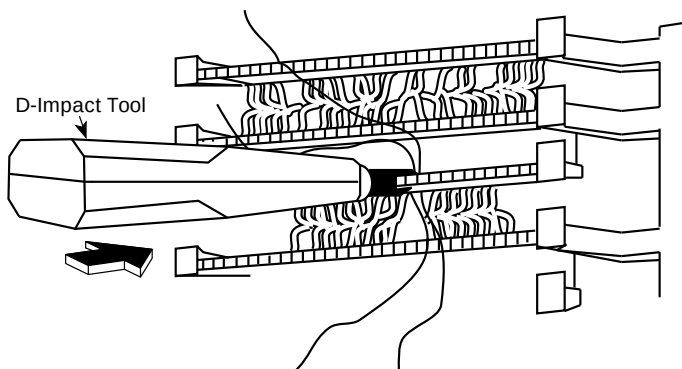


Figure 4-4. Using the D-Impact Tool to Seat the Conductors

- ▶ **8. Test the central office trunks for proper connection.**
See ["Testing Trunks"](#), later in this chapter, for instructions.
- ▶ **9. Label the network interface jacks, control unit module jacks, termination blocks, and D2R cords.**
See ["Labeling Trunks"](#), later in this chapter, for instructions.
- ▶ **10. For each trunk, plug one end of a D2R cord into the designated jack on the termination block and the other end into the line/trunk jack on the proper control unit module.**

 NOTE:

The modular jacks on the termination block are 8-wire jacks. The D2R cords, which are 6-wire, also plug into the 8-wire jacks.

 CAUTION:

Do not plug an analog multiline telephone, an MLX telephone, or anything else that should be plugged into an extension jack into this wiring field: doing so will busy-out the trunk.

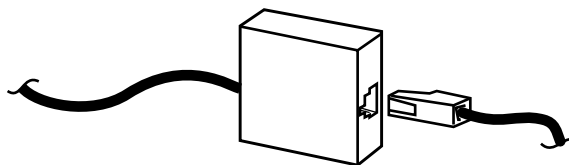
RJ11 and RJ14 Interfaces

RJ11 and RJ14 interfaces are connected to the control unit similarly. However, note the following differences:

- RJ11 connects *one* central office trunk per jack.
- RJ14 connects *two* trunks per jack.

Plug a 267C-type adapter into each RJ14 jack. You need D2R cords for RJ11 jacks. See [Figure 4-5](#).

Single-Line Adapter (RJ11)



2-Line Adapter (RJ14)

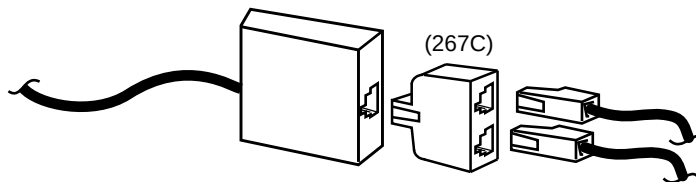


Figure 4-5. RJ11 and RJ14 Interfaces

CAUTION:

Incorrect wiring can damage the ports and cause them to stop functioning. Make sure you use the proper cords. For all GS/LS modules, do the following:

- *Use a D2R cable from an RJ11.*
- *Do not use the Brand-Rex Quad cable from an E66 block.*

If you cannot avoid using the Brand-Rex Quad cable, reverse the tip and ring leads at the E66 block to correct the mismatch.

To connect the RJ11 and RJ14 network interfaces to the control unit, follow the steps below:

- ▶ **1. Test the central office trunks for proper connection.**
See [“Testing Trunks”](#), later in this chapter, for instructions.
- ▶ **2. Label the network interface jacks, the control unit module jacks, and the D2R cords properly.**
See [“Labeling Trunks”](#), later in this chapter, for instructions.
- ▶ **3. Plug one end of a D2R cord into the jack at the network interface and the other end into the appropriate line/trunk jack on the control unit.**
- ▶ **4. Dress the wires properly.**

RJ2GX Interface

The RJ2GX is a 25-pair amphenol interface that connects up to 8 tie trunks. Construct the cross-connect field in the same way you did for the RJ21X interface.

RJ21X and RJ2GX interfaces do not require separate termination blocks. If there is room on the termination block for the trunk wires, you can punch down both the RJ21X and the RJ2GX on the same 110AB1-100JP12 block. Leave any unused wires unterminated.

 CAUTION:

Be careful not to connect tie trunks to GS, LS, or DID ports. Since all the jacks on the termination block are 8-wire jacks, it is possible to interchange tie trunk wires with GS, LS, or DID wires accidentally.

RJ48C/X Interface

The RJ48C/X interface terminates a DS1 trunk at the customer's premises. Both RJ48C and RJ48X interfaces have 8-wire modular jacks. However, the RJ48X interface includes shorting bars that loop the DS1 trunk's receive pair to the transmit pair. This helps in testing the DS1 trunk from the central office.

Testing Trunks

Before you connect the central office trunks to the control unit, verify that there is dial tone and that you can dial out on every trunk. DID trunks can be tested only through the control unit. *Do not* test DID trunks at this time.

 CAUTION:

Do not use analog multiline telephones or MLX telephones for testing. They do not work for these tests and can be damaged if you use them for this purpose.

Testing Loop-Start Trunks

To perform this test, you need a single-line telephone or an installer's test telephone (craft set). If you are installing rotary-dial trunks, use a rotary telephone to perform this test.

To test loop-start trunks, follow the steps below:

- ▶ **1. Plug the single-line telephone or the craft set into each central office line/trunk jack (either at the network interface or at the cross-connect field) and listen for dial tone.**

- ▶ **2. If you find a central office trunk that does not have dial tone, check for a bad adapter or loose connection.**
If adapters and wiring are in working order but you still do not hear a dial tone, notify the Lucent Technologies Service Center acting as the customer's agent.
- ▶ **3. When you hear a dial tone, dial a known telephone number to verify dialing.**
After the central office completes the connection, check that you have good two-way transmission.
- ▶ **4. If you cannot dial out on any of the trunks, notify the Lucent Technologies Service Center acting as the customer's agent.**
It is the customer's responsibility (or that of the customer's agent) to report service outages to the local telephone company.

Testing Ground-Start Trunks

To perform this test, you need a single-line telephone with a ground key or a ground-start button.

NOTE:

If a single-line telephone with a ground key or ground-start button is not available, ground one side of the trunk.

To test ground-start trunks, follow the steps below:

- ▶ **1. Plug the single-line telephone into each central office line/trunk jack (either at the network interface or at the cross-connect field).**
- ▶ **2. Pick up the handset.**
You should hear a dial tone.
- ▶ **3. Ground the ring lead by pushing the ground key or ground button, or by grounding one side of the trunk.**
- ▶ **4. Remove the ground from the ring lead.**
- ▶ **5. Dial a telephone number to verify dialing.**
Also check that you have good two-way transmission after the central office completes the connection.

- ▶ 6. **If you find a central office trunk that does not have dial tone, check for a bad adapter or loose connection.**

If adapters and wiring are in working order but you still do not hear dial tone, notify the Lucent Technologies Service Center acting as the customer's agent.

- ▶ 7. **If you cannot dial out on any of the trunks, notify the Lucent Technologies Service Center acting as the customer's agent.**

Testing NI-BRI Provisioning

The NI-BRI Provisioning Test should be performed after installing an 800 NI-BRI module and connecting to the network. See *Maintenance and Troubleshooting* for the test procedure.

Labeling Trunks

You can have up to 80 central office line/trunk jacks on the system. This procedure describes how to label each D2R or D8W cord, network interface jack, and control unit module jack.

To label trunks, follow the steps below:

- ▶ 1. **Review System Form 2c, System Numbering: Line/Trunk Jacks to determine each central office trunk assignment on the control unit.**
- ▶ 2. **Place a green cord label at each end of every D2R or D8W cord. (These labels are packaged with the basic carrier.)**
The green label indicates the number of the central office line/trunk jack to which the cord is connected.
- ▶ 3. **Label the jacks on the termination blocks.**
- ▶ 4. **Leave a copy of System Form 2c in a secure place near the control unit.**

Installing the Channel Service Unit

The Channel Service Unit (CSU) provides the interface between the 100D module and the DS1 facilities. The system supports three basic models:

- ACCULINK 3150 CSU (You may also install an ACCULINK 3160 or 3164 CSU; these provide 2- or 4-data ports, respectively.)
- ESF (Extended Superframe format) T1 CSU
- 551 T1 CSU

Only the ACCULINK CSUs are available for installation. For more information about the ESF T1 CSU and the 551 T1 CSU, see *Maintenance and Troubleshooting*.

The operator's guides shipped with the ACCULINK CSUs provide detailed installation, set-up and operation, and maintenance and troubleshooting information. Refer to one of these guides if your installation calls for an ACCULINK channel service unit.

NOTE:

Before you can install a CSU, the local telephone company must provide information such as services available, equipment options, and 48-V DC power on the trunk.

ACCULINK CSUs

The Lucent Technologies Paradyne ACCULINK CSUs replace the ESF T1 CSU. They are fully compatible with the ESF units.

The ACCULINK CSUs differ from the ESF T1 CSU in the following ways:

- The ACCULINK front panels include an LCD display and 7-button keypads composed of three functional and four directional keys.
- They contain integral 2400-bps modems for remote access and alarm reporting.

- The front-panel LEDs are labeled and colored differently from the ESF T1 CSU.
- The NETWORK connectors on the rear of the ACCULINK models are 8-pin modular jacks (RJ48C) instead of male 15-pin D-connectors. Cables are shipped with the units for the CSU-to-Smart Jack connection.
- There are no DIP switch options. All options are set via software commands. Access the options in the following ways:
 - Locally, from the front panel
 - Remotely, using the integral 2400-bps modem. The front panel of a local ACCULINK, in Passthrough mode, can access and option a remote CSU
 - Locally and remotely, through the COMPORT connector on the rear and a PC loaded with a Windows™ software package (available at an extra charge from Paradyne)

The ACCULINK CSUs come equipped with two factory-set option configurations: Factory 1 (Fact 1) and Factory 2 (Fact 2). They leave the factory set at Fact 1. Two of the default parameters in Fact 1 are ESF/B8ZS. In the Fact 2 setting, two of the default parameters are D4/AMI.

The CSUs offer a number of front-panel alarms and monitor alarm conditions occurring either on the network interface or on the DTE interface. If an ACCULINK CSU detects two alarm conditions at the same time, it reports the higher-priority alarm. Alarms remain active until the alarm condition is cleared.

Network performance is continually monitored and maintained by internal memory registers when the network interface is configured for ESF operation. The registers collect performance data for the previous 24-hour period.

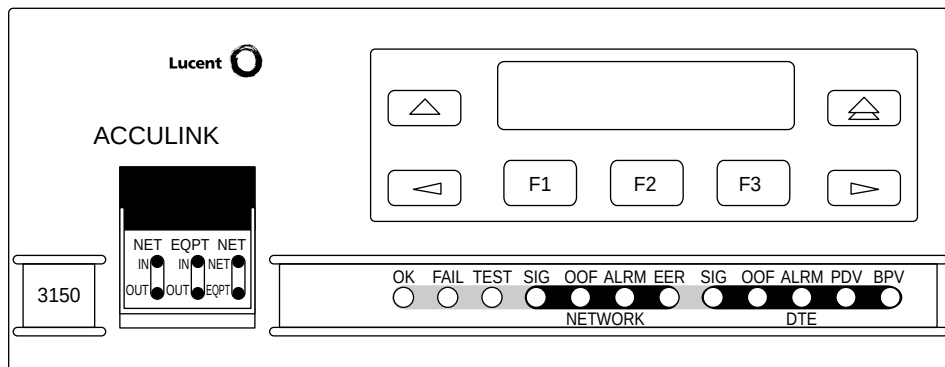


Figure 4-6. 3150 Front Panel

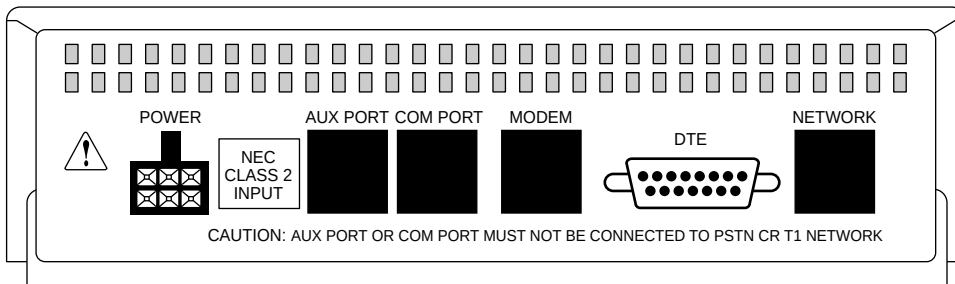


Figure 4-7. 3150 Back Panel

Installing the PC, CAT, or Printer

5

Once you complete the installation procedures presented in the previous chapters, you can connect a Station Message Detail Recording (SMDR) or Call Accounting Terminal (CAT) printer and a personal computer (PC), or a CAT and CAT printer, to the system.

Connecting a PC to the Control Unit

You can use a PC with MS-DOS 3.3 or higher and SPM 4.15 for SMDR, system programming, or maintenance. The method you use to connect the PC to the control unit depends on the distance between the hardware:

- If the PC is within 50 ft. (15.2 m) of the control unit, see [“Connecting a PC Within 50 Feet”](#) on the following page.
- If the PC is more than 50 ft. (15.2 m) from the control unit, see [“Connecting a PC More Than 50 Feet \(15.2 m\) Away”](#) later on this chapter.



CAUTION:

To prevent damage from electrostatic discharge (ESD), avoid touching leads, connectors, pins, and other components. Use a properly grounded wrist strap.

Connecting a PC Within 50 Feet

Use this procedure to connect a PC to the control unit when the PC is within 50 ft. (15.2 m) of the control unit.

You need the following hardware for this procedure:

- 355AF adapter
- D8W cord
- EIA-232-D cable (optional)

To connect a PC within 50 ft. (15.2 m) of the control unit, follow the steps below. See [Figure 5-1](#).

► **1. Connect the D8W cord.**

- For system programming or maintenance, plug one end of a D8W cord into the ADMIN jack on the control unit.
- For SMDR, plug one end of a D8W cord into the SMDR jack on the control unit.

► **2. Plug the other end of the D8W cord into a 355AF adapter.**

► **3. Connect the 355AF adapter.**

- If you are using an EIA-232-D cable, plug one end of the cable into the 355AF adapter and plug the other end into the COM1 port on the PC.
- If you are not using an EIA-232-D cable, plug the 355AF adapter directly into the COM1 port on the PC.

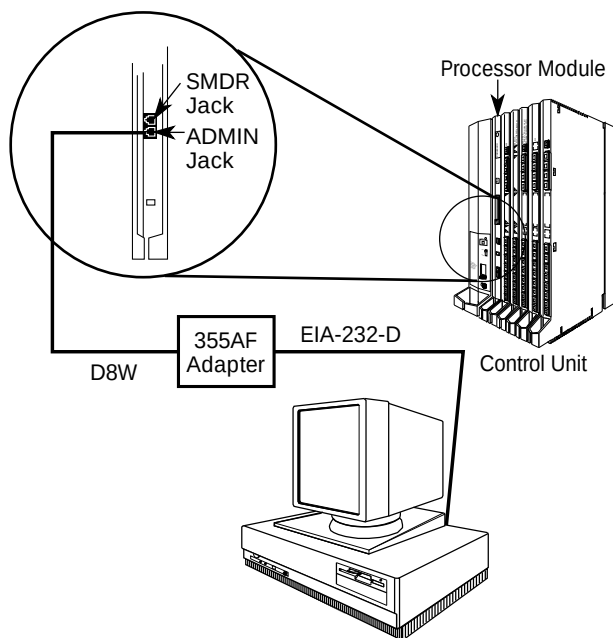


Figure 5-1. Connecting a PC Within 50 ft. (15.2 m)

Connecting a PC More Than 50 Feet (15.2 m) Away

Use this procedure to connect a PC to the control unit when the distance is 50 ft. (15.2 m) or more.



NOTE:

If you are installing the PC in a different room than the control unit, make sure that both locations have working wall outlets and wall jacks. Also make sure that the building wiring has been connected so that the wall jacks in each location connect to each other.

You need the following hardware for this procedure:

- 355AF adapter
- EIA crossover cable
- Two Z3A2 Asynchronous Data Units (ADUs)
- ADU crossover cable
- 400B2 power adapter
- 2012D transformer
- BR1A-4P adapter and 102 connecting block or 103 connecting block
- 248B adapter
- 8-position wall jacks
- 4-pair plug-ended cable
- D8W cords
- D6AP power cord
- EIA-232-D cables

To connect a PC 50 ft. (15.2m) or more distant, follow the steps below.

See [Figure 5-2](#).

- ▶ 1. Plug one end of a D8W cord into the ADMIN jack on the control unit.
- ▶ 2. Plug the other end of the D8W cord into a 355AF adapter.
- ▶ 3. Connect an EIA crossover cable to the 355AF adapter.
- ▶ 4. Connect one end of an EIA-232-D cable to the EIA crossover cable and plug the other end into the 25-pin male connector on the Z3A2 ADU.



CAUTION:

If the PC is in a building outside the main building (control unit location), you must install an ADU and an additional protector in each building. The ADUs and protectors provide both the control unit and the PC with additional protection against lightning, inadvertent contact with power lines, and power currents induced by nearby power lines. For more information, see the installation notes packaged with the ADU.

- ▶ 5. Plug one end of a D8W cord into the WALL jack on the Z3A2 ADU and connect the other end to an ADU crossover cable.
- ▶ 6. Plug the other end of the ADU crossover cable into one of the jacks on a 400B2 power adapter.
- ▶ 7. Plug one end of a D6AP cord into the 400B2 power adapter.
- ▶ 8. Plug the other end of the D6AP cord into a 2012D-50M transformer.
- ▶ 9. Plug the 400B2 power adapter into a wall jack, BR1A-4P adapter, 102 connecting block, or 103 connecting block.
 - If you plug the 400B2 into a wall jack, make sure the building wiring has been set up so that the wall jack near the control unit is connected to the wall jack near the PC.
 - If you plug the 400B2 into a BR1A-4P adapter, 102 connecting block, or 103 connecting block, use 4-pair plug-ended cable to connect the BR1A-4P adapter (or connecting block) to the wall jack near the PC.

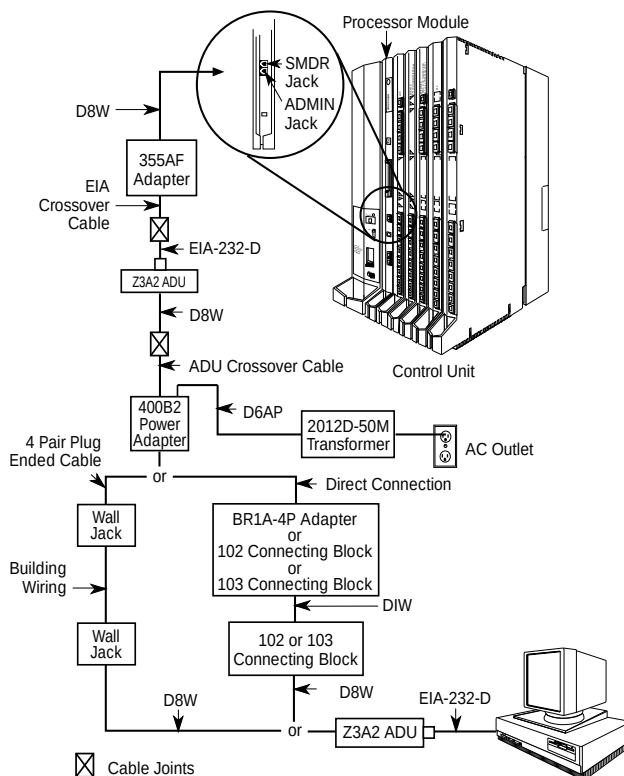


Figure 5-2. Connecting a PC More Than 50 ft. (15.2 m) Away

- ▶ 10. On the PC side, plug one end of a D8W cord into a wall jack and the other end into the WALL jack on the Z3A2 ADU.
- ▶ 11. Plug one end of an EIA-232-D cable into the 25-pin male connector on the Z3A2 ADU and the other end into the COM1 port on the PC.
- ▶ 12. Plug the 2012D-50M transformer into a wall outlet.

Connecting a CAT to the Control Unit

The Call Accounting Terminal (CAT) is a stand-alone unit that provides call accounting information. It connects to the SMDR jack on the control unit and links the control unit to the CAT printer. The connection of the CAT to the control unit depends on the distance and whether the CAT and control unit share the same AC outlet.

The CAT and CAT printer are connected at the same time. For more information, see [“Call Accounting Terminal”](#) in [Chapter 8](#).

- If the CAT is grounded to the same AC outlet as the control unit and the CAT and CAT printer are within 14 ft. (4.27 m) and 50 ft. (15.2 m), respectively, of the control unit, refer to [“Connecting a CAT and Printer on the Same AC Outlet”](#).
- If the CAT is either not grounded to the same AC outlet as the control unit or is more than 14 ft. (4.27 m) from the control unit, refer to [“Connecting a CAT and Printer on a Different AC Outlet”](#).

CAUTION:

To prevent damage from electrostatic discharge (ESD), avoid touching leads, connectors, pins, and other components. Wear a properly grounded wrist strap.

Connecting a Printer to the Control Unit

You can connect any 1200-bpi serial printer set at no parity and one stop bit. If necessary, consult the printer's manual to ensure that these settings are in effect. The system supports the following Lucent Technologies printers:

- Lucent Technologies 572 Printer
- Lucent Technologies 475/476 Printer

- Lucent Technologies Call Accounting Terminal (CAT) Printer
- Lucent Technologies Call Accounting System Printer
- Lucent Technologies Applications Printer

 NOTE:

The Lucent Technologies 570 printer is not compatible with the system.

Printer connection varies depending on the printer model, whether the printer is grounded on the same AC outlet as the control unit, and whether the printer is within 50 ft. (15.2 m) of the control unit. The procedures covered in this chapter are described below:

- If the CAT serial printer is used with a CAT and is grounded to the same AC outlet as the control unit and is *within* 50 ft. (15.2 m) of the control unit, refer to [“Connecting a CAT and Printer on the Same AC Outlet”](#).
- If the CAT serial printer is used with a CAT and is either *not* grounded to the same AC outlet as the control unit or is *more* than 50 ft. (15.2 m) from the control unit, refer to [“Connecting a CAT and Printer on a Different AC Outlet”](#).
- If the SMDR or CAT printer is *within* 50 ft. (15.2 m) of the control unit and is connected to the same 117-V AC branch as the control unit, refer to [“Connecting a Printer Within 50 Feet \(15.2 m\)”](#).
- If the SMDR or CAT printer is *more* than 50 ft. (15.2 m) from the control unit and is *not* connected to the same 117-V AC branch as the control unit, refer to [“Connecting a Printer 50 Feet \(15.2 m\) or More Away”](#).

 CAUTION:

Before touching leads, connectors, pins, and other components, wear a properly grounded wrist strap, to prevent damage from electrostatic discharge (ESD).

Connecting a CAT and Printer on the Same AC Outlet

Use this procedure to connect a CAT and CAT serial printer into the same AC outlet as the control unit, provided the CAT is fewer than 14 ft. (4.27 m) and the printer is fewer than 50 ft. (15.2 m) from the control unit.

You need the following hardware for this procedure:

- Z200A EMI filter
- D8W cord
- 355A adapter

To connect a CAT and CAT printer on the same AC outlet, follow the steps below. See [Figure 5-3](#).

- ▶ 1. Plug the short end of the Z200A EMI cord into the SMDR jack on the control unit.
- ▶ 2. Plug the other end of the Z200A EMI cord into the SMDR jack on the back of the CAT.
- ▶ 3. Plug one end of a D8W cord into the PRINTER jack on the back of the CAT.
- ▶ 4. Plug the other end of the D8W cord into a 355A adapter.
- ▶ 5. Plug the 355A adapter into the serial port on the back of the printer.
- ▶ 6. Set the appropriate printer options for SMDR.

See [“Setting Printer Options and DIP Switches”](#), later in this chapter, for instructions.

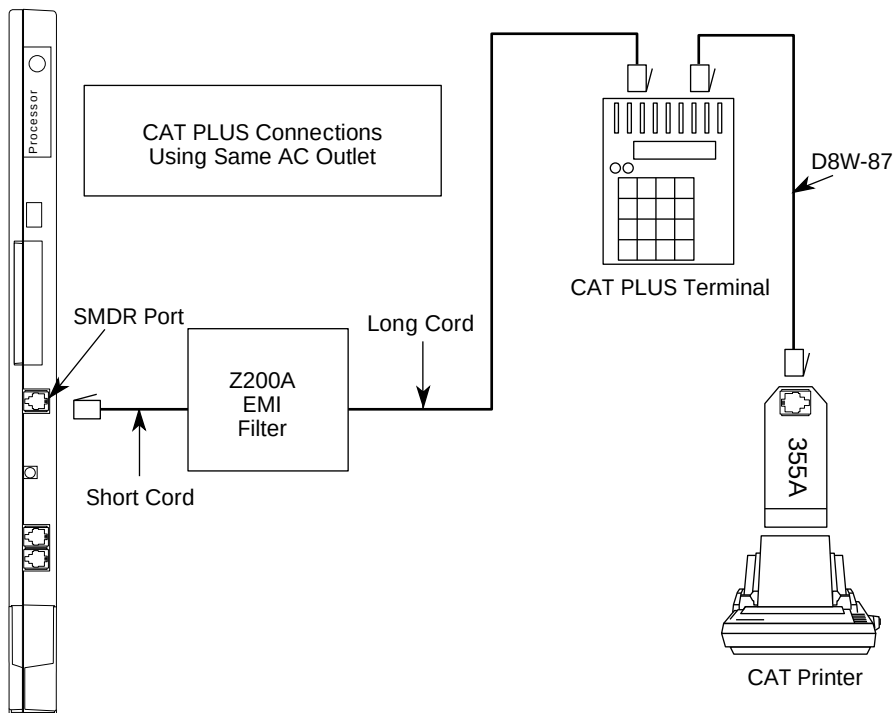


Figure 5-3. Connecting a CAT and Printer on the Same AC Outlet

Connecting a CAT and Printer on a Different AC Outlet

If the printer is not grounded to the same AC outlet as the control unit or CAT, or if the printer is more than 50 ft. (15.2 m) from the control unit, use the following procedure to connect a CAT serial printer to the control unit.

 NOTE:

If you are installing the printer in a different room than the control unit, make sure that both locations have working wall outlets and wall jacks, and that the building wiring has been connected so that the wall jacks in each location connect with each other.

You need the following hardware for the following procedure:

- 248B adapters
- 355AF, 355A adapters
- 400B2 power adapters
- D8W cords
- D6AP power cords
- D8AM modular crossover cable
- M7U null modem cable (25-pin cable)
- Z3A2, Z3A4 ADUs
- 2012D transformer
- Z200A EMI filter

To connect a CAT printer on a different AC outlet, first make the connections at the control unit, then at the printer.

Follow the steps below to make the connections at the control unit. Refer to [Figure 5-4](#) throughout the procedure.

- ▶ 1. **Plug the short end of a Z200A EMI cord into the SMDR jack on the control unit.**
- ▶ 2. **Plug the other end of the Z200A EMI cord into a 355AF adapter.**
- ▶ 3. **Plug the 355AF into one end of an M7U null modem cable.**
- ▶ 4. **Plug the other end of the M7U null modem cable into the 25-pin female connector on a Z3A4 ADU.**
- ▶ 5. **Plug one end of a D8W cord into the WALL jack on the Z3A4 ADU.**
- ▶ 6. **Plug the other end of the D8W cord into a modular jack on the D8AM modular crossover cable.**
- ▶ 7. **Plug the other end of the D8AM modular crossover cable into the top jack on the 400B2 power adapter.**
- ▶ 8. **Plug the 400B2 power adapter into the wall jack for the control unit.**
Make sure the building wiring is set up so that the wall jack for the control unit can communicate with the wall jack for the printer.
- ▶ 9. **Plug one end of a D6AP cord into the 2012D-50M transformer.**
If you are using a 248B adapter and 2012D transformer instead of a 2012D-50M transformer, plug the D6AP cord into the jack on the 248B adapter and then connect the spade-tip wires on the 248B adapter to the screws on a 2012D transformer.

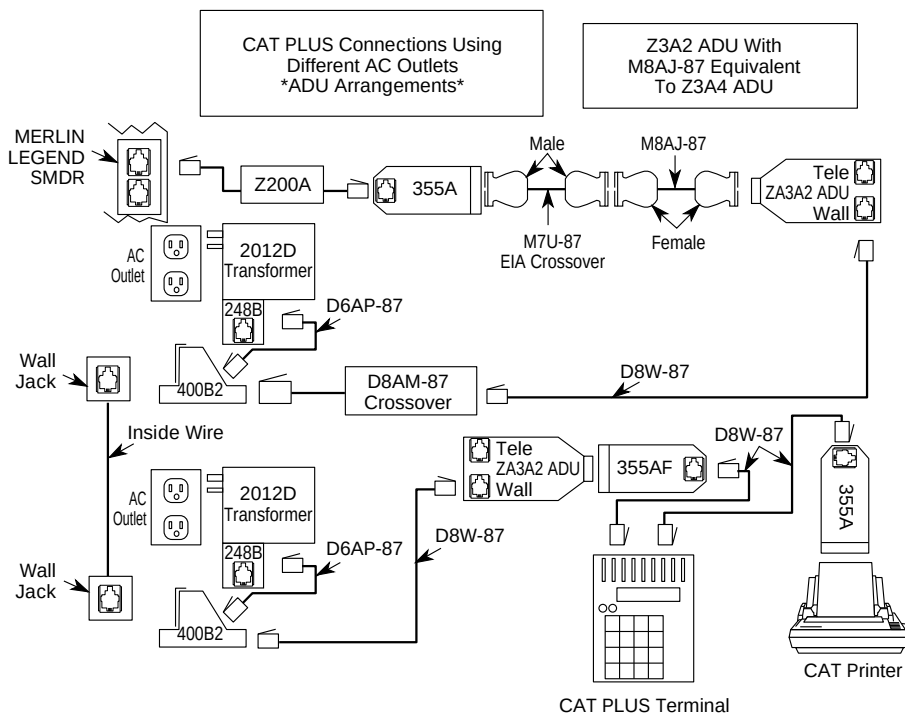


Figure 5-4. Connecting a CAT and Printer on Different AC Outlets: Control Unit Connections

- ▶ 10. Plug the other end of the D6AP cord into the lower jack on the 400B2 power adapter.
- ▶ 11. Plug the 2012D-50M (or 2012D) transformer into the wall outlet for the control unit.

To make the connections at the printer, follow the steps below. See [Figure 5-4](#).

- ▶ 1. At the printer location, either plug one end of a D6AP cord into a 2012D-50M transformer or follow the instructions in Step 9 above.
- ▶ 2. Plug the other end of the D6AP cord into the lower jack on a 400B2 power adapter.
- ▶ 3. Plug the 400B2 power adapter into the wall jack.
- ▶ 4. Plug the 2012D-50M (or 2012D) transformer into the wall outlet for the printer.
- ▶ 5. Plug one end of a second D8W cord into the top jack on the second 400B2 power adapter.
- ▶ 6. Plug the other end of the second D8W cord into the WALL jack on the Z3A2 ADU.
- ▶ 7. Connect the 25-pin male connector on the Z3A2 ADU to the 25-pin female end on a second 355AF adapter.
- ▶ 8. Plug one end of a third D8W cord into the second 355AF adapter.
- ▶ 9. Plug the other end of the third D8W cord into the SMDR jack on the back of the CAT.
- ▶ 10. Plug one end of a fourth D8W cord into the PRINTER jack on the back of the CAT.
- ▶ 11. Plug the other end of the fourth D8W cord into a third 355A adapter.
- ▶ 12. Slide the third 355A adapter into the serial port on the back of the printer.
- ▶ 13. Set the appropriate printer options for SMDR.
See ["Setting Printer Options and DIP Switches"](#) for instructions.

Connecting a Printer Within 50 Feet (15.2 m)

If the printer is within 50 ft. (15.2 m) of the control unit and is connected to the same 117-V AC branch as the control unit, use this procedure to connect a printer to the control unit.

You need the following hardware for this procedure:

- Z200A EMI filter
- Adapter for the connector on the interface cable
 - 355A for a male connector
 - 355AF for a female connector

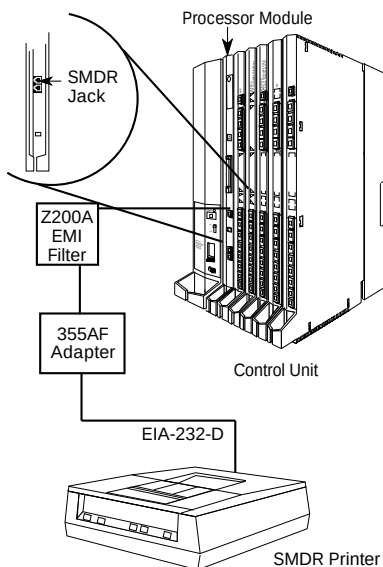


Figure 5-5. Connecting a Printer Within 50 ft. (15.2 m)

To connect a printer within 50 ft. (15.2 m), follow the steps below. Refer to [Figure 5-5](#).

- ▶ 1. Plug the short end of a Z200A EMI cord into the SMDR jack on the control unit.
- ▶ 2. Plug the other end of the Z200A EMI cord into a 355AF or 355A adapter.
- ▶ 3. Plug the female end of the adapter into either the 25-pin male connector on the printer's interface cable or the serial port on the printer.
- ▶ 4. Set the appropriate printer options for SMDR.
See ["Setting Printer Options and DIP Switches"](#) for instructions.

Connecting a Printer 50 Feet (15.2 m) or More Away

Use this procedure to connect a printer to the control unit if the following conditions apply:

- The printer is not a CAT printer connected to a CAT.
- The printer is 50 ft. (15.2 m) or more from the control unit.
- The printer is not grounded to the same AC outlet as the control unit. The printer is not grounded to an outlet that is on the same 117-V AC branch as the control unit and that is 50 ft. (15.2 m) or closer to the control unit.



NOTE:

If you are installing the printer in a different room than the control unit, make sure that both locations have working wall outlets and wall jacks, and that the building wiring has been connected so that the wall jacks in each location communicate with each other.

You need the following hardware for this procedure:

- Z200A EMI filter
 - Adapter for the interface cable connector
 - 355A for the male connector
 - 355AF for the female connector
- 400B2 power adapter
- Z3A2 ADUs
- BR1A-4P adapter or 102 connecting block or 103 connecting block
- 8-position wall jacks
- EIA crossover cable
- ADU crossover cable
- 2012D transformer

- 248B adapter
- D8W cords
- D6AP power cord
- EIA-232-D cable
- 4-pair plug-ended cable

To connect a printer 50 ft. (15.2 m) or more away from the control unit, follow the steps below. See [Figure 5-6](#).

- ▶ 1. Plug the short end of a Z200A EMI cord into the SMDR jack on the control unit.
- ▶ 2. Plug the other end of the Z200A EMI cord into a 355AF adapter.
- ▶ 3. Plug the female end of the 355AF adapter into one end of an EIA crossover cable.
- ▶ 4. Plug the other end of the EIA cable into the 25-pin male connector of the Z3A2 ADU.



CAUTION:

If the printer is in a building outside the main building (control unit location), you must install an ADU and an additional protector in each building. The ADUs and protectors provide both the control unit and the printer with additional protection against lightning, inadvertent contact with power lines, and power currents induced by nearby power lines. See the installation notes packaged with the ADU for more information.

- ▶ 5. Plug one end of a D8W cord into the WALL jack on the Z3A2 ADU.
- ▶ 6. Plug the other end of the D8W cord into an ADU crossover cable.
- ▶ 7. Plug the other end of the ADU crossover cable into one of the jacks on a 400B2 power adapter.
- ▶ 8. Plug one end of a D6AP cord into the other jack of the 400B2 adapter.

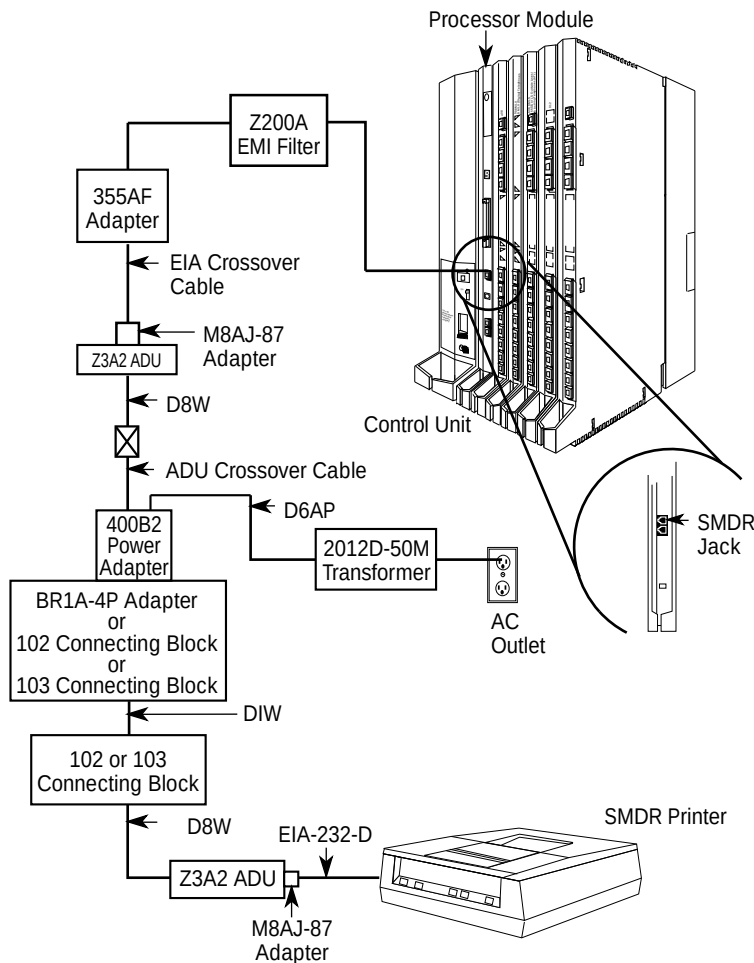


Figure 5-6. Connecting a Printer More Than 50 ft. (15.2 m) Away

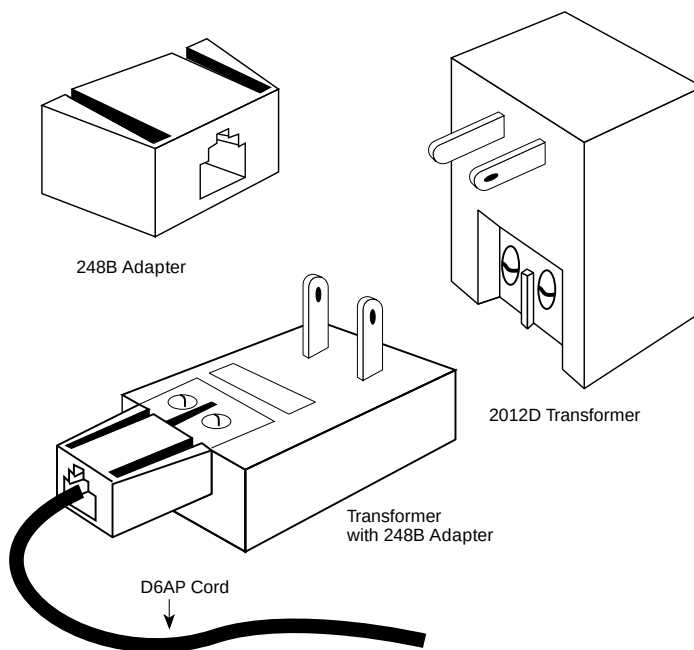


Figure 5-7. Connecting the 248B Adapter and the 2012D Transformer

- ▶ **9. Plug the other end of the D6AP cord into the 2012D-50M transformer.**

If you are working with a 248B adapter and 2012D transformer instead of a 2012D-50M transformer, plug the D6AP cord into the jack on the 248B adapter, and then connect the spade-tip wires on the 248B adapter to the screws on a 2012D transformer. See [Figure 5-7](#).

- ▶ **10. Plug the 400B2 adapter into a wall jack, BR1 A-4P adapter, 102 connecting block, or 103 connecting block.**
- ▶ **11. Complete the 400B2 connection.**

- If the 400B2 is plugged into a wall jack, make sure that building wiring has been set up so that the wall jack for the control unit can communicate with the wall jack for the printer.
 - If the 400B2 is plugged into a BR1A-4P adapter, 102 connecting block, or 103 connecting block, use 4-pair plug-ended cable to connect the BR1A-4P adapter (or connecting block) to the wall jack for the printer.
- ▶ **12. On the printer side, plug one end of a D8W cord into the wall jack and the other end into the WALL jack on the Z3A2 ADU.**
- ▶ **13. Plug one end of an EIA-232-D cable into the 25-pin male connector on the Z3A2 ADU and the other end into the serial port on the printer.**
- ▶ **14. Plug the 2012D-50M (or 2012D) transformer into a wall outlet.**
- ▶ **15. Set the appropriate printer options for SMDR.**
See [“Setting Printer Options and DIP Switches”](#) for instructions.

Setting Printer Options and DIP Switches

If the customer has an Lucent Technologies 572, Lucent Technologies 475/476, CAT, or Lucent Technologies Applications printer, use this section to set up printer options. If another type of serial printer is being used, review these setup options for guidance and consult the manual for the printer. Use the information below to determine the correct printer setting for the printer:

- For the 572 printer, set the options on the printer according to [Table 5-1](#). (See the user's guide supplied with the printer for more information.)
- For the 475/476 printer, set the DIP switches on the printer according to [Table 5-2](#). (See the user's guide supplied with the printer for more information.)
- For the CAT printer, set the DIP switches on the printer according to [Table 5-3](#). (See the user's guide supplied with the printer for more information.)
- For the Applications printer, set all the DIP switches on the printer to *off*. (See the user's guide supplied with the printer for more information.)

Table 5-1. Lucent Technologies 572 Printer Options

No.	Function	Menu	Status
01	FORM LENGTH	09	11
02	LPI	01	6
03	CPI	01	10
04	LQ or NLQ	01	LQ
05	BUZZER	01	ON
06	FONT	01	BUILT-"IN"
07	RESOLUTION	01	144
11	BUFFER	02	ON-"LINE"
13	PW ON MODE	01	ON-"LINE"
14	DIRECTION	01	BI-DIR. 1
15	BUFFER FULL	02	LF + CR
16	P.E.	01	ACTIVE
17	AUTO CR	01	CR + LF
18	ZERO	01	0
22	AUTO LF	01	CR ONLY
31	1" SKIP	01	OFF

Continued on next page

Table 5–1, Continued

No.	Function	Menu	Status
32	CHAR. SET (G0, GL)	02	USA
33	CHAR. SET (G1, GR)	01	UK
34	CHAR. SET (G2)	03	GE
35	CHAR. SET (G3)	0	"LINE" DRAWING
81	OFF- "LINE" STATE	01	ALL RECEIVE
82	DSR	02	OFF
83	RTS TIMING	01	RTS
84	CD	02	OFF
85	CTS	02	OFF
91	OVER RUN	02	256
92	DATA BIT	02	8
93	PROTOCOL	03	XON/XOFF ¹
94	STOP BIT	01	2
95	PARITY	01	NON
96	BPS	04	1200

-
1. This is the default status, but the system cannot read the character sent by the printer.
-

Table 5-2. Lucent Technologies 475/476 Printer DIP Switch Settings¹

Switch 1	Switch 2	Switch 21
DIP 1-Open	DIP 1-Open	DIP 1-Open
DIP 2-Closed	DIP 2-Open	DIP 2-Open
DIP 3-Open	DIP 3-Open	DIP 3-Open
DIP 4-Open	DIP 4-Open	DIP 4-Closed
DIP 5-Closed	DIP 5-Open	DIP 5-Open
DIP 6-Closed	DIP 6-Open	DIP 6-Open
DIP 7-Closed	DIP 7-Closed	DIP 7-Open
DIP 8-Open	DIP 8-Open	DIP 8-Closed

Switch 22	Switch 23	Switch 24
DIP 1-Open	DIP 1-Closed	DIP 1-Open
DIP 2-Closed	DIP 2-Open	DIP 2-Closed
DIP 3-Closed	DIP 3-Open	DIP 3-Closed
DIP 4-Open	DIP 4-Open	DIP 4-Open
	DIP 5-Closed	DIP 5-Open
	DIP 6-Open	DIP 6-Closed
		DIP 7-Open
		DIP 8-Closed

1. Open= off; Closed = on

Table 5-3. Lucent Technologies Printer DIP Switch Settings¹

Switch 1	Switch 2	Control Switch
DIP 1-On	DIP 1-On	DIP 1-Off
DIP 2-On	DIP 2-On	DIP 2-Off
DIP 3-On	DIP 3-Off	DIP 3-Off
DIP 4-On	DIP 4-Off	DIP 4-Off
DIP 5-On	DIP 5-On	DIP 5-On
DIP 6-On	DIP 6-On	DIP 6-Off
DIP 7-On	DIP 7-On	DIP 7-On
DIP 8-On	DIP 8-Off	DIP 8-Off

1. Open = off; Closed = on

Applications Printer DIP Switch Settings

For the Applications Printer, the only DIP switch setting is the control switch. Set all control switch DIP switches (1 through 8) to Off (open).

Connecting Data Equipment

6

This chapter explains how to set up data stations. A data station sends and/or receives data. If the data station includes a telephone, the station can also send and receive voice. If the system includes both modem and terminal adapter data stations that need to communicate with each other, then you need to set up a modem pool for those data stations. Modem pools are described in the applications note entitled *MERLIN LEGEND Communication System Modem Pooling*.

Data Stations

A data station is a combination of equipment that can include a telephone and a PC, printer, optical scanner, or fax machine. If the data station is connected to a tip/ring, analog, or MLX extension jack for data communications over analog trunks, it requires a modem to convert the signal from digital to analog or from analog to digital. If, however, the data station is connected to an MLX extension jack for data communications over a DS1 (Digital Signal Level 1) Primary Rate Interface (PRI) facility, it requires an ISDN terminal adapter instead of a modem.

[Table 6-1](#) provides a detailed comparison of data station configurations.

Table 6-1. Data Station Configurations

Type of Station	Telephone (for voice)	GPA or MFM	DCE	DTE
Analog voice and modem data	Analog multiline telephone and BR-241-B1 bridging adapter	GPA	Modem	Terminal, PC, fax (cannot dial), optical scanner, or host computer
Modem data-only*	None	None	Modem	Terminal, PC, fax, credit card verification, optical scanner, or host computer
MLX voice and modem data	Any MLX telephone	MFM	Modem	Terminal, PC, fax, credit card verification, optical scanner, or host computer
MLX voice and Terminal Adapter	Any MLX telephone	None	7500B or ExpressRoute Terminal Adapter	Terminal, PC, fax, credit card verification, optical scanner, host computer, or video codec
Terminal Adapter data-only	None	None	7500B or ExpressRoute Terminal Adapter and a 440A4 terminating resistor adapter	Terminal, PC, fax, credit card verification, optical scanner, host computer, or video codec
Synchronous Terminal Adapter for Video MLX 2B Data	Passive bus MLX	None	PE equipment or Terminal Adapter	PC with video applications

*. A single-line telephone may be attached for dialing purposes.

 NOTE:

The analog voice and modem data station requires a bridging adapter to connect the telephone to the two adjacent analog extension jacks.

The terminal adapter data-only station requires a terminating resistor adapter to connect the terminal adapter to the MLX extension jack.

See [“Video Conferencing Data Stations”](#), later in this chapter, for configuration details on stations including video codecs.

The cord length from the terminal adapter to the telephone cannot be more than 80 ft. (24 m).

Do not connect two terminal adapters on one line.

Modem Data Stations

A modem data station uses a modem to convert digital signals so that it can send and receive analog signals. This type of station allows data communication without PRI facilities.

The system supports the types of modem data stations listed below.

- **Analog Voice and Modem Data.** This station includes a data terminal and an analog multiline telephone.
- **Modem Data-Only.** This station includes a data terminal and modem. If this station's modem has a phone jack, you can connect a single-line telephone; however, voice and data at the same time are not possible.
- **MLX Voice and Modem Data.** This station includes a data terminal, a modem, and an MLX telephone.

See Form 2a, System Numbering: Extension Jacks for your customer's specifications. Then refer to the appropriate section later in this chapter for instructions on setting up modem data stations.

Terminal Adapter Data Stations

A terminal adapter data station uses a 7500B or ExpressRoute data module to convert MLX voice signals and DTE digital signals to the digital transmission signaling standard, so that it can send and receive digital signals. This type of station requires PRI facilities to send and receive data to and from digital data stations that are outside the system.

The system supports the following types of data stations connected to terminal adapters:

- **MLX Voice and Terminal Adapter Data.** This station includes a terminal adapter, a data terminal, and an MLX telephone.
- **Terminal Adapter Data-Only.** This station includes a terminal adapter, and a data terminal, but no telephone.

For your customer's specifications, see Form 2a, System Numbering: Extension Jacks and Form 2b, System Numbering: Digital Adjuncts. Then refer to the appropriate section later in this chapter for instructions on setting up terminal adapter data stations.

NOTE:

A video conferencing data station is a synchronous terminal adapter data station. Refer to ["Video Conferencing Data Stations"](#) for more information.

Analog Voice and Modem Data Stations

[Figure 6-1](#) shows the equipment configuration for an analog voice and modem data station.

GPA Settings

The switch on the back of the General Purpose Adapter (GPA) used in Step 4, provides two settings, Automatic and Basic (Join is not used).

Use the Basic setting to originate:

- Modem calls
- Telephone calls while using the modem

When the GPA is connected to an analog multiline telephone and configured using the Automatic setting, you can:

- Answer calls (if this is the case, an Auto Answer All button must be programmed so that calls can be answered automatically).
- Make and receive calls on the telephone while using the modem. The speakerphone must not be used.

Setting Up

To set up an analog voice and modem data station, follow the steps below:

- ▶ **1. If using an external modem, use an EIA-232-D cable to connect the SERIAL port on the data terminal to the modem. If using an internal modem, it should already be connected to the correct serial port.**
If the data terminal has both COM1 and COM2 ports, make sure you use the one designated for data transmission. See the customer's system manager if you are not sure.

- ▶ **2. Make sure that the modem has settings for speed and parity that are compatible with those of the data terminal.**

If you are not sure, see the customer's system manager or the documentation packaged with the modem, data communications software, and data terminal.

- ▶ **3. Connect the modem to the GPA.**

- a. Plug one end of a D4BU cord into the TEL/EQUIP jack on the GPA.
- b. Plug the other end into the modem as indicated in the modem's documentation.

- ▶ **4. Connect the GPA to the analog multiline telephone.**

- a. Plug one end of a D8AC cord into the VT jack on the back of the GPA.
- b. Plug the other end into the OTHER jack on the bottom of the telephone.
- c. Slide the switch on the back of the GPA to Automatic or Basic. See ["GPA Settings"](#) above for your options.

- ▶ **5. Use a D8W cord to connect the STATION jack on the BR-241-B1 bridging adapter to the LINE jack on the analog multiline telephone.**

- ▶ **6. Use two D8W cords to connect the EVEN and ODD jacks on the BR-241-B1 bridging adapter to the extension jacks indicated on Form 2a, System Numbering: Extension Jacks.**

Connect the EVEN jack on the bridging adapter to the extension jack associated with the even-numbered extension, not the logical ID.

- ▶ **7. Connect all power cords to an AC outlet that is not controlled by a wall switch.**

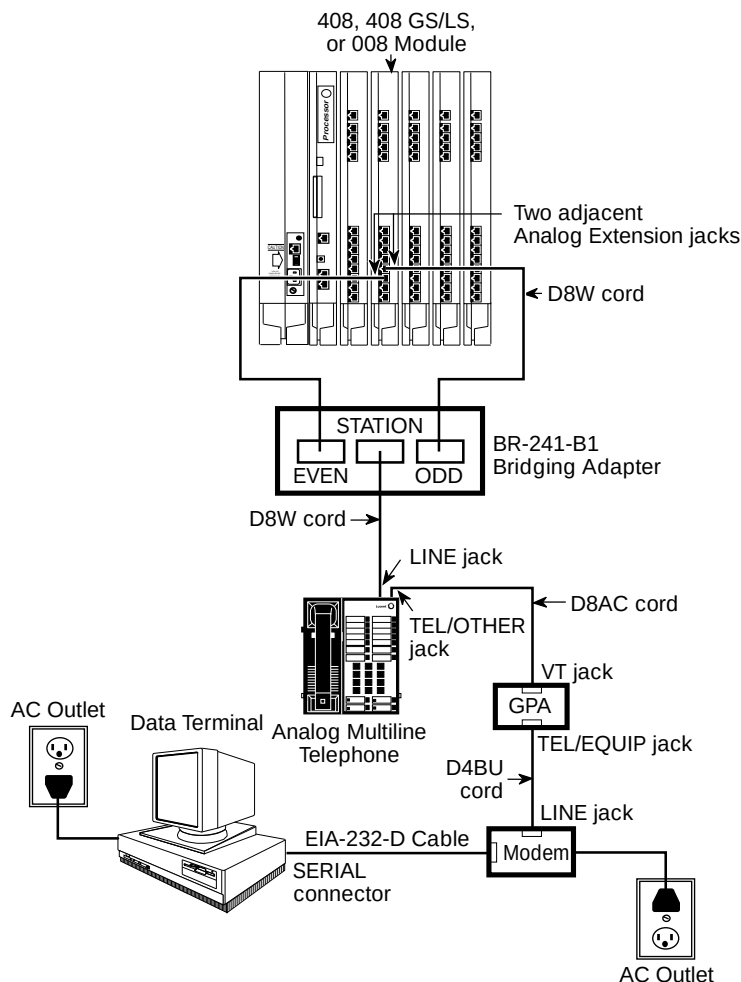


Figure 6-1. Analog Voice and Modem Data Equipment Configuration

Modem Data-Only Stations

[Figure 6-2](#) shows the equipment configuration for a modem data-only station.

To set up a modem data-only station, follow the steps below:

- ▶ **1. If using an external modem, use an EIA-232-D cable to connect the modem to the serial port on the data terminal. If using an internal modem, it should already be connected.**
For a data terminal that has both COM1 and COM2 ports, make sure you use the one designated for data transmission. See the customer's system manager if you are not sure.
- ▶ **2. Make sure that the modem has settings for speed and parity that are compatible with those of the data terminal.**
If you are not sure, see the customer's system manager or the documentation packaged with the modem, data communications software, and data terminal.
- ▶ **3. Connect the modem to the control unit.**
 - a. Plug one end of a D4BU cord into the appropriate modem jack; see the modem's documentation if you are not sure.
 - b. Plug the other end into the appropriate basic extension jack on the 012 or 008 OPT module. See Form 2a, System Numbering: Extension Jacks for the appropriate module and extension jack.
- ▶ **4. Connect all power cords to an AC outlet that is not controlled by a wall switch.**

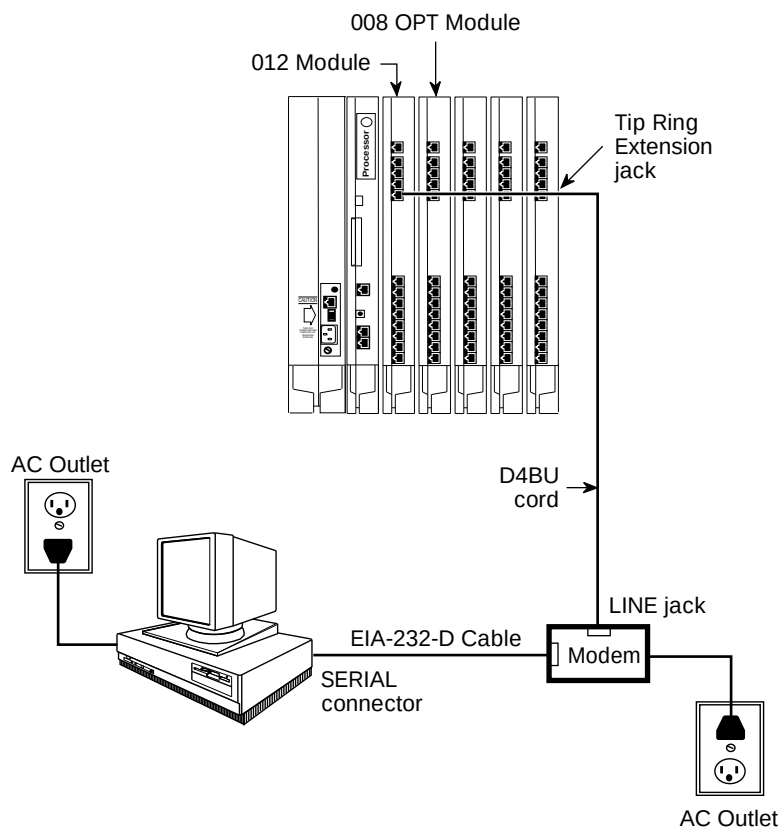


Figure 6-2. Modem Data-Only Equipment Configuration

MLX Voice and Modem Data Stations

[Figure 6-3](#) shows the equipment configuration for an MLX voice and modem data station.

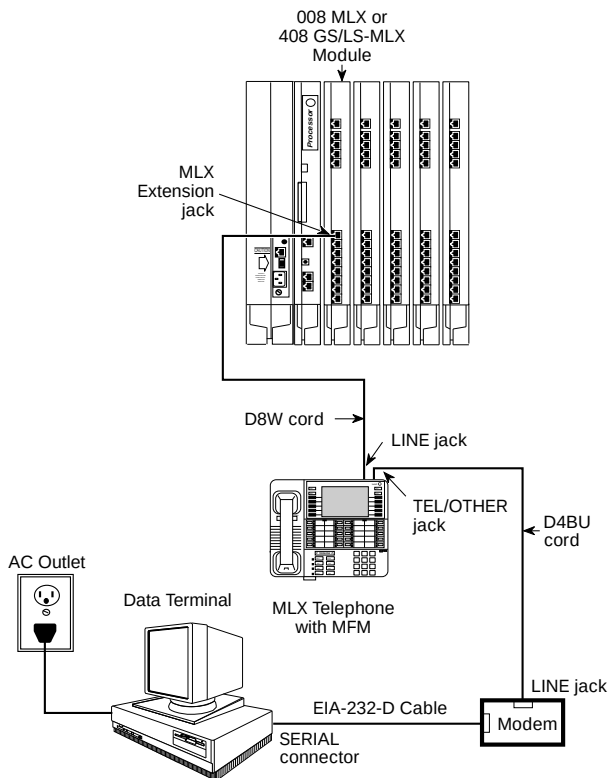


Figure 6-3. Modem Data and MLX Voice Equipment Configuration

To set up a modem data and MLX voice station, follow the steps below:

► **1. Use an EIA-232-D cable to connect the serial port on the data terminal to the modem.**

For a data terminal that has both COM1 and COM2 jacks, make sure you use the one designated for data transmission. See the customer's system manager if you are not sure.

► **2. Make sure that the modem has settings for speed and parity that are compatible with those of the data terminal.**

If you are not sure, see the customer's system manager or the documentation packaged with the modem, data communications software, and data terminal.

► **3. Connect the modem to the MFM in the MLX telephone.**

If the MFM is not installed already, refer to ["Installing Multi-Function Modules"](#) in [Chapter 3](#).

- a. Plug one end of a D4BU cord into the appropriate modem jack, as described in the modem's documentation.
- b. Plug the other end into the TEL/OTHER jack on the bottom of the MLX telephone.
- c. Route the D4BU cord through the telephone's cord channel.

► **4. Connect the MLX telephone to the control unit.**

- a. Plug one end of a D8W cord into the LINE jack on the bottom of the MLX telephone.
- b. Plug the other end into the appropriate MLX extension jack. See Form 2a, System Numbering: Extension Jacks for the appropriate module and extension jack.

► **5. Connect all power cords to an AC outlet that is not controlled by a wall switch.**

MLX Voice and Terminal Adapter Data Stations

[Figure 6-4](#) shows the equipment configuration for MLX voice and terminal adapter data station.

The configuration shown in [Figure 6-4](#) is for *asynchronous* terminal adapter data transmission. For information on setting up *synchronous* terminal adapter data stations, see "[Video Conferencing Data Stations](#)" later in this chapter.

The maximum cord length from the terminal adapter to the telephone is 80 ft. (24.38 m).

Setting Up

To set up an MLX voice and terminal adapter data station, follow the steps below:

- ▶ **1. Use an EIA-232-D cable to connect the serial port on the data terminal to the terminal adapter.**
If the data terminal that has both COM1 and COM2 connectors, make sure you use the one designated for data transmission. See the customer's system manager if you are not sure.
- ▶ **2. Make sure the terminal adapter option settings for parity and speed are compatible with the data terminal. (Speed is synchronized automatically if the factory setting has not changed.)**
If you are not sure about the speed and parity of the data terminal, see the customer's system manager or the documentation packaged with the terminal adapter and data terminal.
- ▶ **3. Plug the other end of the EIA-232-D cable into PORT 1 on the terminal adapter.**
- ▶ **4. Plug the WP90110-L7 power supply cord into the POWER receptacle on the terminal adapter.**

- **5. Connect the terminal adapter to the MLX telephone.**
- Plug one end of a D8W cord into the PHONE jack on the terminal adapter.
 - Plug the other end into the LINE jack on the MLX telephone.
-

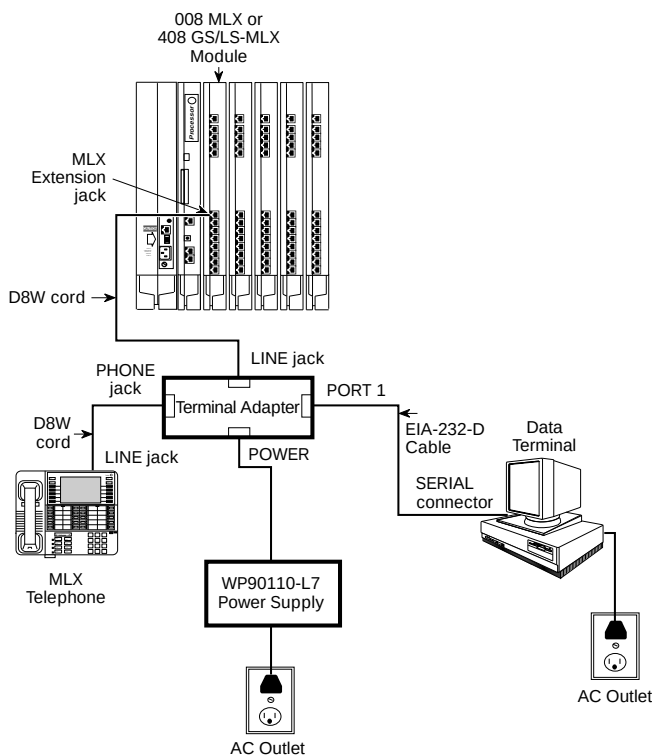


Figure 6-4. MLX Voice and Terminal Adapter Data Equipment Configuration

- ▶ **6. Connect the terminal adapter data module to the control unit.**
 - a. Plug one end of a D8W cord into the LINE jack on the terminal adapter.
 - b. Plug the other end into the appropriate MLX extension jack. See Form 2a, System Numbering: Extension Jacks for the appropriate module and extension jack.
- ▶ **7. Connect all power cords to an AC outlet not controlled by a wall switch.**

Terminal Adapter Data-Only Stations

[Figure 6-5](#) shows an equipment configuration for a terminal adapter data-only station.

To set up a terminal adapter data-only station, follow the steps below:

- ▶ **1. Use an EIA-232-D cable to connect the SERIAL port on the data terminal to the terminal adapter.**

For any data terminal that has both COM1 and COM2 connectors, make sure you use the one designated for data transmission. See the customer's system manager if you are not sure.
- ▶ **2. Make sure that the terminal adapter option settings for parity and speed are compatible with the data terminal. (Speed is synchronized automatically if the factory setting has not been changed.)**

If you are not sure about the speed and parity of the data terminal, see the customer's system manager or the documentation packaged with the terminal adapter and the data terminal.
- ▶ **3. Plug the other end of the EIA-232-D cable into PORT 1 on the terminal adapter.**

- ▶ **4. Plug the WP90110-L7 power supply cord into the POWER receptacle on the terminal adapter.**
- ▶ **5. Use a 440A4 terminating resistor adapter to connect the terminal adapter to the control unit.**
 - a. Use a D8W cord to connect the 440A4 terminating resistor adapter to the LINE jack on the terminal adapter.
 - b. Use a second D8W cord to connect the other end of the adapter to the appropriate MLX extension jack. See Form 2b, System Numbering: Digital Adjuncts for the appropriate module and extension jack.
- ▶ **6. Connect all power cords to an AC outlet not controlled by a wall switch.**

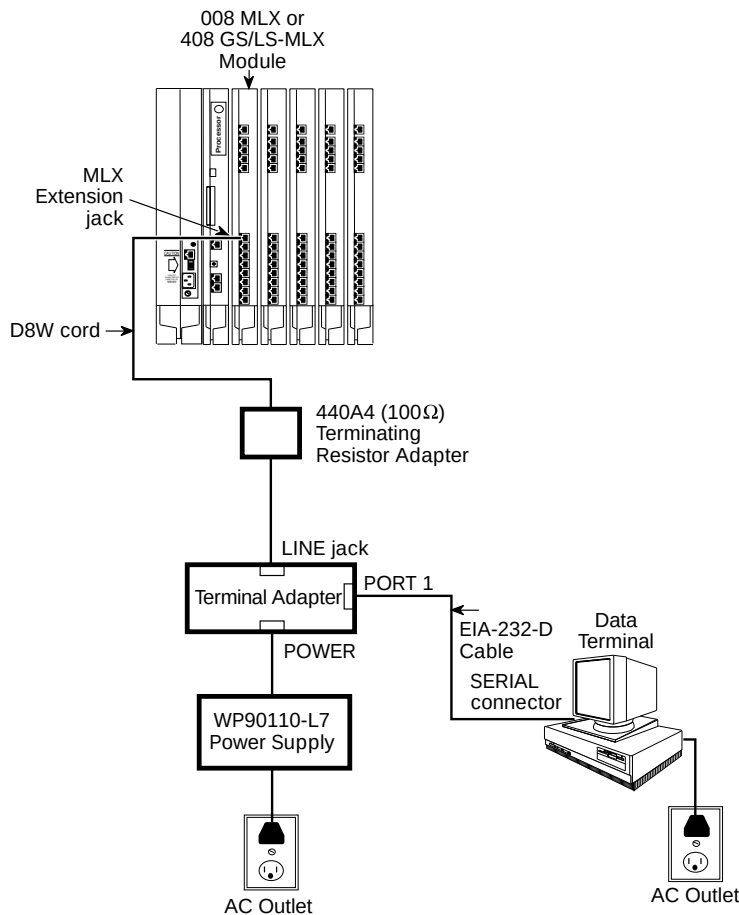


Figure 6-5. Terminal Adapter Data-Only Equipment Configuration

Video Conferencing Data Stations

You can use the terminal adapter with a Multipurpose Enhancement Board for synchronous data communication. This type of station allows data transmission at speeds of 56 or 64 kbps.

This section is only a guideline for connecting video conferencing equipment to the system. For additional information, refer to the documentation packaged with the video codec.

Also, for instructions on using the Multipurpose Enhancement Board or for additional information on setting up the terminal adapter, see the documentation packaged with the terminal adapter.

You need the following hardware:

- 008 MLX module or 408 GS/LS-MLX module and a 100D module in the control unit
- ACCULINK 3150 CSU
- Two terminal adapters:
 - Two 7500B data modules with two 7500B data module feature package 2 upgrades (user manuals included)
 - Two ExpressRoute terminal adapters
- Two Multipurpose Enhancement Boards [install one of these in each terminal adapter for synchronous communication and an RS-366 Automatic Calling Unit (ACU) interface]
- Two WP901 10-L7 power supplies (one per stand-alone terminal adapter)
- Two 440A4 terminating resisting adapters
- Z77A multiple mounting (mounting for multiple 7500B data modules)
- PictureTel video codec unit

- Two Shore Microsystems SM-100EIA-232/V.35 converters (or equivalent)
- Cables:
 - Two male/male EIA-232-D cables, 8 ft. (24 m), to connect the PORT 1 connectors on the terminal adapters to the EIA-232/V.35 converters
 - Two male/male V.35 DB-37 cables, 8 ft. (24 m), to connect the V.35 communication ports on the video codec to the EIA-232/V.35 converters
 - Two male/male RS-366 DB-25 cables, 8 ft. (24 m), to connect the RS-366 dialing port of the video codec to PORT 2 on the terminal adapters

[Figure 6-6](#) shows an example of a video conferencing configuration.



NOTE:

If you are connecting MLX telephones, omit both 440A4 terminating resistors.

The maximum cord length from the terminal adapters to the telephone is 80 ft. (24.38 m).

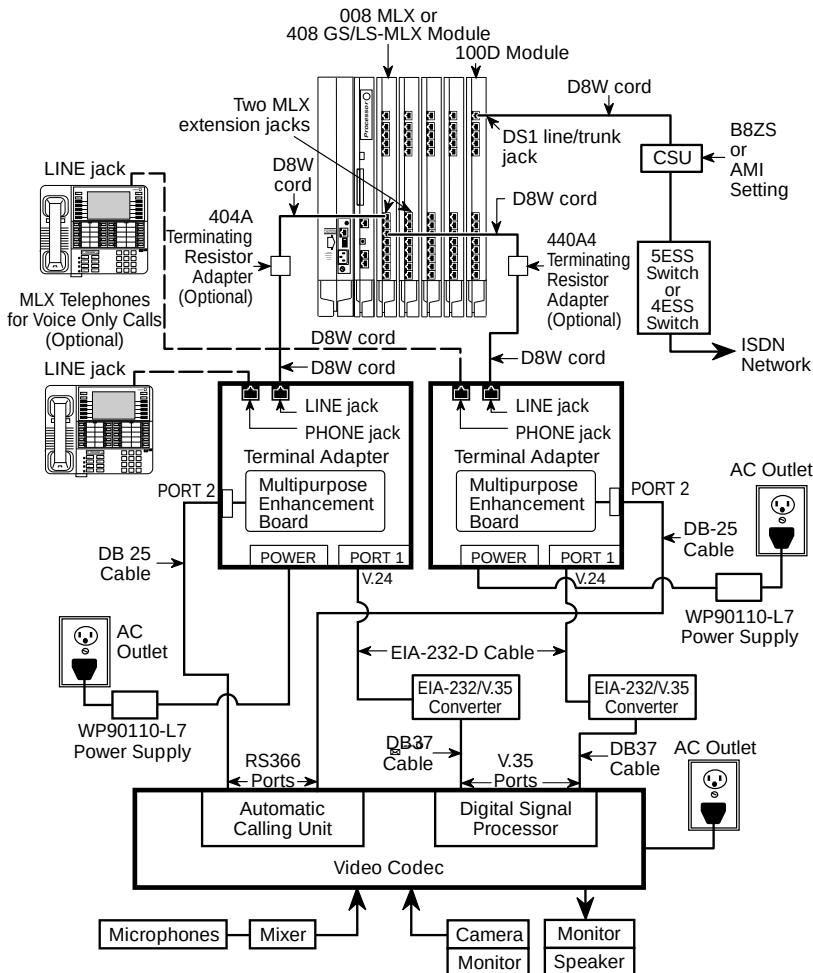


Figure 6-6. Video Conferencing Configuration

To set up the video conferencing configuration, follow the steps below. See [Figure 6-6](#).

- ▶ **1. Plug one end of a D8W cord into the LINE jack on each of the terminal adapter.**
- ▶ **2. Connect the other end of each D8W cord.**
 - If Data Form 1b indicates that you are to install MLX telephones, plug the D8W cords into the MLX extension jacks specified on Data Form 1b, then go to Step 4.
 - If Data Form 1b does not indicate that you are to install MLX telephones, plug each D8W cord into a 440A4 terminating resistor.
- ▶ **3. Using two more D8W cords, connect each 440A4 terminating resistor to the MLX extension jacks specified on Data Form 1b, then go to Step 6.**
- ▶ **4. Connect the MLX telephones to the terminal adapter.**
 - a. Plug a D8W cord into the LINE jack on each MLX telephone.
 - b. Plug the other end of each D8W cord into the PHONE jack on each terminal adapter.
- ▶ **5. Plug each WP901 10-L7 power supply cord into the POWER jacks on the terminal adapter.**

Do not plug the power supplies into the outlets until the end of this procedure.
- ▶ **6. Connect each terminal adapter to the video conferencing data station.**
 - a. Use the DB-25 cables to connect the PORT 2 jacks on each terminal adapter to the dialing ports in the video codec's automatic calling unit. See the documentation packaged with the video codec for instructions.
 - b. Use the EIA-232-D cables to connect the PORT 1 jacks on each terminal adapter to the EIA-232/V.35 converters.

- c. Use the DB-37 cables to connect the EIA-232/V.35 converters to the video codec's V.35 communication ports. See the documentation packaged with the video codec for instructions.
- ▶ **7. If it is not already connected, connect the CSU to the 100D module on the control unit and to the 5ESS or 4ESS exchange switch.**
See ["Installing the Channel Service Unit"](#) in [Chapter 4](#).
- ▶ **8. When you are ready to power up the system, plug the power supplies, CSU, video conferencing equipment, and control unit into the AC outlets.**

Terminal Adapter and CSU Settings

You need to set the terminal adapter and the CSU as indicated in [Table 6-2](#). If the customer's system is running at 56 kbps, set the CSU line-coding DIP switches according to the instructions in "Setting the CSU DIP Switches" in [Chapter 4](#).

Table 6-2. Terminal Adapter Settings

Settings	56 Kbps	64 Kbps
Auto-dial	Off	Off
Busy out	Off	Off
Datarest	On	Off
DTR	Follow	Follow
Duplex	Full	Full
Mode	Cs	Cs
Speed	56,000	64,000

Initializing and Testing the System

7

When you have finished installation, you are ready to initialize the system as described in this chapter.

Initializing the System

To initialize a Release 5.0 system, use one of the following methods:

- Restore from a 5.0 system programming disk or Translation memory card.
- Upgrade to Release 5.0 from Release 1.0, 1.1, 2.0, 2.1, 3.0, 3.1, 4.0, 4.1, 4.2, or 5.0. See [Chapter 9, "Upgrading the System"](#).
- Use system programming forms and the procedures from one of the guides listed in the next section, "Programming Guides."

This section describes how to restore the system from the Translation memory card or the system programming disk.

NOTE:

On initial installations, make sure you perform a System Erase (frigid start), as described in *Maintenance and Troubleshooting*, either immediately before you restore from a disk or memory card or before you program the system. Failure to perform the System Erase (frigid start) can result in incorrect programming.

Programming Guides

The following guides are available to assist you:

- *Programming Summary* for quick-reference procedures (document number 555-630-111)
- *System Programming* for detailed procedures (document number 555-630-140, in the binder accompanying this one)
- *System Programming and Maintenance (SPM)* for detailed SPM procedures (document number 555-630-140, in the binder accompanying this one)

Restoring from the Translation Memory Card

If you received the Release 5.0 Translation memory card, follow the steps below to initialize the system:

- ▶ **1. Perform a System Erase (frigid start).**
See *Maintenance and Troubleshooting* for detailed instructions.
Console Procedure: **Menu**→Maintenance→Slot→Dial or Type
00→Enter→Demand Test→System Erase (Line 5, left button)
twice→Yes
- ▶ **2. Use the programming console and the translation memory card to perform the Restore procedure.**
See Appendix D of *Maintenance and Troubleshooting* for instructions.

Restoring from the System Programming Disk

If you received the Release 5.0 system programming disk, follow the steps below to initialize the system:

- ▶ **1. Perform a System Erase (frigid start).**
See *Maintenance and Troubleshooting* for detailed instructions.
Console Procedure: **Menu**→Maintenance→Slot→Dial or Type
00→Enter→Demand Test→System Erase (Line 5, left button)
twice→Yes

- ▶ **2. Use SPM and the system programming disk to perform the Restore procedure.**

See *System Programming and Maintenance (SPM)* for instructions.

⇒ **NOTE:**

You must restore the system using either the system programming (or backup) disk or memory card whenever a frigid start (System Erase) occurs.

Setting the Time and Date

If the Control Unit Diagram indicates that you should set the time and date, do so before you test the system.

Follow this procedure:

Menu→SysProg→System→Date→Drop→Dial current date→Enter

See *System Programming* if you need additional instructions.

Testing the System

Once you have initialized the system, it is ready for system acceptance testing. Perform the basic tests below to test trunks, telephones, and features.

If any equipment is not working properly, see *Maintenance and Troubleshooting* for troubleshooting instructions.

Testing MLX Telephones

This switch-based software test verifies that the LEDs, ringer, buttons, switchhook, and B-channel operation for MLX telephones are working correctly. You cannot run this test when the telephone is in programming, forced-idle, or maintenance mode. When an MLX telephone is in test mode, the system considers it busy and therefore not available for use.

If you hang up during any of these procedures, test mode ends automatically.

Keep the following in mind when using the speakerphone:

- If the **Mute** button is pressed before the **Speaker** button, the Mute LED cannot be turned off; it winks.
- The Mute and Speaker LEDs remain steady during test mode.
- The pressing of the **Mute** button is processed within the telephone.
- When the telephone test is originated from the **Speaker** button, every second press of the **Mute** button causes the Mute LED to flash off momentarily. Also, both the Mute and Speaker LEDs may occasionally remain on after disconnecting with the **Speaker** button.
- Press the fixed-feature buttons repeatedly to toggle the LEDs on and off.

To test the basic features of an MLX telephone, follow the steps below:

- ▶ 1. **Pick up the handset of the telephone you are testing and push an ICOM button in Key or Behind Switch mode or an SA button in Hybrid/PBX mode.**
- ▶ 2. **When you hear dial tone, dial *00 to activate test mode.**
You should hear a steady test tone over the handset and a ring burst over the speaker. The telephone's red and green LEDs should be on.
- ▶ 3. **To test the line buttons, press any line button with two LEDs (red and green).**
The diagnostic tone should stop, and the LEDs for that button should go off.
- ▶ 4. **Press the same line button repeatedly to toggle between the green and red LEDs. For a QCC, the display should show the name of the feature programmed on the button.**
- ▶ 5. **To test a fixed-feature button with one LED, press the button.**
The Feature and HFAI LEDs should turn off. The first press of the **Speaker** button should turn off the Mute LED. The second press of the **Speaker** button should turn off the Speaker LED.

- ▶ **6. To test the red Message light, press a fixed-feature button without an LED (such as Transfer, Conf, or Drop) or any dialpad button.**
The Message light should turn off.
- ▶ **7. Hang up the handset to leave test mode.**

Testing MLX Display Telephones

While the MLX display telephone is in test mode, follow the steps below to test the display buttons:

- ▶ **1. Press each fixed display button (Home, Menu, Inspct, and More).**
The display should spell out these button labels.
- ▶ **2. Press the unlabeled display buttons.**
The display should indicate Display Button *n*, where *n* is the number of the display button, 1 through 4.

Testing MLX Telephones with MFMs

You should test MLX telephones with MFMs for proper channel operation and test the MFM circuitry for the TTR, the ring generator, and the Message light.

To test an MLX telephone with an MFM installed and configured as a T/R adapter, follow the steps below:

- ▶ **1. Connect a working 2500-type single-line telephone with a Message light to the MFM adapter (the 2500 telephone also must have a mechanical ringer).**
- ▶ **2. Pick up the handset and listen for dial tone. Dial *09.**
You should hear another dial tone.
- ▶ **3. Press any button.**
This will deactivate the test tone.

- ▶ **4. Dial 123456789*0#. Press the switchhook quickly.**
You should hear a confirmation tone.
- ▶ **5. Hang up.**
The control unit should send a ring burst and the Message light on the 2500 telephone should turn on.
- ▶ **6. Turn off the Message light.**
Dial the appropriate feature code.

Testing Telephones for Dial Tone

To test for dial tone, follow the steps below:

- ▶ **1. Press an ICOM or SA button (depending on the mode of operation).**
The red LED next to this button should go on.
- ▶ **2. Press the Speaker button.**
The green LED next to **ICOM** or **SA** button should turn on; you should hear a dial tone, and the green LED next to the **Speaker** button should turn on.
- ▶ **3. Press the Speaker or ICOM or SA button again to disconnect intercom.**
The green LEDs next to **ICOM** or **SA** and Speaker buttons should turn off and the dial tone should stop. The red LED remains on in some cases.

Testing Telephones for Outside Dial Tone

To test for outside line dial tone, follow the steps below:

- ▶ **1. Without lifting the handset, press one of the outside line buttons.**
The red LED next to this button should turn on.
- ▶ **2. Pick up the handset or press the Speaker button.**
The green LED next to the line button should turn on and you should hear a dial tone.
- ▶ **3. Hang up and repeat Steps 1 and 2 for each line button on the telephone.**

Testing Analog Multiline and Single-Line Telephones

To test the basic operation of analog multiline and single-line telephones, follow the steps below:

- ▶ **1. If you are testing a multiline telephone, press an ICOM or SA button.**
- ▶ **2. Pick up the handset and wait for dial tone.**
- ▶ **3. Dial the extension number of another working telephone.**
You should hear ringback on your telephone and ringing at the called telephone.
- ▶ **4. At the called telephone, have someone pick up the handset; verify that you have good two-way communication.**
- ▶ **5. At both telephones, hang up.**
If you are testing a single-line telephone, this is the end of the procedure.
- ▶ **6. If you are testing a multiline telephone, press an outside line or SA button.**
In Hybrid/PBX mode, make sure that the destination telephone has a personal line or is a DLC operator.
 - a. Pick up the handset and wait for the dial tone.
 - b. If you pressed an **SA** button, dial the dial-out code.
 - c. Dial the destination telephone.
You should hear ringback on your telephone and ringing at the destination telephone.
 - d. Have someone pick up the handset at the destination telephone; verify that you have good two-way communication.
 - e. At both telephones, hang up.
- ▶ **7. If the extension is toll-restricted, place a toll call.**
You should hear a reorder tone.

Testing Ground-Start and Loop-Start Trunks (Hybrid/PBX Systems Only)

To test the GS and LS outgoing and incoming trunks at a telephone, follow the steps below:

- ▶ **1. Dial *03 followed by the trunk ID number (01 through 80).**
You should hear dial tone for a working trunk, a reorder tone for a DID trunk or an invalid trunk number, or a busy tone if the trunk is in use.

⇒ NOTE:

Dialing *03 on a single-line telephone works only if the telephone has a touch-tone dialpad and the trunk accepts touch-tone dialing.

- ▶ **2. Repeat Step 1 for all outgoing trunks.**
- ▶ **3. Dial an incoming trunk on the system.**
- ▶ **4. Have someone answer the call at another telephone; verify that you have good two-way communication.**
- ▶ **5. Repeat Steps 3 and 4 for all incoming trunks.**
- ▶ **6. Hang up to exit test mode.**

Testing DID Trunks

To test DID trunks, follow the steps below:

- ▶ **1. Have someone at the central office check all DID trunks, or have someone call from the outside to check each DID trunk.**
- ▶ **2. When the first trunk rings, answer it.**
- ▶ **3. Instruct the caller to put the call on hold or put down the handset while making the next call.**
- ▶ **4. When the next trunk rings, put the previous call on hold and repeat this procedure until all eight DID trunks have been connected successfully.**
- ▶ **5. When all trunks are connected with good communication, disconnect each call and have the caller do the same.**

Testing Tie Trunks

Before you test tie trunks, make sure that the tie trunks for the system are connected and properly programmed. Have someone at the far end ready to place and receive calls throughout the testing procedures listed below.

The tie trunk testing procedures in this section are as follows:

- Automatic-start two-way (both incoming and outgoing)
- Automatic-start incoming only
- Automatic-start outgoing only
- Dial-repeating two-way (both incoming and outgoing)
- Dial-repeating incoming only
- Dial-repeating outgoing only

NOTE:

Dial-repeating tie trunks are also called *wink-*, *immediate-*, and *delay-type tie trunks*. These terms are used in system programming to describe the type of signaling used on the trunk.

Testing Two-Way Automatic-Start Tie Trunks

For two-way automatic-start tie trunks, perform both the incoming and outgoing automatic-start tie trunk tests.

Before testing outgoing or two-way automatic-start tie trunks, have someone ready to take your call at the receiving telephone.

Testing Incoming Automatic-Start Tie Trunks

Perform this test for automatic-start tie trunks that are two-way or incoming only. If you are testing two-way automatic-start tie trunks, perform the outgoing test as well.

To test incoming automatic-start tie-trunks, follow the steps below:

- ▶ **1. At the far-end tie-trunk site, have someone pick up the handset and dial a tie trunk assigned to a button on your telephone.**
Your telephone should ring and the LEDs next to the tie-trunk button should respond as follows: the red LED should turn on and the green LED should flash.
- ▶ **2. Pick up your handset and verify that you have good two-way communication.**
The green LED should change from flashing to steady.
- ▶ **3. At both telephones, hang up.**
The green LED should turn off, the red LED should turn off, and another red LED may turn on.
- ▶ **4. Repeat Steps 1 through 3 for all incoming and two-way automatic-start tie trunks.**

Testing Outgoing Automatic-Start Tie Trunks

Perform this test for automatic-start tie trunks that are two-way or outgoing only. If you are testing two-way automatic-start tie trunks, perform the incoming test as well.

To test outgoing automatic-start tie trunks, follow the steps below:

- ▶ **1. At any telephone that has access to an automatic-start tie trunk, press the first tie-trunk button.**
The red LED next to the tie-trunk button just pressed turns on.
- ▶ **2. Pick up the handset. (In Hybrid/PBX systems with pooled tie trunks, press an SA button and dial the pool dial-out code.)**
The green LED next to the selected button turns on and you hear ringing.
- ▶ **3. When the person answers, verify that you have good two-way communication and hang up.**
The green LED should turn off, the red LED should turn off, and another red LED may turn on.
- ▶ **4. Repeat Steps 1 through 3 for each outgoing and two-way automatic-start tie trunk.**

Testing Two-Way Dial-Repeating Tie Trunks

For two-way dial-repeating tie trunks, perform both the incoming and outgoing dial-repeating tie trunk tests.

Testing Incoming Dial-Repeating Tie Trunks

Perform this test for dial-repeating tie trunks that are two-way or incoming only. If you are testing two-way dial-repeating tie trunks, perform the outgoing test as well.

To test incoming dial-repeating tie trunks, follow the steps below:

- ▶ **1. Have the person at the far end place a dial-repeating call to your telephone by dialing the proper tie-trunk number.**
Your telephone rings and the green LED next to **ICOM** (or **SA** for Hybrid/PBX systems) flashes.
- ▶ **2. Pick up the handset.**
The red LED next to the ringing button turns on and the green LED changes from flashing to steady.
- ▶ **3. Verify that you have good two-way communication and hang up.**
The green LED should turn off, the red LED should turn off, and another red LED may turn on.
- ▶ **4. Repeat Steps 1 through 3 for each incoming or two-way dial-repeating tie trunk.**

Testing Outgoing Dial-Repeating Tie Trunks

Perform this test for dial-repeating tie trunks that are two-way or outgoing only. If you are testing dial-repeating two-way tie trunks, perform the incoming test as well.

To test outgoing dial-repeating tie trunks, follow the steps below:

- ▶ **1. At any telephone that has access to a dial-repeating tie trunk, press the first tie-trunk button.**
The red LED next to the pressed tie-trunk button lights.

- ▶ **2. Pick up the handset. (In Hybrid/PBX systems with pooled tie trunks, press an SA button and dial the pool dial-out code.)**
The green LED next to the selected button lights.
- ▶ **3. Dial the tie-trunk number of the extension where someone is waiting for your call.**
You should hear ringing.
- ▶ **4. When the person answers, verify that you have good two-way communication, then hang up.**
The green LED should turn off, the red LED should turn off, and another red LED may turn on.
- ▶ **5. Repeat Steps 1 through 4 for each outgoing or two-way dial-repeating tie trunk.**

Testing BRI Trunks

Perform the testing described in “800 NI-BRI Module Problems” in Chapter 4 of *Maintenance and Troubleshooting*.

Testing Selected System Features

This section provides procedures to test the following system features:

- **Automatic Route Selection (ARS).** For Hybrid/PBX mode only. Use the same test for Idle Line Preference, a similar feature used in Key mode only. Use the same test for Station Message Detail Recording (SMDR), as explained in the test procedure. Refer to Planning Forms 3e, 3f, and 3g for ARS information.
- **Group Calling.** Use the same test for the Listed Directory Number (the QCC queue), which is for Hybrid/PBX only. Use the same test for Group Paging. Refer to Planning Form 7d for Group Calling information.
- **Coverage.** Refer to Planning Form 7c for Group Coverage information.

If any feature does not work properly, check system programming. You can run these tests easily from an MLX telephone or an analog multiline telephone.

ARS and SMDR Tests

If ARS patterns have been programmed, you can test routing by placing toll calls and checking the trunk indicated on the SMDR printout. Check the report to see which line/trunk the system selected for an outgoing call.

The length of each toll call must be equal to or greater than the minimum SMDR recording time. Otherwise, SMDR does not recognize the attempt as a call. To determine the minimum SMDR recording time, check with the customer's system manager (the factory setting is 40 seconds).

To verify ARS patterns, follow the steps below:

- ▶ **1. In Hybrid/PBX mode, determine which toll numbers to call by examining the system manager's ARS patterns.**
- ▶ **2. At any multiline telephone, pick up the handset and dial the ARS access code and one of the toll numbers.**
Make sure the call is completed before hanging up.
- ▶ **3. Repeat Step 2 for additional toll numbers.**
- ▶ **4. At the SMDR printer, verify that the call was made on the correct trunk group and check the number of seconds before the call is reported on the SMDR printout.**
If there are errors, check system programming.

Group Calling Test

To test Group Calling features, follow the steps below:

- ▶ **1. Make sure that each group member is logged into the group.**
To log in, each member dials #44.
- ▶ **2. At any telephone, pick up the handset and dial the trunk that is programmed to ring for a particular calling group.**

- ▶ 3. **At the ringing telephone, have someone pick up the handset and verify that you have good two-way communication.**
- ▶ 4. **Repeat Steps 2 and 3 for each calling group.**
- ▶ 5. **Make additional calls to check each member of each calling group.**
- ▶ 6. **At any telephone, pick up the handset and dial the group extension number.**
- ▶ 7. **Test the calling group delay announcement (if provided) for each group.**
 - a. Make the group busy or have all members log out of the group (by dialing **#*44** at each group extension).
 - b. Repeat Step 2.
 - c. After listening to the delay announcement, hang up.
 - d. Repeat these steps for each group.
- ▶ 8. **At the ringing telephone, have someone pick up the handset and verify that you have good two-way communication.**

System Speed Dial Test

To test System Speed Dial numbers, follow the steps below:

- ▶ 1. **Find out which numbers have been programmed for System Speed Dial.**
See the system manager or use Form 10b as a reference for System Speed Dial numbers.
- ▶ 2. **From the test telephone, pick up the handset and dial a System Speed Dial code.**
Verify that you have good two-way communication and that the correct party was reached.

Coverage Test

To verify that coverage is in effect, follow the steps below:

- ▶ 1. **Have someone call the covered telephone.**
- ▶ 2. **Count the number of rings at the covered telephone before the covering telephone starts ringing.**
This should be the same as the programmed number of rings.

- ▶ 3. Pick up the handset at the covering telephone and verify that you have good two-way communication.
- ▶ 4. Hang up the handset at the covering telephone.
- ▶ 5. Check both Individual and Group Coverage.

Testing the DSS

At each Direct Station Selector (DSS), check that all lights are operational. Then use the DSS to call a telephone in the system. Test the **Page** buttons on the DSS.

Testing Night Service

To test the Night Service feature on the system operator console, follow the steps below:

- ▶ 1. **At the system operator console, press the Night Service button.**
If Night Service with Outward Restriction is programmed, you must also enter the password. (You can also activate Night Service on a DLC by pressing the **Feature** button and dialing 39.)
The Night Service LED turns on.
- ▶ 2. **Pick up the handset and press a button for an outside trunk.**
- ▶ 3. **Dial the outside number that reaches an operator console that is programmed to receive Night Service coverage.**
- ▶ 4. **Verify that the telephones assigned to the Night Service group are ringing.**
- ▶ 5. **Have someone pick up the handset at a telephone in the Night Service group.**
Verify that you have good two-way communication.
- ▶ 6. **At both telephones, hang up.**
- ▶ 7. **Repeat Steps 2 through 6 for each operator console that is programmed to receive Night Service coverage.**

- ▶ **8. Test telephones that are programmed for Night Service with Outward Restriction.**
 - a. Pick up a handset on a restricted telephone and verify that outside calls are not allowed.
 - b. Using the password, make an outside call.
 - c. Hang up the handset.
 - d. Press the **Recall** button and dial the password. (On an MLX telephone without a programmed Recall button, press the **Feature** button and dial 775 and the password before picking up the handset.)
 - e. Pick up the handset and make an outside call.
 - f. Verify that you have good two-way communication and hang up.
- ▶ **9. At the operator console, press the Night Service button again. If you used a password in Step 1, enter the password again. Verify that the Night Service LED turns off.**

Testing the Dictation System

If dictation equipment has not been installed, skip this test. Place a call to verify that you can access the dictation system.

To access the dictation system, follow the steps below:

- ▶ **1. At the test telephone, pick up the handset.**
- ▶ **2. Dial the access code and the number associated with the dictation equipment.**
- ▶ **3. Verify that the ready tone is transmitted.**
- ▶ **4. Test the transmission in both directions; make a recording and play it back.**
- ▶ **5. Hang up.**

Testing the Paging System

To test the paging system, follow the steps below:

- ▶ **1. Pick up the handset at the test telephone and dial the number for a particular zone.**
If ZoneMate 9 paging equipment is in use with PagePac 20, get an acknowledge tone first and then dial the zone code to make an announcement. You may hear a confirmation tone.
- ▶ **2. Make an announcement into the handset.**
You should hear the announcement over the loudspeaker(s).
- ▶ **3. Hang up.**
- ▶ **4. Repeat Steps 1 through 3 for all paging zones.**

Testing Music On Hold

To verify that music is provided to outside callers placed on hold, follow the steps below. Inside callers do not hear Music On Hold.

- ▶ **1. Pick up the handset at the test telephone.**
- ▶ **2. Dial the central office trunk access code and the system's published directory number; or, if you are using a DID trunk, dial any extension.**
- ▶ **3. At the destination extension, answer the incoming call.**
- ▶ **4. At the destination extension, press the Hold button.**
The line button's green LED should flash.
- ▶ **5. Verify that music is heard at the destination extension and adjust the volume as required.**
- ▶ **6. Hang up.**

NOTE:

If the customer uses equipment that rebroadcasts music or other copyrighted materials, the customer may be required to obtain a copyright license from and pay license fees to a third party such as the American Society of Composers, Artists, and Producers (ASCAP) or Broadcast Music Incorporated (BMI). Or the customer can purchase a Magic-on-Hold system, which does not require that you obtain such a license, from Lucent Technologies.

Testing the Power Failure Transfer Jacks

To test a power failure transfer (PFT) jack for proper operation, you must assign the outside line numbers to the module's line/trunk jacks and the trunks must be operational. A PFT telephone on a GS line must have a GS button attached to the telephone. See [Figure 7-1](#).

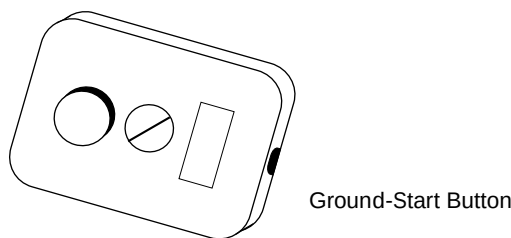


Figure 7-1. Ground-Start Button

To test PFT jacks, follow the steps below:

- ▶ 1. Plug a touch-tone or rotary dial telephone into a PFT jack.
- ▶ 2. Note the outside line number assigned to the lowest line/trunk jack on the module and be sure that the outside trunk is connected to the system.
- ▶ 3. Turn off power to the control unit.
Follow the procedure in [“Powering Down the System”](#) in [Chapter 9](#).
- ▶ 4. If the telephone is connected to a GS trunk, push the GS button attached to the telephone.
- ▶ 5. Pick up the handset on the touch-tone or rotary dial telephone.
You should hear a dial tone.

- ▶ 6. If the telephone is connected to a GS trunk, push the GS button attached to the telephone again.
- ▶ 7. Dial an outside number—make sure someone can answer the call.
- ▶ 8. After the call is answered and you have verified that you have good two-way communication, give the person the telephone number assigned to the outside line bridged by the PFT jack to which you are connected.
This is the number noted in Step 2.
- ▶ 9. Have that person call the number after you hang up.
Your phone should ring after the caller completes dialing the number.
- ▶ 10. Answer the phone and verify that you have good two-way communication. Hang up.
- ▶ 11. Repeat Steps 1, 2, and 4 through 10 to test all PFT jacks.
- ▶ 12. Turn the power back on.
Follow the procedure in [“Powering Up the System”](#) in [Chapter 2](#).

Testing Touch-Tone Receivers

The 400, 400 GS/LS, and 016 T/R modules each provide four touch-tone receivers (TTRs). The 008 OPT module, 800 DID module, 012 T/R module, and 800 GS/LS-ID modules each provide two TTRs.

To test TTRs, follow the steps below:

- ▶ 1. Pick up the handset of a touch-tone single-line telephone that is connected to a 012, 016, or 008 OPT module.
- ▶ 2. Dial *04 and the 2-digit number (starting with 01) of the TTR that you want to test.
You should hear a busy tone if the receiver is in use, or a reorder tone if you misdialed or addressed a receiver not in your system. (This can happen if you dialed 07 and your system has only a 012 module and one 400 module, for a total of six TTRs.)
- ▶ 3. If you hear reorder tone, try again.
If you hear dial tone after one to three seconds of silence, proceed with this test.

- ▶ **4. Dial 123456789*0#.**
You should hear a dual-tone multifrequency (DTMF) signal as each button is pressed. When you finish dialing, you should hear a 3-beep confirmation tone.
- ▶ **5. Repeat the test for each TTR.**

Installing the Control Unit's Housing

After you complete system acceptance testing and if you are confident that the system is completely installed, you can install the control unit's housing.

NOTE:

Beginning with Release 2.1 or later, the control unit covers are identical to those on the MERLIN II Communications System. If you need to install control unit covers on a system prior to Release 2.1, see [Chapter 9, "Upgrading the System"](#).

Installing the Top Cover

To install the top cover, see [Figure 7-2](#) and follow these steps:

- ▶ **1. Be sure the cords have been pressed through the wire managers at the base of the modules.**
- ▶ **2. Hold the top cover with the hooks facing you.**
- ▶ **3. Engage the tabs at the rear of the top cover with the carrier.**
- ▶ **4. Lower the top cover so the legs lock into the vents on the module.**

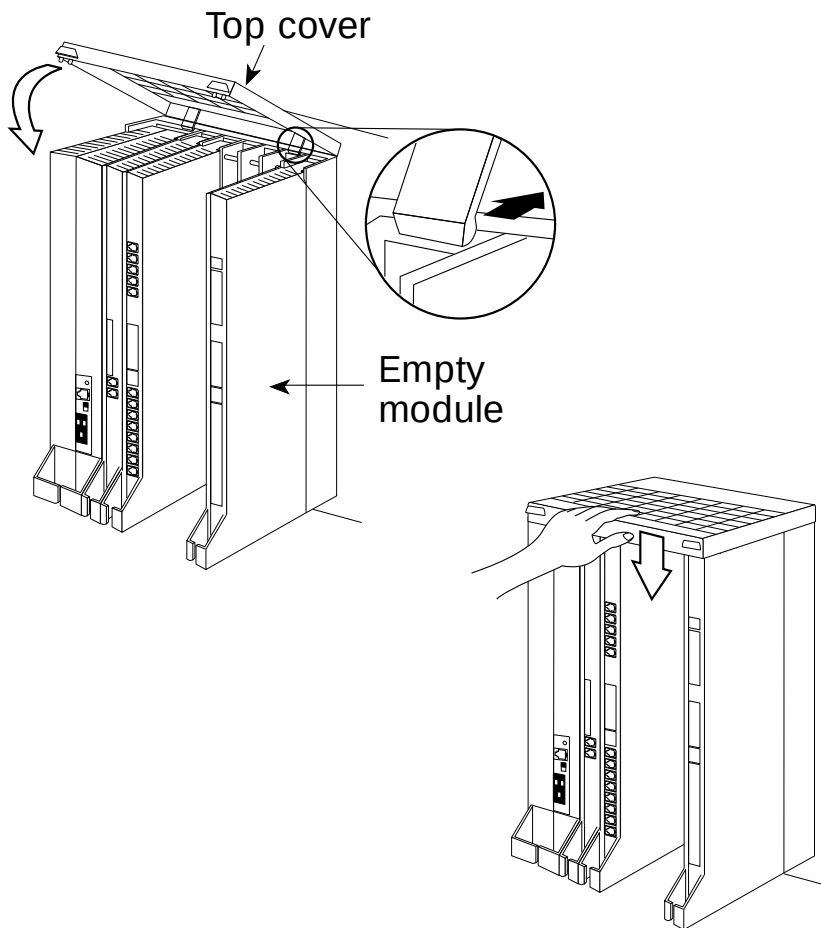


Figure 7-2. Installing the Control Unit Top Cover

Installing the Front Cover

To install the front cover, see [Figure 7-3](#) and follow these steps:

- ▶ 1. Hook the top of the front cover onto the top cover.
- ▶ 2. Push down on the bottom of the front cover until it locks securely on the base of the wire manager on the modules.

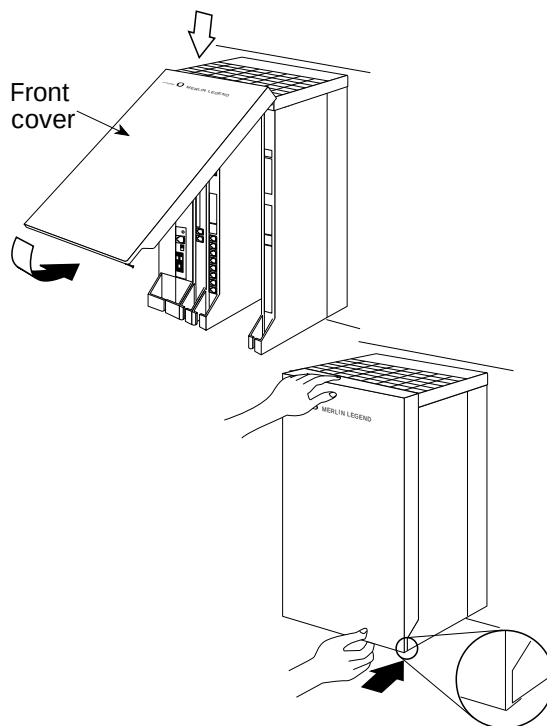


Figure 7-3. Installing the Control Unit Front Cover

Installing Applications

8

This chapter provides installation guidelines and documentation references for the applications that the system supports.

You can install the following software and hardware products on the system.
See the documentation packaged with each application for detailed installation instructions.

- Stand-alone products
 - Call Accounting Terminal (CAT)
 - CAT Business (CAT/B)
 - CAT Hospitality (CAT/H)
 - MERLIN PFC Telephone
 - Lucent Technologies Attendant™
 - MERLIN MAIL™
 - CONVERSANT®
- DOS-based products
 - Call Accounting System (CAS) for the MERLIN LEGEND Communications System
 - CAS Plus V3 Business
 - HackerTracker™ System for CAS Plus V3
 - CAS for Windows

- Call Management System (CMS)
- PassageWay Direct Connect Solution for Microsoft® Windows
- System Programming and Maintenance (SPM)
- Integrated Solution III (IS III) UNIX System-based products
 - AUDIX Voice Power™ IS III
 - Call Accounting System (IS CAS)
 - System Programming and Maintenance (SPM) IS III
 - Fax Attendant System™ IS III

Beginning with Release 5.0, you can also install a Computer Telephony Integration (CTI) link using an MLX port on a 008 MLX or 408 MLX module. See [“Installing a CTI Link”](#) later in this chapter.

Security Alert:

Products that are connected through a voice port must be properly restricted to prevent toll fraud. See Appendix A following Maintenance and Troubleshooting for more information.

Voice Messaging Systems and Touch-Tone Receivers

The following applications are voice messaging systems (VMSs):

- MERLIN MAIL Voice Messaging System
- Lucent Technologies Attendant
- AUDIX Voice Power IS III
- Automated Document Delivery System (ADDS)

Considerations

You must connect applications that use mode codes to integrated VMI ports. Applications that do not use mode codes, such as Lucent Technologies Attendant, connect to generic VMI ports. The T/R ports on 012 or 016 basic telephone modules are programmed as either generic VMI or integrated VMI.

A VMS requires a certain number of touch-tone receivers (TTRs), depending on the number of VMS ports—see [Table 8-1](#). The following modules supply 2 TTRs: 012, 400, 400 GS/LS/TTR, and 008 OPT (but the 008 OPT module does not support VMS applications). The 016 module supplies 4 TTRs.

Table 8-1. TTRs Required by VMS

No. of VMS Ports	No. of TTRs Required
1	1
2	1
3	2
4	2
6	3
8	4
12	6

Automated Document Delivery System

Automated Document Delivery System (ADDS) is a computer-based system for faxing documents. ADDS stores the documents in a database and automatically faxes them, on request, 24 hours a day.

Prompts guide a caller using a touch-tone telephone through the process of selecting a document and indicating the fax number where he or she will receive the information. The caller then receives the requested information in minutes.

Considerations

Using one line for fax transmission limits ADDS to approximately 100 calls per day. Businesses anticipating more than 100 calls per day may need more than one system to handle the call volume efficiently.

Use ADDS in a two-line configuration to maximize performance and minimize busy signals. ADDS can work behind an automated attendant. ADDS does not function with an MFM.

Hardware Requirements

To set up ADDS, a business must have the following:

- Automated Document Delivery System unit
- Touch-tone telephone
- Group III (G3) fax machine with an integrated handset

To request and receive information, a caller must have a touch-tone telephone and a Group III (G3) fax machine.

For backup, one of the following is required:

- Lucent Technologies 705 MT Multitasking Terminal
- Lucent Technologies 6386/SX WGS (or compatible) with ProComm Plus® software.

See the *Lucent Technologies Automated Document Delivery System (ADDs) Administrator's Guide* for installation instructions.

Call Accounting System

Call Accounting System (CAS) is ideal for medium and large companies that want to manage telephone usage and control costs by tracking calls placed from and received by the system.

NOTE:

CAS is also available as part of the UNIX System-based Integrated Solution II (IS II) and Integrated Solution III (IS III) software applications.

CAS runs on an approved DOS PC. Two versions of the product are offered: CAS for Windows and CAS Plus V3.

HackerTracker System for CAS Plus V3 is a software enhancement designed to help detect fraudulent use of the communication system. The HackerTracker software can detect abnormal calling activity by monitoring facilities and account code usage. It then logs the activity and issues a real-time alarm.

Considerations

You can connect only one CAS to the system. CAS operates on a dedicated PC running DOS.

Hardware and Software Requirements

A typical CAS Plus V3 system consists of the following:

- An approved DOS PC with:
 - 640K RAM
 - Hard disk drive with at least 3 MB of available space for the application software
 - Parallel printer output
 - Serial SMDR input
- One parallel printer
- D8W cord and 355AF adapter connecting the SMDR port on the communications system to the COM1 serial port on the PC
- DOS version 3.3 or later
- CAS software

To use CAS for Windows with the system, the following components are recommended:

- For a single-site system, an NCR 3315 PC (20-MHz 386) with 6 MB of RAM and a 120-MB hard disk
- For a multi-site system, an NCR 3332 PC (66-MHz 486) with 16 MB of RAM and a 340-MB hard disk
 - MS-DOS 5.0 or higher
 - Windows 3.1 or later
- VGA color monitor
- Bus mouse
- For a single-site system, a 525-MB tape drive
- For a multi-site system, a 120-MB tape drive
- Okidata® Microline 184T dot matrix or OL830 laser parallel printer

For communications using CAS for Windows, the following components are recommended:

- For a single-site system, one parallel port and two built-in serial ports (DB9 for direct switch connection and DB25 for other connections)
- For a multi-site system, one parallel port and a four-port Equinox Mark-IV board with four RJ45 connections for direct switch hookup
- For remote diagnostics, a Remote Maintenance Board
- If a modem is used, an Lucent Technologies COMSPHERE 3830 or compatible
- If you are using the 9-pin port on your PC for the direct switch connection, you need a DB9-to-modular adapter
- An RJ45 modular cable to connect the PC's COM1 port with the control unit's SMDR port

A summary of the installation procedure is provided below:

- ▶ **1. Connect the hardware.** See [“Connecting a PC to the Control Unit” in Chapter 5.](#)
- ▶ **2. Complete the CAS worksheets.**
Make sure that they show all information you need on telephone lines and extensions, calling patterns and processing options, and departments and personnel.
- ▶ **3. Load and test DOS version 3.3 or later and CAS.** If you are installing CAS for Windows, load and test DOS version 5.0 or later, Windows version 3.1 or later, and CAS.
- ▶ **4. Use the planning worksheets to program the software to meet the needs of the customer.**

CAS Documentation

Call Accounting System Plus V3 Installation

Call Accounting System Plus V3 Administration and Operation

Call Accounting System for Windows Installation, Administration, and Operation

Call Accounting Terminal

Call Accounting Terminal (CAT) Plus is a stand-alone application that provides accurate and flexible call accounting at a low cost. Two versions of this product are offered: CAT Plus Hospitality for hotels and health care facilities and CAT Plus Business for other types of businesses. For more information, see [“Connecting a Printer to the Control Unit”](#) in [Chapter 5](#).

Considerations

You can connect only one CAT to the system. You must use a serial printer such as the CAT printer. You must locate the CAT Plus within the distances noted below:

- Control unit
 - 14 ft. (4.27 m) direct connection
 - 1000 ft. (305 m) using building wiring
- Serial printer, 50 ft. (15.2 m)
- Power supply-grounded wall outlet, 4 ft. (1.22 m)

Hardware Requirements

The following hardware is required for CAT installation:

- Call Accounting Terminal, CAT Plus
- Serial printer (Lucent Technologies CAT Printer is recommended) connected by a Z200A EMI cable to the PRINTER jack of the CAT
- D8W cord and 355AF adapter connecting the SMDR port on the communications system to the SMDR jack of the CAT

A summary of the installation procedure is provided below:

- ▶ 1. **Before connecting the CAT, set the 10 CAT switches to establish the speed or baud rate for the CAT and its associated printer.**
- ▶ 2. **Connect the control unit, CAT, printer, and power supply. See [Chapter 5, “Connecting a Printer to the Control Unit”](#). Do not use an outlet that is controlled by a wall switch.**
- ▶ 3. **Test the CAT Plus, following the instructions provided in the documentation packaged with the application.**

CAT Documentation

Call Accounting Terminal, CAT Plus V3 for Business Installation and Use

Call Accounting Terminal, CAT Plus V3 for Hospitality Installation and Use

Call Management System

Call Management System (CMS) is a DOS-based software application that simulates the actions of a system operator by answering calls and distributing them to individual telephones.

Considerations

You cannot connect a CMS in Behind Switch mode.

If a business requires more than 28 lines or employs more than 28 agents, you can install up to two CMSs on a system to handle a second set of lines.

CMS operates on a dedicated PC with DOS, version 3.3 or higher.

The CMS supervisor's console is a Direct-Line Console.

CMS agents can use any MLX or analog multiline telephone that the system supports.

You must connect agent telephones to the first 58 telephone jacks on the control unit. (CMS allows only a 2-digit method to specify an extension number; jacks 59 to 144 are designated by 4 digits.)

Because CMS is compatible only with 2-digit dialing, do not use flexible numbering on any telephone associated with CMS.

The two CMS interface card ports on the PC must be connected to two analog multiline telephone jacks on the same analog multiline telephone module; these jacks must be operator positions. If two operator position jacks are not available on the same module, another analog multiline telephone module must be installed in the control unit to provide these jacks.

CMS trunks can be loop-start, ground-start, T1 emulated ground-start, or Primary Rate Interface (PRI).

Up to four CMS external alerts can be used for agents and supervisors. For example, an alert sounds if the number of calls waiting to be answered nears a programmed threshold.

Lucent Technologies Attendant can be used to direct callers to the appropriate CMS group.

To play music for waiting callers, you must attach a Music On Hold (MOH) product that is compatible with an MOH coupler.

⇒ NOTE:

If the customer uses equipment that rebroadcasts music or other copyrighted materials, the customer may be required to obtain a copyright license from and pay license fees to a third party such as the American Society of Composers, Artists, and Producers (ASCAP) or Broadcast Music Incorporated (BMI). Or the customer can purchase a Magic-on-Hold system, which does not require that you obtain such a license, from Lucent Technologies.

Hardware and Software Requirements

The following hardware and software are required for CMS installation:

- An approved PC with 640K RAM, 3.5-inch floppy disk drive, and a 20-MB hard disk drive
- An approved monochrome or color monitor
- CMS interface card with two 14-ft. (4.27-m), 4-pair modular plug telephone cords and one 14-ft. (4.27-m) DIN connector cord for connection to Digital Announcement Unit
- CMS software
- Digital Announcement Unit for CMS
- Parallel printer and cable to connect the printer to the PC
- Supervisor console (MERLIN II System Display Console)
- Agent telephones (any MLX or analog multiline telephones supported by the system)
- Two analog multiline modules (008 or 408); one to connect the two PC ports to the operator positions, and one to connect the CMS supervisor console
- DOS, version 3.3 or higher

See the CMS documentation for a list of optional hardware that you can use with CMS.

CMS comes with a hardware installation checklist and information on installing the CMS software, creating an agent directory, programming lines and groups, and testing and managing calls. The control unit permits the connection of two CMS applications, and each application can have one PC.

CMS Documentation

Call Management System (CMS) for the MERLIN LEGEND Communications System Installation and System Programming Guide

Call Management System for MERLIN LEGEND Communications System User's Quick Reference

Call Management System for MERLIN LEGEND Communications System Supervisor's Guide

Call Management System for MERLIN LEGEND Communications System Planning Guide and Forms

CONVERSANT

CONVERSANT is an entry-level voice response system that enables you to run integrated voice response (IVR) applications. CONVERSANT can automatically answer and route calls and execute telephone transactions. CONVERSANT consists of the hardware and software that supports transaction processing, data retrieval, and data entry using a touch-tone telephone connected to a public telephone network.

Security Alert:

Products that are connected through a voice port must be properly restricted to prevent toll fraud. See Appendix A in Maintenance and Troubleshooting for more information.

Considerations

CONVERSANT supports a maximum of 24 channels of analog ports, or up to 6 IVP4 boards. In a co-resident environment, such as CONVERSANT and AUDIX Voice Power, the system supports a maximum of 16 channels. The number of channels assigned to AUDIX Voice Power can never exceed 12.

Hardware Requirements

The platform for CONVERSANT is the Master Controller III (Tower). The Master Controller III is a desktop 20 MHz, 486-SX PC with six available EISA bus slots (with the tape drive installed). It has 8 MB of RAM. It includes a system unit, a monitor, and a keyboard. The Master Controller III has the following components:

- 500-MB fixed disk drive
- 250-MB tape drive
- 3.5-inch floppy disk drive
- Two serial ports and one parallel port are integrated on the main board with connectors on the back panel of the system unit. A diskette drive controller and fixed disk drive interface also are integrated on the main board.
- A Video Graphics Array (VGA) video display controller and a tape drive controller are provided on separate add-in boards.
- Lucent Technologies UNIX System V version 3.2.2

CONVERSANT Intro Documentation

CONVERSANT Intro Application Support Software Installation Guide

CONVERSANT Intro Application Support Software User's Guide

Integrated Solution III

Integrated Solution III (IS III) is a complete package of UNIX System-based voice processing and call analysis software that helps to manage telephone usage and costs. IS III offers a single interface and can include:

- Call Accounting (IS CAS)
- AUDIX Voice Power IS III R 2.1.1
- System Programming and Maintenance (SPM) IS III Release 3.xx or higher
- Fax Attendant (FA)

The number of incoming lines and subscribers programmed for AUDIX Voice Power and the number of busy-hour calls determine how many voice channels are required for the customer's system.

Security Alert:

Products that are connected through a voice port must be properly restricted to prevent toll fraud. See Appendix A in Maintenance and Troubleshooting for more information.

Considerations

IS III uses Lucent Technologies UNIX System V, Release 3.2.2.

For AUDIX Voice Power, program the loop-start ports for reliable far-end disconnect.

For AUDIX Voice Power, you cannot use an 008 OPT module.

If IS III includes AUDIX Voice Power (or Fax Attendant) when users receive voice mail (or fax mail) messages, the Message LEDs on their telephones light (as long as a mailbox or fax mailbox has been assigned to each of those telephones).

The system may need more touch-tone receivers if:

- Single-line telephone users do not get dial tone
- AUDIX Voice Power fails to transfer calls
- Calls fail to ring or go to coverage prematurely
- Message-waiting lights fail to light

CAS IS III uses the call information provided by the system's built-in SMDR feature to process calls.

SPM IS III reports can be printed out or can be written to a disk (hard or floppy).

SPM IS III reports should not be printed while the system is handling more than 100 calls per hour.

Only the CAS IS III and the SPM IS III applications can be connected to a system operating in Behind Switch mode.

Hardware Requirements

The Master Controller II+ (Desktop) and the Master Controller III (Tower) are the PC platforms for IS III. The Master Controller II+ is a desktop 20-MHz, 386-SX PC with three available AT bus slots (with the tape drive installed). It has 8 MB of RAM memory, either a 100-MB or a 200-MB hard disk drive, 3.5-inch floppy drive, and a 125-MB streaming tape drive.

The Master Controller III is a tower 20-MHz 486-SX PC with six available EISA bus slots (with the tape drive installed). It has 8 MB of RAM memory, either 200- or 500-MB hard disk drive, and a 250-MB streaming tape drive.

The following hardware is also required:

- A 355AF adapter for connecting the Master Controller to the serial port on the control unit if they are within 50 ft. (15.2 m) of each other and are on the same AC branch circuit
- ADUs for connecting the Master Controller to the serial port on the control unit, if they are not within 50 ft. (15.2 m) of each other and/or they are not on the same AC branch circuit
- Any additional hardware required by the individual applications included in IS III, including the cables and adapters for connecting the applications to the system
- IVP4 boards or IVP6 cards for AUDIX Voice Power and FAX Attendant
- 012 or 016 basic telephone module to provide the tip/ring interface for AUDIX Voice Power
- TR114 boards for FAX Attendant

A summary of the installation procedure is provided below:

- ▶ **1. Set up the equipment and identify the hardware for IS III.**
- ▶ **2. Connect the hardware as shown in the instructions.**
- ▶ **3. Install the software and test the IS III application.**
If a voice application is installed, you will need two 125-MB tape cartridges for system backup.

For more information, consult *Integrated Solution III Installation and Maintenance Guide*.

Lucent Technologies Attendant

Lucent Technologies Attendant is a stand-alone application that provides operator-like services through the use of pre-recorded messages and electronic switching.

Security Alert:

Products that are connected through a voice port must be properly restricted to prevent toll fraud. See Appendix A in Maintenance and Troubleshooting for more information.

Considerations

You cannot connect Lucent Technologies Attendant to a system that operates in Behind Switch mode.

You cannot connect Lucent Technologies Attendant to a system that has an AUDIX application or a voice mail system installed.

You can connect a maximum of four Attendants to the system.

You should program all lines to Lucent Technologies Attendant for reliable far-end disconnect.

The system may need more touch-tone receivers if:

- Single-line telephone users do not get a dial tone
- Lucent Technologies Attendant fails to transfer calls
- Calls fail to ring or go to coverage prematurely

When Attendant is set up for both daytime and after-hours operation, the time on each Attendant's clock must match the system clock so that the system recognizes the end of the business day.

Hardware Requirements

Lucent Technologies Attendant requires connection to an 012 or 016 basic telephone module. You can use up to eight jacks on an 012 basic telephone module or up to 16 jacks on an 016 basic telephone module for Lucent Technologies Attendants.

If you use all eight jacks on an 012 module for Lucent Technologies Attendant, you cannot connect any other devices to the module. When using fewer than eight jacks on the 012 module, you can use the remaining jacks for tip/ring devices.

The following hardware is also required:

- Lucent Technologies Attendant unit and cords
- Some AC power strips may be needed, since the Attendant is powered by wall-mounted transformers (10 V AC).
- Powering and grounding procedures must follow those established for T/R telephones that require auxiliary power.

For more information, consult *Lucent Technologies Attendant Installer's Guide*.

MERLIN MAIL

MERLIN MAIL Voice Messaging System provides the following integrated call management services:

- Automated Attendant
- Call answering
- Voice mail

Security Alert:

Products that are connected through a voice port must be properly restricted to prevent toll fraud. See Appendix A in Maintenance and Troubleshooting for more information.

The number of incoming trunks and subscribers programmed for Automated Attendant service and the number of busy-hour calls determine how many MERLIN MAIL Voice Messaging System jacks are required for the user's system. See [Table 8-2](#).

Table 8-2. MERLIN MAIL Ports Required

Number of Jacks Required	2	4
Incoming Trunks	1 to 6	7 to 18
Number of Subscribers or Busy-Hour Calls	1 to 20	21 to 60

Considerations

You cannot connect MERLIN MAIL Voice Messaging System to a system operating in Behind Switch mode.

MERLIN MAIL Voice Messaging System is available in 2-port and 4-port configurations. Both models have four hours of message-storage capacity.

You can use up to eight jacks on an 012 basic telephone module or up to 16 jacks on an 016 basic telephone module for MERLIN MAIL.

If you use all eight jacks on an 012 module for MERLIN MAIL, you cannot connect any other devices to the module. When using fewer than eight jacks on the 012 module, you can use the remaining jacks for tip/ring devices.

When a mailbox user receives voice mail messages, the Message LEDs on his or her telephone are on, provided that a physical telephone has been assigned to that mailbox.

Trunks to be answered by MERLIN MAIL should be programmed for reliable far-end disconnect.

Callers who dial from rotary telephones cannot use MERLIN MAIL features.

The system may need more touch-tone receivers if:

- Single-line telephone users do not get a dial tone
- MERLIN MAIL fails to transfer calls
- Calls fail to ring or go to coverage prematurely
- Message-waiting lights fail to light

MERLIN MAIL and Lucent Technologies Attendant should not be used on the same system.

Programming of MERLIN MAIL is done through a touch-tone interface.

MERLIN MAIL has an EIA-232-D serial port and an external modem to support remote diagnostics.

You cannot use the first four logical IDs on a 008 OPT module to physically connect telephone equipment; however, you can use the extension numbers of these logical IDs for phantom extensions.

Additional touch-tone receivers (TTRs) may be needed for the 012 or 016 module to handle a large number of voice connections.

The MERLIN MAIL unit can be desk- or wall-mounted and should be placed in an area with low humidity and proper ventilation.

Follow the power and ground procedures for T/R telephones that require auxiliary power.

Hardware Requirements

The following hardware is required for MERLIN MAIL installation:

- MERLIN MAIL Voice Messaging System unit and power cords
- Remote maintenance device (with a wall-mount transformer)

- Modem cable with a 9-pin connector at one end and a 25-pin connector at the other end to connect the remote maintenance device to the serial port on the MERLIN MAIL Voice Messaging System unit
- D4BU modular cords (two for a 2-port system or four for a 4-port system, plus one for the remote maintenance device)
- 012 or 016 basic telephone module

For more information, consult *MERLIN MAIL Voice Messaging System for the MERLIN LEGEND Communications System, Installation, System Programming, and Maintenance*.

MERLIN PFC

The MERLIN PFC (Phone-Fax-Copier) telephone is a 34-button display telephone with a built-in fax and personal copier that provides the convenience of a fax machine and personal copier in one compact unit. The MERLIN PFC allows the user to make and receive inside and outside calls using the built-in speakerphone, and to send and receive faxes or make quick copies while using the telephone.

Considerations

The fax machine component of the MERLIN PFC telephone does not transmit date, time, and fax number.

In Behind Switch mode, a dedicated fax line for incoming fax calls is also required; in Hybrid/PBX or Key mode, the system can have either a dedicated fax line or Direct Inward Dialing (DID).

You cannot install the MERLIN PFC telephone outside a building.

You must remove all button assignments except the one for the fax line from the fax extension.

You should remove the Voice Announce feature from the fax extension.

If the dedicated fax line is shared for outgoing calls only, you must program the Ringing option to No Ring at every extension except the MERLIN PFC fax extension.

The MERLIN PFC can operate in Hybrid/PBX mode, Behind Switch mode, or in Key mode. The following sections list differences in operation between the two modes.

Hybrid/PBX and Key Modes

The dedicated fax line for incoming fax calls from the central office must be connected to a line jack on the control unit, and the line cannot be assigned to a pool.

If DID is used, a DID number must be assigned to the fax extension.

If a dedicated private line is used, assign a fax line to the voice extension.

No lines or pools can be programmed to the fax extension. At the fax extension, the dedicated fax line should be programmed to Immediate Ring and any other lines should be programmed to No Ring.

Behind Switch Mode

The dedicated fax line should be programmed to the MERLIN PFC fax extension.

The dedicated fax line should be assigned as a secondary (no ring) line at the voice extension.

Hardware Requirements

The MERLIN PFC telephone requires two analog ports: one for the voice line and one for the fax line.

The telephone wiring between the control unit and the MERLIN PFC telephone must be installed in the same building.

For more information, consult *MERLIN PFC Telephone Phone-Fax-Copier Installation and Maintenance Guide*.

PassageWay Direct Connect Solution

PassageWay Direct Connect Solution is a collection of five software applications that provide an interface between an approved DOS PC and the system through an MLX-28D, MLX-20L, or MLX-10DP telephone:

- **Lucent Technologies Call.** A card file application that enables a user to maintain names, addresses, telephone numbers, and other information.
- **Lucent Technologies Set.** A telephone programming application that enables users to program telephone features for their MLX-28D, MLX-20L, or MLX-10DP telephones from the PC. Multiple button programming files can be created, saved, and exchanged with other users.
- **Log Viewer.** An application that enables users to access information from the call log, which stores a record of every call made while using Lucent Technologies Call.
- **Lucent Technologies Connect.** Management software that provides the basis for all the other PassageWay applications. Lucent Technologies Connect also provides autodialing using the command set used by most modems.

- **Lucent Technologies Buzz.** An application that enables users to manage incoming calls (answer, hold, or drop) and view the calling party number (Caller ID) for each incoming call at their telephones.

Considerations

MERLIN LEGEND Communications System Release 3.0 or later is required for caller identification display capabilities.

Local telephone power is required if the MLX telephone is not wired with 4-pair extension wiring or if you use a MLX-20L or MLX-28D with a Direct Station Selector (DSS).

The MLX telephone must have Idle Line Preference activated.

The Automatic Line Selection on the MLX telephone should be programmed so that Idle Line Preference is on an **ICOM** button (in Key and Behind Switch modes) or an **SA** button (Hybrid/PBX mode).

Hardware Requirements

The following hardware is required:

- An approved DOS PC with the following
 - An 80286 or higher processor (80386 or higher recommended)
 - An available serial port
 - A minimum of 2 MB of RAM
 - A 3.5-inch, 1.44-MB, high-density drive or a 5.25-inch, 1.2-MB, high-density drive
 - A hard disk drive with 2 MB of space available
 - A Windows-compatible color video monitor

— A Windows-compatible pointing device (a mouse or trackball is recommended)

- Microsoft Windows, version 3.1 or later
- PassageWay adapter
- 9-pin to 25-pin adapter for 9-pin serial ports
- 4-ft., 4-pair, keyed modular telephone cord (D8AC)

For more information, consult *PassageWay Solution User's Guide*.

System Programming and Maintenance (SPM)

System Programming and Maintenance (SPM) is a DOS-based software application that allows you to use a PC to program and maintain the system. SPM performs the same functions as an MLX-20L telephone used as a system programming console and has some additional features, such as the ability to back up and restore files and print reports. The PC display shows the same button and screen layout as an MLX-20L telephone.

Considerations

SPM operates with DOS version 3.3 or later.

Unless the system is being backed up or restored, a remote user takes priority over a local user. If the local user is programming when a remote user connects to the system, the system sends a message to the local user that a remote connection has been made and disconnects the local user.

The PC with SPM connects to the EIA-232-D ADMIN jack on the processor of the control unit. The EIA-232-D baud rate is 1200/2400 bps with autobaud adjust.

A printer connected to the PC with SPM can print system programming reports. Reports can also be sent to the printer that is connected to the SMDR port on the control unit.

However, SMDR information may be lost while system programming reports are printed through the SMDR jack.

A UNIX System-based version of System Programming and Maintenance is available as part of Integrated Solution III, as discussed earlier in this chapter.

Hardware Requirements

The following hardware is required:

- An approved PC or other DOS-compatible PC with:
 - At least 512K of RAM
 - A double-sided floppy disk drive (either 5.25-inch or 3.5-inch)
 - A serial port assigned to COM1 or COM2. The serial port can use either a DB-9 or DB-25 connector. If a DB-9 connector is used, a 9-pin to 25-pin adapter is also required. The 9-pin side must be female.
- Video monitor (monochrome or color)
- D8W cord and 355AF adapter if the PC is within 50 ft. (15.2 m) of the control unit. Distances of greater than 50 ft. (15.2 m) require back-to-back ADUs.

See *System Programming and Maintenance (SPM)* for installation instructions.

Installing a CTI Link

There are two procedures in this section: how to add a CTI link to the MERLIN LEGEND Communications System—a *new installation*, and how to get a CTI link working again after a link shutdown—a *link reinstatement*.

New Installation

Considerations

In Release 5.0, the MERLIN LEGEND Communications System supports one CTI link.

The system must be in Hybrid/PBX mode.

A telephone cannot be plugged into the CTI link port.

A brand-new, 4-pair cable must be installed. No reuse of wire is supported. Proper Systemax hardware must be used, including cords and connecting blocks.

Hardware Requirements

There are no new hardware requirements in Release 5.0 of the MERLIN LEGEND Communications System.

The CTI link plugs into an available port on an 008 MLX or 408 MLX module. However, the firmware vintage for the module must be other than 29. An earlier or future vintage must be used for CTI link operation. If the firmware vintage is 29, the link administration is prevented and the System Programming screens tell you that the firmware 29 cannot be used.

A summary of the installation procedure is provided below:

These steps should be followed in order. Step 2 cannot come before Step 1, or System Programming will fail (procedure error beeps).

► **1. Install MERLIN LEGEND hardware.**

Choose a slot for an MLX port module (008 MLX or 408 MLX), and insert the module. Identify a port on that MLX port module for the CTI link. Unplug any telephone/adjunct from that port.

► **NOTE:**

Make sure that the MLX board's firmware vintage is NOT 29. Any other vintage is acceptable, that is, earlier or future vintages after 29. If the port module has firmware vintage 29, the link administration is prevented and the System Programming screens tell the administrator that firmware 29 cannot be used.

Do not assign the CTI link to the first and fifth ports normally reserved for the operator positions.

► **2. Program the communications system.**

At the Executive Station or using SPM, program the system in Hybrid/PBX mode, busy out the slot, then program that MLX port as a CTI link port. The functions for programming the system and the MLX port are under the System Programming option. The functions to busy out and restore the slot are under the Maintenance option. Be sure to restore the slot after you finish the programming.

► **3. Plug in the CTI link. Tag the cable and/or the port as the CTI link.**

As a general rule, do not plug in a CTI link unless the port is programmed as a CTI link port. Also, do not plug a telephone into a CTI link port. The other end of this wire is plugged into the ISDN link interface card installed in the NetWare server.

► **NOTE:**

If you are installing an adjunct or an application into the CTI link, refer to the books that come with that adjunct/application. Refer to the System Manager's Guide section "Adding a CTI Link" for detailed instructions.

Refer to the *MERLIN LEGEND Network Manager's Guide* for instructions. At this point the CTI link should be operational.

Link Reinstatement

The considerations and hardware requirements for a link reinstatement are the same as those for a new installation since this procedure is used only after a link shutdown.

A summary of the installation procedure for a link reinstatement is provided below:

► **1. Plug in the CTI link, if unplugged.**

As a general rule, do not plug in a CTI link unless the port is programmed as a CTI link port. Also, do not plug a telephone into a CTI link port. The other end of this wire is plugged into the ISDN link interface card installed in Step 3 of the "New Installation" procedure.

► **2. Resume CTI link traffic.**

Refer to the *MERLIN LEGEND Network Manager's Guide* for instructions.

► **3. Resume MERLIN LEGEND alarming for the CTI link.**

Refer to the *MERLIN LEGEND Network Manager's Guide* for instructions.

Upgrading the System

9

WARNING:

System upgrades should be performed by qualified technicians or service personnel only. Installation or maintenance of this product by anyone other than qualified personnel may damage or impair the product; your limited warranty does not cover such damage. For details, see your limited warranty in Appendix A, Customer Support Information, in Maintenance and Troubleshooting or System Programming.

NOTE:

Upgrading the MERLIN LEGEND Communications System to Releases 4.1, 4.2, and 5.0 requires no new or additional hardware components. Releases 4.1 and 4.2 improve feature capability and Release 5.0 adds the flexibility of a CTI link. The sections below indicate what is necessary for the upgrade. To perform the actual upgrade, refer to *System Programming* for detailed procedures.

Upgrading to Release 5.0

You must have DOS SPM Version 5.15 to upgrade to Release 5.0 from Releases 1.0, 1.1, 2.0, 2.1, 3.0, 3.1, or 4.0.

To upgrade to Release 5.0, you need:

- SPM Version 5.15 or later to back up and convert system programming information and to restore system programming information after the Release 4.0 processor module has been installed.

- Both of the following:
 - Release 3.0 or later processor module that is flash card capable (when converting from Release 2.1 or earlier).
 - A forced installation PCMCIA memory card with Release 4.0 system software (when converting from any release).
- DOS-formatted diskette

Upgrading to Release 4.2

You must have DOS SPM Version 5.15 to upgrade to Release 4.2 from Releases 1.0, 1.1, 2.0, 2.1, 3.0, 3.1, or 4.0.

To upgrade to Release 4.2, you need:

- SPM Version 5.15 or later to back up and convert system programming information and to restore system programming information after the Release 4.0 processor module has been installed.
- Both of the following:
 - Release 3.0 or later processor module that is flash-card capable (when converting from Release 2.1 or earlier).
 - A forced installation PCMCIA memory card with Release 4.0 system software (when converting from any release).
- DOS-formatted diskette

Upgrading to Release 4.1

You must have DOS SPM Version 5.15 to upgrade to Release 4.1 from Releases 1.0, 1.1, 2.0, 2.1, 3.0, 3.1, or 4.0.

To upgrade to Release 4.1, you need:

- SPM Version 5.15 or later to back up and convert system programming information and to restore system programming information after the Release 4.0 processor module has been installed.
- Both of the following:
 - Release 3.0 or later processor module that is flash card capable (when converting from Release 2.1 or earlier)
 - A forced installation PCMCIA memory card with Release 4.0 system software (when converting from any release)
- DOS-formatted diskette

NOTE:

IF SPM is already installed, the Welcome to SPM screen that appears when you start SPM identifies the version on both the last line of the console simulation window and in the upper left-hand corner of the screen. If you are working with Version 5.15, **V5** appears in the upper left-hand corner of the screen and **Version 5.15** appears on the last line of the console simulation window in the welcome message when SPM is started.

Upgrading to Release 4.0

To upgrade to Release 4.0, you need:

- SPM Version 4.15 or higher
- The version number of the SPM software currently installed (if any)
- One of the following:
 - Release 4.0 processor module (when converting from Release 2.1 or earlier)
 - An upgrade PCMCIA memory card with Release 4.0 system software (when converting from Release 3.0)
- DOS-formatted disk

To upgrade the control unit, follow the steps below:

- ▶ **1. If the current system programming is to be used in the upgraded system, back up system programming.**
See [“Backing Up System Programming”](#), next in this chapter, for details.
- ▶ **2. Remove the control unit housing.**
See [“Removing the Control Unit Housing”](#), later in this chapter, for instructions.
- ▶ **3. Power down the system.**
See [“Powering Down the System”](#), later in this chapter, for instructions.
- ▶ **4. Upgrade the control unit.**
See [“Upgrading the Control Unit”](#), later in this chapter, for instructions.
- ▶ **5. If the current system programming is to be used in the upgraded system, convert the backup file and restore system programming.**
See [“Completing the Upgrade”](#), later in this chapter, for instructions.

Backing Up System Programming

⇒ NOTE:

You cannot upgrade system programming for the MERLIN II Communications System; *it must be reprogrammed*. To upgrade a MERLIN II Communications System, see [“Upgrading from the MERLIN II Communications System”](#), later in this chapter.

Use the following procedure to back up programming from Release 1.0, 1.1, 2.0, 2.1, 3.0, or 3.1:

- ▶ **1. Install SPM.**
- ▶ **2. Back up system programming.**
See the Backup command in *System Programming and Maintenance (SPM)*.

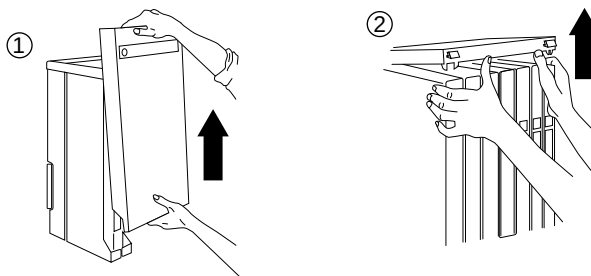
- *To back up system programming from Release 1.0 or 1.1, you can use any version of SPM (1.16 is recommended).*
- *To back up system programming from Release 2.0, you must use SPM version 2.09 or higher.*
- *To back up system programming from Release 2.1, you must use SPM version 2.16 or higher.*
- *To back up system programming from Release 3.0 or 3.1, you must use SPM version 3.18 or higher.*

Removing the Control Unit Housing

Remove the control unit housing as described below. See [Figure 9-1](#).

- For a MERLIN II or a MERLIN LEGEND (Release 2.1 or later) Communications System:
 1. Remove the front housing from each carrier by pulling the bottom front towards you, and lifting it up as shown in [Figure 9-1](#).
 2. Remove the top from each carrier in the system by pushing it straight up from the front.
 3. Do not discard the housing unless new housing is provided. You will reassemble the housing when installation is complete.
- For a MERLIN LEGEND (Release 2.0 or earlier) Communications System:
 1. From both sides of the control unit, pry the clips free from the housing, using a screwdriver if they are difficult to reach.
 2. Carefully pull the housing towards you.
 3. If the system has more than one carrier, make sure you remove the housing only from the basic carrier side; otherwise, the housing may disassemble.
 4. If the housing clips need to be replaced, follow the procedure in "Replacing the Housing Clips."
 5. Discard the housing only if upgraded housing has been provided.

MERLIN II and
MERLIN LEGEND 2.1 and later
Communications System



MERLIN LEGEND 2.0
and earlier
Communications System

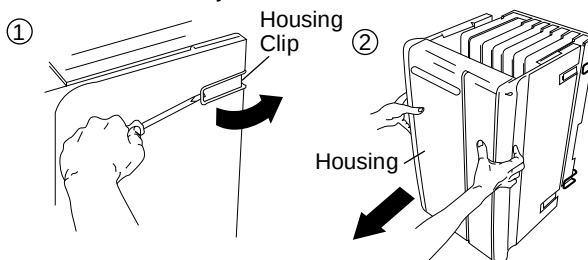


Figure 9-1. Removing the Control Unit Housing

Powering Down the System

You may need to power down the system to add upgraded equipment to the carrier.



CAUTION:

Follow these steps in the exact sequence.

To power down the system, follow the steps below and see [Figure 9-2](#):

- ▶ **1. Turn off the power supply on the basic carrier.**
- ▶ **2. Turn off the power supplies on the expansion carriers.**
- ▶ **3. Unplug any auxiliary power units.**
Because the power supplies are already off, the sequence for removing auxiliary power cords is not important.
- ▶ **4. Unplug the system from the AC outlet.**

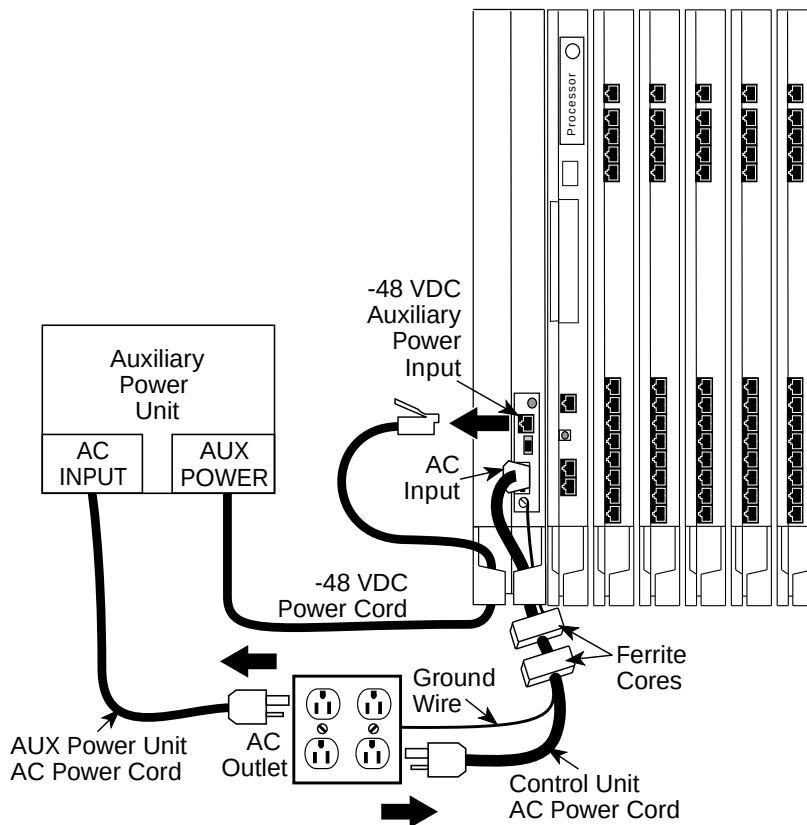


Figure 9-2. Powering Down the System

Upgrading the Control Unit

- ▶ 1. Do not remove any of the existing carriers.
- ▶ 2. Refer to the Control Unit Diagram on the flip side of System Planning Form 1.
If you are installing an expansion carrier, remove the rightmost module from the control unit and set it aside. See [Figure 9-3](#).



CAUTION:

Before removing any cords from the module, make sure they are labeled first for easier replacement.

- ▶ 3. Install any expansion carriers.
See ["Installing Expansion Carriers"](#) in [Chapter 2](#).
- ▶ 4. Install or replace any modules. If you are upgrading from Release 3.0 or later, go to Step 6.
See ["Installing the Modules"](#) in [Chapter 2](#).



NOTE:

If you are replacing an 012 module with an 016 module, you will need to perform a Board Renumber after completing the upgrade. See *System Programming* for more information about Board Renumber.

System→Board Renum→Yes

- **5. Replace the processor module.** See [Figure 9-3](#). Then go to Step 7.

► **NOTE:**

If the processor module is to be modified for Key mode, perform Step 4 through Step 10 of “Modifying the Processor for Key Mode” before proceeding.

- a. Press up on the tab at the bottom rear of the old processor module.
- b. While the tab is unlocked, pull the processor module towards you, then lift it straight up.
- c. Install a Release 4.0 processor module. See [“Installing the Processor”](#) in [Chapter 2](#).
- d. Power up the system.

- **6. Upgrade the processor module to Release 4.0 (when upgrading from Release 3.0 or 3.1).**

► **NOTE:**

If the processor module is to be modified for Key mode, see [“Modifying the Processor for Key Mode”](#) later in this chapter.

- a. Insert an Upgrade memory card into the PCMCIA interface slot on the processor module.
- b. Perform the software installation.

Menu→Maintenance→System→Upgrd/Instll→Yes

See “Forced Installation/Upgrade of System Software” in *Maintenance and Troubleshooting* for more details on this procedure.

- **7. Program the system.**

- If the current system programming is to be used in the upgraded system, see [“Completing the Upgrade”](#) later in this chapter.
- If the system is to be re-programmed, see the System Planning Forms and *System Programming*.

- **8. Test the system.**

See [Chapter 7, “Initializing and Testing the System”](#).

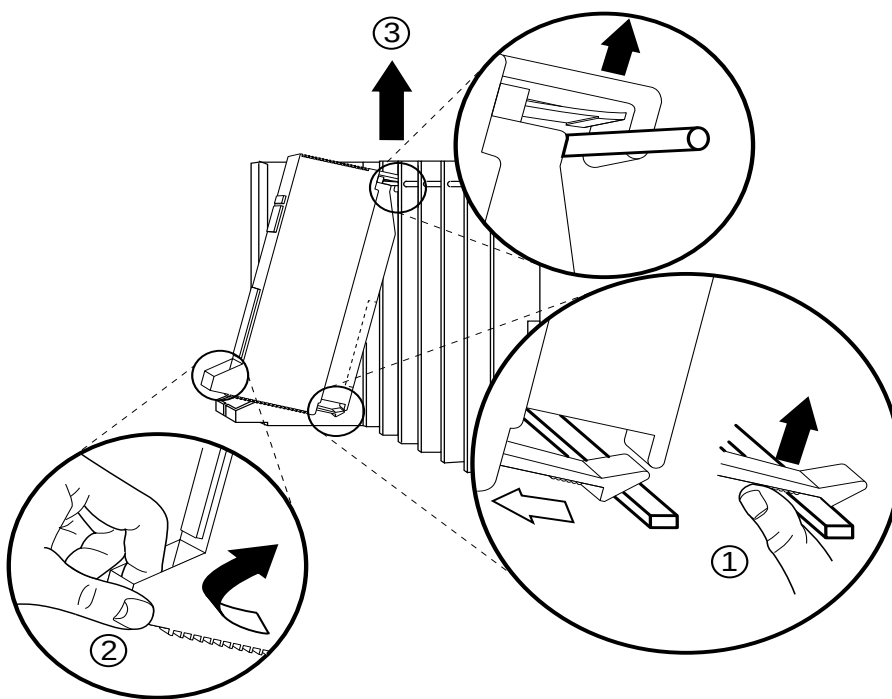


Figure 9-3. Removing a Module from the Carrier

Replacing the Housing Clips

- ▶ **1. Remove the housing clips from the right side of the module.**
 - a. Remove the rightmost module from the control unit. See “Removing a Module” in [Chapter 2](#) for instructions.
 - b. Using a flat-blade screwdriver, unscrew the upper right corner of the carrier only far enough to free the clip.
 - c. Pull the top-right corner of the carrier toward you while grasping the housing clip and pushing it away from you (to free it from the carrier).
 - d. When the clip is free enough to clear the screw molding on the back of the carrier, slide the clip out and discard it.
 - e. Compare the Control Unit Diagram with the existing control unit. If you are installing an additional expansion carrier in this upgrade, do not replace the clips on the right side until the last expansion carrier is installed. If no more carriers are to be installed, replace the clip now, making sure the clip is as far to the right as possible.
 - f. Secure the screw, and then repeat Steps b, c, and d for the lower right corner of the carrier.

- ▶ **2. Remove the power supply module to access the housing clips on the leftmost side of the carrier. See [Figure 9-3](#).**
 - a. Press up on the tab at the bottom rear of the power supply.
 - b. While the tab is unlocked, pull the power supply towards you, then lift it straight up.

WARNING:

Beware of hazardous voltages.

Whenever the carrier connections are exposed, use extreme caution; do not touch them directly or with any type of tool.

Follow all procedures carefully.

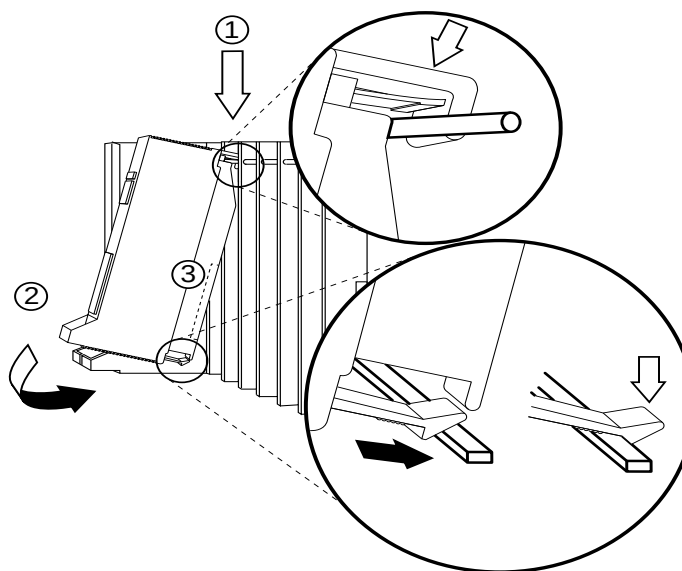


Figure 9-4. Replacing a Module in the Carrier

- ▶ 3. Remove the clips from the left side of the control unit as you did in Step 1; however, make sure you replace the clips before securing the screws again.
- ▶ 4. Reinstall the power supply module by hooking it onto the rod at the top of the carrier and then swinging it down into place. See [Figure 9-4](#).
- ▶ 5. Push the power supply module firmly until you hear it lock.

Modifying the Processor for Key Mode

To modify the processor for Key mode in Release 3.0 and later, follow the steps below. For earlier releases, see Appendix E in *Maintenance and Troubleshooting*.

Prepare a non-metallic surface, such as a table, on which to work.

WARNING:

Do not touch the gold connectors on the rear of the processor module. Electrostatic discharge (ESD) can damage the circuitry, as can the oil from your fingertips. Use a properly grounded wrist strap to prevent damage from electrostatic discharge.

Only a qualified technician should perform this procedure.

- ▶ 1. Remove the control unit housing. See [Figure 9-1](#).
- ▶ 2. Power down the system as described earlier in this chapter. See [Figure 9-2](#).
- ▶ 3. Remove the processor module from the carrier. See [Figure 9-3](#).
- ▶ 4. Place the processor module on a flat surface with the wiring manager on your left.
- ▶ 5. Unclip and remove the left side panel. See [Figure 9-5](#).

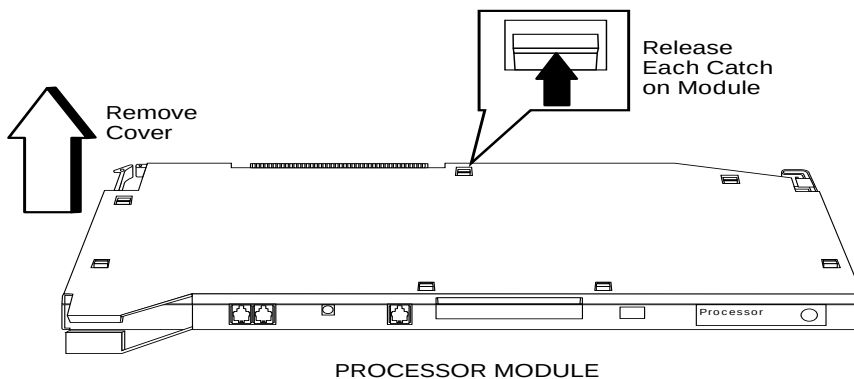


Figure 9-5. Removing the Processor Module Cover

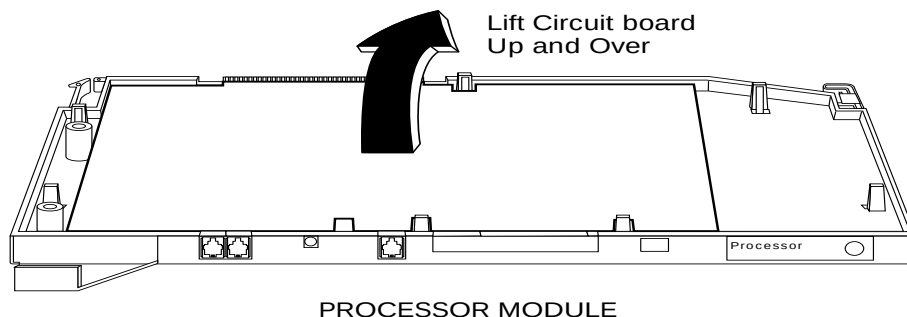


Figure 9-6. Removing the Processor Module Circuit Board

- ▶ 6. Holding the processor circuit board at each end, lift it up and turn it over and away from you. See [Figure 9-6](#).
- ▶ 7. Place the processor circuit board on a flat, *non-metallic* surface.
- ▶ 8. Carefully support the dip switch assembly with your index finger, while moving the switch to the closed position. See [Figure 9-7](#).
- ▶ 9. Replace the processor circuit board face (components) down into the module housing.
- ▶ 10. Replace the processor module side panel and clip into place.
- ▶ 11. Replace the processor module into the carrier. See [Figure 9-4](#).
- ▶ 12. Power up the system.

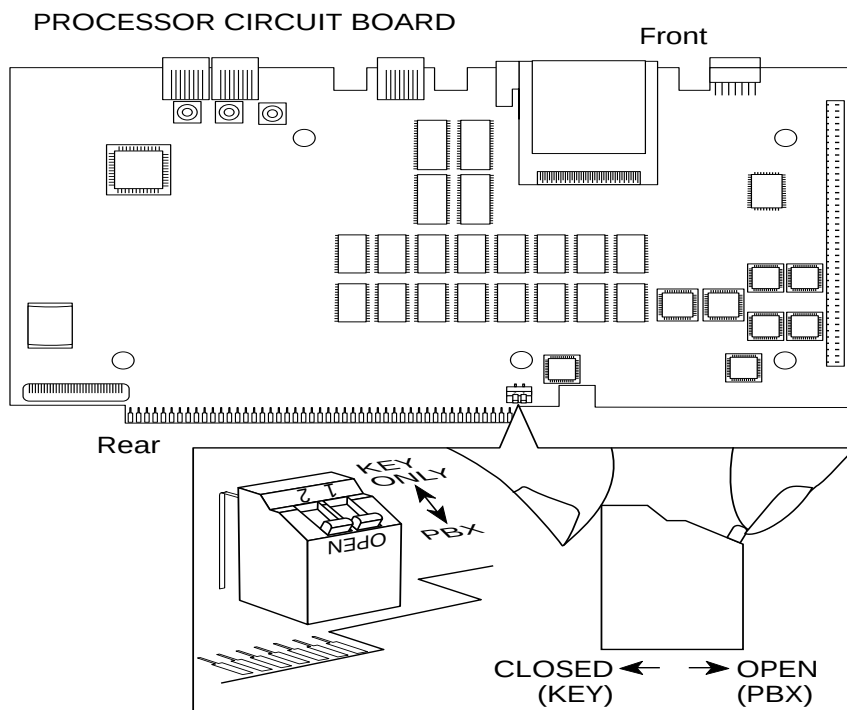


Figure 9-7. Changing the Key Mode Switch Position to Closed

Completing the Upgrade

- ▶ **1. Perform a frigid start (System Erase) to ensure that all system programming is returned to default values.**
Use System Erase from the SPM Maintenance menu:
Maintenance→Slot→00→Demand Test→System Erase (Line 5, left button) twice→Yes
See *Maintenance and Troubleshooting* for more information on System Erase.
- ▶ **2. Convert the backup file.**
This converts the backup file created in Step 2 to Release 4.0 format.
See the Convert menu option in *System Programming and Maintenance (SPM)* for details.
- ▶ **3. Restore system programming; this puts the system in an idle state so that it cannot be used for the duration of the procedure. Refer to [“Restoring from the System Programming Disk”](#) in [Chapter 7](#) for more information.**
Use version 4.15 or higher of SPM and restore the file you converted in Step 5.
- ▶ **4. If applicable, program new features.**
See Chapter 2, Programming with SPM in *System Programming* for a list of new features to be programmed.

Upgrading from the MERLIN II Communications System

To upgrade from the MERLIN II Communications System to Release 4.0, follow the steps below.

- ▶ **1. Install SPM.**
Install (or upgrade to) version 4.15 or higher of SPM.
- ▶ **2. Remove the control unit housing.**
See [Chapter 2, “Installing the Control Unit”](#) if you need instructions.

► **3. Replace old modules and add new modules as specified on the Control Unit Diagram of Form 1, System Planning.**

See [Chapter 2, "Installing the Control Unit"](#) if you need instructions.

► **4. Install the Release 4.0 processor module in the carrier.**

See ["Installing the Processor"](#) in [Chapter 2](#).

► **5. Perform a frigid start (System Erase) to ensure that system programming is returned to default values.**

Use System Erase from the SPM Maintenance menu:

Maintenance→Slot→00→Demand Test→System Erase (Line 5, left button) twice→Yes

See *Maintenance and Troubleshooting* for more information on System Erase.

► **6. Program the system.**

- Restore the system programming from a system programming disk or Translation Memory Card (Release 3.0 and later only), if available.

See ["Restoring from the System Programming Disk"](#) or ["Restoring from the Translation Memory Card"](#) in [Chapter 7](#).

- If a disk or memory card is not available, see *System Programming* for details on programming the system.

► **7. If applicable, program new features.**

See *System Programming* for detailed programming procedures.

Replacing the Control Unit Housing

See [Chapter 2, "Installing the Control Unit"](#), for instructions on replacing the control unit housing for Release 2.1 and later.

Release 2.0 or Earlier

To install the control unit housing, follow the steps below.

- ▶ **1. Place the front panel(s) face down.**
- ▶ **2. If you are housing more than one carrier, connect the front panels together.**
 - a. Line up the arrows.
 - b. Slide the panels until the semicircles form a complete circle. See [Figure 9-8](#).
- ▶ **3. Connect the side panels to the front panel(s) in the same way.**
- ▶ **4. Pick up the housing and place it on the control unit. If the system has more than one carrier, make sure you hold the housing only from the basic carrier side; otherwise, the housing can disassemble.**
 - a. Line up the wire clips that are attached to the carrier with the recesses on the outside of the side panels.
 - b. Push back the panels until the clips hook over the tabs and rest in the recesses.

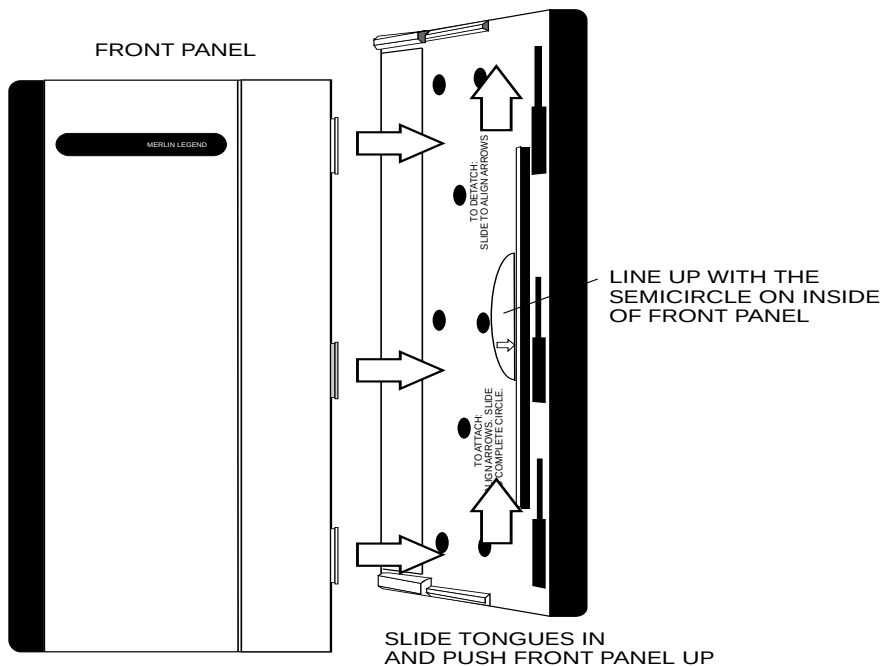


Figure 9-8. Installing the Control Unit Housing

System Numbering Forms



When you change any existing trunk or extension wiring, record information about the wiring on the appropriate system numbering form. This appendix includes examples of all of the system numbering forms, and instructions for completing Form 2a, "System Numbering: Extension Jacks." The system numbering forms, which are included in this appendix, are as follows:

- Form 2a, System Numbering: Extension Jacks ([Figure A-1](#))
- Form 2b, System Numbering: Digital Adjuncts ([Figure A-2](#))
- Form 2c, System Numbering: Line/Trunk Jacks ([Figure A-3](#))
- Form 2d, System Numbering: Special Renumbers ([Figure A-4](#))

See System Planning for completed forms that contain more detailed information regarding the configuration of your customer's system.

Form 2a, System Numbering: Extension Jacks

Renumber System*

☐ 2-Digit ♦ ☐ Selected Extension Numbers ☐ 3-Digit ☐ Set Up Space

Mod. Type	Log. ID	Jack Type			Eqpt.	2-Dig. Ext. No. ♦	3-Dig. Ext. No.	Set Up Space	Renumber to	Label	Old Ext. No.	Wire No.	Person, Location, or Function	Ring Freq. ‡	Voice Mail
		A	D*	B											
	1					10	100	7100							
	2					11	101	7101							
	3					12	102	7102							
	4					13	103	7103							
	5					14	104	7104							
	6					15	105	7105							
	7					16	106	7106							
	8					17	107	7107							
	9					18	108	7108							
	10					19	109	7109							
	11					20	110	7110							
	12					21	111	7111							
	13					22	112	7112							
	14					23	113	7113							
	15					24	114	7114							
	16					25	115	7115							
	17					26	116	7116							
	18					27	117	7117							
	19					28	118	7118							
	20					29	119	7119							
	21					30	120	7120							
	22					31	121	7121							
	23					32	122	7122							
	24					33	123	7123							

Shaded lines indicate possible operator positions.

♦ Factory Setting

* The system capacity for Personal Directories is decreased by one whenever an MLX-20L telephone is connected to an MLX port.

† Use Form 2b for adjuncts connected via MFH or ISDN Terminal Adapter (such as the ExpressRoute 1000 or 7500B data module).

‡ Ringing Frequency is programmable on the 016 TIR module only.

Figure A-1. Form 2a, System Numbering: Extension Jacks

The following explains how to complete Form 2a.

The number in the logical ID column refers to the number of the extension jack in the control unit.

1. In the "Eqpt." (Equipment) column, enter the type of device (such as an MLX-20L console) that is connected to the extension jack. On the second line, enter any attached adjuncts (such as an answering machine).
2. In the "Old Ext. No." column, if the wire run is being changed, enter the extension number of the old extension. If you are working with a new installation, leave this space blank.
3. In the "Renumber to" column, enter the extension number of the extension, if not already filled in. (This includes new installations.)
4. In the "Wire No." column, enter the number of the wire as indicated by the label on the wire.
5. In the "Person, Location, or Function" column, enter the name of the person at the location, or the function of (such as a fax machine) the extension, and any miscellaneous information particular to that extension.

Form 2b, System Numbering: Digital Adjuncts

Log. ID	Factory-Set			Renumber to	Adjuncts	2B	Pass. Bus	MLX Telephone Ext. No.	Person, Location, Function, and Equipment Type
	2-digit	3-digit	Set Up Space						
1	710	300	7300						
2	711	301	7301						
3	712	302	7302						
4	713	303	7303						
5	714	304	7304						
6	715	305	7305						
7	716	306	7306						
8	717	307	7307						
9	718	308	7308						
10	719	309	7309						
11	720	310	7310						
12	721	311	7311						
13	722	312	7312						
14	723	313	7313						
15	724	314	7314						
16	725	315	7315						
17	726	316	7316						
18	727	317	7317						
19	728	318	7318						
20	729	319	7319						
21	730	320	7320						
22	731	321	7321						
23	732	322	7322						
24	733	323	7323						
25	734	324	7324						
26	735	325	7325						
27	736	326	7326						
28	737	327	7327						
29	738	328	7328						
30	739	329	7329						
31	740	330	7330						
32	741	331	7331						
33	742	332	7332						
34	743	333	7333						
35	744	334	7334						
36	745	335	7335						
37	746	336	7336						
38	747	337	7337						
39	748	338	7338						
40	749	339	7339						

Figure A-2. Form 2b, System Numbering: Digital Adjuncts

Form 2c, System Numbering: Line/Trunk Jacks

Music On Hold, Line/Trunk No. _____ Source _____

Maintenance Alarm, Line/Trunk No. _____

Loudspeaker Page, Line/Trunk No(s). _____

Loop-Start Reliable Disconnect*

☐ No †

☐ Yes

Module Type and Slot No.	Log. ID	Jack Type (LS, GS, DID, Tie, etc.)	Line/Trunk No.	Pool Dial-Out Code†‡	Re-number to	Incoming Line/Trunk Type (Main No., Personal Line, WATS, FX, etc.)	Telephone Number or Equipment	Label	Outmode Signaling	Toll Type Prefix Req'd for LD	Hold Disc. Interval	QCC Operator to Receive Calls†	QCC Queue Priority Level†	Function	
									TT‡	R	Yes‡	No	Short	Long ‡	
	1		801					_____							
	2		802					_____							
	3		803					_____							
	4		804					_____							
	5		805					_____							
	6		806					_____							
	7		807					_____							
	8		808					_____							
	9		809					_____							
	10		810					_____							
	11		811					_____							
	12		812					_____							
	13		813					_____							
	14		814					_____							
	15		815					_____							
	16		816					_____							
	17		817					_____							
	18		818					_____							
	19		819					_____							
	20		820					_____							

‡ Factory Setting

* If the system has AUDIX Voice Power/FAX Attendant System™, Integrated Administration will automatically set Loop-Start Reliable Disconnect to Yes.

† Hybrid/PBX mode only.

‡ Maximum: 11 pools with up to 80 trunks per pool.

Factory settings: 70 (main), 891 (dial-in tie), 892 (automatic-in tie).

Figure A-3. Form 2c, System Numbering: Line/Trunk Jacks

Form 2d, System Numbering: Special Renumbers

Pools* (Form 2c) Description	Factory-Set Number	Renumber to
	70	
	890	
	891	
	892	
	893	
	894	
	895	
	896	
	897	
	898	
	899	

Group Paging (Form 7b) Group ID	Factory-Set Number	Renumber to
	793	
	794	
	795	
	796	
	797	
	798	
	799	

Park Zone (Form 6a) Description	Factory-Set Number	Renumber to
	881	
	882	
	883	
	884	
	885	
	886	
	887	
	888	

DSS Page Buttons		
PAGE 1	Beginning extension for range_____	
PAGE 2	Beginning extension for range_____	
PAGE 3	Beginning extension for range_____	

ARS Dial-Out Code [†]	Default	Renumber to
	9	

* Hybrid/PBX mode only.

[†] ARS Dial-Out Code is Idle Line Preference Code in Key mode.

‡ Reserved for AUDIX Voice Power/FAX Attendant System.

Group Calling (Form 7d) Group ID Label	Factory-Set Number	Renumber to
	770	
	771	
	772	
	773	
	774	
	775	
	776	
	777	
	778	
	779	
	780	
	781	
	782	
	783	
	784	
	785	
	786	
	787	
	788	
	789	
	790	
	791	
	792	
	7921	
	7922	
	7923	
	7924 [‡]	
	7925 [‡]	
	7926 [‡]	
	7927 [‡]	
	7928 [‡]	
	7929 [‡]	

Listed Directory Number* (QCC Queue)	Factory-Set Number	Renumber to
	800	

Remote Access Code (Form 3a)	Factory-Set Number	Renumber to
	889	

Figure A-4. Form 2d, System Numbering: Special Renumbers

Unit Load Calculation Worksheet

B

If you determine that you need to recalculate the unit load for any carrier, use the instructions on the following worksheet.

NOTE:

You should have a separate copy of the worksheet for each carrier.

See “Unit Loads” in [Chapter 1](#) for information on recalculating unit loads.

The 391A3 power supply has a maximum rating of 75 unit loads. If your system contains a 391A1 or 391A2 power supply module, and the unit loads for that carrier will exceed 54, it is recommended that a 391A3 power supply be installed in the system. Auxiliary Power Units cannot be used with the 391A3 power supply.

Unit Load Worksheet

1. Number of modules in carrier (excluding power supply and processor:

- If fewer than five, power is adequate. _____
- If five or six, continue to Step 2.

2. Key or Behind Switch mode only:

- ☐ Square
☐ Modified

Indicate configuration of lines; then go to Step 5.

3. Hybrid/PBX mode only:

Do all modules in the carrier have MLX and/or analog multiline telephone jacks?

- ☐ Yes
☐ No

- If no, a newer power supply is not needed.
- If yes, continue to Step 4.

4. Hybrid/PBX mode only:

Calculate the total number of MLX and analog multiline telephones:

Number of MLX-20L consoles connected to modules in the carrier _____

Number of MLX-28D consoles connected to modules in the carrier _____

Number of 34-button analog multiline telephones connected to modules in the carrier _____

Total of MLX-20L, MLX-28D, and 34-button analog telephones _____

- If total is less than or equal to 45, auxiliary power is not required. _____
- If the total is greater than 45, continue to Step 5.

5. Calculate the estimated unit loads.

Module	Qty	x	Unit Load	= Total
008			12.0	
008 MLX			13.5	
008 OPT			8.0	
012			8.4	
016			12.8	
100D			0.0	
400			0.0	
400 EM			8.0	
400 GS/LS/TTR			8.0	
408			12.0	
408 GS/LS			12.0	
408 GS/LS-MLX			13.5	
800			0.0	
800 NI-BRI			0.0	
800 GS/LS			0.0	
800 GS/LS-ID			8.0	
800 DID			8.0	
MERLIN LEGEND Mail			0.0	
Total Estimated Unit Load				

- If the total is less than or equal to 54, any power supply module is sufficient.
- If the total is greater than 54, continue to Step 6.

6. Calculate the actual carrier unit load.

	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Network Access Lines¹				
DID			1.0	1.0
DS1			0.0	0.0
GS/LS			0.0	0.0
Tie			1.4	1.4
Telephones				
MLX-5			0.9	1.2
MLX-5D			0.9	1.2
MLX-10			0.9	1.2
MLX-10D			0.9	1.2
MLX-16DP			1.5	1.5
MLX-28D			1.2	1.7
MLX-20L			1.1	1.6
BIS-10			0.9	1.1
BIS-22			1.0	1.3
BIS-22D			1.0	1.3
BIS-34			1.1	1.5
BIS-34D			1.1	1.5
MLC-5			0.0	0.0
MDC-9000			0.0	0.0
MDCW-9000			0.0	0.0
10-Button Basic			0.9	1.1
10-Button HFAI			1.0	1.2
<i>Continued</i>				

1. Unit loads are computed per trunk for trunk-type network access lines.

	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Telephones (<i>continued</i>)				
34-Button Basic			0.9	1.1
34-Button DLX			1.2	1.7
34-Button BIS			1.2	1.4
34-Button BIS/DIS			1.2	1.4
Single-Line Telephone			0.6	0.7
Optional Equipment¹				
EICON board (CTI link interface board in Netware server.)			0.0	0.0
Direct Station Selector ²			0.7	0.9
General Purpose				
Adapter			0.8	1.0
Hands-Free Unit			0.8	1.0
Headset Adapter			0.8	1.0
Total Actual Unit Load				

1. The MFM has its own wall power unit located at the telephone and therefore is not added to the unit load calculation.
2. Up to two DSSs (one DSS per MLX-28D or MLX-20L console) can be powered from each control unit carrier. For example, a 3-carrier system can have 6 system operator positions, each with one DSS powered from the control unit.
 - If the total actual unit load is less than or equal to 54, any power supply module is sufficient.
 - If the total actual unit load is greater than 54, continue to Step 7.

7. Try to exchange modules between carriers to reduce the unit loads to 54.
(Remember that the 100D, 400, 400 GS/LS/TTR, 800 GS/LS-ID, 800, 800 NI-BRI, and 800 GS/LS modules have unit loads of 0.0.) Repeat Steps 1 through 6 to recalculate unit loads for the new configuration.
 - If the exchange reduces the unit load to 54 or less, any power supply module is sufficient.
 - If the exchange does not reduce the unit load to 54 or less, a 391A3 power supply is needed. Continue to Step 8.



NOTE:

Empty slots are not permitted between modules.

8. Calculate the unit loads for slots 5 and 6 of the carrier.

	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Network Access Lines¹				
DID			1.0	1.0
DS1			0.0	0.0
GS/LS			0.0	0.0
Tie			1.4	1.4
Telephones				
MLX-5			0.9	1.2
MLX-5D			0.9	1.2
MLX-10			0.9	1.2
MLX-10D			0.9	1.2
MLX-28D			1.2	1.7
MLX-20L			1.1	1.6
BIS-10			0.9	1.1
BIS-22			1.0	1.3
BIS-22D			1.0	1.3
BIS-34			1.1	1.5
BIS-34D			1.1	1.5
MLC-5			0.0	0.0
MDC-9000			0.0	0.0
MDCW-9000			0.0	0.0
10-Button Basic			0.9	1.1
10-Button HFAI			1.0	1.2
34-Button Basic			0.9	1.1
34-Button DLX			1.2	1.7
34-Button BIS			1.2	1.4
34-Button BIS/DIS			1.2	1.4
Single-Line Telephone			0.6	0.7
<i>Continued</i>				

1. Unit loads are computed per trunk for trunk-type network access lines.

	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Optional Equipment¹				
EICON board (CTI link interface board in Net-ware server.)			0.0	0.0
Direct Station Selector ²			0.7	0.9
General Purpose Adapter			0.8	1.0
Hands-Free Unit			0.8	1.0
Headset Adapter			0.8	1.0
Total Actual Unit Load				

1. The MFM has its own wall power unit located at the telephone and therefore is not added to the unit load calculation.
2. Up to two DSSs (one DSS per MLX-28D or MLX-20L console) can be powered from each control unit carrier. For example, a 3-carrier system can have 6 system operator positions, each with one DSS powered from the control unit.
 - If the unit load for slots five and six is less than or equal to 27, power is sufficient for the carrier.
 - If the unit load for slots five and six is more than 27, continue to Step 9.

9. Try to exchange modules between carriers to reduce the unit loads for slots five and six through 27. (Remember that the 100D, 400, 400 GS/LS/TTR, 800 GS/LS-ID, 800, 800 NI-BRI, and 800 GS/LS modules have unit loads of 0.0.) Repeat Steps 1 through 8 to recalculate unit loads for new configuration.
 - If the exchange reduces the unit load for slots five and six through 27 or less, power is sufficient.
 - If the exchange does not reduce the unit loads for slots 5 and 6 through 27, install wall power units for the appropriate number of telephones to reduce the unit load to 27.



NOTE:

Empty slots are not permitted between modules.

Glossary

#

7500B data module	See ISDN terminal adapter .
7500B data station	See ISDN terminal adapter data station

A

account code	Code used to associate incoming and outgoing calls with corresponding accounts, employees, projects, and clients.
Accunet	AT&T's switched digital service for 56-kbps, 64-kbps restricted, and 64-kbps clear circuit-switched data calls.
address	A coded representation of the destination of data or of the data's originating terminal, such as the dialed extension number assigned to the data terminal. Multiple terminals on one communication line must each have a unique address.
ADDS	(Automated Document Delivery System) Computer-based application that stores documents in a database and automatically faxes them on request.

adjunct	Optional equipment used with the communications system, such as an alerting device or <i>modem</i> that connects to a multiline telephone or to an extension jack.
ALS	(Automatic Line Selection) Programmed order in which the system makes outside lines available to a user.
AMI	(alternate mark inversion) Line coding format in which a binary one is represented by a positive or negative pulse, a binary zero is represented by no line signal, and subsequent binary ones must alternate in polarity; otherwise, a <i>bipolar violation</i> occurs. AMI is used in the <i>DS1</i> interface.
analog transmission	Mode of transmission in which information is represented in continuously variable physical quantities such as amplitude, frequency, phase, or resistance. See also digital transmission .
analog data station	See modem data station .
ANI	(automatic number identification) Process of automatically identifying a caller's billing number and transmitting that number from the caller's local central office to another point on or off the public network.
application	Software and/or hardware that adds functional capabilities to the system. For example, MERLIN Identifier is an application that provides caller identification information (if available in the local area or jurisdiction).
ARS	(Automatic Route Selection) System feature that routes calls on outside trunks according to the number dialed and trunk availability.

ASCAP	(American Society of Composers, Artists, and Producers)
ASN	(Lucent Technologies Switched Network) Lucent Technologies telecommunications services provided through an Integrated Digital Services Network Primary Rate Interface (ISDN-PRI) trunk, <i>Accunet</i> switched digital service, <i>Megacom</i> , <i>Megacom 800</i> , Software Defined Network (<i>SDN</i>), Multiquest, and Shared Access for Switch Services (<i>SASS</i>).
asynchronous data transmission	A method of transmitting a short bitstream of digital data, such as printable characters represented by a 7- or 8-bit ASCII code. Each string of data bits is preceded by a start bit and followed by a stop bit, permitting data to be transmitted at irregular intervals. See also synchronous data transmission .
Lucent Technologies Attendant	Application with equipment that connects to one or more <i>tip/ring</i> extension jacks and automatically answers incoming calls with a recorded announcement; directs calls in response to touch tones.
Lucent Technologies Switched Network	See ASN .
AUDIX Voice Power	A voice-processing application, part of <i>IS II/III</i> , that provides Automated Attendant, Call Answer, Information Service, Message Drop, Voice Mail, and, optionally, <i>Fax Attendant System</i> for use with the system.
Automated Attendant	<i>IS II/III</i> , <i>MERLIN MAIL</i> , and <i>AT&T Attendant</i> application that automatically answers incoming calls with a recorded announcement and directs callers to a department, an extension, or the system operator.

Automatic Line Selection See [ALS](#).

Automatic Number Identification See [ANI](#).

automatic ring-down tie-trunk See [automatic-start tie trunk](#).

Automatic Route Selection See [ARS](#).

automatic-start tie trunk *Tie trunk* on which incoming calls are routed to an operator or other designated destination without a start signal, as soon as the trunk is seized; the destination is specified during programming. Also called “automatic ringdown” or “auto-in” tie trunk.

auxiliary power unit Device that provides additional power to the system.

B

B8ZS (bipolar 8 zero substitution) Line-coding format that encodes a string of eight zeros in a unique binary sequence to detect *bipolar violation*. See also [bipolar signal](#).

backup Procedure for saving a copy of system programming onto a floppy disk or *memory card*. See also [restore](#).

bandwidth Difference, expressed in hertz, between the highest and lowest frequencies in a range that determines channel capacity.

barrier code Password used to limit access to the *Remote Access* feature of the system.

basic carrier Hardware that holds and connects the *processor*, *power supply*, and up to five modules in the system. See also [expansion carrier](#).

baud rate Strictly speaking, a measurement of transmission speed equal to the number of signal level changes per second. In practice, often used synonymously with *bit rate* and *bps*.

B-channel (Bearer-channel) 64-kbps channel that carries a variety of digital information streams, such as voice at 64 kbps, data at up to 64 kbps, wideband voice encoded at 64 kbps, and voice at less than 64 kbps, alone or combined.

Bearer-channel See [B-channel](#).

Behind Switch mode	One of three modes of system operation, in which the control unit is connected to (behind) another telephone switching system, such as <i>Centrex</i> or DEFINITY, which provides features and services to telephone users. See also Hybrid/PBX mode and Key mode .
binary code	Electrical representation of quantities or symbols expressed in the base-2 number system, which includes zeros and ones.
bipolar 8 zero substitution	See B8ZS .
bipolar signal	Digital signal in which pulses (ones) alternate between positive and negative. See also AMI , B8ZS , and bipolar violation .
bipolar violation	Condition occurring when two positive or two negative pulses are received in succession. See also AMI and B8ZS .
BIS	(Built-In Speakerphone) Part of the model name of some analog multiline telephones.
bit	(binary digit) One unit of information in binary notation; it can have one of two values, zero or one.
bit rate	Speed at which bits are transmitted, usually expressed in <i>bps</i> . Also called "data rate." See also baud rate .
blocking	Condition in which end-to-end connections cannot be made on calls because of a full load on all possible services and facilities. See also glare .
BMI	(Broadcast Music Incorporated)

board	<i>A module, for example, 100D or 408 MLX GS/LS, that allows you to connect lines/trunks and extensions to the communications system or holds the processor or power supply.</i>
board assignment	<i>SPM procedure for assigning line/trunk and extension modules to slots on the control unit.</i>
board renumbering	<i>System programming procedure for renumbering line/trunk and extension modules that have already been assigned to specific slots on the control unit.</i>
BRI	<i>(Basic Rate Interface) Standard interface that specifies the protocol used between two or more communications systems. BRI provides two 64-kbps B-channels for voice and/or data and one 16-kbps D-channel, which carries multiplexed signaling information for the other 2 channels.</i>
bus	<i>Multiconductor electrical path used to transfer information over a common connection from any of several sources to any of several destinations.</i>
button	<i>Key on the face of a telephone that is used to access a line, activate a feature, or enter a code on a communications system.</i>
byte	<i>Sequence of bits (usually eight) processed together. Also called "octet."</i>

C

Call Accounting System See [CAS](#).

Call Accounting Terminal See [CAT](#).

Caller ID In Release 3.0 and later, a system feature that supports a caller identification service provided by some local telephone companies (if local regulations allow) supplying the calling party telephone number. An 800 GS/LS-ID module on the system can capture this information and display it on the screens of MLX telephones. See also [ANI](#).

Calling group Team of individuals who answer the same types of calls.

Call Management System See [CMS](#).

campus cable Cable that runs between buildings connected to the same communications system.

CAS (Call Accounting System) DOS- or UNIX System-based application that monitors and manages telecommunications costs.

CAT (Call Accounting Terminal) Stand-alone unit with a built-in microprocessor and data buffer that provides simple call accounting at a low cost.

CCS	(common-channel signaling) Signaling in which one channel of a group of <i>channels</i> carries signaling information for each of the remaining channels, permitting each of the remaining channels to be used to nearly full capacity. In the system's 100D module, channel 24 can be designated as the signaling channel for channels 1–23.
centralized telephone programming	Programming of features on individual telephones; performed at a central location by the <i>system manager</i> . See also system programming and extension programming .
central office	See CO .
Centrex	Set of system features to which a user can subscribe on telephone lines/trunks from the local telephone company.
channel	Telecommunications transmission path for voice and/or data.
channel service unit	See CSU .
checksum	Sum of ones in a sequence of ones and zeros used to detect or correct errors in data transmission.
circuit-switched data call	Data call made through an exclusively established and maintained connection between <i>data stations</i> .
class of restriction	See COR .
clock synchronization	Operation of digital facilities from a common clock.
CMS	(Call Management System) DOS-based application that simulates the actions of a system operator by answering and distributing calls. Also produces reports for call analysis.

CO	(central office) Location of telephone switching equipment that provides local telephone service and access to toll facilities for long-distance calling.
coaxial cable	Cable consisting of one conductor, usually a small copper tube or wire within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.
codec	(coder-decoder) Device used to convert analog signals, such as speech, music, or television, to digital form for transmission over a digital medium and back to the original analog form.
common channel signaling	See CCS .
communications system	Software-controlled processor complex that interprets dialing pulses, tones, and/or keyboard characters and makes the proper interconnections both inside and outside. Consists of a computer, software, a storage device, and <i>carriers</i> with special hardware to perform the actual connections. Provides voice and/or data communications services, including access to public and private networks, for telephones and other equipment. Also referred to in this guide as "system," short for MERLIN LEGEND Communications System.
control unit	<i>Processor module, power supply modules, line/trunk and extension modules, carriers, and housing of the system.</i>
console	Refers to telephone and adjuncts (if any) at an operator or system programmer extension.
CONVERSANT	Voice response application that automatically answers and routes calls and executes telephone transactions.

**conversion
resource**

See [modem pool](#).

COR

(class of restriction) Various types of restrictions that can be assigned to *remote access* trunks or barrier codes. These restrictions consist of calling restrictions, *ARS Facility Restriction Levels (FRLs)*, Allowed Lists, Disallowed Lists, and pool dial out restrictions.

Coverage

Set of system features that can determine how extensions' calls are covered when the person at the extension is busy or not available.

CRC

(cyclic redundancy check) An error-detection code used on *DS1* facilities with the extended superframe format (*ESF*).

CSU

(channel service unit) Equipment used on customer premises to provide *DS1* facility terminations and signaling compatibility.

CTI link

(Computer Telephony Integration) link. Part of the PassageWay Telephony Services application that allows a link to a *LAN* running Novell NetWare software for worktop software application control of **SA** button calls in a *Hybrid/PBX mode* system. See also [screen pop](#).

**cyclic redundancy
check**

See [CRC](#).

D

D4 framing format	<i>Framing format</i> consisting of a sequence of individual frames of 24 eight- <i>bit</i> slots and one signal bit (193 bits) in a 12-frame superframe. See also ESF .
Data-channel	See D-channel .
data communications equipment	See DCE .
data hunt group	See DHG .
data module	See ISDN terminal adapter .
data rate	See <i>bps</i> .
data station	Special type of extension where data communications take place; includes <i>DTE</i> and <i>DCE</i> . Sometimes a telephone is also part of a data station.
data terminal	An input/output (<i>I/O</i>) device (often a personal computer) that can be connected to the control unit via an interface.
data terminal equipment	See DTE and data terminal .
DCE	(data communications equipment) Equipment such as <i>modems</i> or data modules used to establish, maintain, and terminate a connection between the system and data terminal equipment (<i>DTE</i>), such as printers, personal computers, host computers, or network workstations.
D-channel	(Data-channel) 64-kbps channel that carries signaling information or data on a <i>PRI</i> or 16-kpbs channel to carry signaling information on <i>BRI</i> .

dedicated feature buttons	The imprinted feature buttons on a multiline telephone: Conf or Conference , Drop , Feature , HFAI (Hands Free Answer on Intercom), Hold , Message , Mute or Microphone , Recall , Speaker or Speakerphone , and Transfer .
delay-dial start tie trunk	See dial-repeating tie trunk .
DFT	(direct facility termination) See personal line .
DHG	(data hunt group) Group of modem or <i>ISDN terminal adapters</i> which have a common access code. Calls are connected in a round-robin fashion to the first available data station in the group.
dial access	See feature code .
Dialed Number identification Service	See DNIS .
dial-out code	Digit (usually a 9) or digits dialed by telephone users to get an outside line.
dial plan	Numbering scheme for system extensions, lines, and trunks.
dial-repeating tie trunk	<i>Tie trunk</i> on which the originating end of the tie trunk transmits an off-hook signal to the receiving end and waits for the receiving end to send an off-hook signal followed by an on-hook signal. Also called "delay dial start tie trunk."
DID	(Direct Inward Dialing) Service that transmits from the telephone company central office and routes incoming calls directly to the called extension, <i>calling group</i> , or outgoing trunk <i>pool</i> , bypassing the system operator.

DID trunk	Incoming trunk that receives dialed digits from the local exchange, allowing the system to connect directly to an extension without assistance from the system operator.
digital	Representation of information in discrete elements such as off and on or zero and one. See also analog transmission .
Digital Communications Protocol	See <i>DCP</i> .
digital data station	See ISDN terminal adapter data station .
Digital Signal 0	See DS0 .
Digital Signal 1	See DS1 .
digital switch element	See <i>DSE</i> .
digital transmission	Mode of transmission in which the information to be transmitted is first converted to digital form and then transmitted as a serial stream of pulses. See also analog transmission .
DIP switch	(dual in-line package) Switch on a 400EM module used to select the signaling format for tie-line transmission. Also used on other equipment for setting hardware options.
direct facility termination	(DFT) See personal line .
Direct Inward Dialing	See DID .
Direct-Line Console	See DLC .
Direct Station Selector	See DSS .

display buttons	Buttons on an MLX display telephone used to access the telephone's display.
DLC	(Direct-Line Console) Telephone used by a system operator to answer outside calls (not directed to an individual or a group) and inside calls, transfer calls, make outside calls for users with outward calling restrictions, set up conference calls, and monitor system operation.
DNIS	(Dialed Number Identification Service) Service provided by the Lucent Technologies Switched Network (ASN); it routes incoming 800 or 900 calls according to customer-selected parameters, such as area code, state, or time of call.
door answering unit	Device connected to a basic telephone jack and used at an unattended extension or front desk.
DOS	(disk operating system)
DS0	(Digital Signal 0) Single 64-kbps voice or data <i>channel</i> .
DS1	(Digital Signal Level 1) <i>Bit</i> -oriented signaling interface that multiplexes twenty-four 64-kbps channels into a single 1.544-Mbps stream.

DSS	(Direct Station Selector) 60-button <i>adjunct</i> that enhances the call-handling capabilities of an <i>MLX-20L</i> or <i>MLX-28D telephone</i> used as an operator console.
DTE	(data terminal equipment) Equipment that makes the endpoints in a connection over a data connection, for example, a data terminal, personal computer, host computer, or printer.
DTMF signaling	(dual-tone multifrequency signaling) Touch-tone signaling from telephones using the voice transmission path. DTMF signaling provides 12 distinct signals, each representing a dialed digit or character, and each composed of two voiceband frequencies.

E

E&M signaling	Trunk supervisory signaling, used between two communications systems, in which signaling information is transferred through 2-state voltage conditions (on the Ear and Mouth leads) for analog applications and through two <i>bits</i> for digital applications. See also tie trunk .
EIA	(Electronic Industries Association)
EIA-232-D	Physical interface, specified by the <i>EIA</i> , that transmits and receives asynchronous data at speeds of up to 19.2-kbps over cable distances of 50 ft. (15 m.)
Electronic Switching System	See ESS .

endpoint	Final destination in the path of an electrical or telecommunications signal.
ESF	(extended superframe format) <i>Framing format</i> consisting of individual frames of 24 eight-bit slots and one signal bit (193 bits) in a 24-frame extended superframe. See also D4 framing format .
ESS	(Electronic Switching System) Class of central office (CO) switching systems developed by Lucent Technologies in which the control functions are performed principally by electronic data processors operating under the direction of a stored program.
expansion carrier	<i>Carrier</i> added to the control unit when the basic carrier cannot house all of the required modules. Houses a power supply and up to six additional modules.
extension	An endpoint on the internal side of the communications system. An extension can be a telephone with or without an adjunct. Also called "station." See also data station .
extension jack	An analog, digital, or <i>tip/ring</i> physical interface on a module in the control unit for connecting a telephone or other device to the system. Also called "station jack."
extension programming	Programming performed at an extension to customize telephones for personal needs; users can program features on buttons, set the telephone ringing pattern, and so on. See also centralized telephone programming and system programming .
extended superframe format	See ESF .

F

facility	Equipment (often a <i>trunk</i>) constituting a telecommunications path between the system and the telephone company central office (<i>CO</i>).
Facility Restriction Level	See FRL .
factory setting	Default state of a device or feature when an optional setting is not programmed by the user or system manager.
fax	(facsimile) Scanning and transmission of a graphic image over a telecommunications facility, or the resulting reproduced image, or the machine that does the scanning and transmitting.
Fax Attendant System	Fax-handling and -processing application available with <i>AUDIX Voice Power</i> .
FCC	(Federal Communications Commission)
feature	Function or service provided by the system.
feature code	Code entered on a dialpad to activate a feature.
feature module	Prior to Release 3.0, a circuit pack inserted into the <i>processor</i> module, used to provide system features and replaced when the system is upgraded.
Feature screen	Display screen on MLX display telephones; provides quick access to commonly used features.
ferrite core	Attachment to the AC power cord and ground wire of the carrier power supply for compliance with FCC, part 15 requirements.

Flash ROM	Beginning with Release 3.0, a type of read-only memory provided on the <i>processor module</i> , used to supply system features.
foil shield	Copper foil sheet (for power units) used to prevent excessive noise on the module.
forced idle	Condition of the system during certain programming or maintenance procedures; system prevents initiation of new calls.
foreign exchange	See FX .
frame	One of several segments of an analog or digital signal that has a repetitive characteristic. For example, a <i>DS1</i> frame consists of a framing <i>bit</i> and 24 bytes, which equals 193 bits.
framing format	Pattern of <i>frames</i> used in transmissions.
frequency generator	See ring generator .
FRL	(Facility Restriction Level) <i>ARS</i> calling restriction type that restricts outgoing calls to certain specified routes.
FX	(foreign exchange) Central office (<i>CO</i>) other than the one that is providing local access to the public telephone network.

G

General-Purpose Adapter

See [GPA](#).

glare

Condition that occurs when a user tries to call out on a *loop-start* trunk at the same time that another call arrives on the same trunk.

GPA

(General-Purpose Adapter) Device that connects an analog multiline telephone to optional equipment such as an answering machine or a fax machine.

ground-start trunk

Trunk on which the communications system, after verifying that the trunk is idle (no ground on tip lead), transmits a request for service (puts ground on ring lead) to the telephone company central office (CO).

Group IV (G4) fax machine

A fax unit, offering 400 by 100 dots per inch (DPI) in fine mode, that can operate at any speed for communication with a Group III (G3) fax machine or another Group IV (G4) fax machine.

H

Hands Free Answer on Intercom

See [HFAI](#).

hands-free unit

See [HFU](#).

headset

Lightweight earpiece, microphone, and adapter used for hands-free telephone operation.

HFAI	(Hands Free Answer on Intercom) Feature that allows a user to answer a voice-announced call.
HFU	(Hands-Free Unit) Unit for older analog multiline telephones that allows users to make and receive calls on the speakerphone without using the handset.
Home screen	Display normally shown on an MLX display telephone; shows time, date, and call information, and shows when some features are in use.
host	Telephone company or other switch providing features and services to the system users, usually when the system is operating in <i>Behind Switch mode</i> .
Hybrid/PBX mode	One of three modes of system operation, in which the system uses trunk <i>pools</i> and <i>ARS</i> in addition to <i>personal lines</i> . Provides a single interface (SA buttons) to users for both inside and outside calling. See also Behind Switch mode and Key mode .

I

ICLID	(Incoming Call Line Identification) See Caller ID .
ICOM buttons	(intercom buttons) Telephone buttons that provide access to inside system lines for calling other extensions or receiving calls from them.
immediate-start tie trunk	<i>Tie trunk</i> on which no start signal is necessary; dialing can begin immediately after the trunk is seized.
in-band signaling	See robbed-bit signaling .
inside dial tone	A tone users hear when they are off-hook on an SA or ICOM button .

Inspect screen	Display screen on an MLX display telephone that allows the user to preview incoming calls and see a list of the features programmed on line buttons.
Integrated Administration	Capability of <i>IS III</i> that simplifies the programming of common information for the system, <i>AUDIX Voice Power</i> , and, if it is also installed, <i>Fax Attendant System</i> .
Integrated Services Digital Network	See ISDN .
Integrated Solution II/III	See IS II/III .
Integrated Voice Power Automated Attendant	<i>IS II</i> application that automatically answers incoming calls with a recorded announcement and directs callers to a department, an extension, or the system operator.
intercom buttons	See ICOM buttons .
interface	Hardware and/or software that links systems, programs, or devices.
IROB protector	(In-Range Out-of-Building protector) Surge-protection device for off-premises telephones at a location within 1000 feet (305 m) of cable distance from the control unit.
IS II/III	(Integrated Solution II or Integrated Solution III) Set of UNIX System-based applications that augments and provides additional services using the system.

ISDN	(Integrated Services Digital Network) Public or private network that provides end-to-end digital connectivity for all services to which users have access by a limited set of standard multipurpose user and <i>network interfaces</i> ; provides digital circuit-switched or packet-switched connections within the network and to other networks for national and international digital connectivity.
ISDN terminal adapter	A type of data communications equipment that transmits digital signals over digital telephone company facilities, for example, PRI. A digital data station uses an ISDN Terminal Adapter (such as the Express-Route 1000 or ISDN 7500B data module) as its DCE.
ISDN terminal adapter data station	A type of data station that includes an ISDN terminal adapter as its DCE. It may also include an MLX telephone for simultaneous voice and data. These data stations connect to MLX extension jack modules for digital transmission of data over a DS1 facility.

J

jack	Physical connection point to the system for a telephone, trunk, or other device. Also called "port."

K

kbps	Kilobits per second.
Key mode	One of three modes of system operation, in which the system uses <i>personal lines</i> on line buttons for outside calls, with a separate interface (ICOM buttons) for internal calling. See also Behind Switch mode and Hybrid/PBX mode .

L

LAN	(local area network) Arrangement of interconnected personal computers or terminals, sometimes accessing a host computer, sometimes sharing resources like files and printers.
LDN	(Listed Directory Number)
LED	(light-emitting diode) Semiconductor device that produces light when voltage is applied; light on a telephone.
line	Connection between extensions within the communications system or loop-start communications path with <i>CO</i> ; often, however, used synonymously with <i>trunk</i> .
line and trunk assignment	Assignment of lines and trunks connected to the system control unit to specific buttons on each telephone.

line coding	Pattern that data assumes as it is transmitted over a communications channel.
line compensation	Adjustment for the amount of cable loss in decibels (dB), based on the length of cable between a 100D module and a channel service unit (<i>CSU</i>) or other far-end connection point.
line/trunk	Refers to inside system lines and outside trunks in general terms. See also line and trunk .
line/trunk jack	Physical interface on a module in the control unit for connecting an outside trunk to the communications system. Also called "trunk jack."
line/trunk and extension module	Module on which the jacks for connecting central office lines/trunks and/or the jacks for connecting the extensions are located.
local host computer access	A method for connecting an extension jack to an on-site computer for data-only calls through a <i>modem</i> or data module.
local loop	See <i>access line</i> .
logical ID	Unique numeric identifier for each <i>extension</i> and <i>line/trunk jack</i> in the system control unit.
loop-start trunk	Trunk on which a closure between the tip and ring leads is used to originate or answer a call. High-voltage 20-Hz AC ringing current from the central office signals an incoming call.

M

Magic on Hold	A Lucent Technologies Music on Hold enhancement that promotes a company's products or services or provides custom music selection.
Mbps	megabits per second
Megacom	Lucent Technologies' tariffed digital <i>WATS</i> offering for outward calling.
Megacom 800	Lucent Technologies' tariffed digital 800 offering for inward calling.
memory card	Storage medium, similar in function to a floppy disk, that allows information to be added to or obtained from the communication system through the PCM-CIA interface slot on the processor module.
MERLIN Identifier	Adjunct that allows users to receive, store, and use information provided by caller identification services provided by the local telephone company.
MERLIN Mail Voice Messaging System	Application that provides automated attendant, call answering, and voice-mail services on the system.
MFM	(Multi-Function Module) Adapter that has a <i>tip/ring</i> mode for answering machines, modems, fax machines, and <i>tip/ring</i> alerts, and an <i>SAA</i> mode for -48 VDC alerts. Installed inside an MLX telephone, and used to connect optional equipment to the telephone. The optional equipment and the telephone operate simultaneously and independently.
MLX-10 or MLX-10D telephone	10-line button digital telephone offered with (MLX-10D) or without (MLX-10) a 2-line by 24-character display.

MLX-10DP	Same as an MLX-10D except it has an adjunct in the back for connecting the <i>Passageway Direct Connect Solution</i> application.
MLX-20L telephone	20-line button digital telephone with a 7-line by 24-character display.
MLX-28D telephone	28-line button digital telephone with a 2-line by 24-character display.
mode codes	Streams of touch-tone codes used by voice messaging applications to communicate with the system's control unit.
modem	(modulator-demodulator) device that converts digital data signals to analog signals for transmission over a telephone line, and analog signals received on a telephone line to digital signals.
modem data station	A type of data station that includes a modem as its DCE. It may also include an MLX telephone for simultaneous voice and data (MLX voice and modem data station), an analog multiline telephone (analog voice and modem data station), or a single-line telephone for dialing only (modem data-only station). These data stations connect, respectively, to MLX, analog, or tip/ring extension jack modules. They provide analog transmission of data.
modem pool	Pair, or group of pairs, of <i>modems</i> and data modules with interconnected RS-232 interfaces that converts digital signals to analog, or analog signals to digital, thereby allowing users with <i>ISDN terminal adapter data stations</i> to communicate with users who have analog <i>modem data stations</i> .

module	Circuit pack in the control unit that provides the physical jacks for connection of telephones and/or outside lines/trunks to the communications system. In the name of a module, the first digit indicates the number of <i>line/trunk</i> jacks it contains; the last digit indicates the number of <i>extension jacks</i> it contains. If no letters appear after the number, a line/trunk module provides <i>loop-start trunks</i> or an extension jack module provides analog or <i>tip/ring</i> jacks. For example, a 408 GS/LS MLX module contains four line/trunk jacks and eight digital (MLX) extension jacks, provides either loop-start (LS) or <i>ground-start</i> (GS) <i>trunks</i> . There are also modules for the processor and power supply.
Multi-Function Module	See MFM .
multiline telephone	An analog or digital (MLX) telephone that provides multiple line buttons for making or receiving calls or programming features.
multiplexing	The division of a transmission channel into two or more independent channels, either by splitting the frequency band into a number of narrower bands or by dividing the channel into successive time slots.
Music On Hold	Customer-provided music source or <i>Magic On Hold</i> connected to the system through a <i>loop-start</i> jack.

N

network	Configuration of communications devices and software connected for information interchange.
network interface	Hardware, software, or both that links two systems in an interconnected group of systems, for example, between the local telephone company and a PBX.

O

off-hook	Telephone is said to be off-hook when the user has lifted the handset, pressed the Speaker button to turn on the speakerphone, or used a headset to connect to the communications system or the telephone network.
off-premises telephone	See OPT .
ones density	Requirement for channelized <i>DS1</i> service to the public network that eight consecutive zeroes cannot occur in a digital data stream.
on-hook	Telephone is said to be on-hook when the handset is hung up, the speakerphone is turned off, and the user is not using a headset to connect either to the communications system or the telephone network.

OPT (off-premises telephone) *Single-line telephone* or other *tip/ring* device connected to the system by an 008 OPT module in the control unit. Appears as an inside extension to the system, but may be physically located away from the system.

OPX (off-premises extension)

out-of-band signaling Signaling that uses the same path as voice-frequency transmission and in which the signaling is outside the band used for voice frequencies.

P

parity The addition of a *bit* to a bit string so that the total number of ones is odd or even; used to detect and correct transmission errors.

PassageWay Direct Connect Solution Set of software applications to provide an interface between a personal computer and the system: card-file, telephone programming application, call log and viewer, incoming call management, and identification and applications manager.

pass-through Connection from the internal *modem* to an attached IS II/IS III application on the system.

PBX	(private branch exchange) Local electronic telephone switch that serves local stations (for example, extensions within a business) and provides them with access to the public network.
PC	(personal computer)
PCMCIA memory card	(Personal Computer Memory Card International Association memory card) See memory card .
personal line	Central office trunk that terminates directly on one or more telephones. In <i>Hybrid/PBX mode</i> , a personal line cannot be part of a trunk <i>pool</i> . Also called “DFT” (direct facility termination). Also refers to lines represented on line buttons in <i>Key Mode</i> .
PFT	(Power Failure Transfer) Feature that provides continuity of telephone service during a commercial power failure by switching some of the system’s trunk connections to telephones connected to specially designated extension jacks.
pool	In <i>Hybrid/PBX mode</i> , a group of outside trunks that users can access with a Pool button or by dialing an access code on an SA button . Also used by the <i>ARS</i> feature when choosing the least expensive route for a call.
port	See jack . Also, refers to extension or <i>line jacks</i> before these are numbered according to the <i>dial plan</i> during programming. The lowest jack on a module is always Port 1.
Power Failure Transfer	See PFT .

power supply module	Device that directs electricity to modules and telephones on the system. One power supply module is needed for each carrier, and an <i>auxiliary power unit</i> is added if the module exceeds capacity.
PRI	(Primary Rate Interface) Standard interface that specifies the protocol used between two or more communications systems. As used in North America, provides 23 64-kbps <i>B-channels</i> for voice and/or data and one 64-kbps <i>D-channel</i> , which carries multiplexed signaling information for the other 23 channels.
primary system operator position	First jack on the first MLX or analog multiline extension module in the control unit; that is, the extension jack with the lowest <i>logical ID</i> in the system.
prime line	Individual extension number assigned to a telephone in a system operating in <i>Behind Switch mode</i> . Each telephone user has his or her own prime line and is automatically connected to that line when he or she lifts the handset.
processor module	Module in the second slot of the control unit (Slot 0, to the right of the <i>power supply module</i>). Includes the software and memory that runs the system.
programming port reassignment	Reassignment of the system programming jack position to any of the first five extension jacks on the first MLX module in the control unit.
protocol	Set of conventions governing the format and timing of message exchanges between devices, such as an MLX telephone and the control unit.
public network	Network that is commonly accessible for local or long-distance calling. Also called "public switched telephone network."

Q

QCC	(Queued Call Console) MLX-20L telephone used by a system operator in <i>Hybrid/PBX mode</i> only. Used to answer outside calls (directed to a system operator position) and inside calls, direct inside and outside calls to an extension or an outside telephone number, serve as a message center, make outside calls for users with outward calling restrictions, set up conference calls, and monitor system operation.

R

RAM	(random-access memory) Computer memory in which an individual <i>byte</i> or range of bytes can be addressed and read or changed without affecting other parts of memory.
read-only memory	See ROM .
Remote Access	System feature that allows an outside caller to gain access to the system, almost as if at a system extension.
restore	Procedure whereby saved and archived system programming is reinstated on the system, from a floppy disk or <i>memory card</i> . See also backup .
ring generator	Circuit pack added to the power supply that generates a high-voltage, 20–30-Hz signal to ring a telephone.

riser cable	Cable that runs between floors in a multistory building and connects wiring closets.
RS-232	Physical interface, specified by the Electronics Industries Association (<i>EIA</i>), that transmits and receives <i>asynchronous</i> data at distances of up to 50 feet (15 m).
robbed-bit signaling	Signaling in which the least significant <i>bit</i> of every sixth frame per channel is used for signaling in that channel.
ROM	(read-only memory) Computer memory that can be read but cannot be changed.

S

SAA	(Supplemental Alert Adapter) Device that permits -48-VDC alerting equipment to be connected to an analog multiline telephone jack so that people working in noisy or remote areas of a building can be alerted to incoming calls.
SA buttons	Telephone buttons that provide a single interface to users for both inside and outside calling.
screen pop	Refers to a computer-telephony software application that takes caller information (for example, provided by Caller ID service), queries a database, and displays a screen with information about the caller at the user's PC screen. Screen pop requires that an identifying number or code be available to identify the calling party. See also CTI link .

SDN	(Software Defined Network) Lucent Technologies private networking service created by specialized software within the public network.
SID	(station identification)
simplex signaling	Transmission of signals, in one direction only, across a telecommunications channel.
signaling	Sending of control and status information between devices to set up, maintain, or cease a connection such as a telephone call.
single-line telephone	Industry-standard touch-tone or rotary-dial telephone that handles only one call at a time and is connected to the system via an <i>extension jack</i> on a basic 012 or 008 OPT module.
slot	Position in a <i>carrier</i> for a module; numbered from 0 (<i>processor module</i>).
SMDR	(Station Message Detail Recording) Feature that captures detailed usage information on incoming and outgoing voice and data calls.
SMDR printer	Printer used to produce SMDR reports. Connected to the system via an RS-232 jack on the <i>processor</i> module.
Software Defined Network	See SDN .
special character	Pause, Stop, or End-of-Dialing signal in a programmed dialing sequence such as an Auto Dial or Personal Speed Dial number.
SPM	(System Programming and Maintenance) DOS- or UNIX system-based application for programming and maintaining the system.

square key	Configuration in <i>Key mode</i> operation in which all outside lines appear on all telephones.
station	See extension .
station jack	See extension jack .
Station Message Detail Recording	See SMDR .
Supplemental Alert Adapter	See SAA .
switchhook flash	Momentary (320 ms to 1 second) on-hook signal used as a control signal. May be directed either to the control unit or to a <i>host</i> switch outside the system. Also called "Recall" or "timed flash."
synchronous data transmission	Method of transmitting a continuous digital data stream in which the transmission of each binary <i>bit</i> is synchronized with a master clock. See also asynchronous data transmission .
system acceptance test	Test of all trunks, telephones, data terminals, and features after installation to ensure that they are working correctly.
System Access buttons	See SA buttons .
system date and time	Date and time that appear on MLX display telephones and <i>SMDR</i> reports.

system programming	Programming of system functions and features that affect most users, performed from an <i>MLX-20L telephone</i> or a <i>PC</i> using <i>SPM</i> . See also extension programming and centralized telephone programming .
System Programming and Maintenance	See SPM .
system renumbering	Procedure used to change the numbers assigned to telephones, adjuncts, <i>calling groups</i> , paging groups, park zones, <i>remote access</i> , and lines/trunks.

T

T1	Type of digital transmission facility that in North America transmits at the <i>DS1</i> rate of 1.544 Mbps.
TDM	(time-division multiplex) Process where the transmission channel is divided into time slots.
telephone power supply unit	Equipment that provides power to an individual telephone.
tie trunk	Private trunk directly connecting two telephone switches. See also automatic-start tie trunk , delay-dial start tie trunk , immediate-start tie trunk , and wink-start tie trunk .
timed flash	See switchhook flash .
tip/ring	Contacts and associated conductors of a <i>single-line telephone</i> plug or jack.
touch-tone receiver	See TTR .
T/R	See tip/ring .

trunk	A telecommunications path between the communications system and the telephone company central office (CO) or another switch. Often used synonymously with <i>line</i> .
trunk jack	See line/trunk jack .
trunk pool	See pool .
TTR	(touch-tone receiver) Device used to decode <i>DTMF</i> touch-tones dialed from <i>single-line telephones</i> or <i>Remote Access</i> telephones.

U

uninterruptible power supply	See UPS .
unit load	Measure of the power load drain of a module, telephone, or <i>adjunct</i> .
UPS	(uninterruptible power supply) Device that connects to the system to provide 117 VAC to the equipment when the commercial power source fails.

V

VAC	Alternating-current voltage.
VDC	Direct-current voltage.
VMI	(voice messaging interface) An enhanced <i>tip/ring</i> port.
voice-band channel	A transmission channel, generally in the 300–3400-Hz frequency band.
voice mail	Application that allows users to send messages to other extensions in the system, forward messages received with comments, and reply to messages.
voice messaging interface	See VMI .

W

WATS	(Wide Area Telecommunications Service) Service that allows calls to certain areas for a flat-rate charge based on expected usage.
wink-start tie trunk	<i>Tie trunk</i> on which the originating end transmits an off-hook signal and waits for the remote end to send back a signal (a wink) that it is ready for transmission.

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Lucent Technologies
Bell Labs Innovations



MERLIN LEGEND[®]
Communications System
Release 5.0

Maintenance and Troubleshooting

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Notice

Every effort was made to ensure that the information in this book was complete and accurate at the time of printing. However, information is subject to change.

See Appendix A, "Customer Support Information," for important information. It follows *Maintenance and Troubleshooting* in this binder.

Your Responsibility for Your System's Security

Toll fraud is the unauthorized use of your telecommunications system by an unauthorized party, for example, persons other than your company's employees, agents, subcontractors, or persons working on your company's behalf. Note that there may be a risk of toll fraud associated with your telecommunications system, and if toll fraud occurs, it can result in substantial additional charges for your telecommunications services.

You and your system manager are responsible for the security of your system, such as programming and configuring your equipment to prevent unauthorized use. The system manager is also responsible for reading all installation, instruction, and system administration documents provided with this product in order to fully understand the features that can introduce risk of toll fraud and the steps that can be taken to reduce that risk. Lucent Technologies does not warrant that this product is immune from or will prevent unauthorized use of common-carrier telecommunication services or facilities accessed through or connected to it. Lucent Technologies will not be responsible for any charges that result from such unauthorized use. For important information regarding your system and toll fraud, see Appendix A, "Customer Support Information."

Federal Communications Commission Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. For further FCC information, see Appendix A, "Customer Support Information."

Canadian Department of Communications (DOC)**Interference Information**

This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the radio interference regulations of the Canadian Department of Communications.

Le Présent Appareil Numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

Trademarks

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IMPORTANT SAFETY INSTRUCTIONS



The exclamation point in an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

When installing telephone equipment, always follow basic safety precautions to reduce the risk of fire, electrical shock, and injury to persons, including:

- Read and understand all instructions.
- Follow all warnings and instructions marked on or packed with the product.
- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone wiring has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Use only Lucent Technologies-manufactured MERLIN LEGEND Communications System circuit modules, carrier assemblies, and power units in the MERLIN LEGEND Communications System control unit.

IMPORTANT SAFETY INSTRUCTIONS

Page viii

- Use only Lucent Technologies-recommended/approved MERLIN LEGEND Communications System accessories.
- If equipment connected to the analog extension modules (008, 408, 408 GS/LS) or to the MLX telephone modules (008 MLX, 408 GS/LS-MLX) is to be used for in-range out-of-building (IROB) applications, IROB protectors are required.
- Do not install this product near water, for example, in a wet basement location.
- Do not overload wall outlets, as this can result in the risk of fire or electrical shock.
- The MERLIN LEGEND Communications System is equipped with a 3-wire grounding-type plug with a third (grounding) pin. This plug will fit only into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact an electrician to replace the obsolete outlet. Do not defeat the safety purpose of the grounding plug.
- The MERLIN LEGEND Communications System requires a supplementary ground.
- Do not attach the power supply cord to building surfaces. Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.
- Slots and openings in the module housings are provided for ventilation. To protect this equipment from overheating, do not block these openings.
- Never push objects of any kind into this product through module openings or expansion slots, as they may touch dangerous voltage points or short out parts, which could result in a risk of fire or electrical shock. Never spill liquid of any kind on this product.
- Unplug the product from the wall outlet before cleaning. Use a damp cloth for cleaning. Do not use cleaners or aerosol cleaners.

- Auxiliary equipment includes answering machines, alerts, modems, and fax machines. To connect one of these devices, you must first have a Multi-Function Module (MFM).
- Do not operate telephones if chemical gas leakage is suspected in the area. Use telephones located in some other safe area to report the trouble.

 WARNING:

- *For your personal safety, DO NOT install an MFM yourself.*
- *ONLY an authorized technician or dealer representative shall install, set options, or repair an MFM.*
- *To eliminate the risk of personal injury due to electrical shock, DO NOT attempt to install or remove an MFM from your MLX telephone. Opening or removing the module cover of your telephone may expose you to dangerous voltages.*

SAVE THESE INSTRUCTIONS

About This Book

The MERLIN LEGEND® Communications System is an advanced digital switching system that integrates voice and data communications features. Voice features include traditional telephone features, such as Transfer and Hold, and advanced features, such as Group Coverage and Park. Data features allow both voice and data to be transmitted over the same system wiring.

Intended Audience

This book provides detailed information about system and telephone trouble reports and troubleshooting operations. It is intended for use by qualified field technicians who are responsible for system maintenance and troubleshooting, and as a reference by anyone needing such information, including support personnel, sales representatives, and account executives.

How to Use This Book

This book provides step-by-step procedures for isolating troubles both inside and outside the communications system. Refer to the chapter associated with the reported problem to start the troubleshooting procedure.

Refer to the following documentation for additional information:

- *Equipment and Operations Reference* provides detailed information on system hardware, telephones, and other equipment. (Not updated since Release 3.0).
- *Feature Reference* provides details on the features of the communications system.
- *System Planning* provides procedures and forms for planning a system for installation.
- *System Programming* gives procedural instructions for programming system features.
- Users' guides and Operators' Guides give procedural instructions for programming and using telephone features.

"Related Documents," later in this section, provides a complete list of system documentation together with ordering information.

In the USA only, Lucent Technologies provides a toll-free customer Helpline (1 800 628-2888) 24 hours a day. Call the Helpline, or your Lucent Technologies representative, if you need assistance when installing, programming, or using your system.

Terms and Conventions Used

In this document, the terms in the following list are used in preference to other, equally acceptable terms for describing communications systems.

Lines, Trunks and Facilities

Facility is a general term that designates a communications path between a telephone system and the telephone company central office. Technically a *trunk* connects a switch to a switch, for example the MERLIN LEGEND Communications System to the central office. Technically, a *line* is a loop-start facility or a communications path that does not connect two switches (for example, an intercom line or a Centrex line). However, in actual usage, the terms *line* and *trunk* are often applied interchangeably. In this book, we use *line/trunk* and *lines/trunks* to refer to facilities in general. Specifically, we refer to *digital facilities*. We also use terms such as personal line, ground-start trunk, Direct Inward Dialing (DID) trunk, and so on. When you talk to your local telephone company central office, ask them which terms they use for the specific facilities they connect to your system.

Some older terms have been replaced with newer terms. The following list shows the old term on the left and the new term on the right:

trunk module	line/trunk module
trunk jack	line/trunk jack
station	extension
station jack	extension jack
analog data station	modem data station
digital data station	terminal adapter
7500B data station	terminal adapter
analog voice and analog data station	analog voice and modem data
digital voice and analog data station	MLX voice and modem data
analog data only station	modem data only station
digital data only station	terminal adapter only station
7500B data only station	terminal adapter only station
digital voice and digital data station	MLX voice and terminal adapter station

MLX voice and 7500B data station

MLX voice and terminal
adapter station

Typographical Conventions

Certain type fonts and styles act as visual cues to help you rapidly understand the information presented:

Example	Purpose
It is <i>very</i> important that you follow these steps. You <i>must</i> attach the wristband before touching the connection.	Italics indicate emphasis.
The part of the headset that fits over one or both ears is called a <i>headpiece</i> .	Italics also set off special terms.
If you press the Feature button on an MLX display telephone, the display lists telephone features you can select. A programmed Auto Dial button gives you instant access to an inside or outside number.	The names of fixed-feature, factory-imprinted buttons appear in bold. The names of programmed buttons are printed as regular text.
Choose Ext Prog from the display screen.	Plain constant-width type indicates text that appears on the telephone display or personal computer (PC) screen.
To activate Call Waiting, dial *11.	Constant-width type in italics indicates characters you dial at the telephone or type at the PC.

Product Safety Labels

Throughout these documents, hazardous situations are indicated by an exclamation point inside a triangle and the word **CAUTION** or **WARNING**.

 WARNING:

Warning indicates the presence of a hazard that could cause death or severe personal injury if the hazard is not avoided.

 CAUTION:

Caution indicates the presence of a hazard that could cause minor personal injury or property damage if the hazard is not avoided.

Security

Certain features of the system can be protected by passwords to prevent unauthorized users from abusing the system. You should assign passwords wherever you can and limit knowledge of such passwords to three or fewer people.

Nondisplaying authorization codes and telephone numbers provide another layer of security. For more information, see Appendix A, "Customer Support Information" following *Maintenance and Troubleshooting*.

Throughout this document, toll fraud security hazards are indicated by an exclamation point inside a triangle and the words **Security Alert**.

 Security Alert:

Security Alert indicates the presence of a toll fraud security hazard. Toll fraud is the unauthorized use of your telecommunications system by an unauthorized party (for example, persons other than your company's employees, agents, subcontractors, or persons working on your company's behalf). Be sure to read "Your Responsibility for Your System's Security" on the inside front cover of this book and "Security of Your System: Preventing Toll Fraud" in Appendix A, "Customer Support Information."

Related Documents

In addition to this book, the documents listed below are part of the documentation set. Within the continental United States, these documents can be ordered from the Lucent Technologies BCS Publications Center by calling 1 800 457-1235.

Document No.	Title
	System Documents
555-650-110	<i>Feature Reference</i>
555-650-111	<i>System Programming</i>
555-650-112	<i>System Planning</i>
555-650-113	<i>System Planning Forms</i>
555-650-116	<i>Pocket Reference</i>
555-650-118	<i>System Manager's Guide</i>
	Telephone User Support
555-650-122	<i>MLX-5D*, MLX-10D*, MLX-10DP*, MLX-28D*, and MLX-20L* Display Telephones User's Guide</i>
555-630-150	<i>MLX-5D, MLX-10D and MLX-10DP Display Telephone Tray Cards (5 cards)</i>
555-630-152	<i>MLX-28D and MLX-20L Telephone Tray Cards (5 cards)</i>
555-650-124	<i>MLX 10* Nondisplay Telephone User's Guide</i>
555-630-151	<i>MLX-5 and MLX 10 Nondisplay Telephone Tray Cards (6 cards)</i>
555-630-155	<i>MLX-16DP Display Telephone Tray Cards (5 cards)</i>
555-650-120	<i>Analog Multiline Telephones User's Guide</i>
555-650-126	<i>Single-Line Telephones User's Guide</i>
555-650-138	<i>MDC 9000 and MDW 9000 Telephones User's Guide</i>
	System Operator Support
555-650-134	<i>MLX Direct-Line Consoles Operator's Guide</i>
555-650-132	<i>Analog Direct-Line Consoles Operator's Guide</i>
555-650-136	<i>MLX Queued Call Console Operator's Guide</i>
	Miscellaneous User Support
555-650-130	<i>Calling Group Supervisor's Guide</i>
555-640-105	<i>Data and Video Reference</i>

Document No.	Title
	Documentation for Qualified Technicians
555-650-140	<i>Installation, Programming & Maintenance (IP&M) Binder [consists of Installation, System Programming & Maintenance (SPM), Maintenance & Troubleshooting]</i>
	Toll Fraud Security
555-025-600	<i>BCS Products Security Handbook</i>

How to Comment on This Document

We welcome your comments, both positive and negative. Please use the feedback form on the next page to let us know how we can continue to serve you. If the feedback form is missing, write directly to:

Documentation Manager
Lucent Technologies
211 Mount Airy Road
Room 2W226
Basking Ridge, NJ 07920

Introduction

1

The purpose of maintenance is to detect, report, and clear problems quickly with minimal disruption of service. The system attempts to isolate each problem to a single replaceable unit, whenever possible, by running automatic tests. Errors that it cannot automatically correct are usually recorded in error logs. Most troubleshooting relies on checking the error logs and interpreting them, using [Table 2-2, "Error Codes"](#), in [Chapter 2](#).

Equipment

To perform maintenance, you need a maintenance terminal and some additional tools, all of which are defined below.

Maintenance Terminal

Whether you perform on-site or remote maintenance, you need a maintenance terminal:

- For on-site maintenance, you can use either an MLX-20L system console or a PC with System Programming and Maintenance (SPM) software.
- For remote maintenance, you must use a PC with SPM software.

Detailed information about system programming is included in *System Programming* and in *System Programming and Maintenance (SPM)*.

You can use either a DOS PC or a Master Controller (MCII or MCIII) to run SPM. To connect a PC to the control unit, you need a 355AF adapter and a D8W-87 cord.

 NOTE:

On-site programming maintenance is preferred if it is feasible; remote programming overrides on-site programming, except when on-site backup or restore is in progress. See [“On-Site Programming Maintenance”](#) and [“Remote Programming Maintenance”](#), later in this chapter, for details.

Tools

In addition to the maintenance terminal, you need the following tools:

- EIA breakout box
- Digital voltmeter (KS-20599 or equivalent)
- 110/66-type punchdown tool
- Dracon TS21 or equivalent touch-tone telephone for testing
- Assorted flathead and Phillips-head screwdrivers
- Long-nosed and regular pliers
- Wrist grounding strap
- Replacement parts recommended by your technical support organization

 CAUTION:

Should you ever need to open a module and handle the circuit board, use the wrist strap to connect your wrist to a suitable ground first. Electrostatic discharge can destroy or severely damage the integrated circuits in the power supply, processor, and modules.

On-Site Programming Maintenance

You can perform on-site maintenance with an MLX-20L console or a PC with SPM software. This book provides maintenance instructions from the console. If you are using a PC, refer to *System Programming and Maintenance (SPM)* for details. If you use the UNIX® System, see the documentation for Integrated Solution III (IS III).

Setting Up the MLX-20L Console

To connect an MLX-20L console to the control unit, follow the steps below. Refer to [Figure 1-1](#).

- ▶ 1. **Plug one end of a D8W-87 cord into one of the first five jacks on the leftmost 008 MLX module or 408 GS/LS-MLX module.**

The first MLX jack is the default. If it is already being used for the attendant console, choose another jack. If one of the jacks is already being used for system programming or maintenance, use that jack. Only one jack at a time can be used for system programming or maintenance.

- ▶ 2. **Plug the other end of the D8W-87 cord into the LINE jack on the underside of the MLX-20L console.**

MLX-20L Failure

If the MLX-20L console does not work, follow the steps below.

- ▶ 1. **Replace the MLX-20L console with one that is known to be working (if available).**
- ▶ 2. **If the failure persists, or if a working MLX-20L console is not available, connect the original MLX-20L console directly into the appropriate MLX jack on the control unit using a cord that is known to be working.**

► **3. If the trouble clears, replace the original D8W-87 cord.**

If not, use the PC as your maintenance terminal and then troubleshoot the leftmost MLX module. See [“Module Problems”](#) in [Chapter 4](#) for instructions.

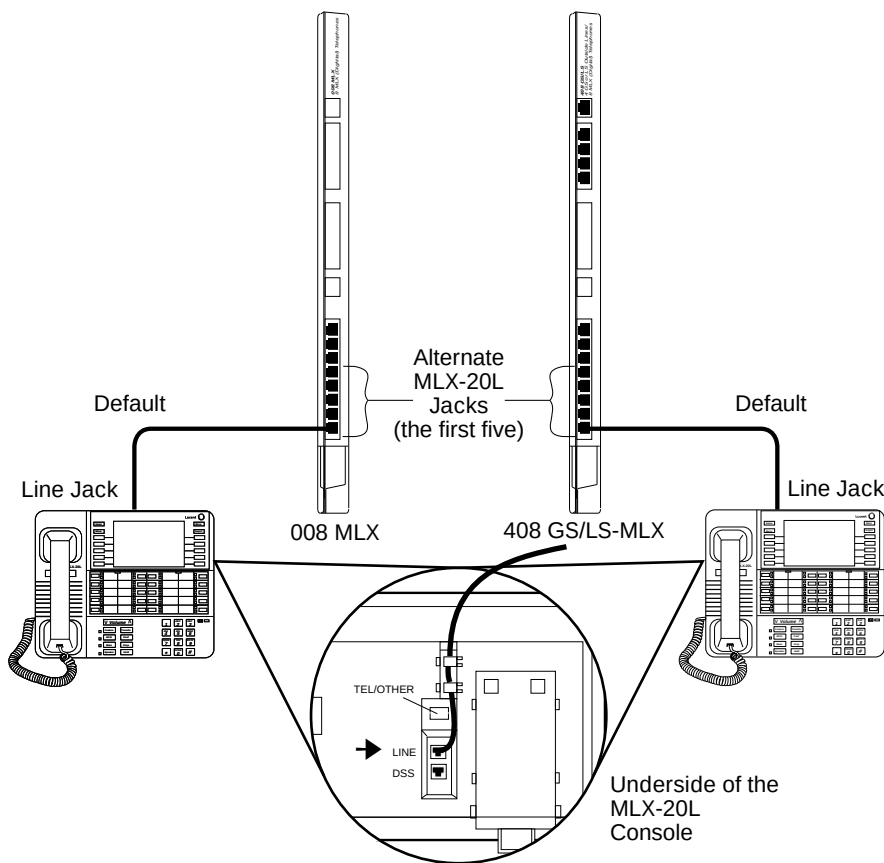


Figure 1-1. Setting Up the MLX-20L Console

Setting Up the PC

Plug a PC into the ADMIN jack on the processor module as shown in If you are using a remote PC for system programming, see [“Remote Programming Maintenance” on page 1-7](#).

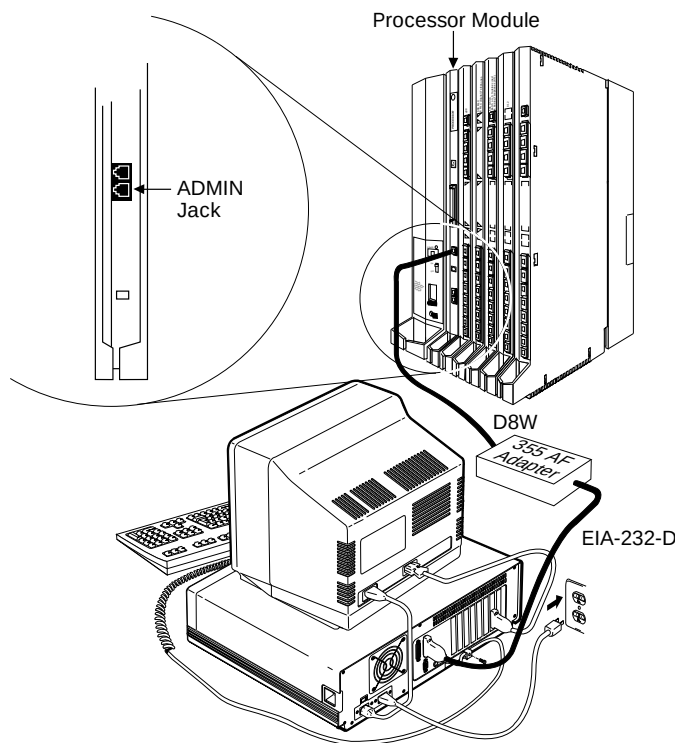


Figure 1-2. Setting Up the PC

Remote Programming Maintenance

Remote maintenance allows you to support the system from an off-premises location. You can check error logs and system status and restart the system remotely.

To perform remote maintenance, you need a PC with SPM software, a tip/ring telephone, and a 1200-bps modem. Beginning with Release 3.0, a 2400-bps modem may also be used.

Considerations

Review the following points before you begin remote maintenance procedures.

- Remote maintenance overrides on-site maintenance and programming, except when on-site backup or restore is in progress. Before you perform remote maintenance, notify the customer's system manager.
- You can perform remote maintenance and programming only from a DOS PC, not from the UNIX environment. If you are running SPM under IS III, you cannot perform remote maintenance.
- Line noise can cause the SPM screen to display unpredictable results. If this occurs, hang up and redial.



NOTE:

Under applicable tariffs, the customer is responsible for any charges incurred through the remote use of system facilities. Precautions should be taken to prevent unauthorized use of the system's outside lines by remote callers, also called toll fraud. See [Appendix A, "Customer Support Information"](#), for more information on security.

Setting Up Equipment for Remote Maintenance

To set up equipment for remote maintenance, follow the steps below while referring to [Figure 1-3](#) and to *Installation*.

- ▶ **1. Connect the PC and modem.**
 - If you have an external modem, use an EIA-232-D cable.
 - If you have an internal modem, the connection is already established.
- ▶ **2. Use a D8W cord to connect the modem to a T/R trunk jack.**
- ▶ **3. Use a D8W cord to connect the modem to a T/R telephone.**

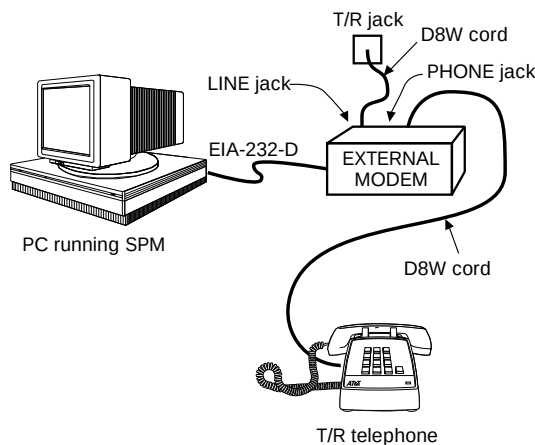


Figure 1-3. External Modem Setup

Using SPM

For more information on using SPM, see *System Programming and Maintenance*.

Starting SPM

The procedure for accessing SPM differs slightly, depending on whether your PC is connected directly or by modem to the control unit.

With a Direct Local Connection

To access SPM when your PC is connected directly to the control unit, follow the steps below.

- ▶ 1. If you do not have a hard drive, insert the SPM diskette into Drive A and switch to Drive A if it is not already the current drive.
- ▶ 2. Start the SPM program.
Type *SPM*. The SPM Welcome screen appears, as shown below.

Console Display/Instructions

Additional Information PC

- ▶ 3. Press any key.

```
Welcome to SPM
The MERLIN LEGEND
System Programming
& Maintenance Utility
Please press any key
to continue:
Version X.xx
```

If the main menu (see Step 4) does not appear, or if the information on the screen is garbled, press any key again.

- ▶ 4. Select an option by pressing one of the function keys.

SPM Main Menu		
Menu: Select Function		
[F1]	Sys Pro-	Mainte-
	gram	nance
[F2]	Backup	Restore
[F3]	Boards	Pass-Thru
[F4]	Print Opts	Password
[F5]	Monitor	Language

With a Local or Remote Modem Connection

When the equipment is set up, you can perform remote maintenance by dialing the remote processor's built-in 2400/1200-bps modem. You can dial the modem directly or call the system operator and request to be transferred to the modem. Both procedures are explained below.

Dialing the System Operator

If you do not know the remote access trunk number, dial the number for the customer's system. To dial the operator, follow the steps below.

- ▶ 1. Start SPM. When the Welcome message appears, press any key.

- ▶ 2. Enter the command to put the modem in originate mode (this command varies depending on the type of modem you are using).
- ▶ 3. Pick up the handset on the T/R telephone and dial the customer's system operator (the Listed Directory Number for the customer's system).
- ▶ 4. When the attendant answers the call, explain what you are doing and ask for any passwords you may need; then ask the operator to transfer you to the modem by pressing the Transfer button and then dialing *10.

⇒ NOTE:

If the password is not known, check the System Information Report or ask to speak with the system manager.

You can change the password without knowing the old password only when you perform on-site maintenance through the ADMIN jack.

- ▶ 5. When you hear the modem tone, hang up.

If nothing appears on the SPM screen, press .

- ▶ 6. Enter the password.

When the Password: prompt appears, type the password (do not press). The SPM main menu appears, and you are ready to proceed with remote maintenance.

Dialing the Modem Directly

To dial the modem directly, follow the steps below.

- ▶ 1. Start SPM. When the Welcome message appears, press any key.
- ▶ 2. Enter the command to put the modem in originate mode (this command varies depending on the type of modem you are using).

- ▶ **3. Pick up the handset on the T/R telephone and dial the remote access trunk number.**

This is possible only if a trunk is programmed as a dedicated trunk for remote access to the built-in modem.

- ▶ **4. If the dial tone begins with three short tones followed by a steady tone, dial the remote access barrier code from the T/R telephone; otherwise, go to Step 5.**

If you do not know the remote access barrier code, contact the customer's system manager, or check Form 3a, Incoming Trunks: Remote Access. If the system accepts the barrier code, you hear ringing followed by dial tone.

 NOTE:

You can change the barrier code without knowing the old one only when you perform on-site maintenance through the ADMIN jack.

- ▶ **5. Connect to the modem on the remote system.**

When you hear dial tone, dial *10.

- ▶ **6. When you hear the modem tone, hang up.**

If nothing appears on the SPM screen, press .

Additional Information PC

Type the remote access password.
The password you enter does not
appear as you type it.

Press one of the function keys.

Press one of the function keys.

Menu: Select Function

F1	Sys Pro-	Mainte-	F6
	gram	nance	
F2	Backup	Restore	F7
F3	Boards	Pass-Thru	F8
F4	Print Opts	Password	F9
F5	Monitor	Language	F10

NOTE:

If you do not know the password, check the System Information Report or ask to speak with the system manager.

You can change the password without knowing the old password only when you perform on-site maintenance through the ADMIN jack.

The SPM Display

SPM screens simulate the MLX-20L console (see [Figure 1-4](#)).

U4	QUIT MENU	Home End F1 F2 F3 F4 F5	Welcome to SPM The MERLIN LEGEND System Programming & Maintenance Utility Please press any key to continue. Version 4.15				PgUp PgDn F6 F7 F8 F9 F10	MORE INSP	Drop ALT-P
Shift F5	LINE 05	LINE 10	Shift F10	Alt F5	LINE 15	LINE 20	Alt F10		Flash ALT-F
Shift F4	LINE 04	LINE 09	Shift F9	Alt F4	LINE 14	LINE 19	Alt F9		TopSP ALT-C
Shift F3	LINE 03	LINE 08	Shift F8	Alt F3	LINE 13	LINE 18	Alt F8		Pause ALT-H
Shift F2	LINE 02	LINE 07	Shift F7	Alt F2	LINE 12	LINE 17	Alt F7		CONVERT ALT-U
Shift F1	LINE 01	LINE 06	Shift F6	Alt F1	LINE 11	LINE 16	Alt F6		HELP CTL-F1
									RESET CTL-F5
									BROWSE CTL-F8

Figure 1-4. The SPM Display

Each SPM screen includes a 7-line by 24-character console simulation window that corresponds to the display area of the MLX-20L telephone. To the right and left of this console simulation window are columns, listing the keys that correspond to similarly located buttons on the MLX-20L telephone.

The 10 function keys, identified on screen as **[F1]** through **[F10]**, are used to select screen options. When a screen displays several choices, press the function key identified by the label next to your choice. (If you were working on the console you would press the telephone button next to your choice.)

Below the console simulation window are 20 simulated line buttons. Using **[PgDn]** (Inspect), you can determine the status of each line.

A list of labels on the right side of the screen shows key combinations that correspond to buttons on the MLX-20L telephone. [Table 1-1](#) describes the function of PC keys within SPM.

Table 1-1. Function of PC Keys in SPM

PC Key	Console	SPM Function
	Home	Quit. Exit from SPM and return to the DOS prompt when you have finished system programming. If you are using a modem, the call is disconnected.
	Menu	Return to the SPM Main Menu.
	More	Display more menu items (when there is an additional screen and the > symbol appears next to the key).
	Inspct	Show the current information that has been programmed for a feature or button.
 + 	Drop	Stop. Enter a stop in a speed dialing sequence. This combination also deletes an entry in a field in any screen except one in which you are entering a speed dialing sequence.
 + 	Conf	Flash. Enter a switchhook flash in a speed dialing sequence.
 + 	n/a	TopSP. Return to the top of the System Programming menu.
 + 	Hold	Pause. Enter a pause in a speed dialing sequence.
 + 	n/a	Convert. Convert a backup file from an earlier release to Release 2.0 or later format.

Continued on next page

Table 1-1 Continued

PC Key	Console	SPM Function
[Ctrl] + [F1]	n/a	Help. Display a help screen about SPM operations. To exit from Help, press [End] .
[Ctrl] + [F5]	n/a	Reset. Reset the communications port. For example, if the information on the screen is garbled, try exiting from and then re-entering the screen. If the screen remains garbled, use [Ctrl] + [F5] to clear the screen and return to the SPM Welcome screen. Note that using [Ctrl] + [F5] drops the modem connection.
[Ctrl] + [F8]	n/a	Browse. View print reports saved with Print Opts.
[Ctrl] + [F9]	n/a	Escape to shell. To use this key in sequence, you must set DEBUG=1 in the SPM configuration file ams.cfg. You can then use this key sequence to execute DOS (or UNIX system) commands. To return to SPM, type <i>exit</i> .
[Enter ↵]	Enter	This key on your PC can be used instead of [F10] (Enter) when Enter appears as a choice in the 7-by-24 console simulation window.
← Bksp	Backspace	← Bksp can be used instead of [F9] when it appears as a choice in the 7-by-24 console simulation window.
[Del]	Delete	The [Del] key on your PC can be used instead of [F8] (Delete) when it appears as a choice in the 7-by-24 console simulation window.
↑ ↓ ← →	n/a	The up, down, left, and right arrow keys can be used to highlight selections in a menu and to select the 20 line buttons below the 7-by-24 console simulation window.

Exiting SPM

To exit SPM, follow these steps.

► 1. Return to the System Programming menu.

If the display gives directions for returning to the main menu, follow the directions. If not, press **[F10]** (Exit) to return to the previous menu. Continue to press **[F10]** (Exit) until the main menu appears.

Console Display/Instructions

Additional Information PC

► 2. Select the Quit option.

SPM Main Menu		
Menu: Select Function		
[F1]	Sys Pro-	Mainte-
	gram	nance
[F2]	Backup	Restore
[F3]	Boards	Pass-Thru
[F4]	Print Opts	Password
[F5]	Monitor	Language

Press the **[Home]** key.

Preparation for Hardware Maintenance

If you are performing on-site hardware maintenance, first remove the control unit housing (the cover of the control unit), then disconnect the AC power.

Removing the Control Unit Housing

To remove the control unit's housing, see [Figure 1-5](#).

- If you have a MERLIN II® Communications System or a MERLIN LEGEND Communications System (Release 2.1 or later):
 1. Pull the bottom front of the housing towards you. When it releases, remove it by lifting up as shown in [Figure 1-5](#).
 2. Remove the top cover from each carrier by pushing it straight up from the front.
- If you have a MERLIN LEGEND Communications System (Release 2.0 or earlier):
 1. Pry the clips from the housing on both sides of the control unit; use a screwdriver if they are difficult to remove.
 2. Carefully pull the housing towards you.



NOTE:

If the MERLIN LEGEND (Release 2.0 or earlier) system has more than one carrier, make sure you hold the housing assembly on the basic carrier at the sides; otherwise, the housing may disassemble as the front and side panels are only slotted together.

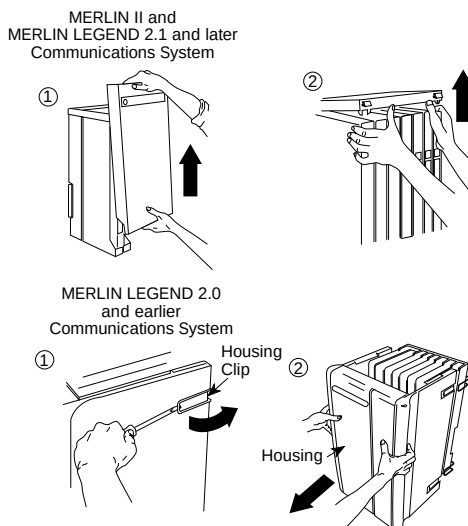


Figure 1-5. Removing the Control Unit Housing

Disconnecting AC Power

To disconnect the AC power, see [Figure 1-6](#), and follow the steps below.

- ▶ 1. **Disconnect the AC power to each auxiliary power unit by unplugging the power cord from the wall outlet.**
- ▶ 2. **Disconnect the AC power to each carrier by unplugging the power cord from the wall outlet.**

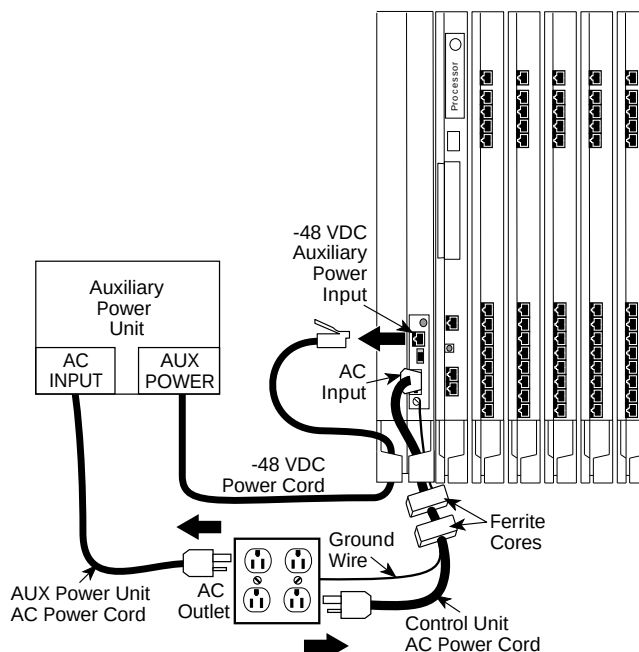


Figure 1-6. Disconnecting AC Power

Maintenance Strategy

The maintenance strategy presented in this section is only a guideline, not a fixed procedure. Refer to [Figure 1-7](#) whenever you are uncertain about how to proceed. As you become more experienced with maintaining and troubleshooting the system, you will most likely develop your own strategy.

Automatic Tests

The system performs ongoing maintenance automatically by running tests that:

- Monitor the status of equipment.
- Audit operations consistency.
- Detect hardware malfunctions.

Without disrupting normal service, the tests check hardware and software that are in service. The system registers any errors it detects in the error logs and, if possible, corrects them automatically.

Alarms

If the automatic tests indicate serious error conditions, the system generates an alarm. Depending on how the system is programmed, the system announces an alarm condition in one of the following ways:

- An LED for a line or feature button turns on at an operator console or other designated telephone.
- The red status LED on the processor module lights.
- In Release 3.0 and later, the error code/status display on the processor module displays F if a frigid start, or C if a cold start, occurs. See [“System Restarts”](#) for details about frigid start (System Erase) or cold start (Restart).

If a software installation or upgrade is taking place, a blinking character is displayed to indicate the status of the procedure. See [“Forced Installation/Upgrade of System Software”](#) in [Chapter 4](#) for more information.

- The status display indicates an alarm (on an MLX-20L console or a PC running SPM), and can be viewed on the Error screen.
- A supplemental alert, bell, chime, or strobe, if installed, is activated.

If an LED is programmed to indicate the alarm, the LED stays lit until the error is cleared.

When the system indicates an alarm, check the permanent error log screen.

Clearing Alarms

The system clears alarms automatically when the error condition no longer exists.

To clear an alarm manually, select **Drop** on the MLX-20L console or **[Alt]+[P]** on a PC while viewing the error. See ["Error Logs"](#) in [Chapter 2](#) for more information.

System Restarts

Depending on the severity and duration of a problem, you may need to restart the system manually. Some errors cause the system to restart automatically. Every restart causes an error log entry, and each type of restart has its own error code. A cold start (Restart) or frigid start (System Erase) also causes a C or F to appear on the error code/status display on the processor module.

There are three types of system restarts, all of which occur automatically:

- Warm start (you cannot select this from the Maintenance menu)
- Cold start (select Restart to do this manually)
- Frigid start (select System Erase to do this manually)

Warm Start

A loss of power for less than 250 ms can cause a warm start. If this occurs, calls in progress are not dropped, but calls in the process of being connected may be dropped.

Considerations

- Power interruptions of less than 100 ms usually do not affect the system.
- Warm starts may cause telephones without incoming calls to ring.

Cold Start (Restart)

If you need to restart the system, cold start (Restart) is recommended.

Restart drops all calls but saves system programming.

To perform a cold start, select Restart as follows:

Console Procedure **Menu**→SysProgram→Exit→System→ →Yes

PC Procedure F6 → F5 → F1 → F1 → F2

Considerations

- A cold start (Restart) occurs automatically after a power interruption of more than one second.
- A cold start (Restart) does not blank out the screen on an MLX-20L telephone until the cold start is completed.
- A cold start (Restart) can cause extensions with the Extension Status feature to lose their toll restrictions.
- For more information on the Restart procedure, see *System Programming*.

For more information on Restart, see [“Processor Problems”](#) in [Chapter 4](#).

Frigid Start (System Erase)



CAUTION:

All system programming is erased. When you perform a frigid start (System Erase), all calls are dropped, and the system configuration information is erased. All system memory must be reinitialized, including system programming. Then the entire system must be rebooted.

To perform a frigid start, select System Erase as follows:

Console Procedure

Menu→Maintenance→Slot→Dial 00→Demand
Test→System Erase (Line 5 of the display, left
button)→System Erase→Yes

PC Procedure

[F6] → [F1] → Type 00 → [F2] → [F3] → [F3] → [F2]

Considerations

- System Erase is not displayed on the MLX-20L status display. To select System Erase, press the left button on Line 5 of the display twice.
- After a System Erase, the default printer is the PC printer, not the Station Message Detail Recording (SMDR) printer. If you want on-site printouts from the SMDR printer, make sure you change the option.
- To change the printer option, see *System Programming and Maintenance (SPM)* for information on the Print Opts option on the SPM Main Menu.

For more information on System Erase, see [“Processor Problems”](#) in [Chapter 4](#).

Isolating the Trouble

You can isolate any problem to one of the following areas:

- Telephone
- Control unit
- Central office

NOTE:

If you change the jack assignment of any telephone, be sure to record the extension jack change on Form 2a, System Numbering: Extension Jacks. See [Appendix B, "System Numbering Forms"](#), for details.

Check Telephone Problems

If a customer reports telephone problems, use the following steps as a guideline for determining the possible cause. [Chapter 3, "Telephone Problems"](#), discusses telephone problems in more detail.

- ▶ 1. Discuss the problem with the user who reported the problem.
- ▶ 2. Run the appropriate test to verify the complaint.
- ▶ 3. Replace the telephone with one that works properly.
- ▶ 4. If the problem persists, go to ["Check the Error Logs"](#) below.
- ▶ 5. If the problem persists, replace the telephone wiring.

Check the Error Logs

If a system alarm turns on (see the top-right area of [Figure 1-7](#)), begin troubleshooting by checking the permanent errors in the error logs.

Use the following steps as a guideline to check the error logs. For more information on performing the procedures, see ["Checking the Error Logs"](#) in

[Chapter 2](#). Also, when you check the error logs, you should refer to [Table 2-2, "Error Codes"](#), in [Chapter 2](#) for a detailed description of each problem.

- ▶ 1. Check the permanent errors.
- ▶ 2. If errors still exist, check the transient errors.
- ▶ 3. Check the last 30 errors whenever you want to review the 30 most recently recorded errors—either permanent or transient.



NOTE:

Prior to Release 4.0, the error log displays only the last 10 messages.

Trouble Accessing the Error Logs

If you cannot access the error logs, or if the system is inoperable, use the following steps as a guideline to troubleshoot the system.

- ▶ 1. Check the power supply LED.
 - a. Is the power switch turned on?
 - b. Is the power cord connected to an AC wall outlet that is not controlled by a wall switch?

If the LED is off and you are sure that the power is connected and turned on, see ["Power Supply Problems"](#) in [Chapter 4](#).

- ▶ 2. If you still cannot access the error logs after checking the power supply, see ["Processor Problems"](#) in [Chapter 4](#).
- ▶ 3. If you still cannot access the error logs after checking the processor, see ["Carrier Problems"](#) in [Chapter 4](#).
- ▶ 4. If you still cannot access the error logs, review the "System Inventory" screen as detailed in [Chapter 2](#) and escalate the problem to your technical support organization.

Check the Access Log

At any time during the maintenance process, you can check the access log for maintenance and system programming. This log indicates the last 20 times that someone accessed maintenance or system programming. If you find that someone accessed maintenance or system programming shortly before the problem originated, that person may be able to help you isolate the trouble by providing additional information on what was done.

Once you receive that information, use any maintenance or system programming feature that may lead to the root of the problem. See "Access Log for Maintenance and System Programming" in [Chapter 2](#) for additional information. See *System Programming* for information about system programming and the Inspect function.

Check the Power Supply

If the error logs indicate the power supply as the source of the problem, see ["Power Supply Problems"](#) in [Chapter 4](#).

Check the Processor

If the error logs indicate the processor as the source of the problem, use the following as a guideline to check the processor.

- Back up system programming.
 - System programming can be backed up to a floppy disk, using SPM.
 - For Release 3.0 and later, system programming can be backed up to a memory card, using SPM or the MLX-20L console. See [Appendix D, "Backing Up with a Memory Card"](#), for more information.
- See ["Processor Problems"](#) in [Chapter 4](#) to troubleshoot the processor.

Check the Modules

If the error logs indicate any modules, see [“Module Problems”](#) in [Chapter 4](#).

Check the Control Unit Carrier

Within the control unit, the last possible cause of a problem is the carrier. If the carrier is damaged, it must be replaced. See [“Carrier Problems”](#) in [Chapter 4](#) for instructions.

Check the Trunks

Troubleshoot the trunks that are connected to the control unit. See [Chapter 5](#), [“Central Office Problems”](#).

Check the Central Office

If the error logs indicate the central office (CO) as the source of the problem, and you have resolved all other possible causes, notify the customer that they should call the central office and ask the central office to check the problem at their end (see [Chapter 5](#), [“Central Office Problems”](#)):

- If the problem is in the central office, wait for the CO to fix it. Then duplicate the problem conditions to ensure that the problem is really fixed.
- If the problem persists, get the customer to again call the central office with the problem.
- If they indicate that the problem is not in the central office, escalate the problem as described below.

Escalating the Problem

Escalate any unresolved problems to your technical support organization.

See "[System Inventory](#)" in [Chapter 2](#), which explains how to access the System Inventory screen. This screen contains information (such as the hardware vintage, software vintage, and ROM ID for each module) that your technical support organization may request.

Unit Loads

A unit load is a measure of power (1.9 watts) used to determine the electrical load that the following components have on each carrier's power supply:

- Telephones and adjuncts
- Direct-Inward Dial (DID) modules

Only the telephones and adjuncts that connect to the analog and digital ports on the control unit require unit load calculation. Do not include any equipment with its own power supply (for example, an answering machine) in the unit load calculation.

Checking Unit Loads

In the event of maintenance or equipment changes, recalculate the unit loads for each carrier where there is a different configuration. Use the worksheet in [Appendix C, "Unit Load Calculation Worksheet"](#).

Generally, if you can distribute the DID modules and telephone modules equally across the carriers, you prevent unnecessary drain on any one carrier.

The rules vary, however, depending on the system's mode. The next two sections provide the rules for calculating unit loads in various modes.

Unit Loads for Hybrid/PBX Mode

The power supply (model 391A1) generally supports six modules of any type in a Hybrid/PBX system. However, if both of the following conditions are true, the unit loads on a carrier can exceed the 54-unit (102.6-watts) maximum:

- All six carrier slots are occupied by MLX telephone or analog multiline telephone modules.
- The carrier has more than 45 MLX-20L telephones and/or 34-button analog multiline telephones installed.

Unit Loads for Key or Behind Switch Mode

In a Key or Behind Switch system with four or fewer modules, no calculation is needed. The power supply (model 391A1) generally supports four modules of any type in Key or Behind Switch mode.

Upgrading the Power supply

The 391A3 power supply has a maximum rating of 75 unit loads. If your system contains a 391A1 or 391A2 power supply module, and the unit loads for that carrier will exceed 54, it is recommended that a 391A3 power supply be installed in the system. Auxiliary Power Units cannot be used with the 391A3 power supply.



CAUTION:

Running the system with more than 54 unit loads (102.6 watts) per carrier may not appear to do harm. However, this can cause the system to malfunction, creating "No Trouble Found" conditions.

If a new power supply is required, complete installation instructions are provided in Installation.

Error Logs, Access Logs, and System Inventory

2

As described in [“Maintenance Strategy”](#) in [Chapter 1](#), much of your troubleshooting relies on the error logs and the access log, for maintenance and system programming. Both of these maintenance features are described here in detail. This chapter also explains how to access the System Inventory screen, which you may need when you escalate problems to your technical support organization.

For information on entering and exiting maintenance functions on a console or a PC running SPM, see [Chapter 1, “Introduction”](#).

Error Logs

When an error occurs, the system records it in the error logs, which are stored in battery backed-up RAM. These errors indicate problems that span the entire system, including the control unit, telephones, adjuncts, and network interface.

Transient errors are less serious than permanent errors. However, some transient errors can become permanent if they occur a certain number of times, as shown in [Table 2-1](#). The Threshold column indicates the number of occurrences at which a transient error becomes permanent.

Table 2-1. Transient/Permanent Error Thresholds

Error Code	Error Description	Transient/Permanent Threshold
7402	LOOP BIT CONTROL NOT SET	4
7403	NO LOOP CURRENT	4
7404	STUCK RINGING	2
8403	NO EXTERNAL RELEASE	2
840B	NO LOOP CURRENT	4
840C	STUCK RINGING	2
840D	INCORRECT FIRMWARE STATE	2
2E01	T1 ACC VIOL	10

Checking the Error Logs

Once you have reviewed the error logs, you should print the error information. This will help you determine whether your work has resolved each problem. (Refer to “Summary” below or *System Programming* for additional information about printing.)

Summary

Console Procedure

Menu→Maintenance→System→Error
Log→Last 30 or Permanent or Transient



NOTE:

Prior to Release 4.0, the error log displays only the last 10 messages.

PC Procedure

[F6]→[F1]→[F2]→[F1] or [F2] or [F3]

Printing from Console

Menu→System Programming→Exit→**More**→
Print→**More**→**More**→Error Log

Printing from PC

[F1]→[F5]→[PgUp]→[F3]→[PgUp]→[PgUp]→[F6]

To check the error logs, follow the steps below.

Console Display/Instructions Additional Information PC

- **1. From the Maintenance menu, select the System option.**

```
Maintenance
Make a selection
System
Slot
Port

Exit
```

[F1]

- **2. Select Error Log.**

```
System:
Make a selection
Status          Upgrd/Instll
Error Log
Inventory
Access Log
Exit            Enter
```

[F2]

- **3. Select an error log option.**

```
System Error Log:
Make a selection
Last 30
Permanent
Transient
(most recent alarm)
Exit
```

If you select Last 30,
see [“Checking the Last 30 Errors”](#)
If you select Permanent, see
[“Checking Permanent Errors”](#)
If you select Transient,
see [“Checking Transient Errors”](#)

[F1]

[F2]

[F3]

The most recent alarm message stays on the System Error Log screen until it is replaced by another. The screen does not update the most recent alarm while displayed; to see any updates, you need to exit this screen and re-enter.

Checking Permanent Errors

Follow Steps 1 through 3 above for “Checking the Error Logs.” In Step 3, select Permanent.

Console Display/Instructions	Additional Information	PC.

Permanent Errors: >

xxxxxxxxxxxxxxxxxxxxxxxx

Slotxx Portxx Countxxx

First mm/dd/yy hh:mm

Last mm/dd/yy hh:mm

Code xxxx

Exit

Press the **More** button to page through the permanent errors.

[PgDn]

Press the **Drop** button to delete an error log entry.

[Alt] + [P]

Line 2 provides a brief description of the error code identified on Line 6. For more information on an error code, see [Table 2-2](#).

Line 3 indicates the slot and port where the error was detected.

Line 5 indicates the error's last occurrence.

➡ NOTE:

Depending on which entry you delete, you might clear an alarm. See [“Alarms”](#) in [Chapter 1](#) for additional information about alarms.

Checking Transient Errors

Follow Steps 1 through 3 above for “Checking the Error Logs.” In Step 3, select Transient.

Console Display/Instructions	Additional Information	PC.

Transient Errors: >

xxxxxxxxxxxxxxxxxxxxxxxx

Slotxx Portxx Countxxx

First mm/dd/yy hh:mm

Last mm/dd/yy hh:mm

Code xxxx

Exit

Press the **More** button to page through the transient errors.

[PgUp]

Press the **Drop** button to delete an error log entry.

[Alt] + [P]

Line 2 provides a brief description of the error code identified on Line 6. For more information on an error code, see [Table 2-2](#).

Line 3 indicates the slot and port where the error was detected.

Line 5 indicates the error's last occurrence.

Checking the Last 30 Errors

Follow Steps 1 through 3 above for "Checking the Error Logs." In Step 3, select Last 30.

Console Display/InstructionsAdditional Information

PC.

Last 30 System Errors:>

XXXXXXXXXXXXXXXXXXXXXXXXXX

Slotxx Portxx

Last mm/dd/yy hh:mm

Code xxxx

Exit

Press the **More** button to page through the last 30 errors.

PgUp

Line 2 provides a brief description of the error code identified on Line 6. For more information on an error code, see [Table 2-2](#).

Line 3 indicates the slot and port where the error was detected.

Line 5 indicates the error's last occurrence.

NOTE:

You cannot delete an error log entry from this screen.

Interpreting Error Codes

[Table 2-2](#) explains how to interpret each error from the error logs.

For additional information on how to use the error logs, read this entire chapter and see "[Maintenance Strategy](#)" in [Chapter 1](#).

Table 2-2. Error Codes

Error Codes	Description	Action
0001	TIMEOUT COLD START: System programming is okay.	No action required; however, if problem persists, troubleshoot the processor.
0002	POWER UP WARM START: System programming is okay.	No action required; however, if problem persists, troubleshoot the processor.
0003	SOFTWARE COLD START: System programming is okay.	If problem persists, troubleshoot the processor.
0004	SOFTWARE WARM START: System programming is okay.	If problem persists, troubleshoot the processor.
0005	Reset - DIAGNOSTIC SWITCH:	
0006	INCOMPLETE COLD START: System was cold-started while a restart was in progress.	If problem persists, troubleshoot the processor.
0007	SANITY TIMEOUT RESET: Faulty software, module, carrier, or processor sanity timer.	Troubleshoot module and or processor.
0008	MAX RESET COUNT EXCEEDED: System was cold-started (System Reset) because too many warm starts occurred. System programming is okay.	If problem persists, troubleshoot the processor.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
0009	FRIGID START: System was restarted and initialized to default programming. This error is also logged after a System Erase.	If the processor was removed while in use, the system may perform a frigid start due to loss of system programming. Restore system as described in <i>System Programming and Maintenance (SPM)</i> , or in Appendix D, "Backing Up with a Memory Card" .
000A	POWER UP COLD START: A RAM failure was detected in the processor. System programming is okay.	If problem persists, troubleshoot the processor.
000B	CARD INSERTED/REMOVED:	No action required.
000C	SLOT STREAM CNT EXCEEDED: Slot has generated excessive interrupts.	If problem persists, troubleshoot the module.
000D	FMWR NOT IN STANDBY MODE: Module firmware is not in standby mode.	If problem persists, troubleshoot the module.
000E	COMMAND BUFFER FULL:	If problem persists, troubleshoot the processor and module.
000F	TASK RUNNING TOO LONG:	No action required: however, if problem persists, troubleshoot the processor.
0010	INVALID SLOT INTERRUPT: Cannot determine module responsible for generating the interrupt.	Troubleshoot modules and replace if necessary. If problem persists, troubleshoot the processor.
0011	STACK OVERFLOW: Processor problem.	Troubleshoot the processor.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
0012	INVALID RESET FLAG: Processor problem.	Troubleshoot the processor.
0013	DUART STREAMING INT: Processor problem.	Troubleshoot the processor.
0014	PROCESSOR ERR INTERRUPT: Processor problem.	Troubleshoot the processor.
0015	MODULE MISMATCH: Physical and logical type mismatch. Module inserted into wrong slot.	Change system programming to reflect the proper module or install the proper module.
0016	POWER UP COLD START: A module dual port RAM failure was detected. System programming is okay.	If problem persists, troubleshoot the module for the slot indicated.
0017	REAL TIME CLOCK FAULT: Date and/or Time incorrect or non-readable.	If this problem persists, replace the processor module.
0018	RTC COLD START: This error is not displayed.	
0019	RESET TIME & DATE: The system performs a cold start because the real time clock chip is not working correctly.	If this problem persists, replace the processor module.
0401	ABK CARD NOT INSERTED: A PCMCIA memory card for Translation is not inserted.	Insert a Translation card or a card that has not been formatted.
0402	ABK INCORRECT CARD TYPE: A PCMCIA memory card for non-Translation is inserted.	Remove the current card and insert a Translation card or a card that has not been formatted.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
0403	ABK CARD WRITE-PROTECTED: The Translation card has the write protection switch on.	Flip the write protection switch on the card to off (non-write protect mode/position.) If this problem persists, try another card, then replace the processor module if the problem remains.
0404	ABK EXTENSION BUSY: A station is in program, administration, or maintenance mode.	Wait until the station changes mode. Make sure the programming device (SPM or the console) is not in programming mode when autobackup is scheduled to occur.
0405	ABK FAULTY CARD: Unknown cause of a bad card.	Reset card and retry. If the problem remains, try another card. If the problem still remains, replace the processor module.
0801 and 1C07 and 5801	CTI LINK DELETED: A board renumber or slot restore moved the CTI Link to an unacceptable port and the system has removed the link.	Check that the following are true: 1. The system is in Hybrid/PBX mode. 2. The link is on an 008 MLX or 408 MLX board. 3. The MLX board firmware vintage is not 29. 4. Board renumber has not moved the extension to an operator position. 5. An MLX telephone is not connected to that port. 6. Board renumber has not moved the MLX extension to the system programming port.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
0C01	NO I-VMS PORT IN SERV: This error indicates that the VMS machine may be down.	No action required.
0C02	DID INTERDIGIT TIMEOUT: May be noisy line or central office problem.	No action required. If problem persists, troubleshoot the DID line and inform the central office if necessary.
1C01	POOL M-BUSY EXCEEDS 50%: More than half the trunks in the pool are busy.	Troubleshoot trunk.
1C02	DPR TEST NOT COMPLETED	Slot did not complete initializing.
1C03	FW UPGRADE ATTEMPT:	No action required.
1C04	FW UPGRADE COMPLETE:	No action required.
1C05	INVALID FMW 29 DETECTED: Incompatibility problem. The specified video endpoint or UDM is connected to an 008 or 408 GS/LS MLX with firmware vintage 0x29.	Replace the 008 or 408 MLX board with one of another firmware vintage and retire this permanent alarm manually.
1C06	BAD BOARDS IN SYSTEM: At least one incompatibility problem of type HER 0x1c05 detected. Turns on CPU red LED.	Replace the 008 or 408MLX board with one of another firmware vintage and retire this permanent alarm manually.
1C07	see error code 0801	
2C01	T1 ACCESS VIOLATION: T1 Services (Channels-Voice/Data) administered incorrectly.	Check facility provisioning and reprogram channels appropriately for voice or data. If the problem persists, contact the NSAC.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
3001	ALARM TABLE FULL : The error logs are full, and no more errors can be added to them. Turns on the processor LED.	Correct indicated errors, and then remove entries from the transient system error log to free up space. If problem persists, cold-start the system before continuing with troubleshooting. Sys Program→System→Restart
4401	USER REQUESTED SYS ERASE : This error is logged after a System Erase. If the System Erase is successful, this error is removed immediately.	If this error remains in the transient log, do the System Erase again. If problem persists, troubleshoot the processor.
4402	USER REQST UPGRD/INSTALL : This is just a record of the event.	No action required.
5801	see error code 0801	
6C01	DS1 LOSS OF SIGNAL ALARM : Service on the link has been lost.	Usually no action is required. Troubleshoot the T1 trunk, channel service unit (CSU), and the cable between the CSU and the 100D module. If problem persists, escalate to your technical support organization.
6C02	DS1 BLUE ALARM : All unframed ones signal being received. The link cannot be used for communication.	Blue alarms are generated by intermediate equipment, such as a CSU or DDM 1000/2000. The far end of the network interface may be out of service. Troubleshoot the T1 trunk, channel service unit (CSU), and the cable between the CSU and the 100D module. If problem persists, escalate to your technical support organization.

Continued on next page

Table 2-2 *Continued*

Error Codes	Description	Action
6C03	DS1 RED ALARM: Incoming signal does not have valid framing information. Service on the link has been lost.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization.
6C04	DS1 YELLOW ALARM: The far end of the network interface has lost frame synchronization. Service on the link has been lost.	Troubleshoot the T1 trunk. If problem persists, check the CSU and the DS1 configuration (the framing format). If problem persists, escalate to your technical support organization.
6C05	DS1 LOSS OF MULTIFRAME: Service on the link has been lost.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization.
6C06	DS1 REMOTE MULTIFRAME: The far end of the network interface is experiencing loss of multiframe. Service on the link has been lost.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization.
6C07	DS1 MAJOR ALARM: Average bit error rate exceeds 10E-3. Service on the link has been lost.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization. Maintenance→Slot→Error Events→Current hr
6C08	DS1 MINOR ALARM: Average bit error rate exceeds 10E-6.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization. Maintenance→Slot→Error Events→Current hr

Continued on next page

Table 2-2 *Continued*

Error Codes	Description	Action
6C09	DS1 MISFRAME ALARM: Misframe count reached 18.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization. Maintenance→Slot→Error Events→Current hr
6C0A	DS1 SLIP ALARM: Slip count reached 88.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization. Maintenance→Slot→Error Events→Current hr
6C0B	HARDWARE INOPERATIVE: Hardware is not operating properly. If this is the only 100D (DS1) or 800 CO-BRI module, or if this is the module designated to have the active clock, its TDM bus clock generator was not activated.	If problem persists, escalate to your technical support organization.
6C0C	BRI LOSS OF SYNC:	Usually no action is required. Troubleshoot the BRI trunk. If problem persists, contact your technical support organization.
6C0D	BRI NET DEACTIVATED:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.
6C0E	BRI NET INV 2B+D LB ACT:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
6C0F	BRI NET INV B1 LB ACT:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.
6C10	BRI NET INV B2 LB ACT:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.
6C11	BRI NET INV IL LB ACT:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.
6C12	BRI NET INV QM LB ACT:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.
6C13	BRI SLIPS > 88:	Usually no action is required. Troubleshoot the BRI trunk. If problem persists, contact your technical support organization.
6C14	BRI NET REQUESTED CCRCs:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.
7001	PRI SVC AUDIT TIMEOUT:	Troubleshoot the PRI trunk and report to service provider; otherwise, no action required. If problem persists, contact your technical support organization.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
7002	PRI SVC STATE INCONSIST:	Troubleshoot the PRI trunk and report to service provider; otherwise, no action required. If problem persists, contact your technical support organization.
7003	PRI D-CHNL INOPERATIVE:	Troubleshoot the PRI trunk and report to service provider; otherwise, no action required. If problem persists, contact your technical support organization.
7004	PRI B-CHNL NOT RELEASED:	Troubleshoot the PRI trunk and report to service provider; otherwise, no action required. If problem persists, contact your technical support organization.
7005	PRI B-CH GROUP INCONSIST:	Troubleshoot the PRI trunk and report to service provider; otherwise, no action required. If problem persists, contact your technical support organization.
7006	PRI PROTOCOL MISMATCH: A mismatch in the protocol being supplied versus the protocol expected by MERLIN LEGEND.	1. Inform the service provider to change the administration for this circuit. 2. After the service provider restarts the circuit, verify that all alarms for this slot are cleared.
7401	TRK UPLINK MESSAGE ERROR: Communication problems between processor and modules. Unrecognized message from module to processor.	Test the trunk with a single-line telephone. If the problem is not in the trunk, replace the module with one that is known to be working. If the problem is gone when using the known good module, replace the module and restart.

Continued on next page

Table 2-2 *Continued*

Error Codes	Description	Action
7402	LOOP CONTROL BIT NOT SET: No loop current on an outgoing call. If this error occurs four times consecutively, and if Automatic Maintenance-Busy is enabled and the 50% maintenance-busy limit has not been exceeded, the trunk is busied-out automatically.	Test the trunk with a single-line telephone. If the problem is not in the trunk, replace the module with one that is known to be working. If the problem is gone when using the known good module, replace the module and restart.
7403	NO LOOP CURRENT: Communication problems between the module and central office. No loop current. If this error occurs four times consecutively, and if Automatic Maintenance-Busy is enabled and the 50% maintenance-busy limit has not been exceeded, the trunk is busied-out automatically.	Test the trunk with a single-line telephone. If the problem is not in the trunk, replace the module with one that is known to be working. If the problem is gone when using the known good module, replace the module and restart.
7404	STUCK RINGING: Communication problems between the module and central office. If this error occurs twice consecutively, the trunk is busied-out automatically, whether or not Automatic Maintenance-Busy is enabled.	Test the trunk with a single-line telephone. If the problem is not in the trunk, replace the module with one that is known to be working. If the problem is gone when using the known good module, replace the module and restart.
7801	NOT IN NORMAL OP MODE: Module not in normal operation mode. Reported in background module check.	Reset the board. If problem persists, troubleshoot the module. Maintenance→Slot→Slot Number→Reset

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
7802	SANITY INT NOT GENERATED: Only applies to modules that have extension jacks.	Reset the board. If problem persists, troubleshoot the module.
7803	NO PORT BOARDS AVAILABLE: This error is reported when modules are not present.	No action required. Delete this entry from the transient log.
7804	INVALID SANITY RESPONSE: This error occurs when a sanity test gets invalid responses. Applies only to modules that have extension jacks.	Reset the board. If problem persists, troubleshoot the module.
7805	INVALID SLOT NUMBER: Rarely occurs. Software could not process an event detection because the slot number was invalid.	No action required; however, if problem persists, restart the system.
7806	NOT IN STANDBY MODE: Reported during cold start or background check.	Reset the board. If problem persists, troubleshoot the module.
7807	SELF TEST NOT COMPLETED: Reported during cold start.	Reset the board. If problem persists, troubleshoot the module.
7808	TEST RESULT REGISTER BAD: A module error or processor error resulted while running test.	Reset the board. If problem persists, troubleshoot the module.
7809	TEST STATUS REGISTER BAD: A module error or processor error resulted while running test.	Reset the board. If problem persists, troubleshoot the module.

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Table 2-2 Continued

Error Codes	Description	Action
780A	DPR TEST NOT COMPLETED: Reported during cold start.	If problem persists, troubleshoot the module.
780C	RAM TEST FAILURE: Memory failed the RAM test. Turns on the processor LED.	If problem persists, replace the processor.
780D	UPPER ROM FAILURE: Memory failed the ROM test. Turns on the processor LED.	If problem persists, replace the processor.
780E	LOWER ROM FAILURE: Memory failed the ROM test. Turns on the processor LED.	If problem persists, replace the processor.
8401	MISCELLANEOUS ERROR: Currently not reported.	No action required.
8402	WINK TOO SHORT: Outbound dialing problems on tie trunks. For a tie trunk with delay dial or wink start, the wink from the far end of the network interface is less than the minimum 100 ms. The tie trunk remains waiting for a valid signal.	Troubleshoot the far end of the network interface to see if it is working and translated properly. Troubleshoot for faulty cable. Replace the module.
8403	NO EXTERNAL RELEASE: Communication problems between the module and central office. Far end has not disconnected within four minutes. If this error occurs twice consecutively, the trunk is busied-out automatically, whether or not Automatic Maintenance-Busy is enabled.	Troubleshoot the far end of the network interface to see if it is working and translated properly. Troubleshoot for faulty cable.

Continued on next page

Table 2-2 *Continued*

Error Codes	Description	Action
8404	ON HOOK BEFORE WINK: Outbound dialing problems on tie trunks. For a tie trunk with delay dial or wink start, the far end of the network interface went on-hook before the handshake was completed.	If problem persists, troubleshoot the tie trunk configuration. Troubleshoot the far end to see if it is working and translated properly. Troubleshoot for faulty cable. Replace the module.
8405	ON HOOK BEFORE READY: Outbound dialing problems on tie trunks. For a tie trunk with delay dial or wink start, the far end of the network interface went on-hook before the guard time elapsed.	Troubleshoot the far end of the network interface to see if it is working and translated properly. Troubleshoot for wink start and faulty cable. Troubleshoot the far end of the network. Replace the module.
8406	INTERDIGIT TOO SHORT: Inbound dialing problems on tie and DID trunks.	Troubleshoot the far end of the network interface to see if it is working and translated properly. Troubleshoot for faulty cable. Replace the module.
8407	BAD UPDATE: Communication problems occurred between the processor and the modules. Module may need to be replaced.	Turn the processor off and then on. Repeat system programming procedure. If problem persists, escalate to your technical support organization.
8408	ROTARY RATE > 12PPS: Inbound dialing problems on tie and DID trunks.	Troubleshoot the far end of the network interface to see if it is working and translated properly. Troubleshoot for faulty cable. Replace the module.
8409	ROTARY RATE < 8PPS: Inbound dialing problems on tie and DID trunks.	Troubleshoot the far end of the network interface to see if it is working and translated properly. Troubleshoot for faulty cable. Replace the module.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
840A	BAD DOWNLINK MESSAGE: Communication problems occurred between the processor and the modules. The module received an unrecognized message from the processor.	Turn the processor off and then on. Repeat system programming procedure. If the problem persists, replace the module.
840B	NO LOOP CURRENT: Communication problems between the module and the central office. No loop current. If this error occurs four times consecutively, and if Automatic Maintenance-Busy is enabled and the 50% maintenance-busy limit has not been exceeded, the trunk is busied-out automatically.	Replace the module with a similar module and test. If the problem is resolved, replace the bad module. If the problem persists, reinstall the old module and test the trunk.
840C	STUCK RINGING: Communication problems between the module and central office. If this error occurs four times consecutively, and if Automatic Maintenance-Busy is enabled and the 50% maintenance-busy limit has not been exceeded, the trunk is busied-out automatically.	Replace the module with a similar module and test. If the problem is resolved, replace the bad module. If the problem persists, reinstall the old module and test the trunk.

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Table 2-2 Continued

Error Codes	Description	Action
840D	INCORRECT FIRMWARE STATE: If this error occurs four times consecutively, and if Automatic Maintenance-Busy is enabled and the 50% maintenance-busy limit has not been exceeded, the trunk is busied-out automatically.	Turn power off for at least 1 second and then turn it on. Repeat system programming procedure. If problem persists, replace the module.
840E	UPLINK MESSAGE ERROR: Communication problems between the processor and the module. The module received an unrecognized message from the processor.	Turn the processor off and then on. Repeat system programming procedure. If the problem persists, replace the module.
840F	LOST IDLE MESSAGE ERROR:	
8C01	SLOTS NOT EQUAL: The module that occupies the indicated slot does not match the slot information contained in the PC or PCMCIA card backup file.	Troubleshoot the slot descriptions in your backup file against the actual system modules that occupy those slots. After the mismatch is corrected, repeat the restore operation.
9801	MCARD WRITE ERROR: Write to the memory card is not succeeding or is too slow.	Reset the card and try again. If the problem persists, replace the card and try again. If the problem still persists, replace the processor.
9802	MCARD ERASE ERROR: Erasure of the memory card is not succeeding or is too slow.	Reset the card and try again. If the problem persists, replace the card and try again. If the problem still persists, replace the processor.

Continued on next page

Table 2--2 Continued

Error Codes	Description	Action
9803	MCARD 12-VOLT ERROR: The memory card voltage is incorrect.	Reset the card and try again. If the problem persists, replace the card and try again. If the problem still persists, replace the processor.
9C01	NW REJECTS SPID: Service on the link has been lost.	Check the programmed SPID for correctness. If it is incorrect, modify the programming; otherwise, contact the central office to correct the problem.
9C03	LINK ESTABLISHMENT FAIL: Service on the link has been lost.	Check that the line is securely connected to the port and that the LEDs on the board show proper operation. If the card appears to be working properly, check that the line has been activated by the central office.
9C04	NW NOT RESPOND TO SETUP: Service on the link has been lost.	The network is not responding to the MERLIN LEGEND messages. Contact the central office to correct the problem.
9C05	NW NOT RESPOND TO RELEASE: Service on the link has been lost.	The network is not responding to the MERLIN LEGEND messages. Contact the central office to correct the problem.
9C07	ENDPOINT UNINIT (L2/L3): Service on the link is uninitialized.	The link is in the process of initializing. If this error remains logged for more than a half hour, try re-plugging the DSL. If the problem persists, contact the central office to correct the problem.

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Table 2-2 *Continued*

Error Codes	Description	Action
9C08	PROTOCOL ERROR: Service on the line may be affected.	The network has indicated that a protocol error has occurred. Verify the line provisioning by running the NI-BRI Provisioning Test or through other means. If the provisioning is correct, contact your technical support organization.
A401	CTI LINK BROADCAST RESET: Occurs during a broadcast reset. The Red LED on the CPU will not turn on, but the Red LED for the slot <i>will</i> turn on.	If several of these occur: 1. Check that the system is in Hybrid/PBX mode. 2. Validate the wiring and the connections. 3. Press the Restart Button (see the procedure "Restart" in Chapter 4). 4. Call the TSO's Telephony Services Maintenance Group (800 242-2121) for the procedures to unload and reload the PBX driver.
A801	CTI LINK HIDDEN RESET: Occurs during a hidden reset.	If several of these occur, and the client application has "slow" response time: 1. Validate the wiring and the connections. 2. Press the Restart Button (see the procedure "Restart" in Chapter 4). 3. Call the TSO's Telephony Services Maintenance Group (800 242-2121) for the procedures to unload and reload the PBX driver.

Access Log

In addition to checking the error logs, you can check the access log to help you troubleshoot. Each time maintenance or system programming is accessed, the event is recorded in an access log (up to the last 20 events). This information may be useful in determining whether one of those events caused an error detected shortly thereafter.

Reviewing the Access Log

Each event is documented by the time and date of occurrence. The station button (Sta) column indicates whether the event occurred from an MLX-20L console (if so, the extension number is displayed) or from SPM (SPMD if direct; SPMR if remote). The SP/M column indicates whether the event originated from System Programming (SP) or Maintenance (M).

Scanning the Log

The last 20 events are shown, beginning with the most recently accessed event. When you reach the end of the list, you hear a beep and all variable information is cleared from the screen. To return to the beginning of the list, select Exit and then select Access Log again.

Summary

Console Procedure **Menu**→Maintenance→System→Access Log

PC Procedure F6→F1→F4

To check the access log, follow the steps below.

Console Display/Instructions

Additional Information PC

- 1. From the Maintenance menu, select the System option.

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F1

- 2. Display the first screen of the Access Log.

```
System
Make a selection
Status      Upgrd/Instll
Error Log
Inventory
Access Log
Exit        Enter
```

F4

The screen below shows the access log.

```
SysProg/MaintAccessLog
>
Date   Time   Sta  SP/M
mm/dd/yy hh:mm xxxx  xx
mm/dd/yy hh:mm xxxx  xx
mm/dd/yy hh:mm xxxx  xx
mm/dd/yy hh:mm xxxx  xx
Exit
```

To page through the events,
press the **More** button.

PgUp

System Inventory

If you need to contact your technical support organization, you may also need to access the System Inventory screen. The System Inventory screen shows you the hardware vintage, software vintage, and ROM ID for each module in the control unit.

Summary

Console Procedure **Menu**→Maintenance→System→Inventory→**More**

PC Procedure [F6]→[F1]→[F3]→[PgUp]

To check System Inventory, follow the steps below.

Console Display/Instructions Additional Information PC

- 1. From the Maintenance menu, select the System option.

■ Maintenance
Make a selection
System
Slot
Port

Exit

[F1]

- 2. Select the Inventory option.

■ System
Make a selection
Status Upgrd/Instll
Error Log
Inventory
Access Log
Exit Enter

[F3]

When you access the System Inventory screen, Slot 00 information is displayed. Line 2 indicates that the processor occupies Slot 00.

```
System Inventory:
Slot 00
Board Processor
Hardware Vintage:  xx
LEGEND 5.0 Vx.x
xxxxxxxxxxx
Exit
```

Press the **More** button to review information for each subsequent slot. When you reach the display for the last slot, pressing the **More** button redisplayes the Slot 00 information.



Reviewing the Screen

Lines 4, 5, and 6 indicate information that may be asked of you when you call your technical support organization:

- Line 4, the hardware vintage, indicates the revision level of the processor board's firmware.
- Line 5 indicates the boot ROM release number for the board software, followed by the official software version number.
- Line 6 indicates the revision levels of the ROM pairs on the processor board.

The screen below displays information for slots other than Slot 00.

Console Display/Instructions

```
System Inventory:
Slot xx
Board boardname
Hardware Vintage:  vv
Firmware Vintage:  vv
Application Vintage:
Exit
```

Additional Information PC

xx + slot number entered in Step 2

Press the **More** button to review information for each subsequent slot. When you reach the display for the last slot, pressing the **More** button redisplayes the Slot 00 information.



Phantom Modules

If the system includes a phantom module (an empty slot that has been programmed), the System Inventory screen does not recognize it. When replacing or adding modules, make sure phantom module slots remain empty, and that no modules are installed to their right.

Telephone Problems

3

Once you isolate a problem to the telephone (or a group of telephones), you can run various tests to check a telephone's operation.

Use the procedure below as a general guideline for troubleshooting telephones.

- ▶ **1. Replace the telephone (or adjunct) with one that works properly.**
- ▶ **2. If the problem persists, connect the telephone directly to the control unit, using a cord that works properly.**
 - If this solves the problem, replace the original cord.
 - The power supply may be shorted or open. If the wiring has been crushed or severed, replace it.
 - a. Test the power supply for 48 VDC with a voltmeter or by reconnecting the telephone or adjunct.
 - b. If the test for 48 VDC fails, replace the circuit pack in the telephone or adjunct.

CAUTION:

A faulty circuit pack has the potential to damage the power supply, which can cause widespread damage throughout the system.

- ▶ **3. If the problem persists, replace the mounting cord.**
- ▶ **4. If the problem persists, continue as described below.**

If you change the jack assignment of any telephone, be sure to record the extension jack change on Form 2a, System Numbering: Extension Jacks. See [Appendix B, “System Numbering Forms”](#), for details.

Fixing Telephone Problems

If a reported telephone problem matches any symptom described in Table 3-1, refer to the proper section of this chapter.

Table 3-1. Troubleshooting Telephone Problems

Symptom	Section
Intermittent telephone problem.	General Telephone and Wiring Problems
Analog multiline telephone LEDs and/or ringing tones do not work properly.	Analog Multiline Telephone Problems
Time appears on display of an analog multiline telephone, but incoming call information does not appear.	Analog Multiline Telephone Problems
Telephone does not receive tones from the control unit.	Voice Transmission Problems
Several single-line telephones cannot dial directly, even though they are receiving calls.	Single-Line Telephone Problems
Users cannot make outside calls on single-line, touch-tone telephones.	Single-Line Telephone Problems
Users are getting other people’s calls.	Call Forwarding Problems

General Telephone and Wiring Problems

If intermittent telephone trouble occurs, use the following steps as a guideline to check for general telephone and wiring troubles.

 NOTE:

Refer to “Troubleshooting Trunk Problems” in [Chapter 5](#) if the reported problem is echo during conversations on T1 trunks with GS emulation connected to a toll office.

- ▶ **1. Check modular connections in the telephone for loose or broken connectors.**
- ▶ **2. Check modular connections in the connecting blocks for loose or broken connectors.**
- ▶ **3. Check modular connections in the control unit for loose or broken connectors.**
- ▶ **4. Check transient errors in the error logs for any possible clues.**
- ▶ **5. If local power is provided, check the power supply connectors and voltages.**
- ▶ **6. Replace the telephone with a telephone that works to determine whether the problem is the telephone itself.**
- ▶ **7. If trouble disappears, replace the problem telephone.**
- ▶ **8. If the replacement telephone does not work properly, check the other telephones connected to the same module.**
 - If these telephones work, the problem may be the wiring, or there may be a single-port failure on the module. To check the wiring, go to Step 12.
 - If these telephones do not work, the fault is probably in the module. To check the module, go to Step 9.
- ▶ **9. Check the LEDs on the module.**

If the module does not have LEDs, see “System Status” in [Chapter 4](#) for more information.
- ▶ **10. Check the error log for relevant messages.**

See [Chapter 2, “Error Logs, Access Logs, and System Inventory”](#).
- ▶ **11. Replace the faulty module.**

- ▶ **12. Replace the wiring between the module jack field and the telephone to see if there is a wiring problem.**

Analog Multiline Telephone Problems

If telephone LEDs and/or ringing tones do not work properly on analog multiline telephones, follow the steps below.

- ▶ **1. Move the T/P switch on the left-hand side to the T (test) position.**
You should hear tone ringing, and the red and green LEDs on the terminal should flash alternately.
- ▶ **2. If the LEDs do not light, replace the telephone with one that works.**
If the problem is resolved, go to Step 4.
- ▶ **3. If the LEDs do not light, retest the original telephone.**
Plug it directly into the appropriate jack on the control unit, using a cord that is known to be working.
If this resolves the problem, replace the original cord (or local power unit, if used).
- ▶ **4. Move the T/P switch to its normal position.**
The ringing tone should stop, and the LEDs should be off.
- ▶ **5. If any part of the test fails, replace the telephone.**
If the time appears on the display but incoming call information does not, move the T/P switch on the side of the telephone to the center position.

Voice Transmission Problems

If the telephone does not receive tones, check the control unit and wiring with a telephone that works.

Single-Line Telephone Problems

If more than one single-line telephone cannot dial correctly, even though they are receiving calls, use the steps below to test the touch-tone receivers (TTRs) for a single-line telephone.

- ▶ **1. Pick up the handset; then dial *04 and the 2-digit number of the TTR you want to test.**
 - If you hear a busy tone, the receiver is in use/off hook.
 - If you hear a reorder tone, you have misdialed or have reached an invalid TTR. Try again.
 - If you hear a dial tone, go to Step 2.
- ▶ **2. Dial 123456789*0#.**

You should hear a dual-tone multi-frequency (DTMF) signal as you press each button. If the test is successful, you hear a three-beep confirmation tone one to three seconds after you press #.
- ▶ **3. Hang up and repeat Steps 1 and 2 for each TTR.**
- ▶ **4. If this test fails, replace the module containing the faulty TTR.**

If all TTRs fail this test, repeat the test, using a different telephone that works. If the tests are successful, replace the original telephone.

If users cannot make outside calls on a touch-tone telephone, check the individual trunk for rotary-dial programming. See System Programming for details.

Call Forwarding Problems

Call Forwarding problems usually occur when someone activates Call Forwarding unintentionally, resulting in a user receiving other users' calls.

Cancel the Call Forwarding feature (for the receiving telephone):

- On multiline telephones, press the **Feature** button and dial *34*.
- On single-line telephones, pick up the handset, dial #*34*, and then hang up.

 NOTE:

You can cancel Call Forwarding from the receiving telephone or from the forwarding telephone, providing that you know the number.

MLX Telephone Tests

If the LEDs, ringer, buttons, switchhook, or display appear not to be working, try the steps below.

- ▶ **1. Pick up the handset.**
- ▶ **2. When you hear dial tone, press *00 (the feature access code).**
The telephone enters test mode. For some tests, this means the LEDs turn on; for others, it means the phone starts ringing.
 - This test connects a test tone to the B-channel and sends a repeated ring burst to the telephone.
 - On an MLX telephone with a DSS attached, all LEDs light and the phone rings throughout the test.
 - On an MLX display telephone, the display blanks out and is replaced with a grid of small dots.
- ▶ **3. Press each line/feature button (two LEDs each).**
The red and green LEDs should toggle on and off.
- ▶ **4. Press each fixed-feature button that has an LED (Feature, HFAI, Mute, and Speaker).**
Each LED should toggle on and off.

 NOTE:

Mute and **Speaker** LEDs may not toggle consistently because they are managed by the control unit *and* the telephone.

- ▶ **5. Press each fixed-feature button that does not have an LED (Transfer, Conf, Drop, and Hold) and each dialpad button.**
When you press each one of these buttons, the Message LED should toggle on and off.
- ▶ **6. Press the fixed-feature buttons and the dialpad buttons in the order shown below to turn on all the LEDs.**
 - a. Volume down
 - b. Volume up
 - c. Transfer
 - d. Conf
 - e. Drop
 - f. Hold
 - g. Dial *123456789*0#*The LEDs should toggle on and off.
- ▶ **7. If the MLX telephone does not have a display, hang up and go to Step 9; if it does, continue with the next step.**
- ▶ **8. To test an MLX display, press each display button.**
Each button name should display in the upper-left corner as described in Table 3-2 below.
- ▶ **9. If any of these tests fail, replace the MLX telephone.**
- ▶ **10. Test the Multi-Function Module (MFM) if present.**
 - a. Connect a single-line telephone to the MFM.
 - b. Pick up the handset on the single-line telephone.
 - c. When you hear the system access or intercom dial tone, dial **09* from the single-line telephone.
This connects the diagnostic test tone to the B-channel.
 - d. Dial *123456789*0#*; wait for silence, and then quickly press the **Recall** button to perform a switchhook flash.
You should hear a confirmation tone (three beeps).
 - e. Hang up.
You should hear a ring burst, and the Message LED should turn on.

- f. Dial #54 to turn off the Message LED and resume normal operations.

► **11. If these tests fail, replace the MFM.**

Table 3-2. MLX Telephone Display Buttons

Button	Display
Home	HOME
Menu	MENU
More	MORE
Inspct	INSPECT
Each unlabeled display button	DISPLAY BUTTON <i>nn</i> ; where <i>nn</i> is 1–10, depending on which button you press.

System Requirements for Touch-Tone Receivers

The following symptoms indicate that the system needs more TTRs.

- Single-line telephone users do not get dial tone when they lift the handset to dial out.
- The voice messaging system fails to transfer calls.
- Calls fail to ring or go to coverage prematurely.

⇒ **NOTE:**

If these symptoms are present, use the following steps to calculate the system requirements for touch-tone receivers.

- **1. Determine the number of TTRs required for the voice messaging system (if present) from Table 3-3.**

- ▶ **2. Estimate the hourly call volume for calls originating from single-line telephones, incoming calls on remote access and Direct Inward Dial (DID) lines, and calls on tie lines.**
- ▶ **3. Use Table 3-4 to determine the number of TTRs required by the system.**
 - Use Column 2 if account codes are not being used.
 - Use Column 3 if account codes are being used.
- ▶ **4. Add the number of TTRs obtained in Steps 1 and 3.**
- ▶ **5. Use Table 3-5 to determine the number of TTRs already supplied.**
- ▶ **6. Compare the numbers obtained in Steps 4 and 5 to see if additional TTRs need to be added.**
- ▶ **7. Add a new module if indicated.**
See Installation.

A voice messaging system requires a certain number of TTRs, in addition to any system requirements for TTRs. The number of TTRs required by the voice messaging system depends on the number of ports used by the voice messaging system.

Table 3-3. TTRs Required by VMS

Number of VMS Ports	Number of TTRs Required
1	1
2	1
3	2
4	2
6	3
8	4
12	6

Table 3-4 estimates the total number of TTRs required in the system, based on call volume and whether the system uses account codes. The call volume in this table includes all calls originating from single-line telephones, calls on tie lines, incoming remote access and DID calls, and calls routed to the voice messaging system.

Table 3-4. System Requirement for TTRs

Calls/Hour	No Account Codes Used	Account Codes Used
110	2	4
180	4	4
350	4	4
420	6	8
610	6	6
710	8	8

The following modules supply TTRs for the MERLIN LEGEND Communications System.

Table 3-5. Modules with TTRs

Module	No. of TTRs
008 OPT	2
012	2
016	4
400 GS/LS	4
400	4
800 DID	2
800 LS-ID	2

Control Unit Problems

4

The next step, after resolving problems with telephones, adjuncts, and related wiring, is to troubleshoot the control unit. Troubleshoot the control unit components in the following order:

- Power supply
- Processor
- Line/trunk and extension modules (hereafter referred to as *modules*)
- Carrier



WARNING:

Beware of hazardous voltages. Only qualified technicians should attempt to service the control unit. Follow all procedures carefully.

Backing Up System Programming

Before performing any procedure that requires powering down the system, save system programming in one of the following ways:

- Save the system programming to a floppy disk. See *System Programming and Maintenance (SPM)* for detailed instructions.

- Save the system programming to a memory card (beginning with Release 3.0). See [Appendix D, "Backing Up with a Memory Card"](#), for detailed instructions. If automatic backups are performed, it may not be necessary to save system programming.

 NOTE:

If the processor module is not functioning, it may not be possible to back up system programming.

Power Supply Problems

If the power supply fails, all components connected to the carrier are automatically shut down.

Checking the Power Supply

If you suspect power supply failure, check the following:

- Power supply LED
- Interlocking post (on the carrier, behind the power supply)
- Ring generator, if present
- Auxiliary power unit(s), if present

 WARNING:

Never remove the power supply without first turning off the power switch and disconnecting the power cord from the AC outlet.

Use the following procedures to check the power supply.

Checking the LED

If the power supply's LED is off, check the power switch. If it is off, turn on the power switch for each power supply in the control unit. *Start with the rightmost carrier and end with the basic carrier.* Watch for the following responses:

- The green power LED should light on *each* power supply.
- The red LED on the processor should turn on for 15 to 45 seconds and then turn off.
- All indicators on the 100D, 800 NI-BRI, and 400EM modules (if present) should turn on and then off. They remain off when the modules are idle.

If any of these responses do not occur or if the console operator reports any problems, continue with "Checking the Interlocking Post" below.

Checking the Interlocking Post

If the power supply is not working, follow the steps below to check the interlocking post.

- ▶ 1. Follow Steps 1–4 in ["Replacing the Power Supply"](#), later in this chapter, to *remove* the power supply, then return to Step 2 below.
- ▶ 2. Check the small, cylindrical interlocking post on the carrier that locks into the power supply (see [Figure 4-1](#)).
If the post is broken, replace the carrier.

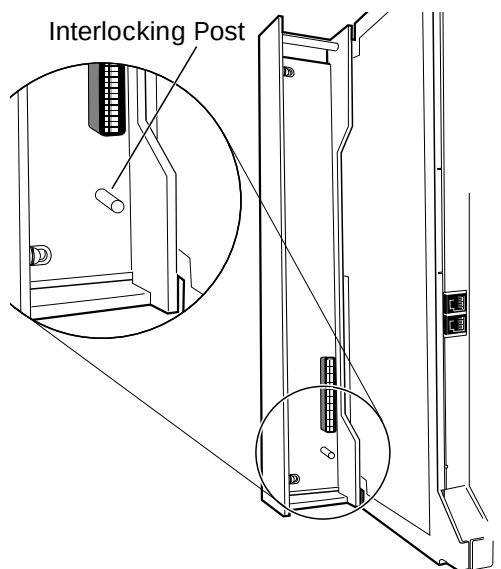


Figure 4-1. Power Supply Interlocking Post

- ▶ 3. If the interlocking post is not broken, *reinstall* the power supply; follow Steps 5–8 in [“Replacing the Power Supply”](#) later in this chapter.

Replacing the Ring Generator

If tip/ring devices (such as single-line telephones, fax machines, and answering machines) do not ring, and an older 012 module is installed, try the procedure below.

Current 012 modules contain built-in ring generators [apparatus code 517G13 (28) or higher letter]. If tip/ring devices connected to a newer module do not ring, see [“Module Problems”](#) later in this chapter. See [Table 4-1](#) below to determine which 012 module is installed.



NOTE:

All 016 modules contain built-in ring generators.

Table 4-1. PEC and Apparatus Codes for 012 Modules

012 Module	PEC	App. Code
with Ring Generator	61494	517G13 (28) or higher letter
Basic Telephone (without ring generator)	61487	517E13 or 517F13 or lower letter



WARNING:

Hazardous electrical voltages may be present if the following steps are not performed correctly.

To replace the ring generator, follow the steps below. Refer to [Figure 4-2](#) throughout the procedure.

- ▶ 1. Follow Steps 1–4 in [“Replacing the Power Supply”](#), later in this chapter, to *remove* the power supply. Then return to Step 2 below.
- ▶ 2. Place the power supply on its left side and remove the five screws.
- ▶ 3. Carefully turn the power supply over on its right side and then remove the top of the power supply housing.
- ▶ 4. Detach the cables from the inside edge of the plastic housing by removing them from the clips.
- ▶ 5. Disconnect the 4-pin cable from the header labeled P202 on the left side of the power supply circuit board.
You may need to pry back the clip to free the cable.

- ▶ **6. Disconnect the other cable from the header labeled P101 on the right side of the power supply circuit board.**
You need to grip this cable firmly and pull forcefully.
- ▶ **7. Remove the four screws from the ring generator, as shown in [Figure 4-2](#).**
- ▶ **8. Remove the ring generator.**
- ▶ **9. Position the replacement ring generator, as shown in [Figure 4-2](#). Align the screw holes.**
Make sure the P1 header on the ring generator is on the same side of the power supply housing as the P101 header on the circuit board.
- ▶ **10. Replace the four screws and fasten them to secure the ring generator.**
- ▶ **11. Connect one end of the new ring generator's cable with the 3-pin connectors to the header labeled P101 on the power supply circuit board.**
This cable connector, as with all four of the cable connectors, is keyed so that you cannot attach it to the header if it is turned the wrong way.
- ▶ **12. Connect the other end of the cable to the header labeled P1 on the ring generator.**
The cable headers, P1 and P101, should be on the same side of the housing, so that the cables are not crossing each other.
- ▶ **13. Connect one end of the new 4-pin cable to the header labeled P202 on the power supply circuit board.**
- ▶ **14. Connect the other end of the cable to the header labeled P2 on the ring generator.**
- ▶ **15. Attach the cables to the clips on the inside edge of the plastic housing.**
- ▶ **16. Replace the top of the module housing.**
Take time to ensure that the on/off faceplate on the front of the power supply housing is aligned and inside the top cover.
- ▶ **17. Carefully, taking time to make sure the on/off faceplate stays aligned, turn the module over and replace the five screws.**

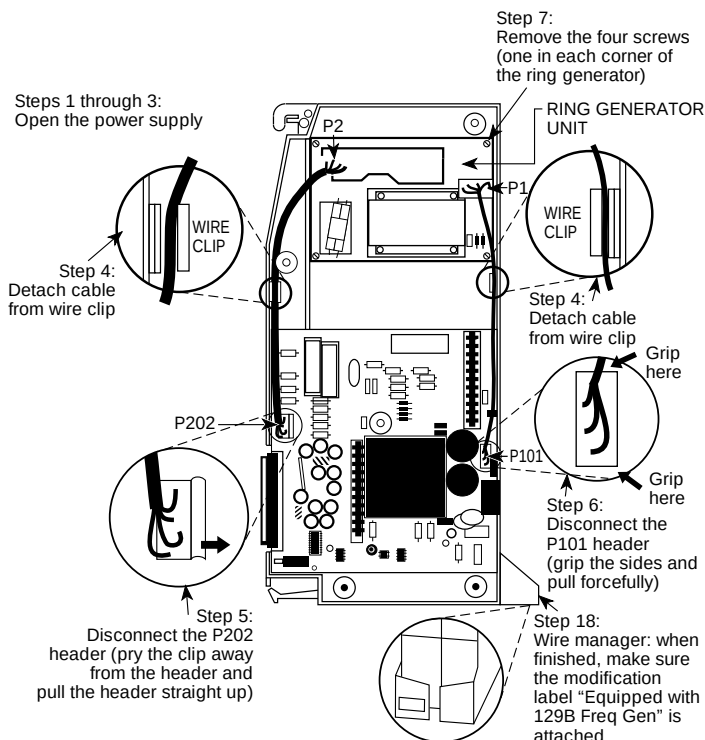


Figure 4-2. Replacing a Ring Generator

- **18. Verify that the modification label (Equipped with 129B Freq Gen) is attached to the front of the power supply (shown in [Figure 4-2](#)).**
If not, attach the label supplied with the new ring generator.
- **19. Reinstall the power supply; follow Steps 5–8 in [“Replacing the Power Supply”](#), later in this chapter.**

Replacing Auxiliary Power Units

Follow this procedure if any of the following symptoms occur:

- The LEDs on the multiline telephones that are connected to the last two modules in the carrier do not light.
- The last two slots in the carrier do not have power.
- The power supply LED is off.

To replace the auxiliary power unit, follow the steps below. Refer to [Figure 4-3](#) throughout this procedure.

- ▶ 1. Make sure the switch on the power supply module is turned off.
- ▶ 2. Unplug the power supply and the auxiliary power unit from the AC outlet.
- ▶ 3. Disconnect the cord from the AUX POWER INPUT jack on the power supply module.
- ▶ 4. Remove the auxiliary power unit (with the two cords still attached).
- ▶ 5. Mount the replacement auxiliary power unit in place of the old one.
- ▶ 6. Plug the power unit line cord into the J2 DC OUTPUT jack on the replacement auxiliary power unit.
- ▶ 7. Plug the other end of the power unit line cord into the AUX POWER INPUT jack on the power supply.

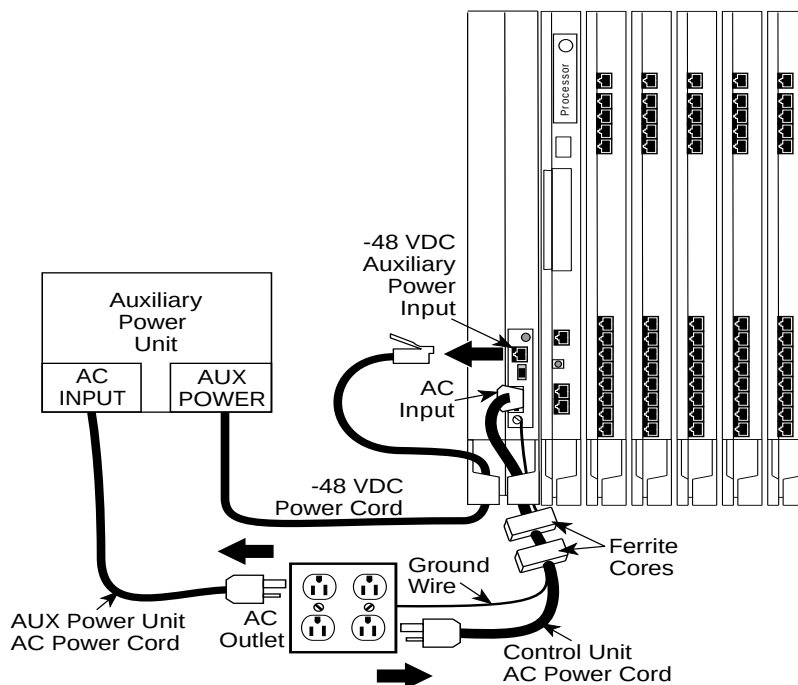


Figure 4-3. Replacing an Auxiliary Power Supply



CAUTION:

Do not plug the power supply or the auxiliary power unit into the AC outlet until you are ready to turn on the system, as described in "Powering Up the System" in Chapter 2 of Installation.

Do not attach the power cord(s) to any building surfaces.

Replacing the Power Supply



WARNING:

Beware of hazardous voltages; whenever the carrier connections are exposed, use extreme caution; do not touch them directly or with any type of tool. Follow all procedures carefully.

To remove the power supply module, follow the steps below.

► **1. If possible, back up system programming on a memory card (Release 3.0 or later only) or floppy disk.**

See *System Programming and Maintenance (SPM)* for information about backing up to a floppy. For information about backing up to a PCMCIA memory card, see [Appendix D, "Backing Up with a Memory Card"](#). If the basic carrier's power supply fails, you cannot back up system programming.

► **2. Power down the system.**

- a. Turn off the power supply in the basic carrier.
- b. Turn off the power supply in each expansion carrier.
- c. Unplug the auxiliary power unit, if present, from the AC outlet.

► **3. Unplug the system from the AC outlet.**

► **4. Remove the power supply.**

- a. Unplug the AC power cord from the power supply.
- b. Remove the ground wire attached to the grounding screw on the front of the power supply module.
- c. Remove the two ferrite cores, if present, from around the AC power cord and ground wire.
- d. Remove the power supply module.

To replace the power supply module, follow the steps below and refer to [Figure 4-3](#).

- ▶ **1. Insert a new power supply.**
 - a. Reinstall the power supply module by hooking the top into the basic carrier and then swinging it down into place. Push the lower end firmly until the locking tab clicks.
 - b. Replace the ferrite cores around the AC power cord and ground wire and slide the ferrite cores between the wire manager and the power supply module.
 - c. Attach the ground wire to the grounding screw.
- ▶ **2. For each power supply and auxiliary power unit, connect the AC power cord to the connector marked AC INPUT on the power supply.**
- ▶ **3. Plug the other end of each AC power cord into the AC outlet.**
- ▶ **4. Power up the system by turning on the components listed below in the order given.**
 - a. Power supply on each expansion carrier
 - b. Power supply on the basic carrier

The system automatically cold starts.



CAUTION:

Do not plug the power supply or the auxiliary power unit into the AC outlet until you are ready to turn on the system, as described in "Powering Up the System" in Chapter 2 of Installation.

Do not attach the power cord(s) to any building surfaces.

Processor Problems

If the error logs (or any aspect of troubleshooting) indicate that the processor is the problem, back up system programming if possible. See *System Programming and Maintenance (SPM)* for instructions on backing up to a floppy disk. See [Appendix D, “Backing Up with a Memory Card”](#), for instructions on backing up to a PCMCIA memory card.

Call your technical support organization for troubleshooting instructions.

- If you are instructed to perform Peek, Poke, or System Erase, refer to the appropriate section below. *Do not perform any of these procedures unless you are instructed to do so.*
- If you are instructed to replace the processor, see [“Replacing the Processor Module”](#) later in this chapter.

Peek

Peek is a demand test that allows you to examine but not change system memory.



CAUTION:

Do not perform Peek unless you are following instructions from your technical support organization.

Summary

Console Procedure

Menu→Maintenance→Slot→Dial
00→Enter→Demand→Test→Peek→Dial
Address→**More**
[F6]→[F2]→Type 00→[F2]→[F1]→Type
Address→[PgUp]

PC Procedure

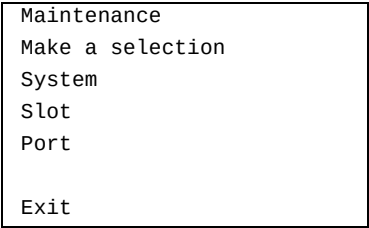
To perform Peek, follow the steps below.

Console Display/Instructions

Additional Information

PC

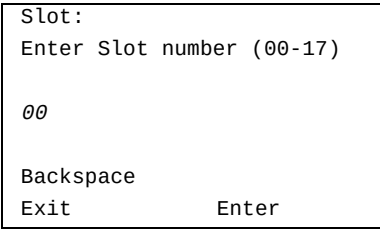
- **1. From the Maintenance menu, select the Slot option.**



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- **2. Specify Slot 00.**



```
Slot:
Enter Slot number (00-17)

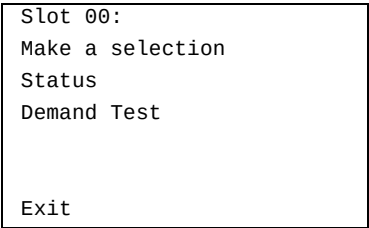
00

Backspace
Exit      Enter
```

Dial or type 00, then select Enter.

F10

- **3. Select the Demand Test.**



```
Slot 00:
Make a selection
Status
Demand Test

Exit
```

F2

Console Display/Instructions

Additional Information

PC

► 4. Select the Peek option.

```
Demand Test Slot 00:
Make a selection
Peek
[Poke]
[System Erase]

Exit
```

Poke and System Erase are not displayed, which prevents customers from accidentally changing the processor memory.

F1

► 5. Dial a memory address.

```
Slot 00 Enter Hex
Address:
nnnnnnnn      Enter
Backspace      Exit
A              B
C              D
E              F
```

Dial [nnnnnnnn], then select Enter.

F6

The screen below shows the details of the address you specified.

```
Peek Address0xaaaaaaaa>

0xaaaa      0xaaaa
0xaaaa      0xaaaa
0xaaaa      0xaaaa
0xaaaa      0xaaaa
Exit
```

aaaaaaaa = address entered in Step 5.

Press the More button to review the next address.

PgUp

Poke

CAUTION:

Do not perform Poke unless you are following instructions from your technical support organization.

Summary

Console Procedure	Menu →Maintenance→Slot→Dial the slot no.→Enter→Reset→Yes.
PC Procedure	F6 → F2 →Type the slot no.→ F10 → F7 → F1

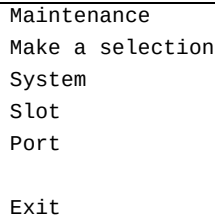
To perform Poke, follow the steps below.

Console Display/Instructions

Additional Information

PC

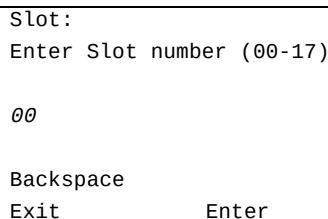
► 1. From the Maintenance menu, select the Slot option.



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

► 2. Specify Slot 00.



```
Slot:
Enter Slot number (00-17)

00

Backspace
Exit          Enter
```

Dial or type 00, then select Enter.

F10

Console Display/Instructions

Additional Information

PC

► 3. Select the Demand Test.

```
Slot 00:  
Make a selection  
Status  
Demand Test  
  
Exit
```

F2

► 4. Select Poke two times.

```
Demand Test Slot 00:  
Make a selection  
Peek  
[Poke]  
[System Erase]  
  
Exit
```

Poke and System Erase are not displayed, which prevents customers from accidentally changing the processor memory.

Press the Poke button (the left button for Line 4) twice.

F2

F2

► 5. Select Continue.

```
Poke - WARNING!! SYSTEM  
MEMORY WILL BE MODIFIED!  
Continue  
Cancel  
  
Exit
```

F1

► 6. Follow the instructions from your technical support organization to select a memory address.

```
Slot 00 EnterHexAddress:  
aaaaaaaa  
  
Enter  
Backspace Exit  
A B  
C D  
E F
```

Console Display/Instructions

Additional Information

PC

- 7. Follow the instructions from your technical support organization to modify the contents of the address entered in Step 6.

0xaaaaaaaa Enter data:	
aa	
	Enter
Backspace	Exit
A	B
C	D
E	F

System Erase (Frigid Start)



CAUTION:

Do not perform a System Erase unless you are installing a replacement processor or following instructions from your technical support organization. This procedure erases all system programming from the processor and resets the system to factory defaults.

Summary

Console Procedure	Menu →Maintenance→Slot→→Dial 00→Enter→Demand Test→System Erase (Line 5, left button)→System Erase (Line 5, left button)→Yes
PC Procedure	F6 → F2 →Type 00→ F2 → F3 → F3 → F2
Preparation Time	Approximately 1 minute

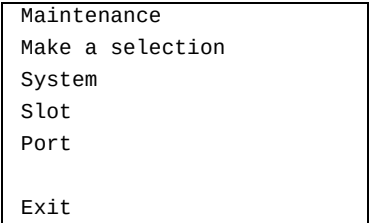
To perform a System Erase (Frigid Start), follow the steps below.

Console Display/Instructions

Additional Information

PC

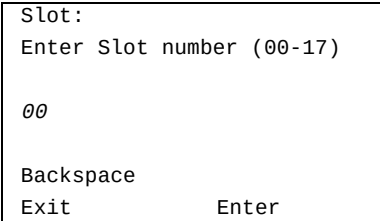
- **1. From the Maintenance menu, select the Slot option.**



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- **2. Specify Slot 00.**



```
Slot:
Enter Slot number (00-17)

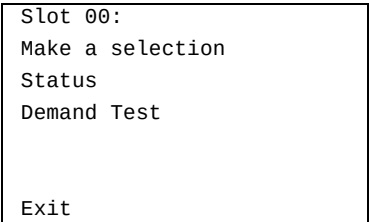
00

Backspace
Exit          Enter
```

Dial or type 00, then select Enter.

F10

- **3. Select the Demand Test.**

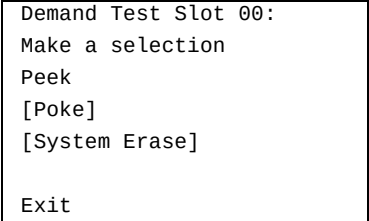


```
Slot 00:
Make a selection
Status
Demand Test

Exit
```

F2

- **4. Select System Erase twice.**



```
Demand Test Slot 00:
Make a selection
Peek
[Poke]
[System Erase]

Exit
```

Poke and System Erase are not displayed, which prevents customers from accidentally changing the processor memory.

Press the System Erase button
(the left button for Line 5) twice.

F3

F3

Console Display/Instructions

Additional Information

PC

► 5. Select Yes.

Slot 00 System Erase:
System will be down...
Do you want to continue?
Yes
No

Exit

F2

System Erase:
Full-default Restarting

Forced Installation/Upgrade of System Software



CAUTION:

Forced installation should be performed only under emergency situations in which on-board system software has been corrupted.

All existing system programming will be erased by this procedure.

Beginning with Release 3.0, the system software can be installed or upgraded through the PCMCIA interface slot on the processor module. Use the following procedure when:

- System software becomes corrupted. Attempt to reinstall software with a Forced Installation memory card. If that does not solve the problem, replace the processor module.

- Upgrading to a later release of system software.

Summary

Console Procedure	Menu →Maintenance→System→ Upgrd/Instll→Exit→Exit→Yes
PC Procedure	F6 → F1 → F5 → F2

► 1. Back up system programming.

To back up system programming onto a floppy disk, see *System Programming and Maintenance (SPM)*. To back up onto a memory card, see [Appendix D, “Backing Up with a Memory Card”](#). If the processor or system software is not working, you may not be able to back up system programming. If the system has been programmed to perform automatic backups, use the latest backup file to restore programming. See Step 12.

► 2. Insert a Forced Installation or Upgrade memory card into the PCMCIA interface slot on the processor module.

See [Figure 4-4](#).

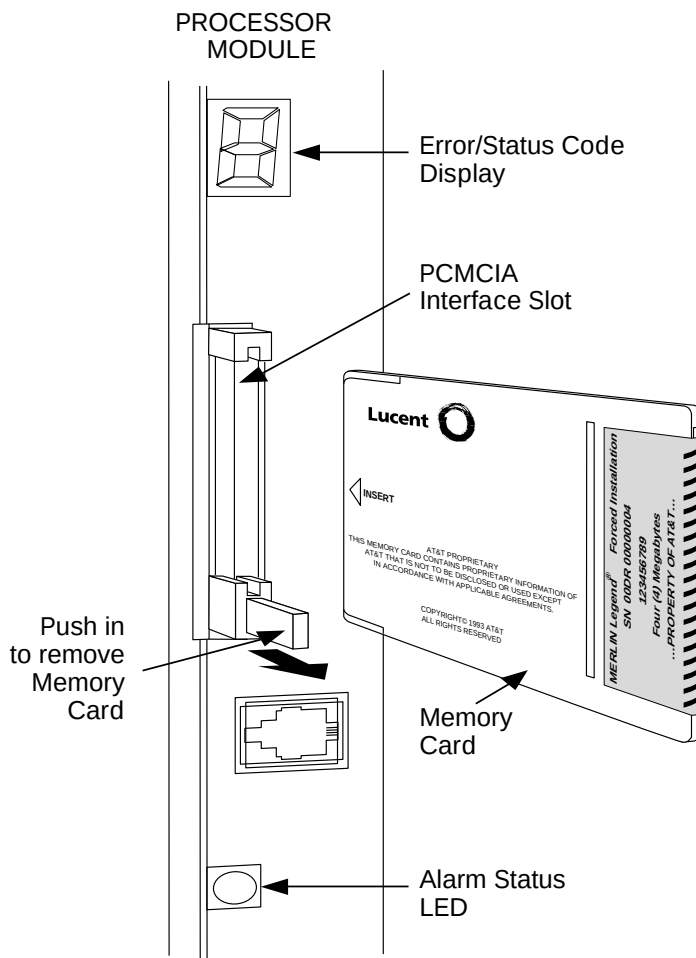


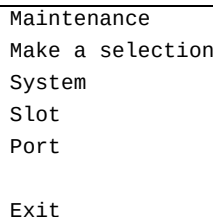
Figure 4-4. Inserting a Memory Card

Console Display/Instructions

Additional Information

PC

► 3. Initiate the software installation.



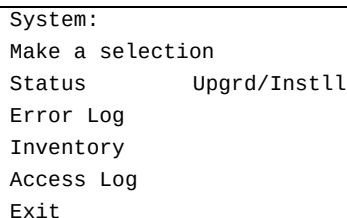
Maintenance
Make a selection
System
Slot
Port

Exit

F1

- If the maintenance screens are functioning correctly, select System from the Maintenance menu. Continue with Step 4.
- If maintenance screens are unreliable or not available, power cycle the system by turning off the system and leaving it off for at least one second. Turn the system back on. The system boots from the memory card and automatically starts the installation software. Go to Step 11.

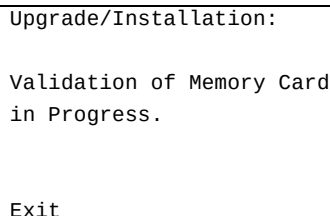
► 4. Select Upgrade/Install.



System:
Make a selection
Status Upgrd/Instll
Error Log
Inventory
Access Log
Exit

F6

► 5. Observe the memory card validation screens.



Upgrade/Installation:

Validation of Memory Card
in Progress.

Exit

Console Display/Instructions

Additional Information

PC

Upgrade/Installation:

Validation of Memory Card
Successfully Completed.

Exit

F5

When completed, select Exit to continue.

- **6. Verify that the memory card or release number is the required one, and select Exit to continue.**

Upgrade:

MemCard Rel: 4.y Vnn.mm
Current Rel: 4.y Vnn.mm
Releases are compatible.

Exit

F5

If the releases are incompatible, the following screen appears.

Upgrade:

MemCard Rel: 4.y Vnn.mm
Current Rel: 4.y Vnn.mm
Incompatible releases.

Exit

F5

See [“Other Error Conditions”](#), following this section, for continuing instructions.

Console Display/Instructions

Additional Information

PC

- **7. If the release number is the one you want, select Yes.**

Upgrade/Installation:
System will be down ...
Do you want to continue?
Yes
No

Exit

F2

- **8. If the forced installation is attempted while a line/trunk or extension is busy, the following screen appears.**

System Busy - Pls Wait

Dial Code:xxxx S/P:ss/pp

Exit

F5

- **9. Observe the progress screen and the error/status display LED on the processor module.**

Upgrade/Installation:
Upgrade/Installation
In Progress.

The error/status LED should show a flashing L during installation of system software. Upon successful completion, the system performs a frigid start (System Erase). While the frigid start is in progress, an F shows on the error/status display.

If the installation of system software was unsuccessful, an error code is displayed and the system may not function. See [Table 4-2](#) and [“Error Conditions During Forced Installation”](#).

- ▶ **10. Remove the memory card from the interface slot.**
- ▶ **11. Verify that system software has been correctly installed and that the default system programming is present.**

No error condition is displayed on the error/status display.

- ▶ **12. Restore system programming.**

After about 10 minutes, check to see if the RED alarm status LED is lit. If it is not, the installation was successful. If the LED is lit, check the error log for the following:

SYS software ROM failure

This indicates a ROM failure and unsuccessful installation.

If the forced installation was performed due to corrupted system software, it is possible that the backup of system programming might also be corrupted. Verify that the error condition that required a forced installation of software is not still present.

Error Conditions During Forced Installation

The error code/status display on the processor module or the maintenance screen informs you of problems during or after a forced installation. See [Table 4-2](#) for error codes displayed. Also see the screens following the table for errors displayed on the maintenance console or PC.

The following error conditions can occur only during or immediately after a forced installation. Instructions for recovery follow the description of each error condition.

Table 4-2. Codes Displayed on the Error/Status Display During Forced Installation

Code	Meaning	Action
L	Upgrade is in progress	No action required.
U	Install is in progress	No action required.
2	Incorrect memory card type	Insert correct memory card and repeat forced installation procedure.
4	Memory card corrupted	Insert new memory card and repeat forced installation procedure.
3	Incorrectly inserted or missing memory card	Insert memory card correctly and repeat forced installation procedure.
7	Bad processor board	Check that memory card is inserted correctly and try installation again. If it fails again, replace the processor module.
9	Unknown	Try installation again with a new memory card. If it fails again, contact your technical support organization.

 NOTE:

Certain conditions force the system to retry the forced installation. The dot on the error code/status display becomes lit at the start of the first retry. (Look carefully; the dot may be hard to see.)

Missing Card or Card Not Inserted Correctly

Upgrade/Installation:
Verify that Memory Card
has been installed
correctly.

Exit

Insert the memory card correctly; then select Exit and begin the forced installation procedure again.

Memory Card Is Wrong Type

Upgrade/Installation:
Memory Card is not the
correct type.
Remove and insert MERLIN
LEGEND Upgrade or
Installation Memory Card
Exit

Select Exit and repeat the forced installation procedure with a new memory card.



NOTE:

Forced installation can be performed successfully with an upgrade memory card only if the installation is performed through the maintenance screens.

Memory Card Is Corrupted

Upgrade/Installation:
Information on the
Memory Card is corrupted.
Please remove the Memory
Card.

Exit

Select Exit and repeat the forced installation procedure with a new memory card.

System Busy

If the forced installation is attempted while a line/trunk or extension is busy, the following screen appears.

System Busy - Pls Wait

Dial Code:xxxx S/P:ss/pp

Exit

When all lines/trunks or extensions are freed, the installation continues. Select Exit to return to the System menu and cancel the installation. If system software is corrupted, system maintenance may not provide an accurate indication of busy lines/trunks or extensions. If this seems to be the case, verify that the listed extensions are truly not busy; then perform the installation by power-cycling the system. See Step 3 of this procedure.

Other Error Conditions

The following error conditions may not be viewed on the error code/status display or the maintenance screens.

Power Cycle During Installation

The system automatically begins the installation procedure again. If the power source is unreliable, it is possible for the installation procedure to retry indefinitely. See ["Power Supply Problems"](#) or Chapter 2 of *Installation* for details on providing a reliable power source.

Removal of Memory Card During Installation

The system is in an indeterminate state. Re-initiate the forced installation by power-cycling the system after inserting the memory card.

Incompatible Releases

If releases are incompatible, see *System Programming and Maintenance (SPM)* for instructions on converting the system programming before upgrading to the new release.



CAUTION:

If releases are incompatible, pressing the hidden key deletes existing programming. Before pressing the hidden key, make a backup of the system programming. Use SPM or a PCMCIA translation card.

Console Display/Instructions

Additional Information

PC

If the releases are incompatible, the following screen appears.

```
Upgrade:
MemCard Rel: 4.y Vnn.mm
Current Rel: 4.y Vnn.mm
Incompatible releases.

Exit
```

Pressing hidden key two times
deletes existing program.

F5

See SPM for instructions on converting the system programming before upgrading to the new release.

If hidden key is pressed, the following screen appears.

Installation:

MemCard Rel: 4.y Vnn.mm

Current Rel: 4.y Vnn.mm

All translations will be
DELETED

Exit

F5

Replacing the Processor Module

A failed processor module must be replaced immediately.

To replace the processor module, follow the steps below.

- ▶ **1. If possible, save system programming.**
See [Appendix D, "Backing Up with a Memory Card"](#). To back up onto a floppy disk, see *System Programming and Maintenance (SPM)*.
- ▶ **2. Power down the system.**
 - a. Turn off the power supply on the basic carrier.
 - b. Turn off the power supply on each expansion carrier.
 - c. Unplug the auxiliary power units (if present) from the AC outlet.
- ▶ **3. Unplug the D8W cord(s) connecting the SMDR printer and/or system programming PC.**
- ▶ **4. Remove the processor module.**
- ▶ **5. Inspect the processor module for any visible problems.**
- ▶ **6. Inspect the carrier.**
- ▶ **7. For Release 3.0 and later, skip to Step 8. For Release 2.1 and earlier, install a feature module in the new processor.**
Use the feature module from the old processor if it appears to be functioning correctly; otherwise, install a new feature module. See ["Replacing the Feature Module"](#) that follows this section.
- ▶ **8. Install the new processor module.**
- ▶ **9. Power up the system.**
 - a. Plug the auxiliary units (if present) into the AC outlet.
 - b. Turn on the power supply on each expansion carrier.
 - c. Turn on the power supply on the basic carrier.

The system automatically cold-starts.
- ▶ **10. Perform a System Erase (frigid start).**
See ["System Erase \(Frigid Start\)"](#) above for instructions.
- ▶ **11. Restore system programming using one of the following:**

- The backup floppy disk or original system programming disk. See *System Programming and Maintenance* for instructions.
 - The backup memory card or original system programming memory card (Release 3.0 and later). See [Appendix D, "Backing Up with a Memory Card"](#), for instructions.
- **12. Reconnect the D8W cord(s) connecting the SMDR printer and/or system programming PC.**
- **13. Attach a tag to the old processor.**
Use the tag to identify any visible problems and relevant error reports.

Replacing the Feature Module

NOTE:

This section applies only to releases earlier than Release 3.0.

CAUTION:

Make sure that you have a backup of system programming before replacing the feature module. See ["Backing Up System Programming"](#).

To replace the feature module, follow the steps below.

- **1. Make sure system power is off.**
- **2. Remove the processor from the carrier.**
- a. Press up on the tab on the bottom rear of the module.
 - b. Pull the bottom of the module away from the carrier.
 - c. Lift upward to disengage the module from the rod on the top of the carrier.
- **3. Place the processor on a flat surface.**

- ▶ 4. Grasp both metal rings on the outside of the feature module and pull straight up.



CAUTION:

Grasping only one of the rings may cause damage to components on the processor circuit board or feature module.

- ▶ 5. Check the **HDR4** header on the processor circuit board for proper mode operation. (For more information about modifying the mode, see Chapter 2 of *Installation*.)

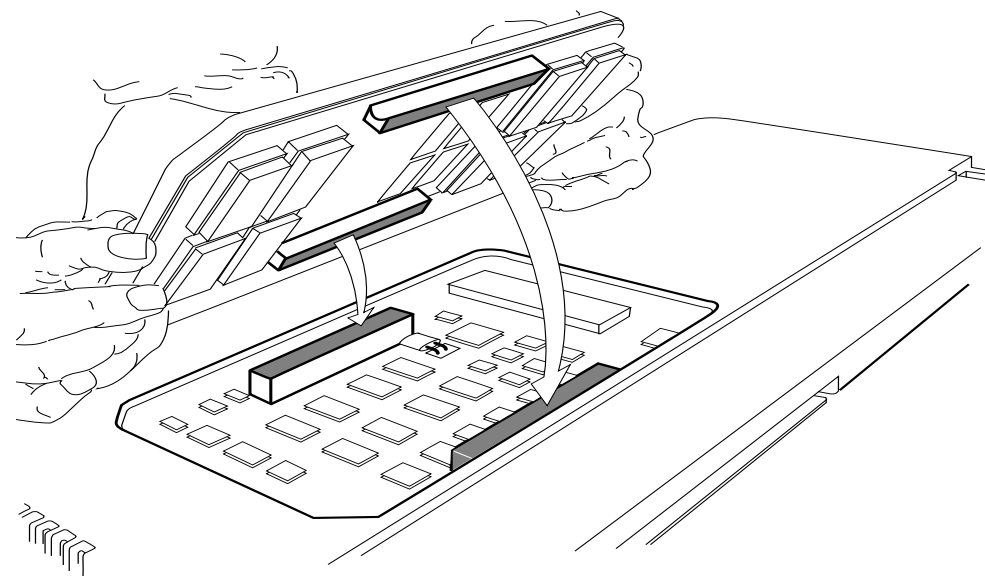


Figure 4-5. Replacing the Feature Module

- ▶ 6. Align the connectors on the new feature module with the connectors in the processor (see [Figure 4-5](#)).
- ▶ 7. Firmly press the new feature module into the processor.
- ▶ 8. Insert the processor back into the carrier. (For more information about inserting the processor, see Chapter 2 of *Installation*.)

Module Problems

If you suspect that a module is faulty, do the following:

- To identify the cause of module errors, run the module tests described below.
- To determine whether the module is faulty, replace it with a module of the same type. If the errors cease, the problem is solved.

Module Tests

The module tests in this section identify the cause of module malfunctions. After each module test, record any errors on the repair tag that will be shipped with the faulty module. If the module is sent for repair, this helps repair personnel troubleshoot the cause of the malfunction.

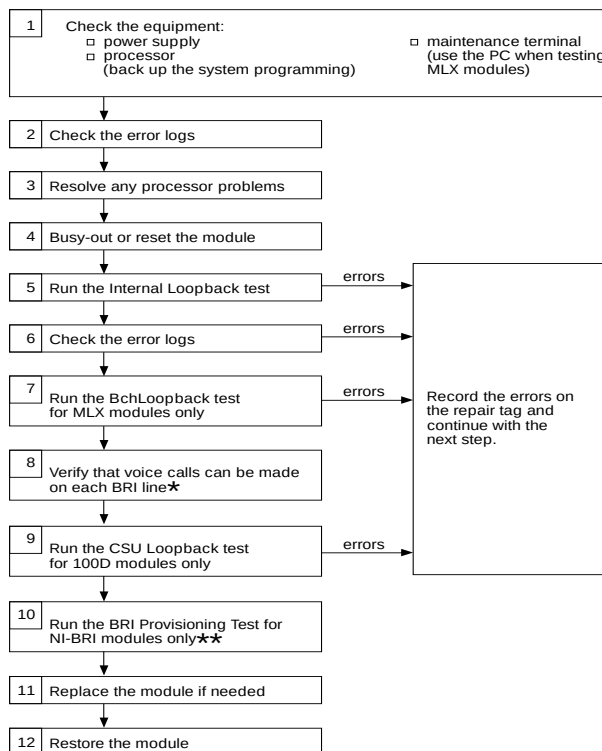
You should read through the following section, "Module Test Process," before running any module tests.

NOTE:

A module on which you run tests cannot be used for service. Because your customer depends on this service, run module tests during off hours, if possible. If you cannot, minimize the time required for each module's downtime whenever possible.

Module Test Process

[Figure 4-6](#) shows the module test process. Refer to it and the text that follows for the recommended approach to testing modules.



- * If any problem arises with the voice call on an NI-BRI module, run the NI-BRI Provisioning Test next. While the BRI test is running, you can run the voice test on the next module.
- ** Run the NI-BRI Provisioning Test on any NI-BRI module that is going to be used for data calls or that had a problem with voice calls and was not previously tested with the tool.

Figure 4-6. Module Test Process

Considerations

Review the following items before you begin a module test procedure.

System Components

Before running a module test, make sure the following system components are working:

- **Power supply**
- **Processor.** Save the system programming onto a floppy disk. See *System Programming and Maintenance (SPM)*. To back up onto a memory card, see [Appendix D, "Backing Up with a Memory Card"](#).
- **Maintenance Terminal** (MLX-20L console or PC). To run tests on the MLX module connected to the MLX-20L console, you must run the test from the PC, not from the MLX-20L console.

Busy-Out/Reset

Before running a module test, busy-out or reset the modules. Busy-Out is the best method, but it will not work if any line or extension is on a stable call. See ["Busy-Out and Reset"](#), later in this chapter, for more information on these features.

Test Notes

For each test, you should note the following:

- When beginning the board controller test or the internal loopback module test, choose to run it once or repetitively.
- You can interrupt any module test by selecting Exit (**F5**) on the PC).
- A module test can fail for one of the following reasons:
 - The module being tested was not busied-out. Exit the test, busy-out the module, and try again.
 - The error messages indicate that the module is faulty.

- If errors indicate that the module is faulty, record them on the module repair tag immediately after running the test.

 NOTE:

If the system does not recognize a 408 GS/LS-MLX module during testing, check the release number of the system. The 408 GS/LS-MLX module does *not* work with Releases 1.0 or 1.1. An 008 MLX module *must* be used to provide extension jacks with Releases 1.0 or 1.1.

To run a module test, follow the steps below.

- ▶ **1. To determine which modules are suspect, read the error logs and review any user-reported problems.**
- ▶ **2. If the error logs indicate the processor is the problem, refer to [“Processor Problems”](#), earlier in this chapter, to service the processor before continuing.**
Replacing a faulty processor may resolve module problems.
- ▶ **3. Busy-out or reset the module.**
See [“Busy-Out and Reset”](#) for general guidelines.
- ▶ **4. Run the internal loopback test.**
See [“Internal Loopback Test”](#), later in this chapter. If errors occur, record them as described in “Considerations” above.
- ▶ **5. Run the board controller test.**
See [“Board Controller Test”](#), later in this chapter. If errors occur, record them as described in “Considerations” above.
- ▶ **6. For MLX modules (008 MLX and 408 GS/LS-MLX) and 800 NI-BRI modules, continue with the B-Channel Loopback test.**
See [“B-Channel Loopback Test”](#), later in this chapter. If errors occur, record them as described in “Considerations” above.
- ▶ **7. For 800 NI-BRI modules, continue with the NI-1 BRI Provisioning Test.**
See [“800 NI-BRI Module Problems”](#) later in this chapter. If errors occur, record them as described in “Considerations” above.

- ▶ **8. For 100D modules, continue with the CSU loopback test.**
See "[100D Module Problems](#)" later in this chapter. If errors occur, record them as described in "Considerations" above.
- ▶ **9. Replace the module with a module of the same type, whether you are troubleshooting or replacing the module permanently.**
- ▶ **10. Restore the module.**

Menu→Maintenance→Slot→Dial the slot no.→Restore→Yes

Restoring automatically undoes the busy-out and reset. For additional information on restoring a module, see "[Restore](#)", later in this chapter.

Persistent Module Problems

If any of the module tests fail and replacing the module does not clear the trouble, then:

- Several modules may be faulty.
- The connector on the carrier may be faulty.

Busy-Out and Reset

Before running any module test, be sure to busy-out or reset the module.

- Busy-out discontinues service from the module being tested to each line and extension only as they become idle. Busy-out is the preferred method, because it does not disrupt calls in progress.
- Reset discontinues service to all lines and extensions on the module instantly.
 - In-progress calls are dropped if all of the calling parties on the call originate and terminate on the module being reset.

- If a call is using a line or extension on the module being Reset and another line and/or extension is involved in the call, the call on the module being reset is put on hold. In this case, the module can be removed and replaced. However, a demand test cannot be performed, because the module is not busied-out.
- Check the status of the reset module before performing a demand test.

Menu→Maintenance→Slot→Status

Once you finish testing a module, you must restore it. Restoring a module terminates the Busy-out or Reset condition. See [“Restore”](#), later in this chapter, for instructions.

Busy-Out

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot
no.→Enter→Busy-Out→Yes.

PC Procedure

[F6]→**[F2]**→Type the slot no.→**[F10]**→**[F2]**→**[F1]**

Appropriate Modules

Any module that you are about to test

Time Estimate

Once all calls are terminated, the busy-out completes in less than 1 second. If calls in progress take too long, ask the callers to hang up.

To busy-out a module, follow the steps below.

Console Display/Instructions

Additional Information

PC

- 1. From the Maintenance menu, select the Slot option.

Maintenance
Make a selection
System
Slot
Port

Exit

[F2]

► 2. Specify the slot number (*nn* = 01 to 17).

Slot:	
Enter Slot number (00-17)	
<i>nn</i>	
Backspace	
Exit	Enter

Dial or type [*nn*] then select Enter.

F10

Console Display/Instructions

Additional Information

PC

► 3. Select Busy-Out.



Slot xx:
Make a selection
Status Demand Test
Busy-Out Reset
Restore Upgrade

Exit

xx = slot number entered in Step 2

F2

For all MLX modules, BChLoopback is also displayed as an option on this screen. For 100D modules, CSU- lpbk, Error Events, and Clock are also displayed as options on this screen. For all 800 NI-BRI modules, Clock, BChLoopback, and Provisioning are also displayed as options on this screen.

► 4. Select Yes.



Busy-Out Slot xx
Do you want to continue?
Yes
Cancel

Exit

xx = slot number entered in Step 2

F1

The screen below appears while the module is discontinuing service to lines/trunks and extensions, without disrupting calls in progress.

Busy-Out Slot xx:

Busy-Out in Progress

Exit

xx = slot number entered in Step 2

The screen below appears when the module is successfully busied-out.

Console Display/Instructions

Additional Information

PC

Busy-Out Slot xx:

xx = slot number entered in Step 2

Busy-Out Complete

Exit

The screen below appears when the busy-out fails. Try again, and be sure to specify the correct slot.

Busy-Out Slot xx:

xx = slot number entered in Step 2

Busy-Out FAILED

Exit

Reset

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot no.→Enter→Reset→Yes.

PC Procedure

[F6]→[F2]→Type the slot no.→[F10]→[F7]→[F1]

Appropriate Modules

Any module that you are about to test

Time Estimate

Less than 1 second (all calls in progress are terminated or put on hold immediately). If you do not want to interrupt calls in progress, use Busy-Out instead of Reset, as described above.

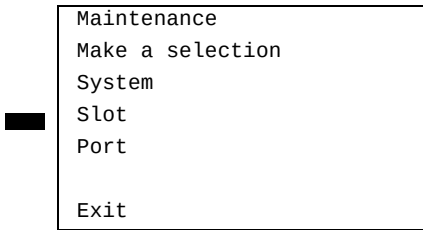
To reset the module, follow the steps below.

Console Display/Instructions

Additional Information

PC

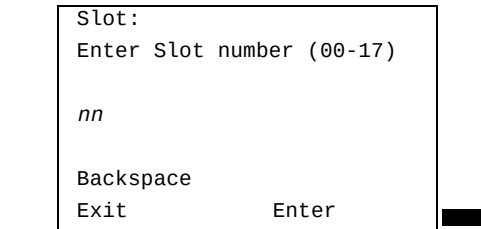
- **1. From the Maintenance menu, select the Slot option.**



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- **2. Specify the slot number (*nn* = 01 to 17).**



```
Slot:
Enter Slot number (00-17)

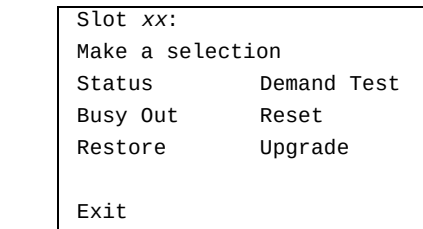
nn

Backspace
Exit          Enter
```

Dial or type [*nn*], then select Enter.

F10

- **3. Select Reset.**



```
Slot xx:
Make a selection
Status      Demand Test
Busy Out    Reset
Restore     Upgrade
Exit
```

xx = slot number entered in Step 2

F7

For all MLX modules, BChLoopback is also displayed as an option on this screen. For 100D modules, CSU-1pbk, Error Events, and Clock are also displayed as options on this screen. For all 800 NI-BRI modules, Clock, BChLoopback, and Provisioning are also displayed as options on this screen.

Console Display/Instructions

Additional Information

PC

► 4. Select Yes.



```
Reset Slot xx
Do you want to continue?
Yes
Cancel

Exit
```

xx = slot number entered in Step 2

F1

The screen below appears while the module is discontinuing service to lines/trunks and extensions. All calls in progress are being dropped.

```
Reset Slot xx:

Reset in Progress

Exit
```

xx = slot number entered in Step 2

The screen below appears when the module is successfully reset.

```
Reset Slot xx:

Reset Complete

Exit
```

xx = slot number entered in Step 2

The screen below appears when the Reset fails. Try again, and be sure to specify the correct slot.

Reset Slot xx:

Reset FAILED

Exit

xx = slot number entered in Step 2

Restore

Once you complete module testing, restore it to terminate the Busy-Out or Reset condition.

Summary

Console Procedure	Menu →Maintenance→Slot→Dial the slot no.→Enter→Restore→Yes.
PC Procedure	F6 → F2 →Type the slot no.→ F10 → F3 → F1
Appropriate Modules	Any module after testing it
Time Estimate	Less than 1 second.

To reset the module, follow the steps below.

Console Display/Instructions

Additional Information

PC

- 1. From the Maintenance menu, select the Slot option.

Maintenance

Make a selection

System

Slot

Port

Exit

F2

► **2. Specify the slot number (*nn* = 01 to 17).**

Slot:	
Enter Slot number (00-17)	
<i>nn</i>	
Backspace	
Exit	Enter

Dial or type [*nn*], then select Enter.

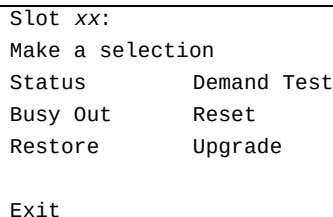
F10

Console Display/Instructions

Additional Information

PC

► 3. Select the Restore option.



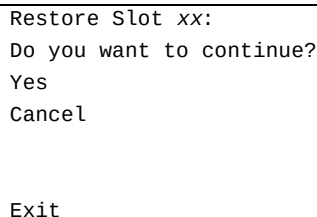
```
Slot xx:
Make a selection
Status      Demand Test
Busy Out    Reset
Restore     Upgrade
Exit
```

xx = slot number entered in Step 2

F3

For all MLX modules, BChLoopback is also displayed as an option on this screen. For 100D modules, CSU- lpbk, Error Events, and Clock are also displayed as options on this screen. For all 800 NI-BRI modules, Clock, BChLoopback, and Provisioning are also displayed as options on this screen.

► 4. Select Yes.



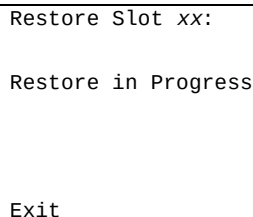
```
Restore Slot xx:
Do you want to continue?
Yes
Cancel

Exit
```

xx = slot number entered in Step 2

F1

The screen below appears while the module is restoring service to lines/trunks and extensions.



```
Restore Slot xx:

Restore in Progress

Exit
```

xx = slot number entered in Step 2

The screen below appears when the module is successfully restored.

Console Display/Instructions

Additional Information

PC

Restore Slot xx:

xx = slot number entered in Step 2

Restore Complete

Exit

The screen below appears when the Restore fails. Try again, and be sure to specify the correct slot.

Restore Slot xx:

xx = slot number entered in Step 2

Restore FAILED

Board Mismatch

Exit

Internal Loopback Test

This test checks communication between the processor and the module being tested. If you have not read "Module Test Process" above, do so before continuing.

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot no.→Enter→Demand Test→IntLoopback→Test Once or Test Repetitive.

PC Procedure

[F6]→[F2]→Type the slot no.→[F10]→[F6]→[F3]→[F2] or [F3]

Appropriate Modules

This test can be run on any module. The 100D module and the 408 GS/LS-MLX module each have two digital switch elements (DSEs); both DSEs are tested.

Time Estimate	It takes approximately 1.5 minutes to run each test. The 100D module and 408 GS/LS-MLX module each take approximately 3 minutes, because they each have two DSEs.
Busy-Out or Reset	Busy-out or reset the module being tested prior to beginning the test. Both Busy-Out and Reset are in the Slot menu, which you can access by doing the following from the console: Menu →Maintenance→Slot See "Busy-Out and Reset" , earlier in this chapter, for additional information.
Interrupting the Test	You can interrupt the test (both Test Once and Repetitive) by selecting Exit.
Test Failure	If the test fails, record the errors on the repair tag and replace the module.
Restore	Restore the module if it successfully completes all module tests and the errors no longer occur. Restore is in the Slot menu, which you can access by doing the following from the console: Menu →Maintenance→Slot See the "Restore" procedure, earlier in this chapter, for additional information.

To run the Internal Loopback Module Test, follow the steps below.

	Console Display/Instructions	Additional Information	PC
►	1. From the Maintenance menu, select the Slot option.		
■	Maintenance Make a selection System Slot Port Exit		F2

Console Display/Instructions

Additional Information

PC

► **2. Specify the slot number (*nn* = 01 to 17).**

```
Slot:
Enter Slot number (00-17)

nn

Backspace
Exit          Enter
```

Dial or type [*nn*], then select Enter.

F10

► **3. Select Demand Test.**

```
Slot xx:
Make a selection
Status          Demand Test
Busy Out        Reset
Restore         Upgrade

Exit
```

xx = slot number entered in Step 2

F5

For all MLX modules, BChLoopback is also displayed as an option on this screen. For 100D modules, CSU- lpbk, Error Events, and Clock are also displayed as options on this screen. For all 800 NI-BRI modules, Clock, BChLoopback, and Provisioning are also displayed as options on this screen.

► **4. Select Internal Loopback Test.**

```
Demand Test Slot xx:
Make a selection
Note:Busy out slot first
BoardCntrlr
IntLoopback

Exit
```

xx = slot number entered in Step 2

F3

Console Display/Instructions

Additional Information

PC

- 5. To run the test once or run it repeatedly, select **Test Once** or **Repetitive**.

```
Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Internal Loopback
Test Once
Repetitive

Exit
```

xx = slot number entered in Step 2.

Select **Test Once** or
Repetitive

F2

F3

The screen below appears while the test is running. At the same time, if the module has a green LED, it flashes.

```
Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Internal Loopback Test
in Progress

Exit
```

xx = slot number entered in Step 2

If you are running the repetitive test,
the screen remains until the test fails.
To interrupt repetitive testing, select
Exit.

F5

The screen below appears only if you selected **Test Once** and the module passes the test.

```
Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Internal Loopback Test
Successfully Completed

Exit
```

xx = slot number entered in Step 2

The screen below appears when either test (Test Once or Repetitive) fails.

Console Display/Instructions

```
Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Internal Loopback Test
FAILED
xxxxxxxxxxxxxxxxxxxxxxxx
xx xx xx xx xx xx xx xx
Exit
```

Additional Information

xx = slot number entered in Step 2

The 100D and 408 GS/LS-MLX module each have two DSEs. To display the second DSE's test results, press the **More** button.

PC



Lines 5 and 6 identify the cause of the failure or the number of errors found per port. There are up to 16 ports, numbered 0 through 15. Line 5 displays the results for ports 0 through 7; Line 6 is for ports 8 through 15.

Interpreting Test Results

If the test is successful, the module ports are free from error. Continue with the next module test or restore the module if you are through testing.

If the test fails, find the error message in [Table 4-3](#) and proceed as indicated.

Table 4-3. Internal Loopback Test Errors

Error Messages	Corrective Action
Slot is not busied-out	Exit the test, busy-out the slot, and try again.
Slot empty or not valid	Exit the test and try again; be sure to type the correct slot number. Do not indicate an empty slot or the processor (00).
FMWR not in Standby Mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Test running too long	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Not in TEST/STANDBY mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Any other error	Record the errors on the repair tag and replace the module.



NOTE:

Be sure to check the second screen if testing a 100D module or a 408 GS/LS-MLX module.

Restoring the Module

When you are finished running module tests, restore the module. See [“Restore”](#), earlier in this chapter.

Board Controller Test

This procedure tests the module's internal functions, such as ROM, RAM, the timer, dual-port RAM, and so on.

Summary

Console Procedure	Menu →Maintenance→Slot→Dial the slot number. →Enter→Demand Test→BoardCntrlr→Test Once or Repetitive.
PC Procedure	F6 → F2 → Type the slot no. → F10 → F6 → F3 → F2 or F3
Appropriate Modules	This test can be run on all modules except the processor.
Time Estimate	Less than 1 second
Busy-Out or Reset	Busy-out or reset the module being tested prior to beginning the test. Both Busy-Out and Reset are in the Slot menu, which you can access by doing the following from the console: Menu →Maintenance→Slot See “Busy-Out and Reset” , earlier in this chapter, for additional information.
Interrupting the Test	You can interrupt the test (Test Once or Repetitive) by selecting Exit.
Test Failure	If the test fails, record the errors on the repair tag and replace the module.
Restore	Restore the module if it successfully completes all module tests and the errors no longer occur. Restore is in the Slot menu, which you can access by doing the following from the console: Menu →Maintenance→Slot See the “Restore” procedure, earlier in this chapter, for additional information.

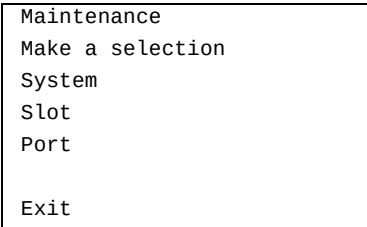
To run the Board Controller Module Test, use the following steps.

Console Display/Instructions

Additional Information

PC

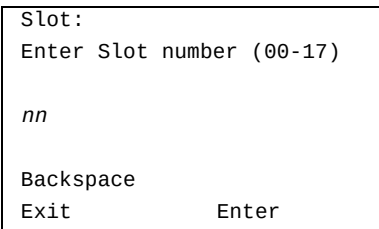
- **1. From the Maintenance menu, select the Slot option.**



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- **2. Specify the slot number (*nn* = 01 to 17).**



```
Slot:
Enter Slot number (00-17)

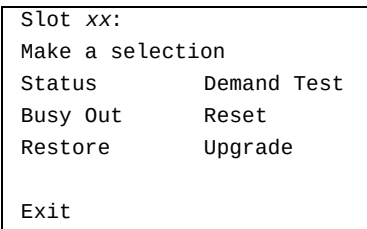
nn

Backspace
Exit          Enter
```

Dial or type [*nn*], then select Enter.

F10

- **3. Select Demand Test.**



```
Slot xx:
Make a selection
Status          Demand Test
Busy Out        Reset
Restore          Upgrade
Exit
```

xx = slot number entered in Step 2

F6

For all MLX modules, BChLoopback is also displayed as an option on this screen. For 100D modules, CSU-lpbk, Error Events, and Clock are also displayed as options on this screen. For all 800 NI-BRI modules, Clock, BChLoopback, and Provisioning are also displayed as options on this screen.

Console Display/Instructions

Additional Information

PC

► 4. Select the Board Controller Test.

```
Demand Test Slot xx:
Make a selection
Note:Busy out slot first
BoardCtrlr
IntLoopback

Exit
```

xx = slot number entered in Step 2

F2

► 5. Select Test Once or Repetitive.

```
Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Board Controller:
Test Once
Repetitive

Exit
```

xx = slot number entered in Step 2.

Select Test Once or
Repetitive

F2

F3

The screen below appears while the test is running. At the same time, if the module has a green LED, it flashes.

```
Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Board ControllerTest
in Progress

Exit
```

xx = slot number entered in Step 2

If you are running the repetitive test,
the screen remains until the test fails.
To interrupt repetitive testing, select
Exit.

F5

The screen below appears only if you selected Test Once and the module passes the test.

```
Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Board Controller Test
Successfully Completed

Exit
```

xx = slot number entered in Step 2

The screen below appears when either test (Test Once or Repetitive) fails.

```

Demand Test Slot xx:
Board aaaaaaaaaaaaaaaaaa
Board Controller Test
FAILED
xxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxx
Exit
  
```

xx = slot number entered in Step 2

Lines 5 and 6 show error messages.
 If there are more than two messages,
 select **More** to see them.

PgUp

Interpreting Test Results

If the test completes successfully, the module's board controller is functioning properly. Continue with the next module test or restore the module if you are finished testing. If the test fails, find the error message in [Table 4-4](#) and proceed as indicated.

Table 4-4. Board Controller Test Errors

Error Messages	Corrective Action
Slot is not busied-out	Exit the test, busy-out the slot, and try again.
Slot empty or not valid	Exit the test and try again; be sure to type the correct slot number. Do not indicate an empty slot or the processor (00).
FMWR not in Standby Mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Test running too long	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Not in TEST/STANDBY mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Any other error	Record the errors on the repair tag and replace the module.

Restoring the Module

When you are finished running module tests, be sure to restore the module. See [“Restore”](#), earlier in this chapter.

B-Channel Loopback Test

This test verifies that specific communication paths on the MLX or 800 NI-BRI modules are operational. If you have not read “Module Test Process” above, do so.

Summary

Console Procedure	Menu →Maintenance→Slot→Dial the slot no.→Enter→BchLoopback
PC Procedures	F6 → F2 →Type the slot no.→ F10 → F4
Appropriate Modules	This test can be run only on MLX or 800 NI-BRI modules.
Time Estimate	Approximately 1.5 minutes.
Busy-Out or Reset	Before beginning the test, busy-out or reset the module being tested. Both Busy-Out and Reset are in the Slot menu, which you can access by doing the following from the console: Menu →Maintenance→Slot See “Busy-Out and Reset” , earlier in this chapter, for additional information.
Interrupting the Test	Interrupt the test by selecting Exit .
Test Failure	If the test fails, record the errors on the repair tag and replace the module.

Restore

Restore the module if it successfully completes all module tests and the errors no longer occur. Restore is in the Slot menu, which you can access by doing the following from the console:

Menu→Maintenance→Slot

See [“Restore”](#), earlier in this chapter, for additional information.

To run the B-Channel Loopback Test, follow the steps below.

Console Display/Instructions

Additional Information

PC

- **1. From the Maintenance menu, select the Slot option.**

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- **2. Specify the module's 2-digit slot number (*nn* = 01 to 17).**

```
Slot:
Enter Slot number (00-17)

nn

Backspace
Exit          Enter
```

Dial or type [*nn*], then select Enter.

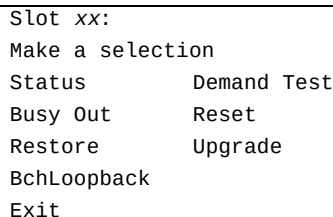
F10

Console Display/Instructions

Additional Information

PC

► 3. Select the B-Channel Loopback test.



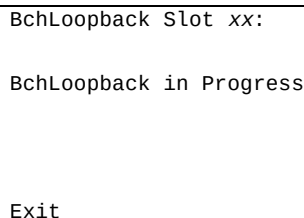
```
Slot xx:
Make a selection
Status      Demand Test
Busy Out    Reset
Restore     Upgrade
BchLoopback
Exit
```

xx = slot number entered in Step 2

F4

For all 800 NI-BRI modules, Clock and Provisioning are also displayed as options on this screen.

The screen below appears while the test is running.



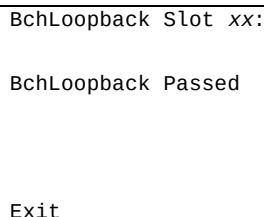
```
BchLoopback Slot xx:

BchLoopback in Progress

Exit
```

xx = slot number entered in Step 2

The screen below appears only if the module passes the test.



```
BchLoopback Slot xx:

BchLoopback Passed

Exit
```

xx = slot number entered in Step 2

The screen below appears only if the test fails.

```
BchLoopback Slot xx:
BchLoopback Failed
xxxxxxxxxxxxxxxxxxxxxxxxxxxx
xx xx xx xx xx xx xx xx

Exit
```

xx = slot number entered in Step 2

Lines 3 and 4 identify the cause of the failure or the number of errors found per B-channel. On an MLX module, there are 16 B-channels, numbered 0 through 15. Line 3 displays the results for B-channels 0 through 7; Line 4 is for B-channels 8 through 15.

Interpreting Test Results

If the test completes successfully, the module's board controller is functioning properly. Continue with the next module test or restore the module if you are finished testing. If the test fails, find the error message in [Table 4-5](#) and proceed as indicated.

Table 4-5. Channel Loopback Errors

Error Messages	Corrective Action
Slot is not busied-out	Exit the test, busy-out the slot, and try again.
Slot empty or not valid	Exit the test and try again; be sure to type the correct slot number. Do not indicate an empty slot or the processor (00).
FMWR not in Standby Mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Test running too long	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Not in TEST/STANDBY mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Any other error	Record the errors on the repair tag and replace the module.

Restoring the Module

When you are finished running module tests, be sure to restore the module. See [“Restore”](#), earlier in this chapter.

Replacing Modules

You can remove and insert line/trunk and extension modules (separately or at the same time) with the system power on without affecting normal call processing.



CAUTION:

This section does not apply to the processor or power supply.

Although the system is designed so that you can remove and replace modules without affecting call processing, partially inserting and removing a module can cause a cold start.

Adding a 100D module or changing any of its DS1 parameters requires that the system be idle.

When you replace a module, be sure to use the same module type. For example, do not put a 008 MLX module in place of a 400 GS/LS module. If a module is replaced with another type of module, or if a module is added to the system without powering down the system first, a cold start occurs.

*If you move any module to a different slot, be sure to renumber the modules by selecting Board Renumber from system programming. See *System Programming* for information on board renumbering.*

To replace a module, follow the steps below.

- ▶ **1. Busy-out or reset the module. Busy-Out is recommended.**
- ▶ **2. Label all cords (if they are not labeled already) and then unplug them from the module.**
For information on labeling trunk and cords, see Chapter 4 in *Installation*.
For instructions on checking poorly labeled wiring, see [“Checking Unlabeled Wiring”](#) following Step 8.
- ▶ **3. Run a demand test by entering test mode.**
- ▶ **4. Remove the module by pushing up firmly on the tab at the bottom rear of the module and inspect the module for visible damage.**
- ▶ **5. Insert the new module. While holding the tab, bring the bottom of the module towards you and away from the carrier.**

- ▶ 6. **Restore the module. Lift up the module to disengage it from the rod at the top of the carrier.**
- ▶ 7. **Connect the trunk and extension cords.**
- ▶ 8. **Attach a tag, error printout, or any information that will help identify any visible problems, failure symptoms, and relevant error reports.**

Checking Unlabeled Wiring

If a label is missing or damaged, use a tone device and a telephone handset to match like wires.

You need the following tools:

- Tone device
- Telephone handset
- Telephone cord with an 8-pin modular plug
- 4-pair patch cord
- Diagonal pliers or wire strippers

To match like wires, follow the steps below.

- ▶ 1. **Insert the telephone cord's 8-pin plug into an outlet on the floor area.**
- ▶ 2. **Using diagonal pliers or wire strippers, cut off the end of the telephone cord to expose the pairs.**
- ▶ 3. **Choose a single pair and then untwist the wires.**
- ▶ 4. **Attach to each clip one wire from the pair you have chosen. The clips extend from the bottom of the tone device.**
- ▶ 5. **Turn on the switch on the outside of the tone device.**
You hear a high-pitched, alternating signal.

- ▶ **6. Take the telephone handset and a 4-pair patch cord to the cross-connect field between the control unit and the telephone.**
- ▶ **7. Go to the blue field on the cross-connect field and, starting at the top left corner, push the patch cord onto the first connecting block.**
- ▶ **8. Using the diagonal pliers or wire strippers, cut off the other end of the patch cord and expose the pairs.**
Do not cut out too much of the cord, because you need the length to test the top rows of the cross-connect field.
- ▶ **9. Attach the handset's clips, which extend from the base, to the exposed wires of the patch cord.**
- ▶ **10. Set the switch on the side of the handset to MONITOR.**
- ▶ **11. Listen to the handset for the tone device signal.**
 - If you hear the signal, you have found the correct wires. Correctly label both the cross-connect field and the outlet.
 - If you do not hear the signal, remove the patch cord from the connecting block and push the patch cord down onto the connecting block to the right of the one just tested. Keep moving the patch cord to the next connector block on the right until you find the pairs that carry the tone device signal.

Upgrading Circuit Module Firmware

Beginning with Release 3.0, MERLIN LEGEND Communications System allows upgrades or reinstallation of circuit module firmware through the PCMCIA interface slot on the processor module. The interface slot is a standard interface through which information may be added to or retrieved from the system.

Circuit modules introduced with Release 3.0 or later may use flash ROM to retain circuit module firmware. Unlike traditional ROMs, flash ROM can be written and erased without being removed from the circuit module. As of

Release 4.0, the circuit modules that include this feature are the 016, the 800 GS/LS-ID, and the 800 NI-BRI.

Firmware on this circuit module can be upgraded or reinstalled with an Upgrade memory card. An upgrade is performed when a new release of firmware enhances a module's capabilities or corrects problems. Firmware can be reinstalled if the existing circuit module firmware has been corrupted.

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot no.→Enter→Upgrade→Yes

PC Procedures

[F6]→[F2]→Type the slot no.→[F10]→[F8] or [F10]→[F4]

Appropriate Modules

This procedure can be run only on the 800 LS-ID, the 016, and the 800 NI-BRI modules or modules introduced after Release 3.0.

Time Estimate

Approximately 1.5 minutes.

Busy-Out or Reset

The module is automatically busied-out after the upgrade procedure begins.

If Busy-Out is unsuccessful, you are given the option of waiting for a Busy-Out or selecting Reset.

Restore

Restore the module after the upgrade successfully completes. Restore is in the Slot menu, which you can access by doing the following from the console:

Menu→Maintenance→Slot

See ["Restore"](#), earlier in this chapter, for additional information.

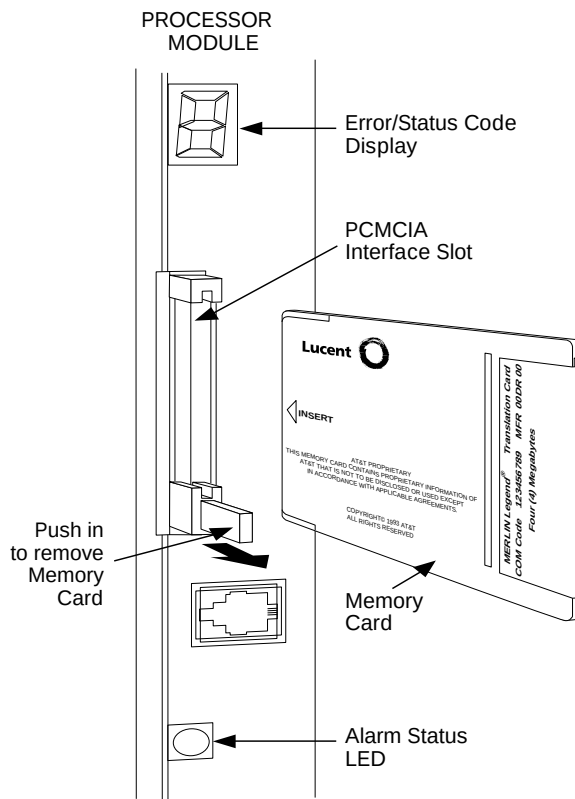


Figure 4-7. Inserting the Upgrade Memory Card

To upgrade or reinstall circuit module firmware, follow the steps below.

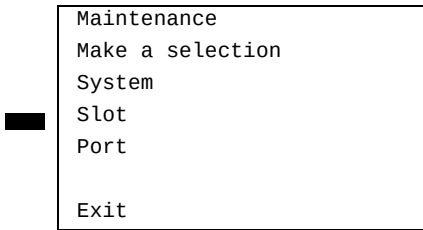
- 1. Insert an upgrade memory card containing the circuit module firmware into the PCMCIA interface slot on the processor board. See [Figure 4-7](#).

Console Display/Instructions

Additional Information

PC

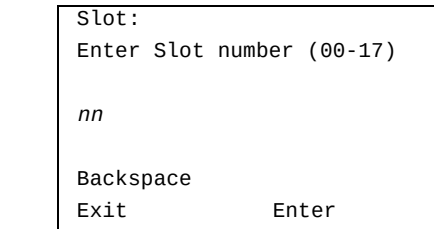
- **2. From the Maintenance menu, select the Slot option.**



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- **3. Specify the slot number (*nn* = 01 to 17).**



```
Slot:
Enter Slot number (00-17)

nn

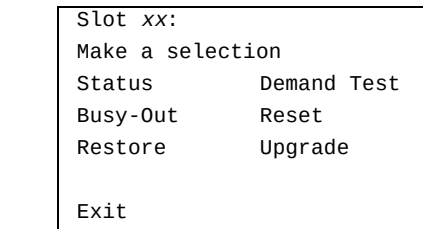
Backspace
Exit          Enter
```

Dial or type [*nn*], then select Enter.

F10

- **4. Select Upgrade.**

The screen below appears for all modules except the 100D, 800 NI-BRI, and MLX boards.



```
Slot xx:
Make a selection
Status      Demand Test
Busy-Out    Reset
Restore     Upgrade
Exit
```

xx = slot number entered in Step 3

F8

For all MLX modules, BchLoopback is also displayed as an option on this screen. For all 800 NI-BRI modules, BchLoopback, Provisioning, and Clock are also displayed as options on this screen.

The screen below appears if the module is a 100D.

Console Display/Instructions

Additional Information

PC

```
Slot xx:
Make a selection
Status          Demand Test
Busy-Out        Reset
Restore         Error
                Events
CSU-lpbk        Clock
Exit            Upgrade
```

xx = slot number entered in Step 3

F10

The screens below appear during the procedure.

```
Module Upgrade:

Validation of MemoryCard
in Progress.
```

```
Module Upgrade:

Validation of MemoryCard
Successfully Completed.

Exit
```

F5

When completed, select Exit to continue.

Console Display/Instructions

Additional Information

PC

► 5. Select the firmware to be programmed.

```
Upgrade Slot xx: >  
aaaaaaaaaaaaaaaaaa Ver: aa  
Select one  
aaaaaaaaaaaaaaaaaa Ver: aa  
aaaaaaaaaaaaaaaaaa Ver: aa  
aaaaaaaaaaaaaaaaaa Ver: aa  
Exit
```

xx = slot number entered in Step 3
Line 2 displays the firmware version
currently installed on the module.

Lines 4, 5 and 6 display firmware
versions available on the memory
card.

F7

F8

F9

If an angle bracket (>) appears in the
upper right corner of the screen, you
may select **More** to display the next
screen with additional firmware versions
available on the memory card.

PgUp

► 6. Select Yes.

```
Upgrade Slot xx:  
Slot will be Busied Out.  
  
Do you want to continue?  
Yes  
No  
Exit
```

xx = slot number entered in Step 3

F3

If the firmware selected provides functionality that is different from the circuit
module's current firmware, the Maintenance display indicates that a Board
Renumber will be required once the installation is complete.

```
Upgrade Slot xx:  
Slot will be Busied Out.  
Renum board when done.  
Do you want to continue?  
Yes  
No  
Exit
```

xx = slot number entered in Step 3

F3

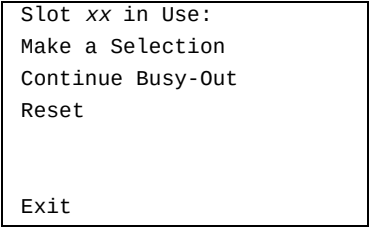
If the module Busy-Out is blocked by an active line or extension, the following screen appears.

Console Display/Instructions

Additional Information

PC

► **7. Choose to wait for the module to busy-out or reset the module.**



Slot xx in Use:
Make a Selection
Continue Busy-Out
Reset

Exit

xx = slot number entered in Step 3

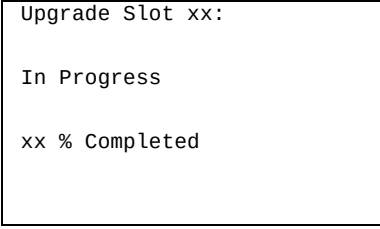
Continue Busy-Out does not interrupt calls in progress, but Reset does.

F1

F2

► **8. Observe the status screen below.**

See the next section, ["Error Conditions During Firmware Upgrade"](#) if error messages appear.

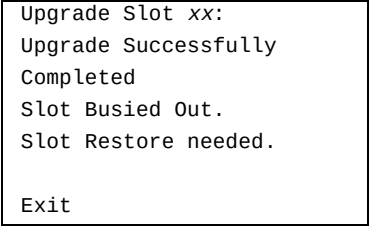


Upgrade Slot xx:

In Progress

xx % Completed

One of the following screens appears when the upgrade has successfully completed. If only a Restore is required to put the module back into service, the screen below appears.



Upgrade Slot xx:
Upgrade Successfully
Completed
Slot Busied Out.
Slot Restore needed.

Exit

F5

If a Board Renumber is also required, the screen below appears.

Console Display/Instructions

Additional Information

PC

Upgrade Slot xx:
Upgrade Successfully
Completed
Slot Busied Out.
Board Renumber needed.

Exit

F5

Perform a Board Renumber and/or Restore as indicated above.

Error Conditions During Firmware Upgrade

The following error conditions can occur during a firmware upgrade. Recovery procedures follow each error condition.

Memory Card In Use By Another Feature

Module Upgrade:

Memory Card in use by
another feature

Exit

F5

Select Exit and begin the upgrade procedure again.

Missing Card or Card Not Inserted Correctly

Module Upgrade:
verify that Memory Card
has been inserted
correctly.

Exit

F5

Insert the memory card correctly; then select Exit and begin the upgrade procedure again.

Console Display/Instructions

Additional Information

PC

Memory Card Is Corrupted

Module Upgrade:
Information on the
Memory Card is corrupted.
Please remove the
Memory Card.

Exit

F5

Select Exit and repeat the upgrade procedure with a new memory card.

Module Cannot Be Upgraded

Upgrade Slot xx:
Module can not be
upgraded.

xx = slot selected in Step 3.

Exit

F5

This procedure can be run only on the 800 GS/LS-ID, 016, or 800 NI-BRI modules or other modules introduced after Release 3.0. Select Exit and repeat the upgrade procedure, being careful to select the correct slot. If upgrade canceled or upgrade incomplete appears on the error screen, the circuit module may be unreliable or unusable until a successful upgrade is performed on it.

Module Error

Console Display/Instructions

```
Upgrade slot xx:  
Module error
```

```
Exit
```

Additional Information

xx = slot selected in Step 3.

PC

F5

Select Exit and reinitiate the upgrade procedure.

```
Upgrade slot xx:  
Module error
```

```
Upgrade CANCELED.  
Upgrade INCOMPLETE.
```

```
Exit
```

xx = slot selected in Step 3.

F5

Select Exit and reinitiate the upgrade procedure.

Memory Card File Error

```
Upgrade slot xx:  
Memory Card file error.
```

```
Exit
```

xx = slot selected in Step 3.

F5

Select Exit, then make sure that the memory card is properly inserted, and reinitiate the upgrade procedure.

Console Display/Instructions

Upgrade slot xx:
Memory Card file error.

Upgrade CANCELED
Upgrade INCOMPLETE

Exit

Additional Information

xx = slot selected in Step 3.

PC

F5

Select Exit, then make sure that the memory card is properly inserted, and reinitiate the upgrade procedure. If the error occurs again, select Exit and insert a new memory card, then reinitiate the upgrade procedure.

Flash ROM Fails to Erase

Upgrade slot xx:
Memory on module will
not erase.

Upgrade CANCELED
Upgrade INCOMPLETE

Exit

xx = slot selected in Step 3.

F5

Repeat the upgrade procedure. If the upgrade continues to fail after several attempts, the module should be replaced. See "Replacing the Module."

Upgrade Attempted on an Empty Slot2

Upgrade slot xx:
No module in slot.

xx = slot selected in Step 3.

Exit

F5

Select Exit and repeat the upgrade procedure, being careful to select the correct slot.

Board Memory Programming Failure

Console Display/Instructions

```
Upgrade slot xx:
Board Memory Programming
Failure.
Upgrade CANCELED
Upgrade INCOMPLETE
```

```
Exit
```

Additional Information

xx = slot selected in Step 3.

PC

F5

Repeat the upgrade procedure. If the upgrade continues to fail after several attempts, the module should be replaced. See "Replacing the Module."

800 NI-BRI Module Problems

An 800 NI-BRI module requires running the Provisioning Test, in addition to the other module tests, under the following circumstances:

- If the module has data endpoints that use the BRI lines
- If Voice Call manual testing of the module's BRI lines indicates problems

The test described in this document supports the NI-1 BRI IOC Package "S" service configuration. Multiline-Hunt Group/Series Completion testing is included here.

See [Figure 4-6](#) for a diagram of the entire module testing process. If you have any questions about the 800 NI-BRI module that this section does not cover, contact NSAC.

NI-1 BRI Provisioning Test

This test verifies that each communication path on the 800 NI-BRI module is operational by establishing and disconnecting a series of voice and data calls between any two communication paths on the module.

Beginning with Release 4.1, the NI-BRI Provisioning Test is enhanced to include testing for BRI facilities that are part of Multiline Hunt Groups (MLHGs). Prior to testing, the BRI facility must have a MLHG group number programmed. The number (up to 10 digits) is appended to the end of the Directory Number (DN) (separated by a “#” character) programmed for the BRI line.

Before proceeding with this test, have available completed copies of *System Planning Form 3-i, Incoming Trunks: BRI Options* and the *NI-1 BRI Planner Form*.

NOTE:

If an 800 NI-BRI Module has only one DN/SPID provisioned on it, the provisioning test cannot be run on that module. To test the line, move one DSL from another 800 NI-BRI module to this module. The DSL that is moved should have been tested successfully and, to make testing easier, should not be part of a MLHG. This move involves administering a line on the DSL and connecting the cable on the target module. Run the test on the two DNs. When the test is successfully completed, remove the programming from the board just tested so that the single line is left on the board, and reconnect the cable to the original slot and port.

Beginning with Release 4.1, all 800 NI-BRI modules must be busied out and those BRI boards not being tested must be unplugged from the carrier before testing can begin.

Summary

Busy-Out or Reset Before beginning the test, busy-out or reset the module being tested. Both Busy-Out and Reset are in the Slot menu, which you can access by doing the following from the console:

Menu→Maintenance→Slot

See [“Busy-Out and Reset”](#), earlier in this chapter, for additional information.

Console Procedure **Menu**→Maintenance→Slot→Dial the BRI slot no.→Enter→Provisioning

PC Procedures [F6]→[F2]→Type the BRI slot no.→[F10]→[F10]

Appropriate Modules This test can be run only on 800 NI-BRI modules.

Time Estimate Approximately 20 minutes for a fully utilized board. However, communication paths with errors increase the time. Boards with fewer administered lines and no errors decrease the time.

Interrupting the Test Interrupt the test by selecting Exit.

Test Failure If the test fails, follow the instructions in Tables 4-6 and 4-7. If the module must be replaced, record the errors on the repair tag and replace the module.

Restore Restore the module when it completes all module tests. Restore is in the Slot menu, which you can access by doing the following from the console:

Menu→Maintenance→Slot

See [“Restore”](#), earlier in this chapter, for additional information.

To run the Provisioning Test, follow the steps below.

► **NOTE:**

Before proceeding with this test, have available completed copies of *System Planning Form 3-i, Incoming Trunks: BRI Options* and the *NI-1 BRI Planner Form*.

Console Display/Instructions

Additional Information

PC

► **1. From the main menu, select the Slot option.**

Maintenance
Make a selection
System
Slot
Port

Exit

F2

► **2. Specify the 800 NI-BRI module's 2-digit slot number (*nn* = 01 to 17).**

Slot:
Enter Slot number (00-17)

nn

Backspace
Exit Enter

Dial or type [*nn*], then select
Enter.

F10

► **3. Select the Provisioning test.**

Slot *xx*:
Make a selection
Status Demand Test
Busy-Out Reset
Restore Clock
BchLoopback Upgrade
Exit Provision-
 ing

xx = slot number entered in
Step 2

F10

Console Display/Instructions

Additional Information

PC

- 4. If the test cannot be run to completion, an error message screen appears, such as the one shown below:.

Provisioning slot xx:

Test running too long

Exit

xx = slot number entered in
Step 2

F5

Find the error message in [Table 4-6](#) and proceed as indicated.

Table 4-6. NI BRI Provisioning Test Errors

Error Messages	Corrective Action
Slot is not busied-out	Exit the test, busy-out the slot, and try again.
Slot empty or not valid	Exit the test and try again. Be sure to type the correct slot number; do not indicate an empty slot or the processor (00). If the problem persists, replace the 800 NI-BRI module.
Test running too long	Exit the test. Remove half of the DSL connectors and rerun the test. Note the result codes of those that fail and then disconnect them. Reconnect the untested DSLs and rerun the test. Note those that fail. Reconnect all DSLs.
Test won't start (applies to Release 4.1 and later)	Check that all BRI boards not being tested are busied out and unplugged from the carrier. Run the test again.

Console Display/Instructions

Additional Information

PC

► 5. Observe the status screens below.

The screen below appears while the test is running.

Provisioning slot xx:
Provisioning in progress
Exit

xx = slot number entered in Step 2

While the test is running, the LEDs are in the following states:

GREEN: Blinks to indicate the test is running.

YELLOW: Flashes on and off while calls are being established
and disconnected.

RED: Stays on until Layers 1–3 are initialized for all
administered communication paths on the module.

In Release 4.0, the screen below appears only if all 16 communication paths
connected to the slot pass the tests.

Provisioning slot xx:
All Lines Passed
Exit

xx = slot number entered in Step 2

The screen below appears if fewer than 16 communication paths are
administered on the module or if one or more communication paths fail. On a
module with fewer than 16 administered paths, the screen will show “OK” for all
successful paths, error codes for all failed paths, and “ADMIN” for any path that
was not administered. Before proceeding, record all the error codes on this
screen, in the correct order.

```
Provisioning slot xx:
At least 1 line not OK
xxxxx xxxxx xxxxx xxxxx
xxxxx xxxxx xxxxx xxxxx
xxxxx xxxxx xxxxx xxxxx
xxxxx xxxxx xxxxx xxxxx
Exit
```

xx = slot number entered in Step 2

Lines 3 through 6 will contain at least one error message.

See [Table 4-7](#).

The communication paths' result codes are ordered as follows on lines 3 through 6:

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Communication paths correspond to the following ports on the 800 NI-BRI module:

PATHS	PORT	PATHS	PORT
1, 2	1	3, 4	2
5, 6	3	7, 8	4
9, 10	5	11, 12	6
13, 14	7	15, 16	8

Beginning with Release 4.1, the following screen appears when the testing for all 16 communication paths is completed. On a module with fewer than 16 administered paths, the screen shows "OKNOH" or "OKH" described in [Table 4-7](#) for all successful paths; error codes for all failed paths; and "SPID" for any path that was not administered. Before proceeding, record all the result codes on this screen, in the correct order.

```
Provisioning slot xx:

xxxxx xxxxx xxxxx xxxxx
xxxxx xxxxx xxxxx xxxxx
xxxxx xxxxx xxxxx xxxxx
xxxxx xxxxx xxxxx xxxxx
Exit
```

xx = slot number entered in Step 2

Lines 3 through 6 will contain the test result codes.

See [Table 4-7](#).

► **6. Interpret the test results**

If the test completes successfully, the module's B-channels are functioning properly. If a communication path fails, find the result code in [Table 4-7](#), and proceed as indicated.

► **7. Restore the module when all tests are completed.**

When all of the lines have passed the test, the red LED will remain on until the CO reinitializes all of the lines.

Follow the procedures in [Table 4-7](#) for examining each BRI line that has an error and make corrections, if necessary, before rerunning the tool.

Table 4-7. NI-BRI Test Result Codes

Result Code	Description	Corrective Action
OK (Release 4.0 and earlier)	BRI facility provisioned with functioning voice and data capabilities	No action required if voice and data functionalities are expected.
CO-V	CO provisioning error for voice calls on that facility	The facility is correctly administered and established on Layers 1, 2, and 3. However, a problem associated with the provisioning at the CO for voice calls was detected. If the facility is intended to provide voice calls, perform the following tests (described later in this section) and record the results before contacting the LEC: ■ Outgoing Voice Call Test ■ Incoming Voice Call Test

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
CO-V <i>continued</i>		Possible causes for this error are: ■ <i>Outgoing voice calls are not possible.</i> (Error identified at Outgoing Voice Call Test, Step 4) ■ <i>Incoming voice calls are not possible.</i> (Error identified at Incoming Voice Call Test, Step 2) If MLH is expected, the possible causes are: — CO provisioning does not allow incoming voice calls, but either the DN or MLHG DN has been verified to be correct. IF MLH is not expected, the possible cause is: — Provisioning on the facility does not allow incoming voice calls. ■ <i>Additional call offering is provisioned</i> Additional call offering allows a voice call to be presented to a busy facility without either party recognizing the condition. Therefore, this condition cannot be detected by manual testing. This cause is valid if incoming voice calls can be received successfully. ■ <i>Features provisioned</i> Supplementary features such as transfer and conference are provisioned at the CO. This condition cannot be detected by manual testing. This cause is valid if incoming voice calls can be received successfully.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
CO-V <i>continued</i>		■ <i>Provisioning on the facility does not always allow outgoing and/or incoming calls..</i> (Error identified at Outgoing Voice Call Test, Step 4 and/or Incoming Voice Call Test, Step 2) This condition may or may not be detected by any single manual test. Therefore, a sequence of calls may be necessary to determine the condition for the failure.
CO-D	CO provisioning error for data calls on that facility	The facility is correctly administered and established on Layers 1, 2, and 3. However, a problem associated with the provisioning at the CO for data calls was detected. If the facility is intended to provide data calls, perform the following tests (described later in this section) with either digital data terminals or analog data terminals and modem pools. Record the results before contacting the LEC: ■ Outgoing Data Call Test ■ Incoming Data Call Test If data terminals are not available, contact the LEC and advise them that the provisioning for data on the facility requires checking. If more information is required, contact the NSAC and provide them with the result code, the slot number, the port number, and the site information (remote access number, etc.).

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
CO-D <i>continued</i>		The possible causes for this error are: ■ <i>Outgoing data calls are not possible.</i> (Error identified at Outgoing Data Call Test, Step 3) ■ <i>Incoming data calls are not possible.</i> (Error identified at Incoming Data Call Test, Step 2) If MLH is expected, the possible causes are: — CO provisioning does not allow incoming data calls, but either the DN or MLHG DN has been verified to be correct. IF MLH is not expected, the possible cause is: — Provisioning on the facility does not allow incoming data calls. ■ Provisioning on the facility does not allow incoming data calls. (Error identified at Outgoing Data Call Test, Step 3 and/or Incoming Voice Call Test Step 2.) This condition may or may not be detected by any single manual test. Therefore, a sequence of calls may be necessary to determine the condition for the failure.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
CO-DV	CO provisioning error for voice and data calls on that facility	This result indicates that facility is correctly administered and established on Layers 1, 2, and 3. However a problem associated with the provisioning at the CO for voice and data calls was detected. If the facility is intended to provide voice and data calls, perform the following tests (described later in this section) with voice terminals or with either digital data terminals or analog data terminals and modem pools. Record the results before contacting the LEC. ■ Outgoing Voice Call Test ■ Incoming Voice Call Test ■ Outgoing Data Call Test ■ Incoming Data Call Test If data terminals are not available, contact the LEC and advise them that the provisioning for data on the facility requires checking. If more information is required, contact the NSAC and provide them with the result code, the slot number, the port number, and the site information (remote access number, etc.) The possible causes for this error are: ■ <i>EKTS or EKTS CACH provisioning</i> (Error identified at Outgoing Voice Call Test, Step 3; Incoming Voice Call Test, Step 2; Outgoing Data Call Test, Step 2; and/or Incoming Data Call Test, Step 2) Both outgoing and incoming calls are not possible. This condition is detectable by the tests listed above. ■ <i>Any of the causes listed for CO-V and CO-D</i>

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
CO-DNV (Release 4.1 and later)	Error on MERLIN LEGEND administration of DN and/or CO provisioning error for voice calls on that facility	The facility is correctly administered and established with layers 1, 2, and 3. However, no incoming voice calls can be received. Check that the facility is administered with the DN provided by the LEC. If the facility is part of an MLHG, check if the voice MLHG DN is absent. If the voice MLHG DN is absent, administer it and rerun the test. The possible causes for this error are: ■ <i>Incorrect DN/MLHG DN</i> ■ <i>Incoming voice calls are not possible</i> (Error identified at Incoming Voice Call, Step 2) and the DN and MLHG DN cannot be verified.
CO-DND (Release 4.1 and later)	Error on MERLIN LEGEND administration of DN and/or CO provisioning error for data calls on that facility	The facility is correctly administered and established with layers 1, 2, and 3. However, no incoming data calls can be received. Check that the facility is administered with the DN provided by the LEC. If the facility is part of an MLHG, check if the data MLHG DN is absent. If the data MLHG DN is absent, administer it and rerun the test. The possible causes for this error are: ■ <i>Incorrect DN/MLHG DN</i> ■ <i>Incoming data calls are not possible</i> (Error identified at Incoming Voice Call, Step 2) and the DN and MLHG DN cannot be verified.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
CO-DDV (Release 4.1 and later)	Error on MERLIN LEGEND administration of DN and/or CO provisioning error for voice and data calls on that facility	The facility is correctly administered and established with layers 1, 2, and 3. However, no incoming data calls can be received. Check that the facility is administered with the DN provided by the LEC. If the facility is part of an MLHG, check if the MLHG DN is absent. If the MLHG DN is absent, administer it and rerun the test. The possible causes for this error are: ■ <i>Any combination of the causes for CODNV and CODND.</i>
CPND (Release 4.1 and later)	No calling party on data calls	The facility is correctly administered and established in layers 1, 2, and 3 with functioning data capabilities, but the CO is not providing calling party information in incoming data calls. If calling party information is expected on data calls, contact the LEC.
CPNV (Release 4.1 and later)	No calling party on voice calls	The facility is correctly administered and established in layers 1, 2, and 3 with functioning voice capabilities, but the CO is not providing calling party information in incoming voice calls. If calling party information is expected on voice calls, contact the LEC.
CPNDV (Release 4.1 and later)	No calling party on voice and data calls	The facility is correctly administered and established in layers 1, 2, and 3 with functioning voice and data capabilities, but the CO is not providing calling party information in incoming voice and data calls. If calling party information is expected on voice and data calls, contact the LEC.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
DN (Release 4.1 and later)	Incorrect DN administration	The facility is established in layers 1, 2, and 3. Check that the facility is administered with the DN provided by the LEC and rerun the test. If the error persists, contact the LEC. If the facility is part of an MLHG, check if the MLHG DN is absent. If the MLHG DN is absent, administer it and rerun the test.
MLHV (Release 4.1 and later)	■ No voice hunting, or ■ Incorrect voice MLHG DN and DN if MLHG DN is present, or ■ Voice hunting was observed with no MLHG DN	The facility is correctly administered and established with layers 1, 2, and 3 with functioning voice capabilities. The possible causes for this error are: ■ <i>Incoming voice calls using the MLHG DN are not possible, but incoming voice calls using the DN are possible.</i> If voice hunting is expected, with the administered MLHG DN, check that the facility is administered with the MLHG DN provided by the LEC and rerun the test. If the error persists, contact the LEC. ■ <i>Incoming voice calls using either the MLHG DN or DN are not possible, and both the MLHG DN and DN have been verified to be incorrect.</i> Readminister the MLHG DN or DN and rerun the test. If the error persists, contact the LEC. ■ <i>MLH is not expected</i> The MLHG DN is not administered and voice calls to the facility using the DN are terminated at the facility as a hunt call. Contact the LEC.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
MLHD (Release 4.1 and later)	■ No data hunting, or ■ Incorrect data MLHG DN if MLHG DN is present, or ■ Data hunting was observed with no MLHG DN	The facility is correctly administered and established with layers 1, 2, and 3 with functioning data capabilities. The possible causes for this error are: ■ <i>Incoming data calls using the MLHG DN are not possible, but incoming data calls using the DN are possible.</i> If data hunting is expected, with the administered MLHG DN, check that the facility is administered with the MLHG DN provided by the LEC and rerun the test. If the error persists, contact the LEC. ■ <i>Incoming data calls using either the MLHG DN or DN are not possible, and both the MLHG DN and DN have been verified to be correct.</i> Readminister the MLHG DN or DN and rerun the test. If the error persists, contact the LEC. ■ <i>MLH is not expected</i> The MLHG DN is not administered and data calls to the facility using the DN are terminated at the facility as a hunt call. Contact the LEC.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
MLHDV (Release 4.1 and later)	■ No voice or data hunting, or	The facility is correctly administered and established with layers 1, 2, and 3 with functioning voice and data data capabilities.
	■ Incorrect voice and data MLHG DN if MLHG DN is present, or	Combination of the causes for MLHV and MLHD.
	■ Voice and data hunting was observed with no MLHG DN	
OKH (Release 4.1 and later)	BRI facility that is part of an MLHG is provisioned with functioning voice and data capabilities	No action is required if the MLH voice and data functionalities are expected. If MLH is not expected, verify that the MLHG DN is present and, if so, remove it and rerun the test.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
OKNOH (Release 4.1 and later. See OK for Release 4.0 and earlier)	BRI facility that is <i>not</i> part of an MLHG is provisioned with functioning voice and data capabilities	No action is required if non-MLH voice and data functionalities are expected. If MLH is expected, verify that the MLHG DN is not present and, if so, administer it and rerun the test.
SPID (Release 4.1 and later)	No or incorrect SPID administration	Check that the facility is administered with the SPID provided by the LEC and rerun the test. If the error persists, contact the LEC.
LG	MERLIN LEGEND BRI error on that facility	This result should never appear; if it does, contact the NSAC.
ADMC0 (Release 4.0 and earlier)	MERLIN LEGEND administration error and/or CO provisioning error on that facility	Check that the facility is administered with the DN provided by the CO. If the DN was not administered properly, correct it and rerun the test. If the error persists, perform the appropriate set of tests (voice only, data only, or voice and data) and record the results before contacting the LEC: ■ Outgoing Voice Call Test ■ Incoming Voice Call Test and/or ■ Outgoing Data Call Test ■ Incoming Data Call Test The possible causes for this error are: ■ <i>Incorrect DN</i> (Error identified at Incoming Voice/Data Call Test, Step 2) Incoming calls fail. ■ <i>Any of the causes listed for CO-V and CO-D</i>

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
ADMIN	No administration or incorrect administration on that facility	Check that the facility is administered with the SPID and DN provided by the CO. If the SPID and DN were not administered properly, correct it and rerun the test. If an error persists, perform the appropriate set of tests (voice only, data only, or voice and data) and record the results before contacting the LEC: ■ Outgoing Voice Call Test ■ Incoming Voice Call Test or ■ Outgoing Data Call Test ■ Incoming Data Call Test The possible causes for this error are: ■ <i>Incorrect SPID</i> (Error identified at Incoming Voice Call Test, Step 3; Incoming Voice Call Test, Step 2; Outgoing Data Call Test, Step 2; and/or Incoming Data Call Test, Step 2) Both outgoing and incoming calls fail. ■ <i>Incorrect DN</i> (Error identified at Incoming Voice/Data Call Test, Step 2) Incoming calls fail.
LAYR1	LAYER 1 BRI Provisioning error on facility	Examine the wiring for the line, ensuring that all connections have been closed. Rerun the test if a wiring problem is identified. If the problem persists, or if there is no wiring problem identified, swap the DSL and its administration to another port on the board. ■ If the problem follows the DSL, contact the LEC. ■ If the problem remains on the original port, mark the port defective and replace the 800 NI-BRI board.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
LAYR2	LAYER 2 BRI Provisioning error on facility	Layer 1 is established. Unplug the connector and replug it into the same port. Rerun the test. If the problem persists, contact the LEC. The possible causes of this problem are: ■ The DSL is provisioned with only one active DN (rather than two) at the CO. ■ Two lines are administered when only one line is provided by the CO. Check that the facilities are administered properly and rerun the tests if you made any corrections.
LAYR3	LAYER 3 BRI Provisioning error on facility	Layers 1 and 2 are established. This result indicates that the CO does not do Layer 3 initialization. This error may not affect service, but the LEC must be contacted.
NOTST	Testing was not performed on this facility because no other Layer 3 initialized facility was available in the time allowed for testing	Layers 1, 2 and 3 are established. Correct the known problems on the other facilities and rerun the test.
?????	Testing was inconclusive because the line(s) used to test this one had problems	Correct the known problems on other facilities and rerun the test.

Outgoing Voice Call Test

Place a voice call from the BRI line under test to either a working facility on the system or to a phone on the premises that is connected to the Central Office (CO).

NOTE:

The 800 NI-BRI module must be restored (removed from the Maintenance Busy state) before performing this test.

- ▶ **1. Assign the BRI line to a button on an MLX display station.**
If using a facility on the system as a destination, also assign the destination facility to a button on another MLX display phone.
- ▶ **2. Press the button associated with the BRI line under test.**
The red LED next to this button should be on and steady. If not, check that the BRI line has been correctly assigned to this button.
- ▶ **3. Go off-hook by lifting the handset or pressing the speakerphone button.**
The red and green LEDs on this button should be on and steady. A dial tone should be heard. If not, record that the outgoing voice call test has failed.
- ▶ **4. Dial the destination number. (In a Centrex environment, it is necessary to dial a 9 before the destination number.)**
Verify the following results and note any failures:
 - Dial tone should be off after the first digit is dialed.
 - Verify that the originating end hears ringback after the last digit is dialed and that the destination phone is ringing.
If either indication is absent, check that the dialed digits are those of the destination Directory Number (DN).
 - If the destination telephone can display calling party number, verify that the DN of the BRI line under test is displayed correctly. If not, record that the calling party information displayed is either incorrect or absent at the destination telephone.

- ▶ **5. Answer the call at the destination telephone and verify the connection.**
- ▶ **6. Disconnect the call at either the originating or receiving end.**
Verify that the green LED next to this button turns off and the connection is removed.

Incoming Voice Call Test

Place a voice call from a known working telephone to the BRI line under test.

NOTE:

The 800 NI-BRI module must be restored (removed from the Maintenance Busy state) before performing this test.

- ▶ **1. Assign the BRI line to a button on an MLX display station.**
If using a facility on the system as a destination, also assign the destination facility to a button on another MLX display phone.
- ▶ **2. Dial the DN of the BRI line under test at the originating telephone.**
Verify that alerting is indicated on the button associated with the BRI line being tested.
- ▶ **3. Verify that the originating number appears on the display of the MLX telephone programmed with the BRI line under test. Verify that the associated green LED flashes.**
If the correct number is not displayed, verify that the number dialed and the DFT administration are correct. If they are incorrect, repeat the test.
- ▶ **4. Answer the call (press line button if necessary) and verify the connection.**
Verify that the green LED next to this button is on and steady.
- ▶ **5. Disconnect the call at either the originating end or the receiving end.**
Verify that the green LED next to the button associated with the BRI line under test turns off.

Outgoing Data Call Test

Place a data call from the BRI line under test to either a working facility on the system or a data endpoint on the premise that is connected to the central office (CO). See the *Data and Video Reference* for details regarding setting up a data call with specific equipment.

NOTE:

The 800 NI-BRI module must be restored (removed from the Maintenance Busy state) before performing this test.

▶ 1. Assign the BRI line to a data terminal.

If using a facility on the system as a destination, assign the destination facility to another data terminal.

▶ 2. Dial the destination number. (In a Centrex environment, it is necessary to dial a 9 before the destination number.)

Verify the following results and note any failures:

- You may hear dial tone at the beginning of dialing and ringback after completion. Alerting may be indicated at the destination. If both ringback and alerting are absent, check that the dialed digits are those of the destination DN. Redial, if necessary. If the call could not be established and the dialing was correct, record that an outgoing data call cannot be completed from this line and indicate the type of tone, if any, that was present at both ends.
- If the destination telephone can display calling party number, verify that the DN of the BRI line under test is displayed correctly. If not, record that the calling party information displayed at the destination telephone is incorrect or absent.

▶ 3. Answer the call at the destination telephone and verify the connection.

The destination data station may be programmed for auto-answer. Verify that the red and green LEDs next to this button are on steady and the communication path is established.

- ▶ **4. Disconnect the call from either the originating or receiving end.**
Verify that the green LED turns off and the communication path is removed.

Incoming Data Call Test

Place a data call from a known working facility to the BRI line under test. See the *Data and Video Reference* for details regarding answering a data call with specific equipment.



NOTE:

The 800 NI-BRI module must be restored (removed from the Maintenance Busy state) before performing this test.

- ▶ **1. Assign the BRI line to a data terminal.**
If using a facility on the system as a destination, assign the destination facility to another data terminal.
- ▶ **2. Place a test call to the BRI line under test.**
Verify that alerting is indicated at the data station associated with the BRI line. If not, check that the dialed number corresponds to the DN of the line.
 - If the number is not correct, redial the call.
 - Otherwise, record that the incoming data call test has failed and note the type of tone (busy, reorder, ringback, etc.) heard at the originating end.
- ▶ **3. If the data station associated with the BRI line under test can display calling party number, verify that the originating DN appears on its display.**
If not, record that the calling party information displayed at the destination telephone is either incorrect or absent.
- ▶ **4. Answer the call and verify the connection.**
The data station may be programmed for auto-answer. Verify that the green LED flashes until the call is answered.
- ▶ **5. Disconnect the call from either the originating or receiving end.**

800 NI-BRI Module Clock Status

If you have not been trained to perform BRI maintenance, contact your technical support organization for instructions on using this procedure.

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot
no.→Enter→Clock→Exit

PC Procedure

[F6]→[F2]→Type the slot no.→[F10]→[F9]→[F5]

Console Display/Instructions

PC

- **1. From the Maintenance menu, select the Slot option.**

```
Maintenance
Make a selection
System
Slot
Port

Exit
```

[F2]

- **2. Specify the 2-digit slot number (*nn* = 01 to 17).**

```
Slot:
Enter Slot number (00-17)

nn

Backspace
Exit          Enter
```

Dial or type [*nn*] and select Enter.

[F10]

- **3. Select Clock.**

```
Slot xx:
Make a selection
Status          Demand Test
Busy-Out        Reset
```

xx = slot number entered in Step 2.

Provisioning and Clock are

Restore	Clock
CSU-lpbk	Upgrade
Exit	Provision-
	ing

 displayed only for the
800 NI-BRI module.

F9

- 4. If you need assistance in interpreting the information displayed on the screen, contact your technical support.

Clock Slot xx:
mm/dd/yy hh:00-hh:mm
Active:
xxxx
Synch:
xxxxx
Source:
xxxx
Port: xx
Exit

xx = slot number entered in Step 2.

100D Module Problems

The 100D module requires the CSU Loopback Test, in addition to the other module tests. See [Figure 4-6](#) for a diagram of the entire module testing process. If you have any questions about the 100D module that this section does not cover, contact your technical support organization.

Error Events

In addition to checking the error logs, the 100D module requires that you check the error events specific to the 100D module. See [“Error Events”](#), later in this chapter, for details.

CSU Loopback Test

The Channel Service Unit (CSU) Loopback Test verifies that the communication path between the following CSUs, 551 T1, ESF T1, or the ACCULINK® 3150, and the 100D module is operational.

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot no.→Enter→CSU- lpbk

PC Procedure

F6→**F2**→Type the slot no.→**F10**→**F4**

Appropriate Modules

This test can be run only on 100D modules.

Time Estimate

Approximately 2 minutes

EQ IN and EQ OUT (551 T1 CSU)

For the 551 T1 CSU only, connect a patch cord from the CSU EQ IN jack to the CSU EQ OUT jack. Details are provided below.

DTE LOOPBACK (ESF T1 CSU)

For the ESF T1 CSU only, flip the DTE LOOPBACK switch on the front panel to the up position to activate the loopback. Details are provided below.

LINE LOOPBACK (ACCULINK 3150 CSU)

For the ACCULINK 3150 only, select front panel Line Loopback command. Details are provided below.

Busy-Out or Reset

Prior to beginning the test, busy-out the 100D module. Both Busy-out and Reset are in the Slot menu, which you can access by doing the following from the console:

Menu→Maintenance→Slot.

See [“Busy-Out and Reset”](#), earlier in this chapter, for additional information.

Interrupting the Test

You can interrupt the test by selecting Exit.

Test Failure

If the test fails, record the errors on the repair tag and replace the module.

Restore

If the 100D module successfully completes the CSU Loopback Test, restore the module. Restore is in the Slot menu, which you can access by doing the following from the console:

Menu→Maintenance→Slot.

See the [“Restore”](#) procedure, earlier in this chapter, for additional information.

In preparation for running the CSU Loopback Test, perform the following steps at the CSU.

► **1. Busy-out the 100D module.**

► **2. Prepare the CSU.**

For the 551 T1 CSU, connect the EQ OUT and EQ IN jacks (see [Figure 4-8](#)).

- a. Plug one end of a bantam-to-bantam patch cord (or a loopback fixture) into the EQ OUT jack on the front of the CSU.
- b. Plug the other end of the patch cord into the EQ IN jack on the CSU.

This causes the 551 T1 CSU to either loop back the network signal or send the all-ones pattern, depending on the chosen CSU option.

For the ESF T1 CSU, flip the DTE LOOPBACK switch on the front panel to the up position to activate the loopback test (see [Figure 4-9](#)).

For the ACCULINK 3150 CSU, Press the **F2** button on the front panel to select "Test" from the menu screen. From the Test screen, press the **F2** button to select "Lpbk." From the Loopback screen, press the right arrow once to display additional loopback tests. Press the **F3** button to display "DLB" (DTE Loopback). When DLB is selected, "Test Started" appears on line 2 of the menu screen. (See Figures [4-10](#) through [4-13](#).)

The ACCULINK 3160/3164 DSU/CSU is physically similar to the 3150 CSU with programming on the front panel and menus appearing on the LCD screen. For the preparation of specific tests, see the operator's guide that comes with the unit.

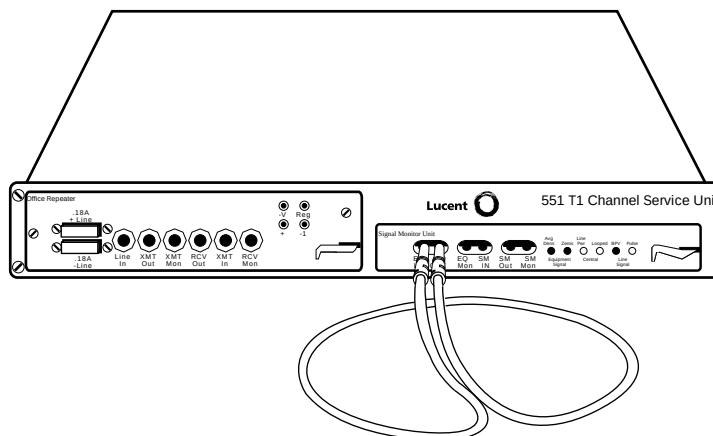


Figure 4-8. 551 T1 CSU Loopback Connection

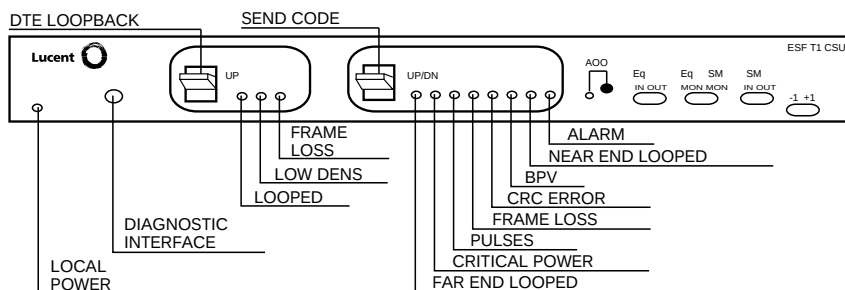


Figure 4-9. ESF T1 CSU DTE Loopback Connection

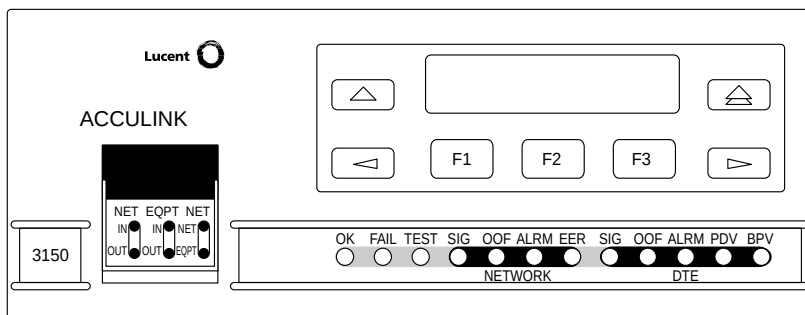


Figure 4-10. ACCULINK 3150 CSU Front Panel

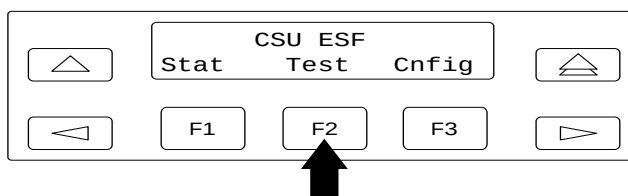


Figure 4-11. ACCULINK 3150 CSU DTE Loopback Command 1

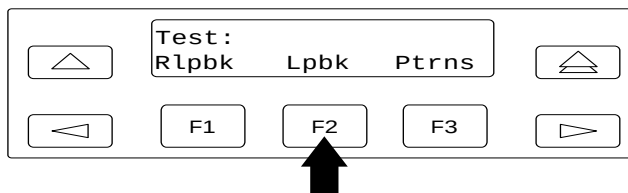


Figure 4-12. ACCULINK 3150 CSU DTE Loopback Command 2

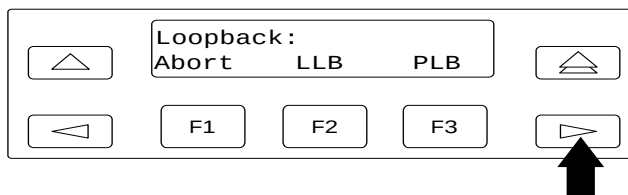


Figure 4-13. ACCULINK 3150 CSU DTE Loopback Command 3

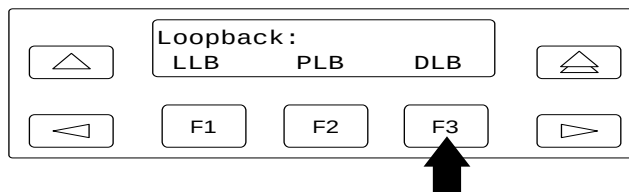


Figure 4-14. ACCULINK 3150 CSU DTE Loopback Command 4

To run the CSU Loopback Test, follow the steps below.

- **1. From the Maintenance menu, select the Slot option.**

Console Display/Instructions

Additional Information

PC

Maintenance
Make a selection
System
Slot
Port

Exit

F2

- **2. Specify the 2-digit slot number (*nn* = 01 to 17).**

Slot:
Enter Slot number (00-17)

nn

Backspace
Exit Enter

Dial or type [*nn*] and select Enter.

F10

- **3. Select the CSU Loopback Test.**

Slot *xx*:
Make a selection
Status Demand Test
Busy-Out Reset
Restore Error

 Events
CSU-lpbk Clock
Exit Upgrade

xx = slot number entered in Step 2.

Error Events and Clock are displayed only for the 100D module.

F4

The screen below appears while the test is running. At the same time, the module's green LED flashes.

Console Display/Instructions

Additional Information

PC

CSU-lpbk Slot xx:

xx = slot number entered in Step 2.

CSU-lpbk in Progress

Exit

The screen below appears only if the module passes the test.

If the test is successful, contact the CO and ask them to check from their end.

CSU-lpbk Slot xx:

xx = slot number entered in Step 2.

CSU-lpbk Passed

Exit

The screen below appears when the test fails.

CSU-lpbk Slot xx:

xx=slot number entered in Step 2.

CSU-lpbk Failed

xxxxxxxxxxxxxxxxxxxxxxxxxxxx

xxx xxx xxx xxx xxx xxx

xxx xxx xxx xxx xxx xxx

xxx xxx xxx xxx xxx xxx

Exit

Lines 3 through 6 identify the cause of the failure or the number of errors found per channel. There are 24 channels, numbered 1 through 24. Line 3 displays the results for channels 1 through 6; Line 4 is for channels 7 through 12; Line 5 is for channels 13 through 18; Line 6 is for channels 19 through 24.

Interpreting Test Results

If the test is successful, the connection between the CSU and the 100D module is good, and the 100D module is probably okay. Continue with the next module test; restore the module if you are finished testing.

If the test fails, find the error message in [Table 4-8](#) and proceed as indicated.

Table 4-8. Internal Loopback Test Errors

Error Messages	Corrective Action
Slot is not busied-out	Exit the test, busy-out the slot, and try again.
Slot empty or not valid	Exit the test and try again; be sure to type the correct slot number. Do not indicate an empty slot or the processor (00).
FMWR not in Standby Mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Test running too long	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Not in TEST/STANDBY mode	Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Any errors on the CSU-lpbk Failed screen	Check the cable between the 100D module and the CSU; then retest. If the problem persists, check the CSU settings. Exit the test and try again; if this error persists, record the errors on the repair tag and replace the module being tested.
Any other error	Record the errors on the repair tag and replace the module; if in doubt, escalate to your technical support organization.

Restoring the Module

After completing the CSU Loopback Test, follow the steps below to restore the module.

- ▶ 1. If you are finished testing modules, restore the 100D module. Refer to [“Restore”](#), earlier in this chapter, for instructions.
- ▶ 2. Reset the CSU.
 - For the 551 T1 CSU, unplug the patch cord, first from the EQ IN jack and then from the EQ OUT jack.
 - For the ESF T1 CSU, flip the DTE LOOPBACK switch down (to deactivate the loopback).
 - For the ACCULINK 3150 CSU press the right arrow key once to display the Ctrl selection, then press the **F3** button to select Ctrl. Press the right arrow key twice to display the reset selection. Now press the **F1** button to initiate a reset of the CSU.

Automatic Tests for the 100D Module

Every 15 minutes, the system checks the 100D module for the following:

- **Initialization.** The system ensures that all T1 ports are properly initialized and placed into service. It also resolves the conflicts of different service levels (for example, between the individual ports or for the initialization of the ports to support features).
- **Error Detection.** The system detects errors and takes the trunk out of service, if appropriate. It attempts to restore the trunk and put it back into service.
- **Error Recording.** The system records all errors and outages in the error logs.
- **Audits and Updates.** The system checks the state of the T1 facilities through audits, status checks, and error logging.

- **Synchronization.** The system maintains proper synchronization to the loop clock and switches to the local clock when the loop clock is not available (for example, during a loss of signal or a blue alarm). When the loop clock source is restored, the system switches back to the loop clock.

100D Module Error Events

This procedure allows you to check for 100D module errors. If you have any questions about interpreting these errors, contact your technical support organization.

Summary

Console Procedure	Menu →Maintenance→Slot→Dial the slot no.→Enter→Error Events→Current hr or Previous hr
PC Procedures	F6 → F2 → Type the slot no. → F10 → F8 → F1 or F2

To check for Errors, follow the steps below.

- **1. From the Maintenance menu, select the Slot option.**

Console Display/InstructionsAdditional Information

PC

Maintenance
Make a selection
System
Slot
Port

Exit

F2

Console Display/Instructions

Additional Information

PC

► **2. Specify the 2-digit slot number (*nn* = 01 to 17).**

```
Slot:
Enter Slot number (00-17)

nn

Backspace
Exit          Enter
```

Dial or type [*nn*] and select Enter.

F10

► **3. Select Error Events.**

```
Slot xx:
Make a selection
Status          Demand Test
Busy-Out        Reset
Restore         Error
                Events
CSU-lpbk        Clock
Exit
```

xx=slot number entered in Step 2.

F8

► **4. Select the current hour or a previous hour.**

```
Error Events Slot xx:
Make a selection
Current hr
Previous hr

Exit
```

xx=slot number entered in Step 2.

Select Current hr
or Previous hr

F1

F2

The current hour always begins at ##:00 and ends at the last complete 15-minute interval. For example, if the current time is 09:46, selecting Current hr displays the errors that have accumulated between 09:00 and 09:45.

The screen below displays the errors that have accumulated during the current hour.

Console Display/Instructions

```
Current hr Slot xx:

mm/dd/yy      hh:00-hh:mm
CurAlm aaaa  MaxAlm aaaa
MIS SLP ES    BS SEC FS
xxx xxx xxx  xxx xxx xxx
Exit
```

Additional Information

PC

xx=slot number entered in Step 2

The screen below displays the errors that have accumulated during the previous hour.

```
Previous hr Slot xx:

mm/dd/yy      hh:00-hh:mm
CurAlm aaaa  MaxAlm aaaa
MIS SLP ES    BS SEC FS
xxx xxx xxx  xxx xxx xxx
Exit
```

xx=slot number entered in Step 2

100D Module Clock Status

If you have not been trained to perform T1 maintenance, contact your technical support organization for instructions on using this procedure.

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot
no.→Enter→Clock→Exit

PC Procedure

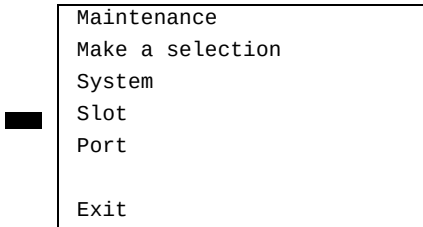
[F6]→[F2]→Type the slot no.→[F10]→[F9]→[F5]

- 1. From the Maintenance menu, select the Slot option.

Console Display/Instructions

Additional Information

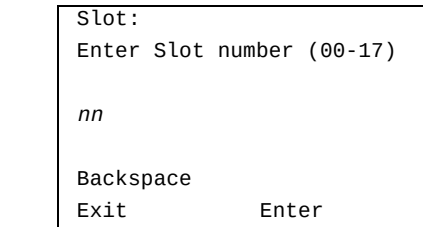
PC



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- 2. Specify the 2-digit slot number (*nn* = 01 to 17).



```
Slot:
Enter Slot number (00-17)

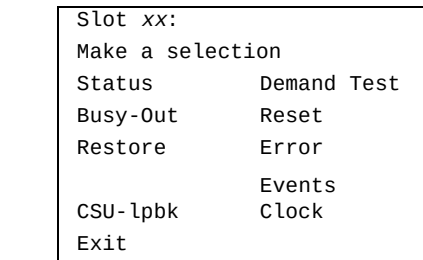
nn

Backspace
Exit      Enter
```

Dial or type [*nn*] and select Enter.

F10

- 3. Select Clock.



```
Slot xx:
Make a selection
Status      Demand Test
Busy-Out    Reset
Restore     Error
            Events
CSU-lpbk    Clock
Exit
```

xx = slot number entered in Step 2.

CSU-lpbk and Error Events are displayed only for the 100D module.

F9

Console Display/Instructions

Additional Information

PC

- 4. If you need assistance in interpreting the information displayed on the screen, contact your technical support.

```
Clock Slot xx:
mm/dd/yy      hh:00-hh:mm
Admin as:
Active:
Synch source:
PPM: xxx
Exit
```

CTI Link Problems

There are four maintenance routines you can perform if you are experiencing CTI Link problems. They are:

- **Viewing Status.** This procedure identifies whether the MERLIN LEGEND Communications System knows the link is physically connected and operational.
- **Test.** This procedure allows you to check whether the MERLIN LEGEND Communications System and the PBX Driver are communicating across the link, without involving the Telephony Services product. This is helpful in isolating a problem to the Telephony Services product.
- **Restart.** This procedure cleans up a link that is experiencing problems, then reconnects the link and makes it operational again. Restart does not shut down the link, but does impact traffic on that port.
- **Vary the Hiding Time.** This procedure may be helpful if a link is experiencing problems. This should be done only at the request of a Tier 3 engineer.



NOTE:

Review the procedures in [“Module Problems”](#) earlier in this chapter to determine that the module into which you are plugged is not faulty.

Before you start maintenance or troubleshooting procedures for the CTI Link, you should verify the following:

- ▶ 1. The MERLIN LEGEND Communications System is operating in Hybrid/PBX mode.
- ▶ 2. The CTI Link is plugged into a port on an 008 MLX or a 408 MLX module.
- ▶ 3. The link is plugged into the RJ45 jack on the ISDN card in the Telephony Server and the wire connection to the server is complete.
- ▶ 4. The firmware for the MLX module is of vintage earlier or later than 29. Link administration is prevented on modules using firmware 29.

Viewing Status

Summary

Console Procedure

Menu→Maintenance→Port→Station→Dial port number→Enter→Status→Exit

PC Procedure

[F6]→[F3]→Type port number→[F10]→[F1]→[F5]

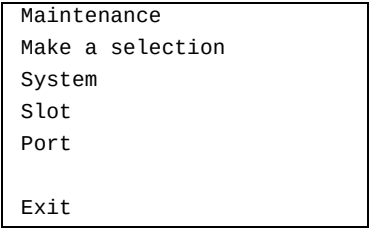
To check Station Status, follow the steps below.

Console Display/Instructions

Additional Information

PC

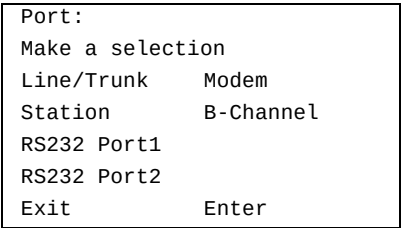
- **1. From the Maintenance menu, select the Port option.**



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F3

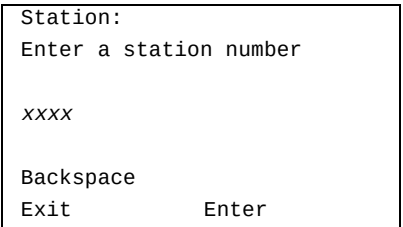
- **2. Select Station.**



```
Port:
Make a selection
Line/Trunk    Modem
Station       B-Channel
RS232 Port1
RS232 Port2
Exit          Enter
```

F2

- **3. Enter station number and select Enter.**



```
Station:
Enter a station number

xxxx

Backspace
Exit          Enter
```

xxxx is dial plan
number, slot/port, or
logical ID.

F10

The following screen appears if the port is not a CTI Link.

■ Station: Make a selection Status Busy Out Restore Exit Enter	xxxx is dial plan number, slot/port, or logical ID.	F5

Exiting from the non-CTI Link screen returns you to the selection screen shown in Step 2 for you to enter a new port number and try again. The following screen appears if the port is a CTI Link.

Console Display/Instructions

Additional Information

PC

► **4. Select Status.**

■ CTI Link xxxx: Make a selection Status Test Restart Exit	xxxx is dial plan number, slot/port, or logical ID.	F1

► **5. Select Exit.**

■ CTI Link xxxx: SlotPort: xxxx Physical Link: PBX Driver Conn: Alarms: Maintenance Busy: Exit	xxxx is dial plan number, slot/port, or logical ID. Physical Link: up or down PBX Driver Conn: up or down Alarms: suspended or active Maintenance Busy: yes or no A yes in the Maintenance Busy field means that the slot shown in the Slot/Port field of this screen is maintenance busy. Do a slot restore on that slot.	F2

Console Display/Instructions

Additional Information

PC

► **3. Enter station number and select Enter.**

```
Station:
Enter a station number

xxxx

Backspace
Exit          Enter
```

xxxx is dial plan
number, slot/port, or
logical ID.

F10

► **4. Select Test.**

```
CTI Link xxxx:
Make a selection
Status          Test
Restart

Exit          Enter
```

xxxx is dial plan
number, slot/port, or
logical ID.

F6

The following screen appears while the test is in progress.

```
Test CTI Link xxxx:

Test in Progress

Exit
```

xxxx is dial plan
number, slot/port, or
logical ID.

Console Display/Instructions

Additional Information

PC

The following screen appears if the test fails.

Test CTI Link xxxx:

Test FAILED

Exit

xxxx is dial plan number,
slot/port, or logical ID.

For this screen, check the following:

1. Verify wiring
2. Go to status screen, see if
Physical link and PBX Driver Conn
are both "up"; if the PBX driver is
not loaded, PBX Driver Conn is
down

F5

If the test fails, exiting from this screen will return you to the selection screen shown in Step 4.

The following screen appears if the test passes.

► 5. Select Exit.

CTI Link xxxx:

Test Successfully
Completed

Exit

xxxx is dial plan
number, slot/port, or
logical ID.

F5

Selecting Exit returns you to the selection screen shown in Step 4 where you can select further maintenance options or exit the maintenance routine.

Summary

PC Procedure F6 → F3 → Type port number → F10 → F1 → F5

To perform restart routine, follow the steps below.

Console Display/Instructions

Additional Information

PC

► 1. From the Maintenance menu, select the Port option.

Maintenance
Make a selection
System
Slot
Port

Exit

F3

► 2. Select Station.

Port:
Make a selection
Line/Trunk Modem
Station B-Channel
RS232 Port1
RS232 Port2
Exit Enter

F2

► 3. Enter station number and select Enter.

Station:
Enter a station number

xxxx

xxxx is dial plan
number, slot/port, or
logical ID.

```
Backspace
Exit          Enter
```

F10

► 4. **Select Restart.**

```
CTI Link xxxx:
Make a selection
Status          Test
Restart

Exit
```

xxxx is dial plan
number, slot/port, or
logical ID.

F2

Console Display/Instructions

Additional Information PC

► 5. **Select Yes.**

```
Restart CTI Link xxxx:
Do you want to continue?
Yes
Cancel

Exit
```

xxxx is dial plan
number, slot/port, or
logical ID.

F1

The following screen appears while the restart is in progress.

```
Restart CTI Link xxxx:

Restart in Progress

Exit
```

xxxx is dial plan
number, slot/port, or
logical ID.

If the restart fails, the following screen appears.

Restart CTI Link xxxx:

Restart FAILED

Exit

xxxx is dial plan number,
slot/port, or logical ID.

F5

Selecting Exit returns you to the selection screen shown in Step 4 where you can select further maintenance options or exit the maintenance routine.

Console Display/Instructions

Additional Information

PC

If the restart passes, the following screen appears.

Restart CTI Link xxxx:

Restart Successfully
Completed

Exit

xxxx is dial plan number,
slot/port, or logical ID.

F5

Selecting Exit returns you to the selection screen shown in Step 4 where you can select further maintenance options or exit the maintenance routine.

Varying Hiding Time

CAUTION:

This procedure should be done only under the direction of NSAC/Tier 3 engineers. It is not recommended for users or service technicians. If this value is changed, a corresponding change must be made for the PBX driver under the direction of Technical Support Organization (TSO) personnel.

Hiding time is the amount of time (in seconds) that the link could be broken but the user would not notice. This interval occurs when the link experiences a hidden reset until the system generates a broadcast reset. A broadcast reset affects CTI link operations and re-initializes the link. The default setting for hiding time is 25 seconds, with a range of settings from 0 to 90 seconds.

Varying the hiding time may be helpful if the link is experiencing problems. If broadcast resets would help identify when a CTI link problem occurs, reduce the hiding time to 10. This broadcasts all link troubles that cause resets. If broadcast resets inhibit troubleshooting a CTI link problem, increase the hiding time. If the broadcast reset messages still interfere with troubleshooting the problem, set the hiding time to zero(0). Setting the value to zero eliminates all broadcast resets; everything is hidden.

Summary

Console Procedure

Menu→Maintenance→Port→Station→Dial port
number→Enter→Restart→Yes→Exit

PC Procedure

[F6]→[F3]→Type port number→[F10]→[F2]→
[F1]→[F5]

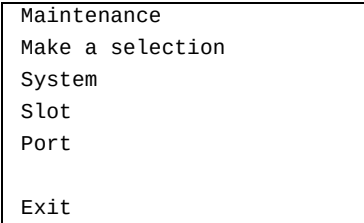
To vary hiding time, follow the steps below.

Console Display/Instructions

Additional Information

PC

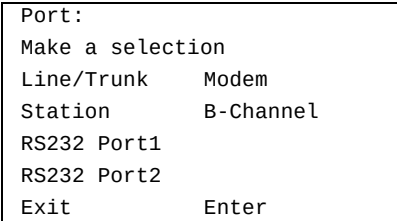
- 1. From the Maintenance menu, select the Port option.



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F3

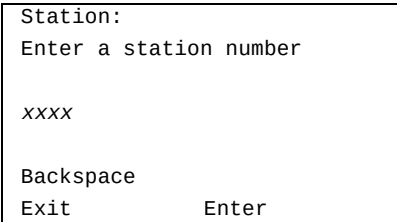
- 2. Select Station.



```
Port:
Make a selection
Line/Trunk    Modem
Station       B-Channel
RS232 Port1
RS232 Port2
Exit          Enter
```

F2

- 3. Enter station number and select Enter.



```
Station:
Enter a station number

xxxx

Backspace
Exit          Enter
```

xxxx is dial plan
number, slot/port, or
logical ID.

F10

► 4. Select Hiding Time.

Hiding Time is *not* shown on the display, but may be selected by pressing the associated softkey twice.

Console Display/Instructions

```
CTI Link xxxx:
Make a selection
Status          Test
Restart

                                Hiding Time

Exit
```

Additional Information PC

xxxx is dial plan number, slot/port, or logical ID.

F9 F9

The following screen appears.

```
CTI Link xxxx:
Enter seconds for hiding
a broken link (0-90)
xx

Exit          Enter
```

xxxx is dial plan number, slot/port, or logical ID.
xx is number of seconds (0–90).
default is 25 seconds. If you enter 1 through 9, the value is changed to a 10.

If you choose **Exit** from this screen, you have not entered any data and you will return to the screen shown in Step 4.

If you choose **Enter** from this screen, you have entered data and you will return to the screen shown in Step 4.

Removing a CTI Link

Two procedures are used for CTI link removal. They are:

- **Permanent Removal.** When you want to permanently remove a CTI link from the MERLIN LEGEND Communications System.

- **Link Shutdown.** When you want to temporarily idle a CTI link before working on it.

Permanent Removal

For a permanent CTI link removal, do the following:

- ▶ **1. (optional) Suspend MERLIN LEGEND alarming for the CTI link.**
Refer to the Network Manager's Guide for the steps to suspend the alarming.
If Step 1 is not performed, the MERLIN LEGEND may generate an alarm about the CTI link before step 5 is performed.
- ▶ **2. Upload the PBX Driver (MLPD).**
Refer to the MERLIN LEGEND Network Manager's Guide for instructions.
- ▶ **3. Unplug the CTI link.**
- ▶ **4. Remove the ISDN link interface card, if desired.**
Refer to the PC/ISDN Platform Installation and Reference, or similar installation manual from the ISDN link interface card vendor.
- ▶ **5. Remove the MERLIN LEGEND administration.**
Delete the MLX port from the list of CTI link ports, using MERLIN LEGEND System Programming (at the MLX Executive Station or SPM). After this, it is safe to plug in an MLX telephone, a data module, or an ISDN terminal adapter. See *System Programming*.

Link Shutdown

Temporarily idling a CTI link before performing maintenance is an optional procedure on the Server side which may prevent unwanted MERLIN LEGEND Communications System alarms. However, a link shutdown is not required before performing maintenance.

For a link shutdown, do the following:

► **1. Suspend MERLIN LEGEND alarming for the CTI link.**

If Step 1 of the link shutdown is not performed, then the MERLIN LEGEND may generate alarms about the CTI link while under maintenance. See the MERLIN LEGEND *Network Manager's Guide* for detailed instructions on this procedure.

► **2. Prevent new CTI link traffic.**

If Step 2 is not performed before working on the CTI link, an application may get confused. For example, if an application sent a service request (such as Make Call) but the CTI link is taken down for maintenance before the MERLIN LEGEND sends a reply, the application will think the request failed even if it succeeded. In contrast, if this step is performed, the application will immediately receive a failure reply. See the MERLIN LEGEND *Network Manager's Guide* for detailed instructions on the Block, Offline, and mloam commands.

► **3. Wait for CTI link traffic to subside.**

If the Offline or mloam command was used in Step 2, skip to Step 4. This step applies only if the Block command was used in Step 2.

Determine when traffic has stopped. On the NetWare server, start the mloam or wmloam tool, then go to the Link Status screen. View the line CTI Link Msg. Rate. If the value there is 0, then traffic on the link has stopped. Refer to the *Network Manager's Guide* for details.

► **4. Unplug the CTI link, or perform appropriate maintenance.**

Carrier Problems

Typical carrier problems include power supply failure, sudden failure of one or more modules, or system problems that cannot be isolated to a specific module. If you find a problem with the carrier, it must be replaced; carriers cannot be repaired in the field.

Removing the Faulty Carrier

- ▶ **1. Remove the control unit housing.**
If you need instructions, see [“Removing the Control Unit Housing”](#) in [Chapter 1](#).
- ▶ **2. Back up system programming.**
If you need instructions, see *System Programming and Maintenance (SPM)* (for disk backups) or [Appendix D, “Backing Up with a Memory Card”](#).
- ▶ **3. Power down the system by turning off the components listed below, in the order given.**
 - a. Power supply on the basic carrier
 - b. Power supply on each expansion carrier
 - c. Auxiliary power units (if present)
- ▶ **4. Unplug the control unit from the AC outlet.**
- ▶ **5. Remove the processor, the power supply, and all other modules from the faulty carrier. (If you prefer to remove the cords first, make sure they are labeled.)**
- ▶ **6. Put the modules aside, in order, so that you can reinstall them later in the replacement carrier.**
- ▶ **7. Remove all modules from the carriers to the right of the faulty carrier.**
- ▶ **8. Starting with the *rightmost* carrier, loosen the four screws that secure the four corners of the carrier to the backboard.**
- ▶ **9. Slide the carrier to the right until the connector disengages from the carrier to the left.**
- ▶ **10. Pull the carrier away from the wall so that the screws slip through the large screw holes.**

- 11. Repeat Steps 8–10 until the faulty carrier is removed.

Replacing the Carrier

After removing the faulty carrier, use the steps below as a guideline for installing a new carrier.

- 1. Install the replacement carrier(s). See *Installation* for instructions.
- 2. Replace the modules with all cords connected as they were before.

Checking System and Slot Status

In addition to checking error logs, and the access log, and running module tests, you can request System Status and Slot Status information for each module.

System Status

The power supply, processor, 400EM module, and 100D module are the only modules that have LEDs. The System Status screen displays simulated LEDs for the processor and for each of these modules but not for the power supply.

The System Status procedure allows you to check simulated LEDs for the processor and other modules. This is explained in detail in “Reading the System Status Screen,” later in this chapter.

Summary

Console Procedure
PC Procedure

Menu→Maintenance→System→Status

F6 → F1 → F1

To check System Status, follow the steps below.

Console Display/Instructions

Additional Information

PC

- 1. From the Maintenance menu, select the System option.

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F1

- 2. Select Status.

```
System:
Make a selection
Status      Upgrd/Instll
Error Log
Inventory
Access Log
Exit        Enter
```

F1

Interpreting the System Status Screen

Console Display/Instructions

Additional Information

PC

```
System Status:
Slot00:Raaa
Slot01:Raaa Yaaa Gaaa
Slot02:Raaa Yaaa Gaaa
Slot03:Raaa Yaaa Gaaa
Slot04:R      Y      G

Exit
```

Raaa = status (On, Off, No) of red LED.
Raaa = status (On, Off, No) of yellow LED.
Raaa = status (On, Off, No) of green LED.

The System Status screen simulates LEDs for each module. The simulated LEDs are represented as R (red), Y (yellow), and G (green).

Immediately following R, Y, or G is its status (*aaa* in the screens shown above), which can be On, Off, or No status (an empty slot in the control unit).

Red LED

When the red LED is on, the module is not in service because it is in standby mode, being tested, or is in an alarm condition. When a module resumes normal operations, the red LED turns off.

Yellow LED

When the yellow LED is on, it usually means that at least one call is in progress on that module. This is usually true for modules with trunks. When this is the status, you must reset the board if you want to terminate any calls in progress rather than waiting for them to terminate during a Busy-Out.

Green LED

The green LED is usually off. It may be on during power up or when an Internal Loopback or CSU Loopback Test is running.

Sample LED Display (Slot 4)

If a call is in progress on a module that is in a working or normal state, the System Status display for that module appears as:

Roff Yon Goff.

If a slot is empty, R, Y, and G appear without indicating a status. Slot 4 is empty, according to the sample screen in the last procedure.

Slot Status

Slot Status provides the following information for a module in a particular slot:

- LED status
- Errors (yes or no)
- Mode (initialization, standby, test, or normal)
- Alarms (yes or no)
- Maintenance busy (yes or no)

Summary

Console Procedure

Menu→Maintenance→Slot→Dial the slot
no.→Enter→Status

PC Procedure

F6 → **F2** → Type the slot no. → **F10** → **F1**

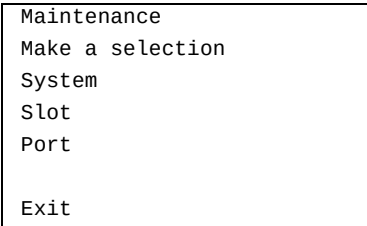
To check Slot Status, follow the steps below.

- 1. From the Maintenance menu, select the Slot option.

Console Display/Instructions

Additional Information

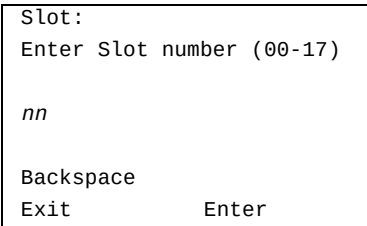
PC



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F2

- 2. Specify the 2-digit slot number (*nn* = 00 to 17).



```
Slot:
Enter Slot number (00-17)

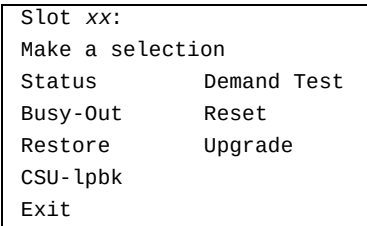
nn

Backspace
Enter
```

Dial or type [*nn*] and select Enter.

F10

- 3. Select the Status option.



```
Slot xx:
Make a selection
Status      Demand Test
Busy-Out    Reset
Restore      Upgrade
CSU-lpbk
Exit
```

xx = slot number entered in Step 2.

F1

For all MLX modules, BChLoopback is also displayed as an option on this screen. For 100D modules, CSU-lpbk, Error Events, and Clock are also displayed as options on this screen. For all 800 NI-BRI modules, Clock, BChLoopback, and Provisioning are also displayed as options on this screen.

If you selected Slot 00, the screen below appears. For detailed information about this status screen, see ["Slot Status"](#), earlier in this chapter.

Console Display/Instructions

```
Status Slot 00:

LED:           Raaa
Errors:

Alarms:

Exit
```

Additional Information

Raaa=status (On, Off, No) of red LED.

PC

If you selected a slot other than 00, the screen below appears. For detailed information about this status screen, see ["Slot Status"](#), earlier in this chapter.

```
Status Slot xx:
LED: Raaa Yaaa Gaaa
Errors:
Mode:
Alarms:
Maintenance Busy:
Exit           Next
```

xx=slot number entered in Step 2.

Raaa =status (On, Off, No) of red LED

Yaaa =status (On, Off, No) of yellow LED

Gaaa =status (On, Off, No) of green LED

Select Next to go from one slot to the next.

F10

Central Office Problems

5

If you have tested the telephones and the modules in the control unit, you have isolated the trouble to the trunks or the CO. To isolate the trouble further, follow the instructions in this chapter to troubleshoot the trunks. If the trouble persists after following these instructions, the customer should contact the CO and ask a representative to troubleshoot from that end.

Trunk Errors

The system records errors not only for trunks, but for T1 ports on the module as well. In some cases, errors occur not because a single port fails, but because the entire T1 link fails. When this happens, 100D automatic testing activates an alarm.

Troubleshooting Trunk Problems

[Table 5-1](#) provides a quick guide to troubleshooting trunks.

Table 5-1. Troubleshooting Trunk Symptoms

Symptom	Section
Incoming calls not being received	Incoming Trunk Problems
Cannot make outgoing calls	Outgoing Trunk Problems
General trunk problems	Manual Correction of Trunk Problems

⇒ NOTE:

If the customer reports echoes during conversations on T1 trunks with GS emulation to a toll office, check the system programming for T1 trunks. The system is not intended to work with GS emulation to a toll office. Tie trunk emulation must be programmed. Program the module to emulate tie trunks to the central office.

Manual Correction of Trunk Problems

If the system cannot seize a trunk even after repeated attempts, you may have to replace the module.

To identify the trunk problem, follow the steps below.

- ▶ **1. Check for dial tone at the control unit.**
- ▶ **2. If you do not hear dial tone, check the error logs and make a trunk test call.**
- ▶ **3. Check for dial tone at the network interface.**

It is sometimes difficult for the customer to detect trunk troubles. If a trunk is down, the system records an error in the error log and takes the trunk out of service. However, if an incoming-only trunk is down, the only sign of trouble is customer complaints that incoming calls are not being received.

Check the error logs for messages about trunk type (such as DID, tie, and T1). Also check the wiring and the system parameters (for example, touch-tone/rotary, toll restriction, and disconnect time interval).

Outgoing Trunk Problems

If the system cannot seize outgoing trunks, try the following procedure for analog lines.

NOTE:

You cannot perform this procedure on a rotary telephone.

▶ 1. Check for outside dial tone at the network interface.

For GS trunks, apply ground to the ring lead to get dial tone. If dial tone is not present, notify the customer.

NOTE:

Steps 2 through 4 only apply to Hybrid/PBX mode. Go to Step 5 for systems in Key or Behind Switch mode.

▶ 2. Pick up the handset of a test telephone to check for system dial tone.

Dial *03, then dial the maintenance password.

NOTE:

If the password is not known, check the System Information Report or ask to speak with the system manager.

You can change the password without knowing the old password only when you perform on-site maintenance through the ADMIN jack.

▶ 3. Dial the 2-digit trunk number (01–80) of the trunk you want to test.

► **4. Listen for dial tone.**

- If dial tone is not present, use a test telephone to isolate the problems either to the module where the trunk terminates or to the location in the trunk access equipment.
- If dial tone is present, dial a working outside number to verify that the call can be completed.
 - Dialing an outside number on a single-line telephone works only if the trunk accepts touch-tone dialing.
 - If you are using a single-line telephone to dial out to an E&M tie trunk or a T1 tie trunk, wait for a click before dialing the outside number.

If the trunk is busy, you hear a busy tone. If you dial a wrong trunk type (such as DID) or an invalid trunk number, you hear a reorder tone.

► **5. If the module continues to malfunction, replace it.**

Incoming Trunk Problems

If incoming trunks do not work properly, try the following procedure.

► **1. Place an incoming call through the troubled trunk.**

- For a loop-start (LS) trunk, connect a single-line telephone to the trunk at the network interface.
- For a ground-start (GS) trunk, connect a single-line telephone to the trunk at the network interface and press the **GS** button. (For GS trunks, the telephone must have a **GS** button attached to it.)

► **2. Listen for ringing.**

► **3. Pick up the handset and check line seizure.**

► **4. Dial an outside number and verify that you have good two-way transmission.**

- ▶ **5. At the maintenance terminal, check the trunk programming to be sure this trunk has been properly translated.**
See the system planning forms.
- ▶ **6. If the module continues to malfunction, replace it.**

Testing Trunks Automatically

The automatic maintenance program takes the ports out of service when a trunk is malfunctioning. When a port is out of service, it is *maintenance-busy*. The trunk is periodically tested and put back into service if possible.

Maintenance-Busy Status

When maintenance-busy is enabled and a trunk cannot be seized for an outgoing call, the trunk is automatically put into a maintenance-busy state. When a trunk is in a maintenance-busy state, no outgoing calls can be placed on it. However, the trunk can still receive incoming calls.

⇒ NOTE:

Maintenance-busy does not apply to DID trunks, since DID trunks cannot be used to make outgoing calls.

While the trunk is in a maintenance-busy state, the software periodically runs tests, attempting to seize the trunk:

- If the seizure is unsuccessful, the trunk stays in a maintenance-busy state.
- If the seizure is successful, the trunk is placed back in service.
- If a test is running when an incoming call is received on the trunk, the test is dropped and the call is processed.

No more than 50 percent of trunks in a pool can be in maintenance-busy states at one time. The only exceptions are as follows:

- User-imposed maintenance-busy (for example, module replacement)
- Module maintenance-busy (for example, a loss-of-service alarm in the 100D module)
- No external release at the central office end of the line
- Digital Trunks

Permanent Errors

A permanent error is entered in the error logs when more than 50 percent of analog trunks in a pool are maintenance-busy. When the maintenance-busy level falls below 50 percent, the system automatically removes the permanent error.

NOTE:

Make sure that modules are not in a maintenance-busy state during a backup procedure. Any module in a maintenance-busy state is recorded as such on the backup disk.

Maintenance-Busy Causes

The causes of maintenance-busy vary according to the type of trunk and are detailed in the following sections.

Ground-Start (GS) Trunk

The following events cause maintenance-busy on a ground-start trunk:

- A seizure of the trunk is attempted that results in incomplete handshaking (or no loop current) between the central office (CO) and the system.

After four occurrences, the trunk is put into a maintenance-busy state and a permanent error is logged.

- The CO fails to disconnect when the GS trunk is dropped by the system.

After two occurrences, the trunk is put into a maintenance-busy state and a permanent error is logged.

Loop-Start (LS) Trunk

No loop current exists when the LS trunk is seized. The port is marked *maintenance-busy*, and a permanent error is logged after four occurrences.

Tie Trunk

The following events cause maintenance-busy on a tie trunk.

- A seizure of an outgoing tie trunk fails.
- A transient error is reported. After four unsuccessful seizure attempts, the port is marked *maintenance-busy* and the error becomes permanent.
- The CO fails to disconnect.
- A transient error is reported. After two occurrences, the port is marked *maintenance-busy* and the error becomes permanent.

NOTE:

The test is not run on auto-out tie trunks.

Maintenance-Busy Programming

You can select Maintenance-Busy as a system programming option. If you do, there is also a menu selection to include tie trunks.

Maintenance-Busy Status

See [“Checking Ports”](#) below for information on maintenance-busy status.

Checking Ports

You perform the following procedures from the maintenance terminal. By selecting Port from the Maintenance screen, you can check the maintenance-busy status and other information for individual trunks and extensions. Once you determine the maintenance-busy status, you might also be interested in the other features on the Port menu, which include the following:

- Resetting EIA-232 ports and modems
- Busying-out and restoring trunks and extensions
- Auditing DS1 PRI lines or calls

Checking Trunk Maintenance-Busy Status

Summary

Console Procedure

Menu→Maintenance→Port→Line/Trunk→
Dial the dial plan no.→Enter→Status

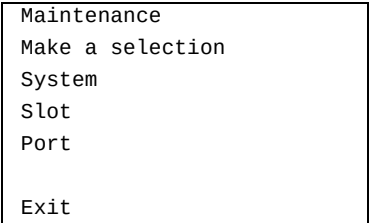
PC Procedure
no.→**F10**→**F1**

F6→**F3**→**F1**→Type the dial plan

To check a trunk's maintenance-busy status, follow the steps below.

Console Display/Instructions Additional Information PC

- **1. From the Maintenance menu, select the Port option.**

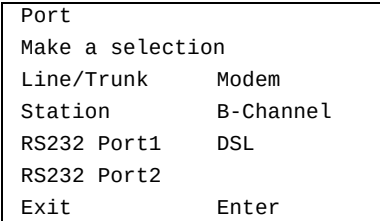


Maintenance
Make a selection
System
Slot
Port

Exit

F3

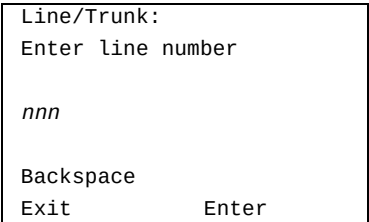
- **2. Select the Line/Trunk option.**



Port
Make a selection
Line/Trunk Modem
Station B-Channel
RS232 Port1 DSL
RS232 Port2
Exit Enter

F1

- **3. Specify the dial plan (line) number for the trunk (nnn = 801 to 880).**



Line/Trunk:
Enter line number

nnn

Backspace
Exit Enter

Dial or type [nnn], then select Enter.

F10

Console Display/Instructions

Additional Information PC

► 4. Select trunk Status.

```
Line/Trunk xxx:
Make a selection
Status
Busy Out
Restore

Exit
```

xxx = line number entered in Step 3

F1

The maintenance-busy status for the trunk you selected is displayed as a Yes or a No, in that field (line 6) on the screen below.

```
Line xxx:
Dial Plan: xxxx
SlotPort: sspp
LogicId: xxx
Label: xxxxxxxxxx
Maintenance Busy: xxx
Exit Next
```

xxx = line number entered in Step 3

Select Next to see the status of the next trunk.

F10

Checking Extension Maintenance-Busy Status

Summary

Console Procedure

Menu→Maintenance→Port→Extension→Dial
the dial plan no.→Enter→Status

PC Procedure
no.→**F10**→**F1**

F6→**F3**→**F2**→Type the dial plan

To check an extension's maintenance busy status, follow the steps below.

Console Display/Instructions Additional Information PC

- **1. From the Maintenance menu, select the Port option.**

Maintenance
Make a selection
System
Slot
Port

Exit

F3

- **2. Select the Station (extension) option.**

Port
Make a selection
Line/Trunk Modem
Station B-Channel
RS232 Port1 DSL
RS232 Port2
Exit Enter

F2

- **3. Specify the dial plan extension number (*nnnn* = 1- to 4-digit number).**

Station:
Enter station number

nnnn

Backspace
Exit Enter

Dial or type [*nnnn*], then select Enter.

F10

► 4. Select Status.

Station xxxx:
Make a selection
Status
Busy Out
Restore

Exit

xxxx = extension number entered in
Step 3

F1

The maintenance-busy status for the trunk you selected is displayed as a Yes or a No, in that field (line 6) on the screen below

Console Display/Instructions

Additional Information PC

Station xxx:
Dial Plan: xxxx
SlotPort: sspp
LogicId: xxx
Label: xxxxxxxxxxxx
Maintenance Busy: xxx
Exit Next

Select Next to see the status of the
next trunk.

F10

Checking Digital Subscriber Line (DSL) Maintenance-Busy Status

Summary

Console Procedure

Menu→Maintenance→Port→Line/Trunk→Dial
the dial plan no.→Enter→Status

PC Procedure
no.→**F10**→**F1**

F6→**F3**→**F1**→Type the dial plan

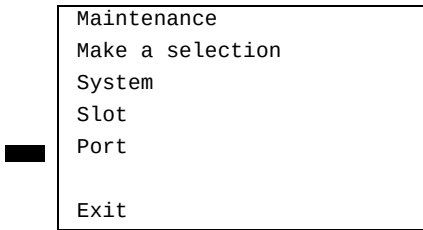
To check a Digital Subscriber Line (DSL)'s maintenance-busy status, follow the steps below.

Console Display/Instructions

Additional Information

PC

- 1. From the Maintenance menu, select the Port option.



```
Maintenance
Make a selection
System
Slot
Port
Exit
```

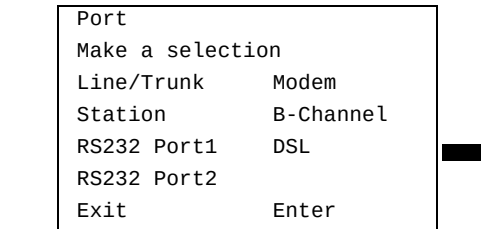
F3

Console Display/Instructions

Additional Information

PC

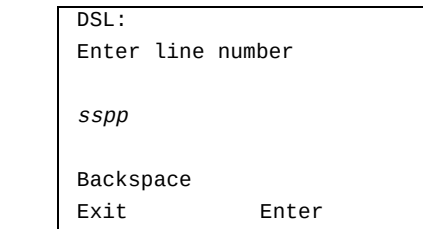
- 2. Select the Digital Subscriber Line (DSL) option.



```
Port
Make a selection
Line/Trunk      Modem
Station         B-Channel
RS232 Port1     DSL
RS232 Port2
Exit            Enter
```

F8

- 3. Specify the dial plan number for the DSL (*sspp* = 2-digit slot number and 2-digit port number).



```
DSL:
Enter line number

sspp

Backspace
Exit      Enter
```

Dial or type [*sspp*], then select Enter.

F10

► 4. Select DSL Status.

```
DSL  sspp:
Make a selection
Status
Busy Out
Restore

Exit
```

sspp = slot/port number entered in
Step 3

F1

The maintenance-busy status for the trunk you selected is displayed as a Yes or a No, in that field (line 6) on the screen below.

```
DSL  sspp:
Dial Plan:  xxxx
SlotPort:  sspp
LogicId:   xxx
Label:     xxxxxxxxxxxx
Maintenance Busy:  xxx
Exit              Next
```

sspp = slot/port number entered in
Step 3

Select Next to see the status of the
next DSL.

F10

Busying-Out a Trunk

Summary

Console Procedure

Menu→Maintenance→Port→Line/Trunk→
Dial the dial plan no.→Enter→Busy-Out

PC Procedure
no.→**F10**→**F2**

F6→**F3**→**F1**→Type the dial plan

To busy-out a trunk, follow the steps below.

Console Display/Instructions

Additional Information

PC

- 1. From the Maintenance menu, select the Port option.

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F3

- 2. Select the Line/Trunk option.

```
Port
Make a selection
Line/Trunk      Modem
Station         B-Channel
RS232 Port1     DSL
RS232 Port2
Exit            Enter
```

F1

- 3. Specify the dial plan number (line) for the trunk (*nnn* = 801 to 880).

```
Line/Trunk:
Enter line number

nnn

Backspace
Exit      Enter
```

Dial or type [*nnn*], then select Enter.

F10

Console Display/Instructions

Additional Information PC

► 4. Select Busy-Out.



```
Line/Trunk  xxx:
Make a selection
Status
Busy Out
Restore

Exit
```

xxx = line number entered in Step 3

F2

The screen below is shown until Busy-Out finishes or fails.

```
Line/Trunk  xxx:

Busy-Out in Progress

Exit
```

xxx = line number entered in Step 3

The screen below appears when Busy-Out is completed successfully.

```
Line/Trunk  xxx:

Busy-Out Successfully
Completed

Exit
```

xxx = line number entered in Step 3

The screen below appears when Busy-Out fails. If this occurs, exit and try again.

```
Line/Trunk  xxx:

Busy-Out FAILED

Exit
```

xxx = line number entered in Step 3

Busying-Out an Extension

Summary

Console Procedure **Menu**→Maintenance→Port→Extension→Dial
the dial plan no.→Enter→Busy-Out

PC Procedure [F6] → [F3] → [F2] → Type the dial plan
no.→[F10] → [F2]

To busy-out an extension, follow the steps below.

Console Display/Instructions Additional Information PC

- 1. From the Maintenance menu, select the Port option.



Maintenance
Make a selection
System
Slot
Port

Exit

[F3]

- 2. Select the Station (extension) option.



Port
Make a selection
Line/Trunk Modem
Station B-Channel
RS232 Port1 DSL
RS232 Port2
Exit Enter

[F2]

Console Display/Instructions

Additional Information PC

- **3. Specify the dial plan number extension number (*nnnn* = 1- to 4-digit extension number).**

```
Station:
Enter station number

nnnn

Backspace
Exit          Enter
```

Dial or type [*nnnn*], then select Enter.

F10

If *nnnn* is the CTI link, you see the following screen:

```
CTI Link xxxx:
Make a selection
Status          Test
Restart

Exit
```

xxxx is dial plan number,
slot/port, or logical ID.

F5

Press Exit. You are returned to the selection screen above.

- **4. Select Busy-Out.**

```
Station xxxx:
Make a selection
Status
Busy Out
Restore

Exit
```

xxxx = extension number entered in
Step 3

F2

The screen below is shown until Busy-Out finishes or fails.

```
Station  xxxx:

Busy-Out in Progress

Exit
```

xxxx = extension number entered in
Step 3

The screen below appears when Busy-Out is completed successfully.

```
Station  xxxx:

Busy-Out Successfully
Completed

Exit
```

xxxx = extension number entered in
Step 3

The screen below appears when Busy-Out fails. If this occurs, exit and try again.

```
Station  xxxx:

Busy-Out FAILED

Exit
```

xxxx = extension number entered in
Step 3

F5

Busy-Out a Digital Subscriber Line (DSL)

Summary

Console Procedure

Menu→Maintenance→Port→DSL→Dial the dial
plan no.→Enter→Busy-Out

PC Procedure

F6 → F3 → F8 → Type the dial plan no. → F10 → F2

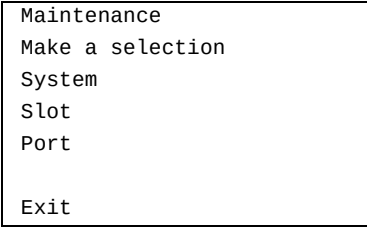
To busy-out a Digital Subscriber Line (DSL), follow the steps below.

Console Display/Instructions

Additional Information

PC

- 1. From the Maintenance menu, select the Port option.



Maintenance
Make a selection
System
Slot
Port

Exit

F3

Console Display/Instructions

Additional Information PC

► 2. Select the DSL option.

```
Port:
Make a selection
Line/Trunk      Modem
Station         B-Channel
RS232 Port1     DSL
RS232 Port2
Exit            Enter
```

F8

► 3. Specify the dial plan DSL number (*sspp* = 2-digit slot number and 2-digit port number).

```
DSL:
Enter DSL  (sspp)

sspp

Exit            Enter
```

Dial or type [*sspp*], then select Enter

F10

► 4. Select Busy-Out.

```
DSL sspp:
Make a Selection
Status
Busy Out
Restore
Error Events
Exit
```

sspp = slot/port number entered in
Step 3

F2

The screen below is shown until Busy-Out finishes or fails.

```
DSL sspp:

Busy-Out in Progress

Exit
```

sspp = slot/port number entered in
Step 3

The screen below appears when Busy-Out is completed successfully.

```
DSL  sspp:

Busy-Out Successfully
Completed

Exit
```

sspp = slot/port number entered in
Step 3

The screen below appears when Busy-Out fails. If this occurs, exit and try again.

```
DSL  sspp:

Busy-Out FAILED

Exit
```

sspp = slot/port number entered in
Step 3

Restoring a Trunk

Summary

Console Procedure

Menu--Maintenance→Port→Line/Trunk→Dial the
dial plan no.→Enter→Restore

PC Procedure

[F6]→[F3]→[F1]→Type the dial plan no.→[F10]→[F3]

To restore a trunk, follow the steps below.

Console Display/Instructions

Additional Information

PC

- 1. From the Maintenance menu, select the Port option.

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F3

- 2. Select the Line/Trunk option.

```
Port:
Make a selection
Line/Trunk      Modem
Station         B-Channel
RS232 Port1     DSL
RS232 Port2
Exit            Enter
```

F1

- 3. Specify the dial plan number (line) for the trunk (*nnn* = 801 to 880).

```
Line/Trunk:
Enter line number

nnn

Backspace
Exit            Enter
```

Dial or type [*nnn*], then select Enter

F10

- 4. Select Restore.

```
Line/Trunk xxx:
Make a Selection
Status
Busy Out
Restore
Exit
```

xxx = line number entered in
Step 3

F3

The screen below is shown until Restore finishes or fails.

Restore Line/Trunk xxx:
Restore in Progress
Exit

xxx = line number entered in
Step 3

The screen below appears when Restore is completed successfully.

Restore Line/Trunk xxx:
Restore Successfully Completed
Exit

xxx = line number entered in
Step 3

The screen below appears when Restore fails. If this occurs, exit and try again.

Restore Line/Trunk xxx:
Restore FAILED
Exit

xxx = line number entered in
Step 3

Restoring an Extension

Summary

Procedure

Menu→Maintenance→Port→Station→Dial
the dial plan no.→Enter→Restore

PC Procedure

[F6]→[F3]→[F2]→Type the dial plan no.→[F10]→[F3]

To restore an extension, follow the steps below.

Console Display/Instructions

Additional Information

PC

- **1. From the Maintenance menu, select the Port option.**

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F3

- **2. Select the Station (extension) option.**

```
Port:
Make a selection
Line/Trunk      Modem
Station         B-Channel
RS232 Port1     DSL
RS232 Port2
Exit            Enter
```

F2

- **3. Specify the dial plan extension number (*nnnn* = 1- to 4-digit number).**

```
Station:
Enter station number

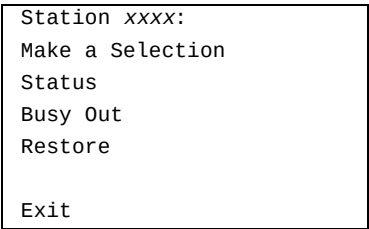
nnnn

Backspace
Exit            Enter
```

Dial or type [*nnnn*], then select Enter

F10

► **4. Select Restore.**

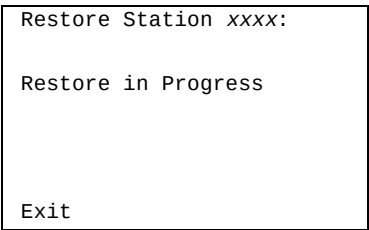


Station xxxx:
Make a Selection
Status
Busy Out
Restore
Exit

xxxx = extension number entered in
Step 3

F3

The screen below is shown until Restore finishes or fails.



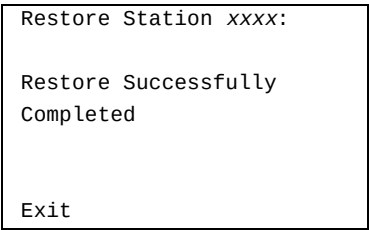
Restore Station xxxx:

Restore in Progress

Exit

xxxx = extension number entered in
Step 3

The screen below appears when Restore is completed successfully.



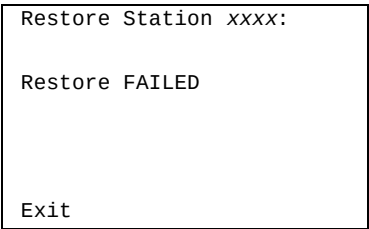
Restore Station xxxx:

Restore Successfully
Completed

Exit

xxxx = extension number entered in
Step 3

The screen below appears when Restore fails. If this occurs, exit and try again.



Restore Station xxxx:

Restore FAILED

Exit

xxxx = extension number entered in
Step 3

Restoring a Digital Subscriber Line (DSL)

Summary

Procedure **Menu**→Maintenance→Port→DSL→Dial the dial
plan no.→Enter→Restore

PC Procedure [F6]→[F3]→[F8]→Type the dial plan no.→[F10]→[F3]

To restore an extension, follow the steps below.

Console Display/Instructions Additional Information PC

- **1. From the Maintenance menu, select the Port option.**

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F3

- **2. Select the Station (extension) option.**

```
Port:
Make a selection
Line/Trunk      Modem
Station          B-Channel
RS232 Port1      DSL
RS232 Port2
Exit              Enter
```

F8

- **3. Specify the dial plan extension number (*sspp* = 2-digit slot number and 2-digit port number).**

```
DSL:
Enter DSL    number

sspp

Exit              Enter
```

Dial or type [*sspp*], then select Enter

F10

Console Display/Instructions

Additional Information PC

► 4. Select Restore.



```
DSL sspp:  
Make a Selection  
Status  
Busy Out  
Restore  
Error Events  
Exit
```

sspp = slot/port number entered in
Step 3

F3

The screen below is shown until Restore finishes or fails.

```
Restore DSL sspp:  
  
Restore in Progress  
  
Exit
```

sspp = slot/port number entered in
Step 3

The screen below appears when Restore is completed successfully.

```
Restore DSL sspp:  
  
Restore Successfully  
Completed  
  
Exit
```

sspp = slot/port number entered in
Step 3

The screen below appears when Restore fails. If this occurs, exit and try again.

```
Restore DSL sspp:  
  
Restore FAILED  
  
Exit
```

sspp = slot/port number entered in
Step 3

Resetting an RS-232 Port

The ADMIN (SPM) port is RS-232 Port 1, and the SMDR port is RS-232 Port 2.

Summary

Console Procedure **Menu**→Maintenance→Port→RS232 Port1 or RS232 Port2→Dial the dial plan no.→Enter→Reset→Yes

PC Procedure **F6**→**F3**→**F3** or **F4**→Type the dial plan no.→**F10**→**F1**→**F3**

To reset an RS-232 port, follow the steps below.

Console Display/Instructions Additional Information PC

- **1. From the Maintenance menu, select the Port option.**

```
Maintenance
Make a selection
System
Slot
Port
Exit
```

F3

- **2. Specify the RS-232 port.**

```
Port:
Make a selection
Line/Trunk      Modem
Station          B-Channel
RS232 Port1      DSL
RS232 Port2
Exit              Enter
```

Select RS232 Port 1 or
RS232 Port 2.

F3

F4

- **3. Specify the dial plan extension number (*sspp* = 2-digit slot number and 2-digit port number).**

```
RS232 Port x:
Make a selection
Reset
Exit
```

x = port selected in Step 2

F1

Console Display/Instructions

Additional Information PC

► 4. Select Yes.

RS232 Port x Reset:

x = port selected in Step 2

Do you want to continue?

Yes

Cancel

Exit

F2

The screen below is shown until Reset finishes or fails.

RS232 Port x Reset:

x = port selected in Step 2

Reset in Progress

Exit

The screen below appears when Reset is completed successfully.

RS232 Port x Reset:

x = port selected in Step 2

Reset Successfully

Completed

Exit

The screen below appears when Reset fails. If this occurs, exit and try again.

RS232 Port x Reset:

x = port selected in Step 2

Reset FAILED

Exit

F5

Resetting the Processor's Internal Modem

Summary

Console Procedure

Menu→Maintenance→Port→Modem→Reset→Yes

PC Procedure

[F6]→[F3]→[F6]→[F1]→[F2]

To reset the processor's internal modem, follow the steps below.

Console Display/Instructions Additional Information PC

- **1. From the Maintenance menu, select the Port option.**

Maintenance
Make a selection
System
Slot
Port

Exit

[F3]

- **2. Select the Modem option.**

Port:
Make a selection
Line/Trunk Modem
Station B-Channel
RS232 Port1 DSL
RS232 Port2
Exit Enter

[F6]

- **3. Select Reset.**

Modem Port:
Make a selection
Reset

Exit

[F1]

Console Display/Instructions

Additional Information

PC

► 4. Select Yes.

Modem Port Reset:

Do you want to continue?

Yes

Cancel

Exit

F2

The screen below is shown until Reset finishes or fails.

Modem Port Reset:

Reset in Progress

Exit

F5

The screen below appears when Reset is completed successfully.

Modem Port Reset:

Reset Successfully
Completed

Exit

F5

The screen below appears when Reset fails. If this occurs, exit and try again.

Modem Port Reset:

Reset FAILED

Exit

F5

Auditing DS1 PRI B-Channels

The Auditing Lines and Auditing Calls procedures initiate an audit. Once an audit is initiated, you need to wait for the far end to send a message, which usually takes about four minutes. After waiting four minutes, check the error logs to see if any new PRI errors have occurred.

- **Auditing Lines.** If troubleshooting indicates problems with PRI lines between the control unit and the CO, this audit, if successful, fixes the problem. It allows either side of the PRI interface to synchronize both ends by exchanging messages.
- **Auditing Calls.** If troubleshooting indicates problems with PRI calls to or from MLX telephones, this audit, if successful, fixes the problem. It allows either side of the PRI interface to synchronize both ends by exchanging messages.



NOTE:

If an audit fails, the customer should call the CO to correct the problem from that end. Repeat the audit when the problem is fixed.

Auditing Lines

Summary

Procedure	Menu →Maintenance→Port→B-Channel→Dial the slot and port no.→Enter→ Audit Lines
PC Procedure	F6 → F3 → F7 →Type the slot and port no.→ F10 → F1
Appropriate Slot or Port	This test can be run only on the slot and port of a DS1 PRI B-channel.
Time Estimate	4 minutes
Backup Procedure	Not required
Busy-Out or Reset	Not required
Interrupting the Test	You cannot interrupt this test.
Restore	Not required

To audit lines, follow the steps below.

Console Display/Instructions Additional Information PC

- **1. From the Maintenance menu, select the Port option.**

```
Maintenance
Make a selection
System
Slot
Port

Exit
```

F3

- **2. Select the B-Channel option.**

```
Port:
Make a selection
Line/Trunk      Modem
Station          B-Channel
RS232 Port1      DSL
RS232 Port2
Exit              Enter
```

F7

- **3. Specify the slot and port number (*ss*=2-digit slot number; *pp*=2-digit port number).**

```
B-Channel:
Enter B-Channel (sspp)

xxxx

Exit              Enter
```

Dial or type [*sspp*] and select Enter.

F10

Console Display/Instructions

Additional Information PC

► 4. Select Audit Line.



```
B-Channel xxxx:
Make a selection
Audit Line
Audit Call

Exit
```

xxxx = slot and port number entered
in Step 3.

F1

The screen below appears only if the audit message is successfully created and sent.

```
BChannel xxxx Audit Line

Audit Initiated

Exit
```

xxxx = slot and port number entered
in Step 3.

After about four minutes, check the error logs.

- If new PRI errors occur, contact your technical support organization for help on interpreting the results and your action.
- If no new PRI messages appear, the ends are most likely in agreement.

The screen below appears when the message cannot be sent due to signaling failure.

```
BChannel xxxx Audit Line

Audit Failed

Exit
```

xxxx = slot and port number entered
in Step 3.

This indicates that the problem may be at the CO end. First, make sure the correct B-channel is selected. If the correct B-channel is selected, the customer or Lucent Technologies representative acting as the customer's agent should ask the CO to clear the problem from that end. If the problem is not at the CO end, select the correct B-channel and repeat the Audit Lines procedure.

Auditing Calls

Summary

Console Procedure	Menu →Maintenance→Port→B-Channel→Dial the slot and port no.→Enter→Audit Call
PC Procedure	F6 → F3 → F7 →Type the slot and port no.→ F10 → F2
Appropriate Slot or Port	This test can be run only on the slot and port of a DS1 PRI B-channel.
Time Estimate	Four minutes
Backup Procedure	Not required
Busy-Out or Reset	Not required
Interrupting the Test	You cannot interrupt this test.
Restore	Not required

Console Display/Instructions Additional Information PC

- 1. From the Maintenance menu, select the Port option.

Maintenance
Make a selection
System
Slot
Port

Exit

F3

Console Display/Instructions

Additional Information PC

► 2. Select the B-Channel option.

```
Port:
Make a selection
Line/Trunk      Modem
Station         B-Channel
RS232 Port1     DSL
RS232 Port2
Exit            Enter
```

F7

► 3. Specify the slot and port number (*ss*=2-digit slot number; *pp*=2-digit port number).

```
B-Channel:
Enter B-Channel (sspp)

xxxx

Exit            Enter
```

Dial or type [*sspp*] and select Enter.

F10

► 4. Select Audit Call.

```
B-Channel xxxx:
Make a selection
Audit Line
Audit Call

Exit
```

xxxx = slot and port number entered
in Step 3.

F2

The screen below appears only if the audit message is successfully created and sent.

```
BChannel xxxx Audit Call

Audit Initiated

Exit
```

xxxx = slot and port number entered
in Step 3.

After about four minutes, check the error logs.

- If new PRI errors occur, contact your technical support organization for help on interpreting the results and your action.
- If no new PRI messages appear, the ends are most likely in agreement.

The screen below appears when the message cannot be sent.

Console Display/Instructions

```
BChannel xxxx Audit Call

Audit Failed

Exit
```

Additional Information PC

xxxx = slot and port number entered
in Step 3.

If this occurs, make sure an active call is in progress on the specified B-channel and try the audit again.

Conclusion of Hardware Maintenance

Installing the Control Unit Housing (Release 2.1 or Later)

After you have completed maintenance and troubleshooting on Release 2.1 or later, follow the steps below to reinstall the control unit housing.

Installing the Top Cover

To install the top cover, see [Figure 5-1](#) and follow these steps.

- ▶ 1. Be sure the cords have been pressed through the wire managers at the base of the modules.
- ▶ 2. Hold the top cover with the hooks facing you.
- ▶ 3. Engage the tabs at the rear of the top cover with the carrier.
- ▶ 4. Lower the top cover, so that the legs lock into the vents on the module.

Installing the Front Cover

To install the front cover, see [Figure 5-2](#) and follow these steps.

- ▶ 1. Hook the top of the front cover onto the top cover.
- ▶ 2. Push down on the bottom of the front cover until it locks securely on the base of the wire manager on the modules.

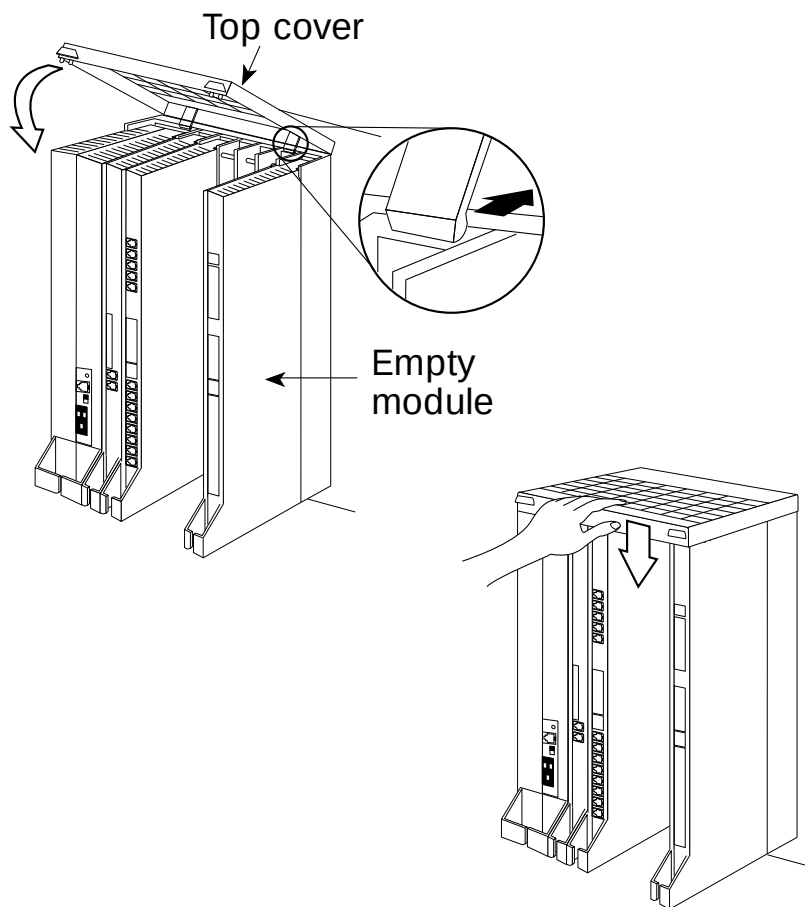


Figure 5-1. Installing the Control Unit Top Cover (Release 2.1 and Later)

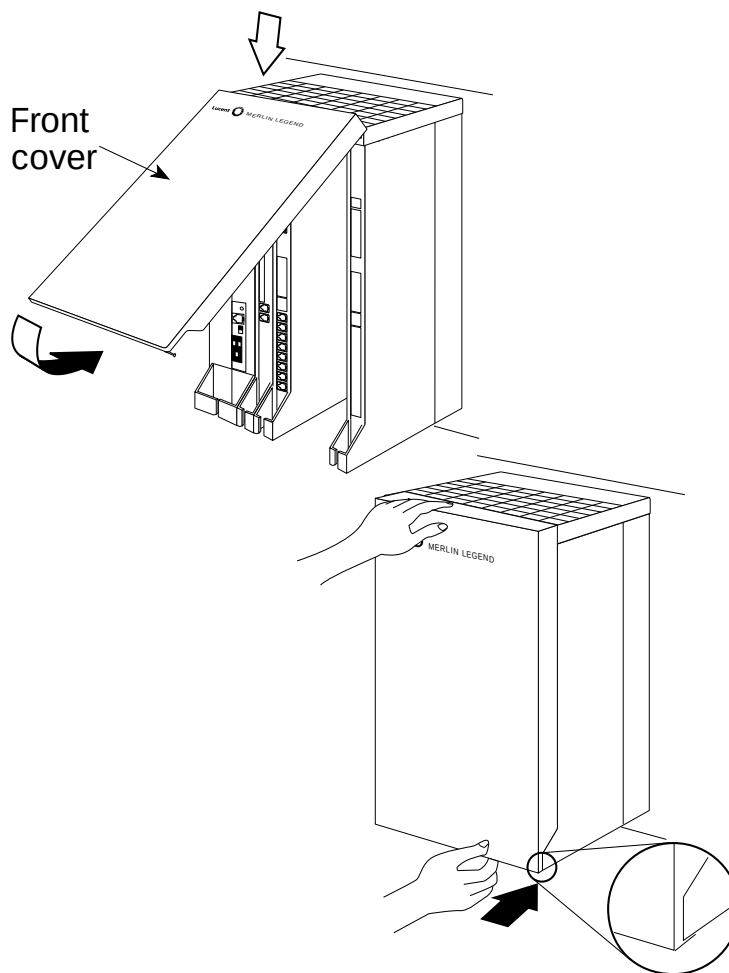


Figure 5-2. Installing the Control Unit Front Cover (Release 2.1 and Later)

Installing the Control Unit Housing (Release 2.0 or Earlier)

After you have completed maintenance and troubleshooting, follow the steps below to reinstall the Release 2.0 or earlier control unit housing.

- ▶ **1. Assemble the control unit housing. See [Figure 5-3](#).**
 - If the housing is already assembled, go to Step 2.
 - If the housing is not assembled:
 - a. Lay the front panel(s) face down.
 - b. If you are housing more than one carrier, connect the front panels together by lining up the arrows and then sliding the panels until the semicircles form a complete circle.
 - c. Connect the side panels to the front panel(s) similarly.

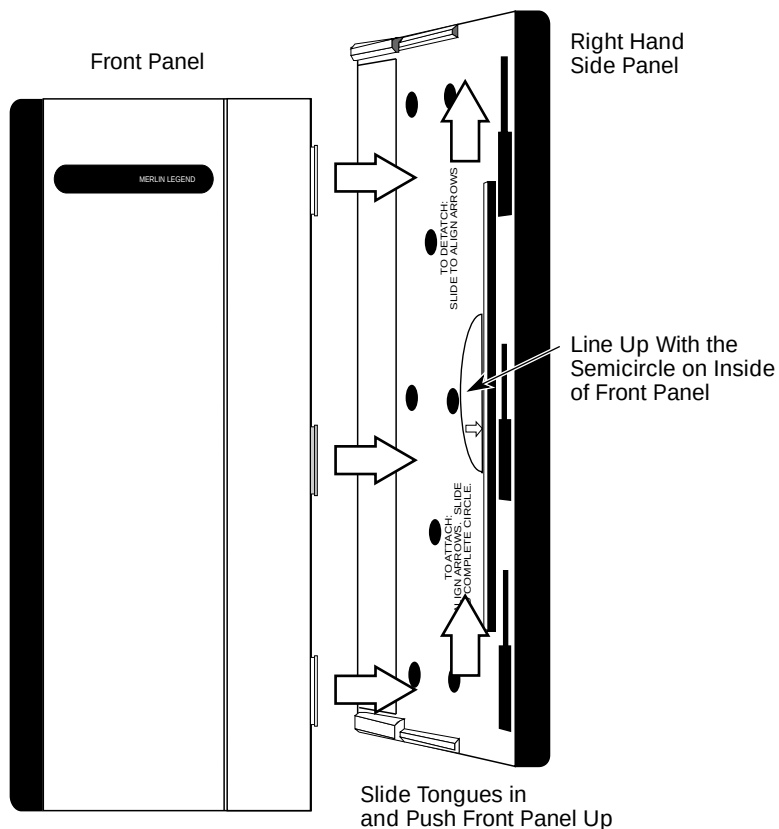


Figure 5-3. Assembling the Control Unit Housing (Release 2.0 and Earlier)

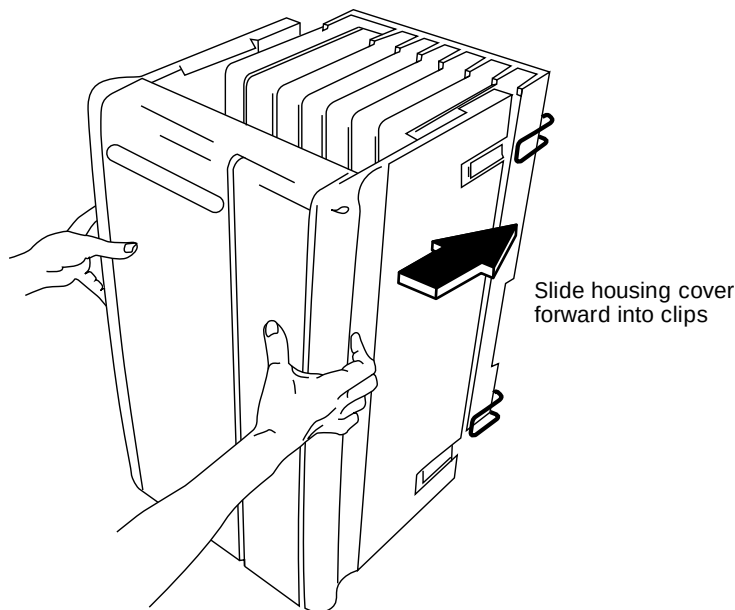


Figure 5-4. Installing the Control Unit Housing (Release 2.0 and Earlier)

- ▶ 2. Line up the wire clips attached to the carrier with the recesses on the outside of the side panels. See [Figure 5-4](#).
If the wire clips are not attached to the control unit, see "Installing the Housing Clips" in Chapter 2 of *Installation*.
- ▶ 3. Push the panels back until the clips hook over the tabs and rest in the recesses.

Customer Support Information



Support Telephone Number

In the USA only, Lucent Technologies provides a toll-tree customer Helpline (1 800 628-2888) 24 hours a day. If you need assistance when installing, programming, or using your system, call the Helpline, or your Lucent Technologies representative. Consultation charges may apply.

Outside the USA, if you need assistance when installing, programming, or using your system, contact your Lucent Technologies representative.

Federal Communications Commission (FCC) Electromagnetic Interference Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

Canadian Department of Communications (DOC) Interference Information

This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the radio interference regulations of the Canadian Department of Communications.

Le Présent Appareil Numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

FCC Notification and Repair Information

This equipment is registered with the FCC in accordance with Part 68 of its rules. In compliance with those rules, you are advised of the following:

- **Means of Connection.** Connection of this equipment to the telephone network shall be through a standard network interface jack, USOC RJ11C, RJ14C, RJ21X. Connection to E&M tie trunks requires a USOC RJ2GX. Connection to off-premises extensions requires a USOC RJ11C or RJ14C. Connection to 1.544-Mbps digital facilities must be through a USOC RJ48C or RJ48X. Connection to DID requires a USOC RJ11C, RJ14C, or RJ21X. These USOCs must be ordered from your telephone company. Connection to 56-Kbps or 64-Kbps facilities requires a USOC RJ11C, RJ14C, or RJ21.
- **Party Lines and Coin Telephones.** This equipment may not be used with party lines or coin telephone lines.
- **Notification to the Telephone Companies.** Before connecting this equipment, you or your equipment supplier must notify your local telephone company's business office of the following:
 - The telephone number(s) you will be using with this equipment.
 - The appropriate registration number and ringer equivalence number (REN), which can be found on the back or bottom of the control unit, as follows:
 - If this equipment is to be used as a Key system, report the number AS593M-72914-KF-E.
 - If the system provides both manual and automatic selection of incoming/outgoing access to the network, report the number AS593M-72682-MF-E.
 - If there are no directly terminated trunks, or if the only directly terminated facilities are personal lines, report the number AS5USA-65646-PF-E.

- The REN (Ringer Equivalence Number) for all three systems is 1.5A.
- The facility interface code (FIC) and service order code (SOC):
 - For tie line connection, the FIC is TL31M and the SOC is 9.0F.
 - For connection to off-premises stations, the FIC is OL13C and the SOC is 9.0F.
 - For equipment to be connected to DID facilities, the FIC is 02RV2-T and the SOC is AS.2.
 - For equipment to be connected to 1.544-Mbps digital service, the SOC is 6.0P and the FIC is:
 - 04DU9-BN for D4 framing format with AMI zero code suppression.
 - 04DU9-DN for D4 framing format with bipolar 8 zero code suppression (B8ZS).
 - 04DU9-IKN for extended superframe format (ESF) with AMI zero code suppression.
 - 04DU9-ISN with ESF and B8ZS.
 - For equipment to be connected to 56-Kbps or 64-Kbps digital facilities, the FIC is 02B1Q.
- The quantities and USOC numbers of the jacks required.
- For each jack, the sequence in which lines are to be connected, the line types, the FIC, and the REN by position when applicable.

- **Ringer Equivalence Number (REN).** The REN is used to determine the number of devices that may be connected to the telephone line. Excessive RENs on the line may result in the devices not ringing in response to an incoming call. In most, but not all, areas the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the local telephone company to determine the maximum REN for the calling area.
- **Disconnection.** You must also notify your local telephone company if and when this equipment is permanently disconnected from the line(s).

Installation and Operational Procedures

The manuals for your system contain information about installation and operational procedures.

- **Repair Instructions.** If you experience trouble because your equipment is malfunctioning, the FCC requires that the equipment not be used and that it be disconnected from the network until the problem has been corrected. Repairs to this equipment can be made only by the manufacturers, their authorized agents, or others who may be authorized by the FCC. In the event repairs are needed on this equipment, contact your authorized Lucent Technologies dealer or, **in the USA only**, contact the National Service Assistance Center (NSAC) at 1 800 628-2888.
- **Rights of the Local Telephone Company.** If this equipment causes harm to the telephone network, the local telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will also be informed of your right to file a complaint with the FCC.

- **Changes at Local Telephone Company.** Your local telephone company may make changes in its facilities, equipment, operations, or procedures that affect the proper functioning of this equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.
- **Hearing Aid Compatibility.** The custom telephone sets for this system are compatible with inductively coupled hearing aids as prescribed by the FCC.
- **Automatic Dialers.** WHEN PROGRAMMING EMERGENCY NUMBERS AND/OR MAKING TEST CALLS TO EMERGENCY NUMBERS:
 - Remain on the line and briefly explain to the dispatcher the reason for the call.
 - Perform such activities in off-peak hours, such as early morning or late evening.
- **Direct Inward Dialing (DID).** This equipment returns answer supervision signals to the Public Switched Telephone Network when:
 - Answered by the called station
 - Answered by the attendant
 - Routed to a recorded announcement that can be administered by the customer premises equipment user
 - Routed to a dial prompt

This equipment returns answer supervision on all DID calls forwarded back to the Public Switched Telephone Network. Permissible exceptions are when:

- A call is unanswered
- A busy tone is received
- A reorder tone is received

Allowing this equipment to be operated in such a manner as not to provide proper answer supervision signaling is in violation of Part 68 rules.

New Network Area and Exchange Codes. The MERLIN LEGEND software does not restrict access to any new area codes or exchange codes established by a local telephone company. If the user has established toll restrictions on the system that could restrict access, then the user should check the lists of allowed and disallowed dial codes and modify them as needed.

Equal Access Codes. This equipment is capable of providing users access to interstate providers of operator services through the use of access codes. Modifications of this equipment by call aggregators to block access dialing codes is a violation of the Telephone Operator Consumers Act of 1990.

DOC Notification and Repair Information

NOTICE: The Canadian Department of Communications (DOC) label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The DOC does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect it to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring for single-line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or any equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected. This precaution may be particularly important in rural areas.



CAUTION:

Users should not attempt to make such connections themselves, but should contact the appropriate electrical inspection authority or electrician, as appropriate.

To prevent overloading, the Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop used by the device. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all the devices does not exceed 100.

DOC Certification No.: 230 4095A

CSA Certification No.: LR 56260

Load No.: 6

Renseignements sur la notification du ministère des Communications du Canada et la réparation

AVIS: L'étiquette du ministère des Communications du Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme à certaines normes de protection, d'exploitation et de sécurité des réseaux de télécommunications. Le Ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunication. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. Dans certains cas, les fils intérieurs de l'entreprise utilisés pour un service individuel à ligne unique peuvent être prolongés au moyen d'un dispositif homologué de raccordement (cordon prolongateur téléphonique interne). L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêchent pas la dégradation du service dans certaines situations. Actuellement, les entreprises de télécommunication ne permettent pas que l'on raccorde leur matériel à des jacks d'abonné, sauf dans les cas précis prévus pas les tarifs particuliers de ces entreprises.

Les réparations de matériel homologué doivent être effectuées par un centre d'entretien canadien autorisé désigné par le fournisseur. La compagnie de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

AVERTISSEMENT: L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours à un service d'inspection des installations électriques, ou à un électricien, selon le cas.

L'indice de charge (IC) assigné à chaque dispositif terminal indique, pour éviter toute surcharge, le pourcentage de la charge totale qui peut être raccordée à un circuit téléphonique bouclé utilisé par ce dispositif. La terminaison du circuit bouclé peut être constituée de n'importe quelle combinaison de dispositifs, pourvu que la somme des indices de charge de l'ensemble des dispositifs ne dépasse pas 100.

No d'homologation: 230 4095A

No de certification: CSA LR 56260

L'indice de charge: 6

**MERLIN LEGEND D.O.C.
Location Label Placement**

**Ministère des Communications
du Canada emplacement de
l'étiquette**

 MERLIN LEGEND	Model 511A Control Unit
 LISTED 538E MADE IN U.S.A.	 TELEPHONE EQUIPMENT LR 56260
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Complies with Part 68, FCC Rules. See the System Reference Manual for proper FCC Classification. FCC Reg. Nos. MF: AS593M-72682-MF-E KF: AS593M-72914-KF-E PF: AS5USA-65646-PF-E REN: 1.5A	
WARNING: If equipment is used for out-of-building applications, approved secondary protectors are required. See Installation Manual. AVERTISSEMENT: Si l'équipement est utilisé pour des applications extérieures, l'installation d'un protecteur secondaire est requise. Voir le manuel d'installation.	
Use only Lucent Technologies manufactured MERLIN LEGEND circuit modules, carrier assemblies, and power units, as specified in the Installation Manual, in this product. There are no user serviceable parts inside. Contact your authorized agent for service and repair. This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the radio interference regulations of the Canadian Department of Communications. Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.	

Security of Your System:

Preventing Toll Fraud

As a customer of a new telephone system, you should be aware that there is an increasing problem of telephone toll fraud. Telephone toll fraud can occur in many forms, despite the numerous efforts of telephone companies and telephone equipment manufacturers to control it. Some individuals use electronic devices to prevent or falsify records of these calls. Others charge calls to someone else's number by illegally using lost or stolen calling cards, billing innocent parties, clipping on to someone else's line, and breaking into someone else's telephone equipment physically or electronically. In certain instances, unauthorized individuals make connections to the telephone network through the use of the Remote Access features of your system.

The Remote Access features of your system, if you choose to use them, permit off-premises callers to access the system from a remote telephone by using a telephone number with or without a barrier code. The system returns an acknowledgment signaling the user to key in his or her barrier code, which is selected and administered by the system manager. After the barrier code is accepted, the system returns dial tone to the user. In Release 3.1 and later systems, barrier codes are by default restricted from making outside calls. In prior releases, if you do not program specific outward calling restrictions, the user will be able to place any call normally dialed from a telephone associated with the system. Such an off-premises network call is originated at, and will be billed from, the system location.

The Remote Access feature, as designed, helps the customer, through proper administration, to minimize the ability of unauthorized persons to gain access to the network. Most commonly, phone numbers and codes are compromised when overheard in a public location, through theft of a wallet or purse containing access information, or through carelessness (for example, writing codes on a piece of paper and improperly discarding it). Additionally, hackers may use a computer to dial an access code and then publish the information to other hackers. Enormous charges can be run up quickly. It is the customer's responsibility to take the appropriate steps to properly implement the features, evaluate and administer the various restriction levels, protect access codes, and distribute access codes only to individuals who have been fully advised of the sensitive nature of the access information.

Common carriers are required by law to collect their tarified charges. While these charges are fraudulent charges made by persons with criminal intent, applicable tariffs state that the customer of record is responsible for payment of all long-distance or other network charges. Lucent Technologies cannot be responsible for such charges and will not make any allowance or give any credit for charges that result from unauthorized access.

To minimize the risk of unauthorized access to your communications system:

- Use a nonpublished Remote Access number.
- Assign access codes randomly to users on a need-to-have basis, keeping a log of *all* authorized users and assigning one code to one person.
- Use random-sequence access codes, which are less likely to be easily broken.
- Use the longest-length access codes the system will allow.
- Deactivate all unassigned codes promptly.
- Ensure that Remote Access users are aware of their responsibility to keep the telephone number and any access codes secure.

- When possible, restrict the off-network capability of off-premises callers, using calling restrictions, Facility Restriction Levels (Hybrid/PBX mode only), and Disallowed List capabilities. In Release 3.1 and later systems, a prepared Disallowed List (number 7) is provided and is designed to prevent the types of calls that toll-fraud abusers often make.
- When possible, block out-of-hours calling.
- Frequently monitor system call detail reports for quicker detection of any unauthorized or abnormal calling patterns.
- Limit Remote Call Forwarding to persons on a need-to-have basis.
- Change access codes every 90 days.
- Use the longest-length barrier codes possible, following the guidelines for passwords. (See ["Choosing Passwords"](#).)

Toll Fraud Prevention

Toll fraud is the unauthorized use of your telecommunications system by third parties to make long distance telephone calls. Under the law, you, the customer, are responsible for paying part or all of those unauthorized calls. Thus, the following information is of critical importance.

Unauthorized persons concentrate their activities in two areas with the MERLIN LEGEND Communications System:

- They try to transfer out of the MERLIN LEGEND Communications System to gain access to an outgoing trunk and make long-distance calls.
- They try to locate unused or unprotected mailboxes and use them as drop-off points for their own messages.

The following is a discussion of how toll fraud is often perpetrated and ways to prevent unauthorized access that can lead to toll fraud.

Physical Security, Social Engineering, and General Security Measures

Criminals called hackers may attempt to gain unauthorized access to your communications system and voice messaging system in order to use the system features. Hackers often attempt to trick employees into providing them with access to a network facility (line/trunk) or a network operator. This is referred to as social engineering. Hackers may pose as telephone company employees and employees of Lucent Technologies or your authorized dealer. Hackers will go through a company's trash to find directories, dialing instructions, and other information that will enable them to break into the system. The more knowledgeable they appear to be about the employee names, departments, telephone numbers, and the internal procedures of your company, the more likely it is that they will be able to trick an employee into helping them.

Preventive Measures

Take the following preventive measures to limit the risk of unauthorized access by hackers:

- Provide good physical security for the room containing your telecommunications equipment and the room with administrative tools, records, and system manager information. These areas should be locked when not attended.
- Provide a secure trash disposal for all sensitive information, including telephone directories, call accounting records, or anything that may supply information about your communications system. This trash should be shredded.

- Educate employees that hackers may try to trick them into providing them with dial tone or dialing a number for them. All reports of trouble, requests for moving extensions, or any other administrative details associated with the MERLIN LEGEND Communications System should be handled by one person (the system manager) or within a specified department. Anyone claiming to be a telephone company representative should be referred to this person or department.
- No one outside of Lucent Technologies needs to use the MERLIN LEGEND Communications System to test facilities (lines/trunks). If a caller identifies him or herself as an Lucent Technologies employee, the system manager should ask for a telephone number where the caller can be reached. The system manager should be able to recognize the number as an Lucent Technologies telephone number. *Before connecting the caller to the administrative port of the MERLIN LEGEND Communications System, the system manager should feel comfortable that a good reason to do so exists.* In any event, it is not advisable to give anyone access to network facilities or operators, or to dial a number at the request of the caller.
- Any time a call appears to be suspicious, call the Lucent Technologies GBCS Fraud Intervention Center at 1 800 628-2888 (fraud intervention for System 25, PARTNER® and MERLIN® systems).
- Customers should also take advantage of Lucent Technologies monitoring services and devices, such as the NetPROTECTSM family of fraud detection services, CAS with HackerTracker®, and CAT Terminal with Watchdog. Call 1 800 638-7233 to get more information on these Lucent Technologies fraud detection services and products.

Security Risks Associated with Transferring through voice messaging systems

Toll fraud hackers try to dial into a voice mailbox and then execute a transfer by dialing [*][T]. The hacker then dials an access code (either [9] for Automatic Route Selection or a pooled facility code) followed by the appropriate digit string to either direct dial or access a network operator to complete the call.

NOTE:

In Release 3.1 and later systems, all extensions are initially and by default restricted from dial access to pools. In order for an extension to use a pool to access an outside line/trunk, this restriction must be removed.

Preventive Measures

Take the following preventive measures to limit the risk of unauthorized transfers by hackers:

- Outward restrict all MERLIN LEGEND voice mail port extensions. This denies access to facilities (lines/trunks). In Release 3.1 and later systems, voice mail ports are by default outward restricted.
- As an additional security step, network dialing for all extensions, including voice mail port extensions, should be processed through ARS using dial access code [9].

Security Alert:



The MERLIN LEGEND system ships with ARS activated with all extensions set to Facility Restriction Level 3, allowing all international calling. **To prevent toll fraud**, ARS Facility Restriction Levels (FRLs) should be established using:

- *FRL 0 for restriction to internal dialing only*
- *FRL 2 for restriction to local network calling only*

- *FRL 3 for restriction to domestic long distance (excluding area code 809 for the Dominican Republic as this is part of the North American Numbering Plan, unless 809 is required)*
- *FRL 4 for international calling*

In Release 3.1 and later systems, default local and default toll tables are factory-assigned an FRL of 2. This simplifies the task of restricting extensions: the FRL for an extension merely needs to be changed from the default of 3.

*Each extension should be assigned the appropriate FRL to match its calling requirements. **All voice mail port extensions not used for Outcalling should be assigned to FRL 0 (the default setting in Release 3.1 and later).***

- Deny access to pooled facility codes by removing pool dial-out codes 70, 890-899, or any others on your system.
- Create a Disallowed List or use the pre-prepared Disallowed List number 7 (Release 3.1 and later systems only) to disallow dialing 0, 11, 10, 1700, 1809, 1900, and 976 or 1(wildcard)976. In Release 3.1 and later systems, Disallowed List number 7 does not include 800 and 1800 and 411 and 1411, but Lucent Technologies recommends that you add them. **Assign all voice mail port extensions to this Disallowed List. Lucent Technologies recommends assigning Disallowed List number 7. *This is an added layer of security, in case outward restriction is inadvertently removed.*** (In Release 3.1 and later systems, voice messaging ports are assigned by default to Disallowed List number 7.)

If Outcalling is required by voice messaging system extensions:

- Program an ARS Facility Restriction Level (FRL) of 2 on voice mail port extension(s) used for Outcalling.
- If 800 and 411 numbers are used, remove 1800, 800, 411, and 1411 from Disallowed List number 7.

- If Outcalling is allowed to long distance numbers, build an Allowed List for the voice mail port extension(s) used for Outcalling. This list should contain the area code and the first three digits of the local exchange telephone numbers to be allowed.

Additional general security for voice messaging systems:

- Use a secure password for the General Mailboxes.
- The default administration mailbox, 9997, must be reassigned to the system manager's mailbox/extension number and securely password protected.
- All voice messaging system users must use secure passwords known only to the user.

Security Risks Associated with the Automated Attendant Feature of voice messaging systems

Two areas of toll fraud risk associated with the Automated Attendant feature of voice messaging systems are the following:

- Pooled facility (line/trunk) access codes are translated to a menu prompt to allow Remote Access. If a hacker finds this prompt, the hacker has immediate access. (In Release 3.1 and later systems, dial access to pools is initially factory-set to restrict all extensions: to allow pool access, this restriction must be removed by the system manager.)

- If the Automated Attendant prompts callers to use Remote Call Forwarding (RCF) to reach an outside telephone number, the system may be susceptible to toll fraud. An example of this application is a menu or Submenu that says, "To reach our answering service, select prompt number 5," and transfers a caller to an external telephone number.
- Remote Call Forwarding can only be used securely when the central office provides "reliable disconnect" (sometimes referred to as forward disconnect or disconnect supervision), which guarantees that the central office will not return a dial tone after the called party hangs up. In most cases, the central office facility is a loop-start line/trunk which does not provide reliable disconnect. When loop-start lines/trunks are used, if the calling party stays on the line, the central office will return a dial tone at the conclusion of the call, enabling the caller to place another call as if it were being placed from your company. Ground-start trunks provide reliable disconnect and should be used whenever possible.

Preventive Measures

Take the following preventive measures to limit the risk of unauthorized use of the Automated Attendant feature by hackers:

- *Do not* use Automated Attendant prompts for Automatic Route Selection (ARS) Codes or Pooled Facility Codes.
- Assign all unused Automated Attendant Selector Codes to zero, so that attempts to dial these will be routed to the system attendant.
- If Remote Call Forwarding (RCF) is required, MERLIN LEGEND Communications System owners should coordinate with their Lucent Technologies Account Team or authorized dealer to verify the type of central office facility used for RCF. If it is a ground-start line/trunk, or if it is a loop-start line/trunk and central office reliable disconnect can be ensured, then nothing else needs to be done.



NOTE:

In most cases these will be loop-start lines/trunks without reliable disconnect. The local telephone company will need to be involved to change the facilities used for RCF to ground start lines/trunks. Usually a charge applies for this change. Also, hardware and software changes may need to be made in the MERLIN LEGEND system. The MERLIN MAIL Automated Attendant feature merely accesses the RCF feature in the MERLIN LEGEND system. Without these changes being made, this feature is highly susceptible to toll fraud. These same preventive measures must be taken if the RCF feature is active for MERLIN LEGEND system extensions whether or not it is accessed by an Automated Attendant menu.

Security Risks Associated with the Remote Access Feature

Remote Access allows the MERLIN LEGEND Communications System owner to access the system from a remote telephone and make an outgoing call or perform system administration, using the network facilities (lines/trunks) connected to the MERLIN LEGEND system. Hackers, scanning the public switched network by randomly dialing numbers with war dialers (a device that randomly dials telephone numbers, including 800 numbers, until a modem or dial tone is obtained), can find this feature, which will return a dial tone to them. They can even employ war dialers to attempt to discover barrier codes.

Preventive Measures

Take the following preventive measures to limit the risk of unauthorized use of the MERLIN LEGEND Communications System Remote Access feature by hackers:

- The Remote Access feature can be abused by criminal toll fraud hackers, if it is not properly administered. Therefore, this feature should not be used unless there is a strong business need.

- It is strongly recommended that customers invest in security adjuncts, which typically use one-time passcode algorithms. These security adjuncts discourage hackers. Since a secure use of the Remote Access feature generally offers savings over credit-card calling, the break-even period can make the investment in security adjuncts worthwhile.
- If a customer chooses to use the Remote Access feature without a security adjunct, then multiple barrier codes should be employed, with one per user if the system permits. The MERLIN LEGEND system permits a maximum of 16 barrier codes.
- The maximum length should be used for each barrier code, and should be changed periodically. Barrier codes, like passwords, should consist of a random, hard-to-guess sequence of digits. While MERLIN LEGEND Release 3.0 permits a barrier code of up to 11 digits, systems prior to Release 3.0 permit barrier codes of up to only four digits.

If Remote Access is used, an upgrade to MERLIN LEGEND Communications System Release 3.0 is encouraged to take advantage of the longer barrier code.

Other Security Hints

Make sure that the Automated Attendant Selector Codes do not permit outside line selection.

Following are a number of measures and guidelines that can help you ensure the security of your communications system and voice messaging system.

Multiple layers of security are always recommended to keep your system secure.

Educating Users

Everyone in your company who uses the telephone system is responsible for system security. Users and attendants/operators need to be aware of how to recognize and react to potential hacker activity. Informed people are more likely to cooperate with security measures that often make the system less flexible and more difficult to use.

- Never program passwords or authorization codes onto Auto Dial buttons. Display telephones reveal the programmed numbers and internal abusers can use the Auto Dial buttons to originate unauthorized calls.
- Discourage the practice of writing down barrier codes or passwords. If a barrier code or password needs to be written down, keep it in a secure place and never discard it while it is active.
- Operators or attendants should tell their system manager if they answer a series of calls where there is silence on the other end or the caller hangs up.
- Users who are assigned voice mailboxes should frequently change personal passwords and should not choose obvious passwords.
- The system manager should advise users with special telephone privileges (such as Remote Access, Outcalling, and Remote Call Forwarding) of the potential risks and responsibilities.
- Be suspicious of any caller who claims to be with the telephone company and wants to check an outside line. Ask for a callback number, hang up and confirm the caller's identity.
- Never distribute the office telephone directory to anyone outside the company; be careful when discarding it (shred the directory).
- Never accept collect telephone calls.
- Never discuss your telephone system's numbering plan with anyone outside the company.

Educating Operators

Operators or attendants need to be especially aware of how to recognize and react to potential hacker activity. To defend against toll fraud, operators should follow the guidelines below:

- Establish procedures to counter *social engineering*. *Social engineering is a con game that hackers frequently use to obtain information that may help them gain access to your communications system or voice messaging system.*
- When callers ask for assistance in placing outside or long-distance calls, ask for a callback extension.
- Verify the source. Ask callers claiming to be maintenance or service personnel for a callback number. Never transfer to *10 without this verification. Never transfer to extension 900.
- Remove the headset and/or handset when the console is not in use.

Detecting Toll Fraud

To detect toll fraud, users and operators should look for the following:

- Lost voice mail messages, mailbox lockout, or altered greetings
- Inability to log into voice mail
- Inability to get an outside line
- Foreign language callers
- Frequent hang-ups
- Touch-tone sounds
- Caller or employee complaints that the lines are busy
- Increases in internal requests for assistance in making outbound calls (particularly international calls or requests for dial tone)
- Outsiders trying to obtain sensitive information
- Callers claiming to be the "phone" company
- Sudden increase in wrong numbers

Establishing a Policy

As a safeguard against toll fraud, follow these guidelines for your MERLIN LEGEND Communications System and voice messaging system:

- Change passwords frequently (at least quarterly). Changing passwords routinely on a specific date (such as the first of the month) helps users to remember to do so.
- Always use the longest-length password allowed.
- Establish well-controlled procedures for resetting passwords.
- Limit the number of invalid attempts to access a voice mailbox to five or less.
- Monitor access to the MERLIN LEGEND dial-up maintenance port. Change the access password regularly and issue it only to authorized personnel. Disconnect the maintenance port when not in use. (However, this eliminates Lucent Technologies 24-hour maintenance surveillance capability and may result in additional maintenance costs.)
- Create a communications system management policy concerning employee turnover and include these suggestions:
 - Delete all unused voice mailboxes in the voice mail system.
 - If a terminated employee had Remote Access calling privileges and a personal authorization code, remove the authorization code immediately.
 - If barrier codes and/or authorization codes were shared by the terminated employee, these should be changed immediately.
- Regularly back up your MERLIN LEGEND system files to ensure a timely recovery should it be required. Schedule regular, off-site backups.

- Keep the Remote Maintenance Device turned off when not in use by Lucent Technologies or your authorized dealer.
- Limit transfers to registered subscribers only.
- Use the Security Violations Notification options (Mailbox Lock or Warning Message) to alert you of any mailbox break-in attempts. Investigate all incidents.
- Review security policies and procedures and keep them up to date.

Choosing Passwords

Passwords should be the maximum length allowed by the system.

Passwords should be hard to guess and should **not** contain:

- All the same numbers (for example, 1111, 666666)
- Sequential characters (for example 123456)
- Numbers that can be associated with you or your business, such as your name, birthday, business name, business address, telephone number, or social security number.
- Words and commonly used names.

Passwords should be changed regularly, at least on a quarterly basis. Recycling old passwords is not recommended. Never program passwords (or authorization codes or barrier codes) onto a speed dial button.

Physical Security

You should always limit access to the system console (or attendant console) and supporting documentation. The following are some recommendations:

- Keep the system console and supporting documentation in an office that is secured with a changeable combination lock. Provide the combination only to those individuals having a real need to enter the office.
- Keep telephone wiring closets and equipment rooms locked.
- Keep telephone logs and printed reports in locations that only authorized personnel can enter.
- Design distributed reports so they do not reveal password or trunk access code information.
- Keep the voice messaging system Remote Maintenance Device turned off.

Limiting Outcalling

When Outcalling is used to contact subscribers who are off-site, use the MERLIN LEGEND Communications System Allowed Lists and Disallowed Lists or Automatic Route Selection features to minimize toll fraud.

If the Outcalling feature will not be used, outward restrict all voice messaging system ports. If Outcalling will be used, ports not used for Outcalling should be Outward Restricted (for Merlin Mail Voice Messaging Systems, port 2 on a two-port system, port 4 on a four-port system, ports 5 and 6 on a six-port system). Use Outward Restriction, Toll Restrictions, Allowed Lists, Disallowed Lists and Facility Restrictions Levels, as appropriate to minimize the possibility of toll fraud.

Limited Warranty and Limitation of Liability

Lucent Technologies warrants to you, the customer, that your MERLIN LEGEND Communications System will be in good working order on the date Lucent Technologies or its authorized reseller delivers or installs the system, whichever is later ("Warranty Date"). If you notify Lucent Technologies or its authorized reseller within one year of the Warranty Date that your system is not in good working order, Lucent Technologies will without charge to you repair or replace, at its option, the system components that are not in good working order. Repair or replacement parts may be new or refurbished and will be provided on an exchange basis. If Lucent Technologies determines that your system cannot be repaired or replaced, Lucent Technologies will remove the system and, at your option, refund the purchase price of your system, or apply the purchase price towards the purchase of another Lucent Technologies system.

If you purchased your system directly from Lucent Technologies, Lucent Technologies will perform warranty repair in accordance with the terms and conditions of the specific type of Lucent Technologies maintenance coverage you selected. If you purchased your system from an Lucent Technologies-authorized reseller, contact your reseller for the details of the maintenance plan applicable to your system.

This Lucent Technologies limited warranty covers damage to the system caused by power surges, including power surges due to lightning.

The following will not be deemed to impair the good working order of the system, and Lucent Technologies will not be responsible under the limited warranty for damages resulting from:

- Failure to follow Lucent Technologies' installation, operation, or maintenance instructions
- Unauthorized system modification, movement, or alteration
- Unauthorized use of common carrier communication services accessed through the system

- Abuse, misuse, or negligent acts or omissions of the customer and persons under the customer's control
- Acts of third parties and acts of God

LUCENT TECHNOLOGIES' OBLIGATION TO REPAIR, REPLACE, OR REFUND AS SET FORTH ABOVE IS YOUR EXCLUSIVE REMEDY.

EXCEPT AS SPECIFICALLY SET FORTH ABOVE, LUCENT TECHNOLOGIES, ITS AFFILIATES, SUPPLIERS, AND AUTHORIZED RESELLERS MAKE NO WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIM ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Limitation of Liability

Except as provided below, the liability of Lucent Technologies and its affiliates and suppliers for any claims, losses, damages, or expenses from any cause whatsoever (including acts or omissions of third parties), regardless of the form of action, whether in contract, tort, or otherwise, shall not exceed the lesser of: (1) the direct damages proven; or (2) the repair cost, replacement cost, license fee, annual rental charge, or purchase price, as the case may be, of the equipment that gives rise to the claim. Except as provided below, Lucent Technologies and its affiliates and suppliers shall not be liable for any incidental, special, reliance, consequential, or indirect loss or damage incurred in connection with the equipment. As used in this paragraph, consequential damages include, but are not limited to, the following: lost profits, lost revenues, and losses arising out of unauthorized use (or charges for such use) of common carrier telecommunications services or facilities accessed through or connected to the equipment. For personal injury caused by Lucent Technologies' negligence, Lucent Technologies' liability shall be limited to proven damages to person. **No action or proceeding against Lucent Technologies or its affiliates or suppliers may be commenced more than twenty-four (24) months after the cause of action accrues.** THIS PARAGRAPH SHALL SURVIVE FAILURE OF AN EXCLUSIVE REMEDY.

Remote Administration and Maintenance

The Remote Administration and Maintenance feature of your telecommunications system, if you choose to use it, permits users to change the system features and capabilities from a remote location.

The Remote Administration and Maintenance feature, through proper administration, can help you reduce the risk of unauthorized persons gaining access to the network. However, telephone numbers and access codes can be compromised when overheard in a public location, are lost through theft of a wallet or purse containing access information, or through carelessness (for example, writing codes on a piece of paper and improperly discarding them). Additionally, hackers may use a computer to dial an access code and then publish the information to other hackers. Substantial charges can accumulate quickly. It is your responsibility to take appropriate steps to implement the features properly, evaluate and administer the various restriction levels, and protect and carefully distribute access codes.

Under applicable tariffs, you will be responsible for payment of toll charges. Lucent Technologies cannot be responsible for such charges and will not make any allowance or give any credit resulting from unauthorized access.

To reduce the risk of unauthorized access through Remote Administration and Maintenance, please observe the following procedures:

- The System Administration and Maintenance capability of a Hybrid/PBX or Key system is protected by a password.
 - Change the default password immediately.
 - Continue to change the password regularly.
 - Only give the password to people who need it and impress upon them the need to keep it secret.
 - If anyone who knows the password leaves the company, change the password immediately.

- If you have a special telephone line connected to your Hybrid/PBX or Key system for Remote Administration and Maintenance, you should do one of the following:
 - Unplug the line when it is not being used.
 - Install a switch in the line to turn it off when it is not being used.
 - Keep the Remote Administration and Maintenance telephone number secret. Only give it to people who need to know it, and impress upon them the need to keep it a secret. Do not write the telephone number on the Hybrid/PBX or Key system, the connecting equipment, or anywhere else in the system room.
- If your Remote Administration and Maintenance feature requires that someone in your office transfer the caller to the Remote Administration and Maintenance extension, you should impress upon your employees the importance of only transferring authorized individuals to that extension.

System Numbering Forms



When you change any existing trunk or extension wiring, record information about the wiring on the appropriate system numbering form. This appendix includes examples of all of the system numbering forms, and instructions for completing Form 2a, “System Numbering: Extension Jacks.” The system numbering forms, which are included in this appendix, are as follows:

- Form 2a, System Numbering: Extension Jacks([Figure B-1](#))
- Form 2b, System Numbering: Digital Adjuncts ([Figure B-2](#))
- Form 2c, System Numbering: Line/Trunk Jacks ([Figure B-3](#))
- Form 2d, System Numbering: Special Renumbers ([Figure B-4](#))

See *System Planning* for completed forms which contain more detailed information regarding the configuration of your customer’s system.

Form 2a, System Numbering: Extension Jacks

Renumber System*

☐ 2-Digit ☒ Selected Extension Numbers ☐ 3-Digit ☐ Set Up Space

Mod. Type	Log. ID	Jack Type			Eqpt.	2-Dig. Ext. No. ♦	3-Dig. Ext. No.	Set Up Space	Renumber to	Label	Old Ext. No.	Wire No.	Person, Location, or Function	Ring Freq. ‡	Voice Mail
	1					10	100	7100							
	2					11	101	7101							
	3					12	102	7102							
	4					13	103	7103							
	5					14	104	7104							
	6					15	105	7105							
	7					16	106	7106							
	8					17	107	7107							
	9					18	108	7108							
	10					19	109	7109							
	11					20	110	7110							
	12					21	111	7111							
	13					22	112	7112							
	14					23	113	7113							
	15					24	114	7114							
	16					25	115	7115							
	17					26	116	7116							
	18					27	117	7117							
	19					28	118	7118							
	20					29	119	7119							
	21					30	120	7120							
	22					31	121	7121							
	23					32	122	7122							
	24					33	123	7123							

Shaded lines indicate possible operator positions.

♦ Factory Setting

* The system capacity for Personal Directories is decreased by one whenever an MLX-20L telephone is connected to an MLX port.

† Use Form 2b for adjuncts connected via MFM or ISDN Terminal Adapter (such as the ExpressRoute 1000 or 7500B data module).

‡ Ringing Frequency is programmable on the 016 T/R module only.

Figure B-1. Form 2a, System Numbering: Extension Jacks

The following explains how to complete Form 2a.

The number in the logical ID column refers to the number of the extension jack in the control unit.

1. In the "Eqpt" (Equipment) column, enter the type of device (such as an MLX-20L console) that is connected to the extension jack. On the second line, enter any attached adjuncts (such as an answering machine).
2. In the "Old Ext. No." column, if the wire run is being changed, enter the extension number of the old extension. If you are working with a new installation, leave this space blank.
3. In the "Renumber to" column, enter the extension number of the extension, if not already filled in. (This includes new installations.)
4. In the "Wire No." column, enter the number of the wire as indicated by the label on the wire.
5. In the "Person, Location, or Function" column, enter the name of the person at the location of, or the function of (such as a fax machine) the extension, and any miscellaneous information particular to that extension.

Form 2b, System Numbering: Digital Adjuncts

Log. ID	Factory-Set			Renumber to	Adjuncts	2B	Pass. Bus	MLX Telephone Ext. No.	Person, Location, Function, and Equipment Type
	2-digit	3-digit	Set Up Space						
1	710	300	7300						
2	711	301	7301						
3	712	302	7302						
4	713	303	7303						
5	714	304	7304						
6	715	305	7305						
7	716	306	7306						
8	717	307	7307						
9	718	308	7308						
10	719	309	7309						
11	720	310	7310						
12	721	311	7311						
13	722	312	7312						
14	723	313	7313						
15	724	314	7314						
16	725	315	7315						
17	726	316	7316						
18	727	317	7317						
19	728	318	7318						
20	729	319	7319						
21	730	320	7320						
22	731	321	7321						
23	732	322	7322						
24	733	323	7323						
25	734	324	7324						
26	735	325	7325						
27	736	326	7326						
28	737	327	7327						
29	738	328	7328						
30	739	329	7329						
31	740	330	7330						
32	741	331	7331						
33	742	332	7332						
34	743	333	7333						
35	744	334	7334						
36	745	335	7335						
37	746	336	7336						
38	747	337	7337						
39	748	338	7338						
40	749	339	7339						

Figure B-2. Form 2b, System Numbering: Digital Adjuncts

Form 2c, System Numbering: Line/Trunk Jacks

Music On Hold, Line/Trunk No. _____ Source _____

Loudspeaker Page, Line/Trunk No(s). _____

Maintenance Alarm, Line/Trunk No. _____

Loop-Start Reliable Disconnect*

☐ No ♦ ☐ Yes

Module Type and Slot No.	Log ID	Jack Type (LS, GS, DID, Tie, etc.)	Line/Trunk No.	Pool Dial-Out Code†‡	Re-number to	Incoming Line/Trunk Type (Main No., Personal Line, WATS, FX, etc.)	Telephone Number or Equipment	Label	TT	♦	R	Toll Type Prefix Req'd for LD	Yes	No	Hold Disc. Interval	Short	Long	♦	QCC Operator to Receive Callist (No ♦)	QCC Queue Priority Level† (4 ♦)	Function
	1		801					_____													
	2		802					_____													
	3		803					_____													
	4		804					_____													
	5		805					_____													
	6		806					_____													
	7		807					_____													
	8		808					_____													
	9		809					_____													
	10		810					_____													
	11		811					_____													
	12		812					_____													
	13		813					_____													
	14		814					_____													
	15		815					_____													
	16		816					_____													
	17		817					_____													
	18		818					_____													
	19		819					_____													
	20		820					_____													

♦ Factory Setting
* If the system has AUDIX Voice Power/FAX Attendant System™, Integrated Administration will automatically set Loop-Start Reliable Disconnect to Yes.

† Hybrid/PBX mode only.

‡ Maximum: 11 pools with up to 80 trunks per pool.
Factory settings: 70 (main), 891 (dial-in tie), 892 (automatic-in tie).

Figure B-3. Form 2c, System Numbering: Line/Trunk Jacks

Form 2d, System Numbering: Special Renumbers

Pools* (Form 2c) Description	Factory-Set Number	Renumber to
	70	
	890	
	891	
	892	
	893	
	894	
	895	
	896	
	897	
	898	
	899	

Group Paging (Form 7b) Group ID	Factory-Set Number	Renumber to
	793	
	794	
	795	
	796	
	797	
	798	
	799	

Park Zone (Form 6a) Description	Factory-Set Number	Renumber to
	881	
	882	
	883	
	884	
	885	
	886	
	887	
	888	

DSS Page Buttons	
PAGE 1	Beginning extension for range
PAGE 2	Beginning extension for range
PAGE 3	Beginning extension for range

ARS Dial-Out Code [†]	Default	Renumber to
	9	

Group Calling (Form 7d) Group ID Label	Factory-Set Number	Renumber to
	770	
	771	
	772	
	773	
	774	
	775	
	776	
	777	
	778	
	779	
	780	
	781	
	782	
	783	
	784	
	785	
	786	
	787	
	788	
	789	
	790	
	791	
	7920	
	7921	
	7922	
	7923	
	7924 [‡]	
	7925 [‡]	
	7926 [‡]	
	7927 [‡]	
	7928 [‡]	
	7929 [‡]	

Listed Directory Number* (QCC Queue)	Factory-Set Number	Renumber to
	800	

Remote Access Code (Form 3a)	Factory-Set Number	Renumber to
	889	

* Hybrid/PBX mode only.

[†] ARS Dial-Out Code is Idle Line Preference Code in Key mode.

[‡] Reserved for AUDIX Voice Power/FAX Attendant System.

Figure B-4. Form 2d, System Numbering: Special Renumbers

Unit Load Calculation Worksheet



If you determine that you need to recalculate the unit load for any carrier, use the instructions on the following worksheet.

NOTE:

- You should have a separate copy of the worksheet for each carrier.
- See [“Unit Loads”](#) in [Chapter 1](#) for information on recalculating unit loads.

The 391A3 power supply has a maximum rating of 75 unit loads. If your system contains a 391A1 or 391A2 power supply module, and the unit loads for that carrier will exceed 54, it is recommended that a 391A3 power supply be installed in the system. Auxiliary Power Units cannot be used with the 391A3 power supply.

Unit Load Worksheet

1. Number of modules in carrier (excluding power supply and processor): _____

- If fewer than five, power is adequate.
- If five or six, continue to Step 2.

2. Key or Behind Switch mode only: ☐ Square
Indicate configuration of lines; then go to Step 5. ☐ Modified

3. Hybrid/PBX mode only:

Do all modules in the carrier have MLX and/or analog multiline telephone jacks? ☐ Yes

- If no, a newer power supply is not needed.
- If yes, continue to Step 4.

4. Hybrid/PBX mode only:

Calculate the total number of MLX and analog multiline telephones:

Number of MLX-20L consoles connected to modules in the carrier _____

Number of MLX-28D consoles connected to modules in the carrier _____

Number of 34-button analog multiline telephones connected to modules in the carrier _____

Total of MLX-20L, MLX-28D, and 34-button analog telephones _____

- If total is less than or equal to 45, auxiliary power is not required.
- If the total is greater than 45, continue to Step 5.

5. Calculate the estimated unit loads.

Table 1:

Module	Qty	x	Unit Load	= Total
008			12.0	
008 MLX			13.5	
008 OPT			8.0	
012			8.4	
016			12.8	
100D			0.0	
400			0.0	
400 EM			8.0	
400 GS/LS/TTR			8.0	
408			12.0	
408 GS/LS			12.0	
408 GS/LS-MLX			13.5	
800			0.0	
800 NI-BRI			0.0	

Table 1:

800 GS/LS		0.0	
800 GS/LS-ID		8.0	
800 DID		8.0	
MERLIN LEGEND Mail		0.0	
Total Estimated Unit Load			

- If the total is less than or equal to 54, any power supply module is sufficient.
 - If the total is greater than 54, continue to Step 6.
6. Calculate the actual carrier unit load.

	Qty	x	Unit Load		= Total
Equipment			Hybrid/PBX or Modified	Square	
Network Access Lines*					
DID			1.0	1.0	
DS1			0.0	0.0	
GS/LS			0.0	0.0	
Tie			1.4	1.4	
Telephones					
MLX-5			0.9	1.2	
MLX-5D			0.9	1.2	
MLX-10			0.9	1.2	
MLX-10D			0.9	1.2	
MLX-16DP			1.5	1.5	
MLX-28D			1.2	1.7	
MLX-20L			1.1	1.6	
BIS-10			0.9	1.1	
BIS-22			1.0	1.3	
BIS-22D			1.0	1.3	
BIS-34			1.1	1.5	

	Qty	x	Unit Load		= Total
Equipment			Hybrid/PBX or Modified	Square	
BIS-34D			1.1	1.5	
MLC-5			0.0	0.0	
MDC-9000			0.0	0.0	
MDCW-9000			0.0	0.0	
10-Button Basic			0.9	1.1	
10-Button HFAI			1.0	1.2	
34-Button Basic			0.9	1.1	
34-Button DLX			1.2	1.7	
34-Button BIS			1.2	1.4	
34-Button BIS/DIS			1.2	1.4	
Single-Line Telephone			0.6	0.7	
Continued					

*Unit loads are computed per trunk for trunk-type network access lines.

	Qty	x	Unit Load		= Total
Equipment			Hybrid/PBX or Modified	Square	
Optional Equipment¹					
Direct Station Selector ²			0.7	0.9	
General Purpose Adapter			0.8	1.0	
Hands-Free Unit			0.8	1.0	

	Qty x	Unit Load		= Total
Headset Adapter		0.8	1.0	
PC ISDN Card				
		Total Actual Unit Load		

-
1. The MFM has its own wall power unit located at the telephone and therefore is not added to the unit load calculation.
 2. Up to two DSSs (one DSS per MLX-28D or MLX-20L console) can be powered from each control unit carrier. For example, a 3-carrier system can have 6 system operator positions, each with one DSS powered from the control unit.
 - If the total actual unit load is less than or equal to 54, any power supply module is sufficient.
 - If the total actual unit load is greater than 54, continue to Step 7.

7. Try to exchange modules between carriers to reduce the unit loads to 54.
(Remember that the 100D, 400, 400 GS/LS/TTR, 800 GS/LS-ID, 800, 800 NI-BRI, and 800 GS/LS modules have unit loads of 0.0.) Repeat Steps 1 through 6 to recalculate unit loads for the new configuration.
 - If the exchange reduces the unit load to 54 or less, any power supply module is sufficient.
 - If the exchange does not reduce the unit load to 54 or less, a 391A3 power supply is needed. Continue to Step 8.



NOTE:

Empty slots are not permitted between modules.

8. Calculate the unit loads for slots 5 and 6 of the carrier.

	Qty x	Unit Load		= Total
Equipment		Hybrid/PBX or Modified	Square	
Network Access Lines*				
DID		1.0	1.0	
DS1		0.0	0.0	
GS/LS		0.0	0.0	
Tie		1.4	1.4	
Telephones				
MLX-5		0.9	1.2	
MLX-5D		0.9	1.2	
MLX-10		0.9	1.2	
MLX-10D		0.9	1.2	
MLX-16DP		1.5	1.5	
MLX-28D		1.2	1.7	
MLX-20L		1.1	1.6	
BIS-10		0.9	1.1	
BIS-22		1.0	1.3	
BIS-22D		1.0	1.3	
BIS-34		1.1	1.5	
BIS-34D		1.1	1.5	
MLC-5		0.0	0.0	
MDC-9000		0.0	0.0	
MDCW-9000		0.0	0.0	
10-Button Basic		0.9	1.1	
10-Button HFAI		1.0	1.2	
34-Button Basic		0.9	1.1	
34-Button DLX		1.2	1.7	
34-Button BIS		1.2	1.4	
34-Button BIS/DIS		1.2	1.4	
Single-Line Telephone		0.6	0.7	
Continued				

*Unit loads are computed per trunk for trunk-type network access lines.

	Qty	x	Unit Load		= Total
Equipment			Hybrid/PBX or Modified	Square	
Optional Equipment¹					
Direct Station Selector ²			0.7	0.9	
General Purpose Adapter			0.8	1.0	
Hands-Free Unit			0.8	1.0	
Headset Adapter			0.8	1.0	
			Total Actual Unit Load for Slots 5 and 6		

1. The MFM has its own wall power unit located at the telephone and therefore is not added to the unit load calculation.
2. Up to two DSSs (one DSS per MLX-28D or MLX-20L console) can be powered from each control unit carrier. For example, a 3-carrier system can have 6 system operator positions, each with one DSS powered from the control unit.
 - If the unit load for slots five and six is less than or equal to 27, power is sufficient for the carrier.
 - If the unit load for slots five and six is more than 27, continue to Step 9.

9. Try to exchange modules between carriers to reduce the unit loads for slots five and six through 27. (Remember that the 100D, 400, 400 GS/LS/TTR, 800 GS/LS-ID, 800, 800 NI-BRI, and 800 GS/LS modules have unit loads of 0.0.) Repeat Steps 1 through 8 to recalculate unit loads for new configuration.
 - If the exchange reduces the unit load for slots five and six through 27 or less, power is sufficient.
 - If the exchange does not reduce the unit loads for slots 5 and 6 through 27, install wall power units for the appropriate number of telephones to reduce the unit load to 27.



NOTE:

Empty slots are not permitted between modules.

Backing Up with a Memory Card

D

A PCMCIA (Personal Computer Memory Card International Association) interface slot is present on the processor module. The slot is a standard interface through which information can be added to or obtained from the system using a memory card. The PCMCIA interface slot accepts one memory card at a time.

This section covers the following memory card functions:

- Memory card formatting
- Restore
- Backup
- Automatic backup

Card Types

The types of memory cards are described below. The card type is identified by a preprinted, color-coded label.

- **Upgrade Card.** This card is used for MERLIN LEGEND Communication System software upgrades. The upgrade can be performed by the system manager using the memory card and the Maintenance option on the SPM Main Menu.

This card is identified by an orange label with black lettering.

- **Translation Card.** The backup and restore procedures previously available to system managers through SPM (using the PC and floppy disks) can now be performed using the memory card and the new Backup/Restore option on the System menu. A new automatic backup feature permits you to set the system to perform automatic backups to the memory card on a daily or weekly basis. See [“Backup”](#) and [“Restore”](#) for more information.

This card is identified by a white label with black lettering.

- **Forced Installation.** For use by qualified service technicians only, this card is used when the system software has been corrupted and a re-installation must be done at the customer site. The use of the card for forced installation is reserved for emergency situations in which the system software on the processor module has been damaged.

This card is identified by an orange label with black lettering. In addition, black stripes are present on the card to distinguish it from an upgrade card.

[Figure D-1](#) shows a sample Translation card.

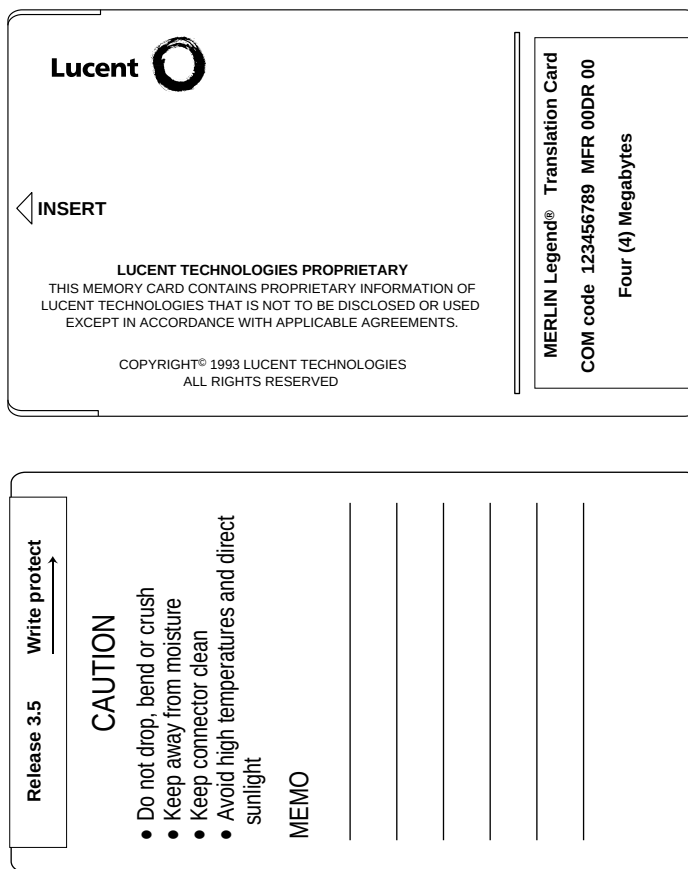


Figure D-1. PCMCIA Translation Memory Card

Inserting the Card

To insert the card, hold the card with the Lucent Technologies logo facing up and the arrow pointing toward the slot. See [Figure D-2](#) for the proper way to insert the memory card into the slot on the processor module.

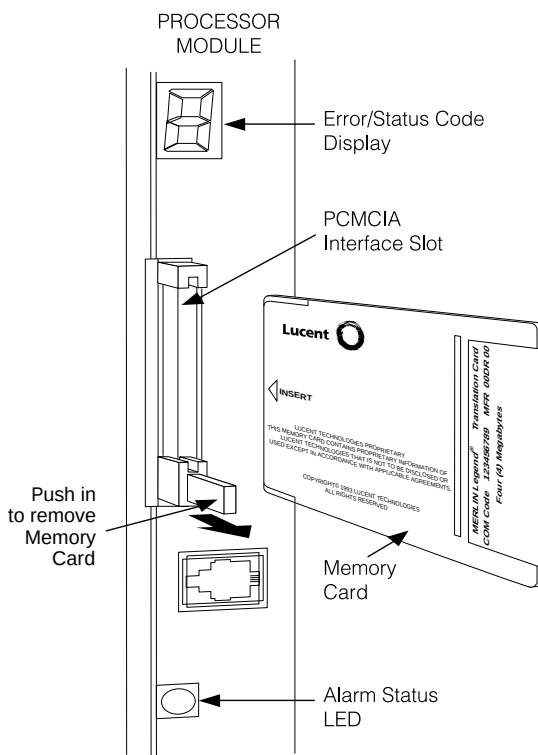


Figure D-2. Inserting the Memory Card

Memory Card Formatting

The memory card may have to be formatted before you begin any manual or automatic backup procedures. This section details the screens and messages that appear during the format procedure.

CAUTION:

Formatting overwrites previous data on the memory card. Make certain that there is no important information on the card before you begin formatting.

Unformatted Card

```
Memory Card Backup:
Inserted Memory Card is
not the correct type.
Do you want it formatted?
Yes
No
Exit
```

If you begin a backup procedure with an unformatted or incorrectly formatted card, this screen appears.

The inserted memory card is not the correct type. You have the option of formatting the memory card as a translation memory card or repeating the backup procedure with a different translation memory card.

NOTE:

Only 4-MB Series I or Series II PCMCIA memory cards may be formatted, except those already formatted as translation cards.

If a memory card cannot be formatted, a message appears on screen. These messages are noted in the procedures as appropriate.

A memory card may need to be formatted if it is intended for use as a translation card but is currently blank, or contains data other than backup files for the system.

Format Warning

```
Format Memory Card:
All data on card will be
DELETED.
Do you want it formatted?
Yes
No
Exit
```

This screen appears if you respond to the system prompt to format the memory card.

Select Yes (or press **3**) to begin the memory card format. [Table D-1](#) lists the screen messages that may appear while formatting is in progress.

Table D-1. Memory Card Formatting Messages

Message	What it Means
Formatting Memory Card	The format is in progress.
Formatting of Memory Card Completed.	The format was successful and has completed.
Memory Card cannot be formatted.	The memory card cannot be formatted. Remove the card and repeat the procedure with another card.
Formatting of Memory Card FAILED.	The format was unsuccessful. Remove the card and repeat the procedure with another card.
Missing Card or Card Not Inserted Correctly	Verify that the card is inserted correctly and repeat the procedure.

Backup

Use this procedure to make a copy of your customized system data. You should create a backup at least three times during system installation (so that programmed information is not lost), and once after each system upgrade, service technician visit, or major system reconfiguration.

Summary: Backup

Programmable by	System Manager
Mode	All
Idle Condition	System Forced Idle
Planning Form	Form 1, System Planning
Factory Setting	Not applicable
Valid Entries	1- to 11-character filename
Inspect	Yes
Copy Option	No
Console Procedure	Insert memory card→System→Back/Restore→Backup→Select backup file→Dial the new backup filename→Enter→Yes→Exit→Exit→Exit
PC Procedure	Insert memory card→ F1 → F9 → F1 →Select backup file→Type the new backup filename→ F6 → F1 → F5 → F5 → F5

Procedure: Backup

- ▶ 1. Insert the memory card into the PCMCIA interface slot on the processor module.

Console Display/Instructions

Additional Information PC

► 2. Select the System menu.

```
System Programming:  >  
Make a selection  
  
System      Extensions  
SysRenumbr  Options  
Operator    Tables  
LinesTrunks AuxEquip  
Exit        NightSrvce
```

F1

► 3. Select Back/Restore.

```
System:  
Make a selection  
  
Restart      MaintenBusy  
SProg Port   Date  
Mode         Time  
Board Renum  Back/Restore  
Exit
```

F9

► 4. Select Backup.

```
Memory Card:  
Make a selection  
  
Backup  
Restore  
Auto Backup  
  
Exit
```

F1

Console Display/Instructions

Additional Information PC

► 5. Select the backup filename.

```
Memory Card Backup:
Make a selection
BACK1. *****  AUTO.BACK1
BACK2. *****  AUTO.BACK2
BACK3. *****

Exit
```

If you select AUTO.BACK1 or AUTO.BACK2, go to Step 8. You cannot rename either of these two files

If you select BACK1., BACK2., or BACK3. and do not want to rename the file, go to Step 8.

Press the button or function key next to your selection.



► 6. Rename the backup file (*n* = 1 to 11 characters).

```
Backup File: Enter name
BACKx.mmdd
Punctuation
Backspace
A ' , B
C - & D
E . Space F
```

x = backup file selected in Step 5
mm/dd = current month and day

Use Punctuation to toggle between the letters and punctuation.

Dial or type [*n*].



Use the buttons next to the display to specify the letters A through I and punctuation. Use the line/feature buttons to specify additional alphanumeric characters for labels. Use the template provided with the MLX-20L telephone to see which line buttons correspond to which alphanumeric characters.

► 7. Save your entry.

Select Enter.

F6

Note: **F6**, not **F10**.

Console Display/Instructions

Additional Information PC

► 8. Respond to the prompt.

Backup *filename*:

Do you want to continue?

Yes

No

Exit

filename = file selected in
Step 5 or entered in Step 6

Select No to abort the backup. F2
Go to Step 11.

Select Yes to continue the F1
backup.

► 9. Observe the backup progress screen.

Backup *filename*:

Backup in Progress,
Please Wait.

xx% completed

Exit

filename = file selected in Step 5
or entered in Step 6

xx% = percentage of backup
completed



► 10. Observe the backup completion screen.

Backup *nnnnnnnnnnnn* :

Backup Successfully
Completed.

Exit

nnnnnnnnnnnn = backup filename

► 11. Return to the System Programming menu.

Select Exit three times.

F5 F5 F5

Automatic Backup

If an automatic backup fails for any reason, except when the failure results from the memory card being write-protected, the automatic backup feature is turned off. Follow the procedure below to reprogram automatic backup.

Summary: Automatic Backup

Programmable by	System Manager
Mode	All
Idle Condition	Not required
Planning Form	Form 1, System Planning
Factory Setting	Weekly backup (Sunday at 2:00 am)
Valid Entries	Daily: hhmm (00 to 23; 00 to 59) Weekly: dhhmm (0 to 6; 00 to 23; 00 to 59)
Inspect	No
Copy Option	No
Console Procedure	To program daily backup: Insert memory card→System→Back/Restore→ Auto Backup→Daily→ Drop →Dial time→Enter →Exit→Exit To program weekly backup: Insert memory card→System→Back/Restore→ Auto Backup→Weekly→ Drop →Dial day and time →Enter→Exit→Exit
PC Procedure	To program daily backup: Insert memory card→[F1]→[F9]→[F3]→[F2]→ [Alt] + [P]→Type time→[F10]→[F5]→[F5] To program weekly backup: Insert memory card→[F1]→[F9]→[F3]→[F3]→ [Alt] + [P]→Type day and time→[F10]→[F5]→[F5]

Procedure: Automatic Backup

Console Display/Instructions

Additional Information PC

- ▶ 1. Insert the memory card into the PCMCIA interface slot on the processor module.
- ▶ 2. Select the System menu.

```
System Programming:  >
Make a selection
System              Extensions
SysRenumber         Options
Operator            Tables
LinesTrunks         AuxEquip
Exit                NightSrvce
```

F1

- ▶ 3. Select Back/Restore.

```
System:
Make a selection
Restart            MaintenBusY
SProg Port        Date
Mode              Time
Board Renum       Back/Restore
Exit
```

F9

- ▶ 4. Select Auto Backup.

```
Memory Card:
Make a selection
Backup
Restore
Auto Backup

Exit
```

F3

Console Display/Instructions

Additional Information

PC

► 5. Make a selection.

Auto MemCard Backup:

Select one

Off

Daily

Weekly

Exit

Enter

Select Off,
Daily, or
Weekly

F1

F2

F3

► 6. Save your entry.

Select Enter.

F10

If you selected Off you have finished this procedure. Go to Step 7.

If you selected Daily go to

● Daily Backup Procedure.

If you selected Weekly go to

◆ Weekly Backup Procedure.

► 7. Return to the System Programming menu.

Select Exit two times.

F5 F5

● Daily Backup Procedure

Console Display/Instructions

Additional Information

PC

► 1. Erase the current daily backup time (xxxx).

Daily MemCard Backup:
Enter hour (00-23) and
minutes (00-59) HHMM
xxxx

Backspace

Exit Enter

Press **Drop**.

► 2. Enter the time when you want the automatic backup to run every day (*hh* = 00 to 23, *mm* = 00 to 59).

Daily MemCard Backup:
Enter hour (00-23) and
minutes (00-59) HHMM

Backspace

Exit Enter

Dial or type [*hhmm*].



► 3. Save your entry.

Select Enter.



► 4. Return to the System Programming menu.

Select Exit two times.

◆ Weekly Backup Procedure

Console Display/Instructions

Additional Information

PC

► **1. Erase the current weekly backup day and time (xxxxxx).**

```
Weekly MemCard Backup:
Enter day (0-6) hr
(00-23)
and min (00-59) DHHMM
xxxxxx
```

Backspace

Exit Enter

Press **Drop**.

► **2. Enter the day (*d* = 0 to 6) and time (*hh* = 00 to 23, *mm* = 00 to 59) when you want the automatic backup to run each week.**

```
Weekly MemCard Backup:
Enter day (0-6), hr
(00-23)
and min (00-59) DHHMM
```

Backspace

Exit Enter

0 = Sunday, 1 = Monday, and so on.

Dial or type [*dhhmm*].



► **3. Save your entry.**

Select Enter.



► **4. Return to the System Programming menu.**

Select Exit two times.

Backup Messages

During manual or automatic backup procedures, additional screens may appear to alert you to problems with the translation memory card, the backup file, or the backup procedure. This section contains illustrations of each screen and information about what to do if the screen appears.

NOTE:

The screens shown in this section are from the manual backup procedure; however, the screens that may appear in both the manual and automatic backup procedures are similar. The screens in both procedures differ only in the appearance of the first line. On the automatic backup screens, AutoMemory Card Backup replaces the word Backup shown on the screens below.

Backup Canceled

Console Display/Instructions

```
Backup x:
BACKUP IS CANCELED.
File has been DELETED.

Exit
```

Additional Information

x = backup filename

PC

If the system detects an error, either on the memory card or with the backup file, or if you abort the backup, this screen appears.

The backup file being created is deleted, and the backup is aborted.

You must repeat the backup procedure.

Card Removed While Backup Is in Progress

```
Backup x:
BACKUP IS CANCELED.
Verify that Memory Card
has been inserted
correctly.
File has been DELETED.
Exit
```

x = backup filename

The memory card is not inserted or is inserted incorrectly while a backup is in progress. The backup file that was being created is deleted and the backup is aborted. You must reinsert the memory card and repeat the backup procedure.

Card Missing or Card Not Inserted Correctly

```
Memory Card Backup:
Verify that Memory Card
has been inserted
correctly.

Exit
```

The memory card is either not inserted or is inserted incorrectly. The backup is aborted. You must reinsert the memory card and repeat the backup procedure. This screen may also appear if the wrong type of memory card is inserted and a backup or automatic backup is requested within one minute of insertion. Verify that the card is a translation memory card.

Card Is Write-Protected

```
Memory Card Backup:
Memory Card is Write-
Protected.
Reset Write-Protect Tab
on Memory Card.

Exit
```

The memory card is write-protected. You must remove the memory card, flip the write-protect tab, reinsert the memory card, and repeat the backup procedure.



CAUTION:

The memory card may be write-protected to avoid the accidental erasure of the backup files. Make certain this is not the case before you change the write-protect tab.

Card Failure

```
Memory Card Backup:
Backup Failure
Try a different file or
a new Memory Card.

Exit
```

If the card is damaged, repeat the backup with a different card. If a backup is in progress and fails, the system makes two additional attempts at the backup. At the start of each attempt, a message appears with the percentage of the backup that is completed. If the backup fails after three attempts, the screen shown above appears. Repeat the backup procedure using a different file and/or memory card.

Restore

Use this procedure to restore system conditions that were backed up onto a translation memory card. The information in a backup file on the translation card is copied to the system.

The restore procedure is necessary under the following conditions:

- System RAM is corrupt.
- A previously stored set of system conditions is preferred over the current set.
- The processor module is replaced.
- After a System Erase (frigid start) has been performed.
- The system software has been reinstalled.

The Inspect feature (**Inspect** or **PgDn**) is available to view the attributes of the backup files on the memory card prior to initiating the restore procedure. The attributes included on the Inspect screen are the filename, the time and day of the file backup/update, the location of the system programming port, and information about the system software release from which the backup was made.

If any type of programming is taking place at another extension when you begin the restore procedure, the restore is canceled and the number of the busy extension appears on the screen. Repeat the restore procedure when the busy extension becomes idle.

If a line is busy (incoming call or active call) when you begin the restore procedure, the restore is canceled and the number of the active line appears on the screen. Repeat the restore procedure when the line becomes idle.

Also see ["Restore Messages"](#) for information about errors that may occur during the restore procedure.

Summary: Restore

Programmable by	System Manager
Mode	All
Idle Condition	System Forced Idle
Planning Form	Not applicable
Factory Setting	Not applicable
Valid Entries	Not applicable
Inspect	Yes
Copy Option	No
Console Procedure	Insert memory card→System→Back/Restore→ Restore→Select restore file→Yes
PC Procedure	Insert memory card→ F1 → F9 → F2 →Select restore file→ F3

Procedure: Restore

Console Display/Instructions

Additional Information

PC

- ▶ 1. Insert the memory card into the PCMCIA interface slot on the processor module.

- ▶ 2. Select the System menu.

```
System Programming:  >
Make a selection
System              Extensions
SysRenumber         Options
Operator            Tables
LinesTrunks         AuxEquip
Exit                NightSrvce
```

F1

- ▶ 3. Select Back/Restore.

```
System:
Make a selection
Restart            MaintenBusy
SProg Port         Date
Mode              Time
Board Renum       Back/Restore
Exit
```

F9

- ▶ 4. Select Restore.

```
Memory Card:
Make a selection
Backup
Restore
Auto Backup

Exit
```

F2

Console Display/Instructions

Additional Information

PC

► 5. Select the restore file.

```
Memory Card Restored:
Select one
BACK1.mddd      AUTO.BACK1
BACK2.mddd      AUTO.BACK2
BACK3.mddd
Exit            Enter
```

mddd = month and day of
backup

Press the button or function key
next to your selection.



► 6. Observe the restore file validation screen.

```
Memory Card Restore:

File is being validated.
```

► 7. Respond to the prompt.

```
Restore n :
System will be down ...
Do you want to continue?
Yes
No

Exit
```

n = filename selected in Step 5

Select Yes to continue the
restore
Select No to abort the restore.
Go back to Step 5.

F3

F2

► 8. Observe the restore progress screen.

```
Restore n :
Restore in Progress,
Please Wait.
```

n = filename selected in Step 5

Console Display/Instructions	Additional Information	PC

► **9. Observe the restore file validation screen.**

```
Restore n :  
Restore Successfully  
Completed.  
System is Restarting.  
Please Wait.
```

n = filename selected in Step 5

The session is finished and the system restarts. You must enter system programming again to continue.

Restore Messages

During the restore procedure, additional screens may appear to alert you to problems with the translation memory card, the backup file or the restore procedure. This section contains displays of each screen and information about what to do if the screen appears.

Card Missing or Card Not Inserted Correctly

```
Memory Card Restore:  
Verify that Memory Card  
has been inserted  
correctly.  
  
Exit
```

The memory card is either not inserted or inserted incorrectly. The restore is aborted. You must reinsert the card and repeat the restore procedure. This screen may also appear if the wrong type of memory card is inserted and a restore is requested within one minute of insertion. Verify that the card is a translation memory card.

Card Removed after Confirmation

```
Memory Card Restore:  
RESTORE IS CANCELED.  
System is DOWN.
```

The memory card was removed from the processor slot while the restore was in progress. The restore is aborted and the system performs a System Erase (frigid start). You must reinsert the memory card and repeat the restore procedure.

Wrong System Programming Port

Console Display/Instructions

```
Restore n :  
Change Sys Programming  
Port to Extension xxxx  
before Restoring.  
  
Exit
```

Additional Information

n = filename selected
xxxx = system programming port
extension

PC

The system programming port is not set to the same system programming port as that set in the backup file. The restore is aborted. Use the **Inspect** feature to view the port of the file on the card. Change the system programming port to match the port shown on the card (see “System Programming Position Assignment” in System Programming, or System Programming Summary) and repeat the restore procedure.

Release Mismatch

```
Restore n :  
File is Not Compatible  
for Release X.Y  
Restore Canceled.  
Conversion Required.  
  
Exit
```

n = filename selected
X.Y = release number

This screen appears only if you are upgrading from Release 3.0 or higher and the releases are not compatible.

Card Failure

Console Display/Instructions

```
Memory Card Restore:  
Restore Failure.  
Try a different file  
or a new Memory Card.  
  
Exit
```

Additional Information

PC

If the restore fails because the card is damaged, the system performs a System Erase (frigid start). Repeat the restore procedure using a different file and/or memory card.

Card Failure after Confirmation

```
Restore x :  
Restore Failure  
RESTORE IS CANCELED.  
  
System is DOWN.
```

x = filename selected

If the restore fails because the card is damaged, the system performs a System Erase (frigid start). Repeat the restore procedure using a different file and/or memory card.

Wrong Type of Card

```
Memory Card Restore:
Inserted Memory Card is
not the correct type.
Remove and insert MERLIN
LEGEND Backup/Restore
Card.
Exit
```

The inserted card does not match the card option selected from the System menu. Remove the card and repeat the restore procedure with the correct type of card. See ["Card Types"](#) for information about the card labels.

Board Mismatch

Console Display/Instructions

```
Restore x :
Restore Failure
RESTORE IS CANCELED.
Board mismatch between
control unit and file.

Exit
```

Additional Information

x = filename selected

PC

A mismatch exists between the hardware components present on the current system and the hardware components reflected in the backup file. The restore is aborted. You can do one of the following:

- Repeat the restore procedure with another file.
- Modify the system hardware to match the configuration of the backup file and repeat the restore procedure with the same file.

Strap in Place for Key Mode but Mode is Set to Hybrid

```
Restore n :  
Restore Failure  
RESTORE IS CANCELED.  
Restore File Mode is  
Hybrid/PBX. Control Unit  
strap in place for KEY.  
Exit
```

n = filename selected



CAUTION:

This procedure should be performed only by qualified service personnel.

If the processor module has been strapped for Permanent Key mode, a restore to Hybrid/PBX mode is not possible. See chapter 9 in the *Installation Guide* for details on modifying the processor.

Modifying A Release 2.1 or Earlier Processor Key Mode



Release 2.1 and Earlier



CAUTION:

This procedure must be performed for KF registration with the FCC.

This procedure prevents the system from being programmed as a Hybrid-PBX system. Do this only if the system is programmed for Key mode and GS trunks are not indicated on Form 2c, System Numbering: Line/Trunk Jacks.

To modify the processor for Permanent Key mode, follow the steps below. Refer to [Figure E-1](#).

- ▶ 1. Remove the processor from its packaging.
- ▶ 2. Place the processor on a flat surface.
- ▶ 3. If the feature module is installed, remove it.
See [“Replacing the Feature Module”](#) in [Chapter 4](#) for instructions.

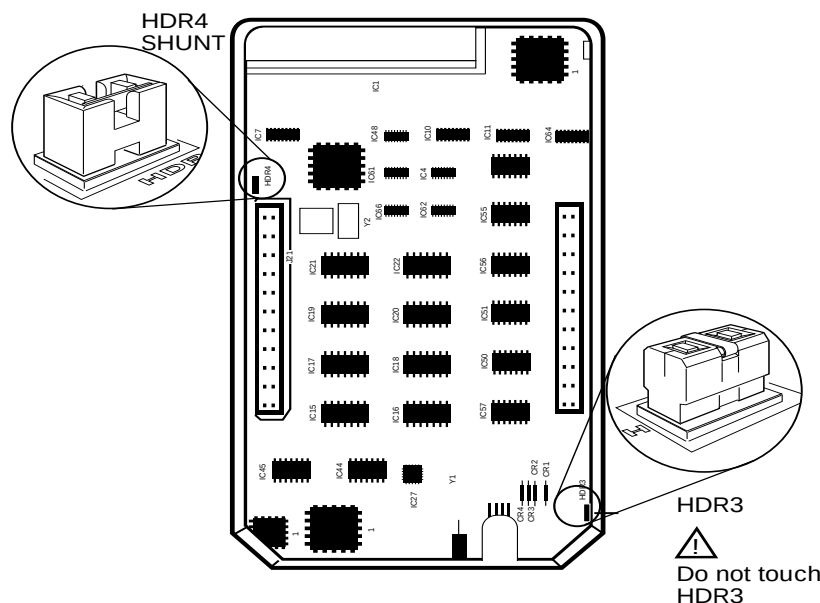


Figure E-1. Modifying the Processor for Key Mode



CAUTION:

Do not touch the HDR3 header on the processor board; the header is exposed when the feature module is not installed in the processor. If the HDR3 header is removed, system programming may be deleted and will have to be restored.

- ▶ 4. **On the exposed portion of the processor board, find the header marked *HDR4*; it is in the upper-left area.**
A shunt is attached to one of the pins on the HDR4 header.
- ▶ 5. **Remove the shunt from the single header pin; then reinsert it so that it covers both pins on the header.**
- ▶ 6. **Take the KF label from the Jack Numbering Labels Sheet, which is packaged with the feature module, and fasten it to the wire manager at the base of the module.**

Installing the Control Unit Housing (Release 2.1 and Earlier)

To install the control unit's housing, follow the steps below.

- ▶ 1. **Lay the front panel(s) face down.**
- ▶ 2. **If you are housing more than one carrier, connect the front panels together.**
 - a. Line up the arrows.
 - b. Slide the panels until the semicircles form a complete circle. See [Figure E-2](#).
- ▶ 3. **Connect the side panels to the front panel(s) in the same way.**
- ▶ 4. **Pick up the housing and place it on the control unit. If the system has more than one carrier, make sure you hold the housing only from the basic carrier side; otherwise, the housing can disassemble.**
 - a. Line up the wire clips that are attached to the carrier with the recesses on the outside of the side panels.
 - b. Push back the panels until the clips hook over the tabs and rest in the recesses.

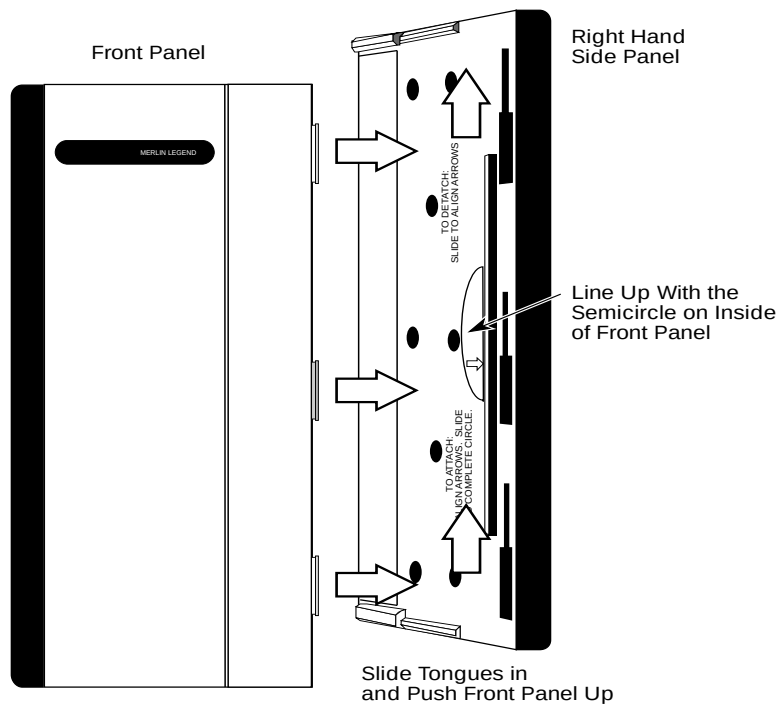


Figure E-2. Installing the Control Unit Housing

NI-1 BRI Provisioning



This appendix provides detailed information concerning the features and translations that make up the ISDN Ordering Code (IOC) standardized capability package “S”, as well as the Multi-Line Hunt (MLH) feature. The MLH feature may be provisioned as either the Multi-Line Hunt Group or Series Completion feature depending on the CO switch type.

Specific translations are provided for the following switches:

- Lucent Technologies 5ESS
- Northern Telecom DMS-100
- Siemens SSC EWSD

After determining that the local service provider offers National ISDN-1 service, the information contained in this appendix should be given to the local service provider if necessary.

 NOTE:

The administrative screens shown in this appendix are representative samples only. The local service provider will need to enter applicable data (such as the telephone numbers) where necessary. Also note that the administration covered in this appendix *does not* take place on the MERLIN LEGEND Communications System. All administration is performed by the local service provider on the CO switch.

Lucent Technologies 5ESS Switch Translations

For the Lucent Technologies 5ESS switch, Capability Package "S" (2B) includes alternate voice/circuit-switched data on two B-channels. Data and voice capabilities include Calling Number Identification. Please note that in order to have simultaneous calls on the two B-channels, two DNs must be assigned with this package.

The Lucent Technologies 5ESS switch also provides for alternate voice and data hunting on one DN via the Series Completion feature.

ISDN Capability Package "S"

The information listed below provides the DN translations that define Capability Package "S", and the screens and fields that must be populated.

The information provided shows the translations for one DSL and two DNs. For multiple DSLs/DNs, the CO will duplicate these screens and enter the applicable DSL and DN values as needed.

ISDN Ordering Code: Capability S

VIEW 23.2

DN1 Translations

Fields that must be populated on Screens 1, 2, 3 and 4:

1. DSL TN <C plus Telephone number>
9. ASSOC <U>
11. OE <enter OE and type>
14. D ISCN <enter value>
15. DSERV <SX>
16. B1SERV <DMD>
17. B2SERV <DMD>

- 18. NT1 TYPE <enter NT1 type>
- 20. DSL CLS <STD>
- 21. RSTR MP <N>
- 22. MDPKT <0>
- 23. MTERM <2>
- 42. USPID <enter value>
- 43. MAXBCHL <2>
- 44. ACT USER <Y>

Fields that must be populated on Screens 4, 5, and 6:

- 48. CKT TN <enter TN>
- 49. CKT LCC <enter LCC>
- 50. CKT RAX <enter RAX value>
- 55. TERMTYP <TYPEA>
- 56. DISPLAY <Y>
- 60. CSV <1>
- 61. CSV CHL <ANY>
- 63. CSV LIMIT <1>
- 69. CSD <2>
- 70. CSD CHL <ANY>
- 72. CSD LIMIT <2>
- 126. CPN SCR N <Y>
- 140. PIC <enter PIC>

The Calling Number Identification feature is assigned using the standard BRCS preconstructed features **/LICNDA** and **/CPCOFA**. If it is possible, request **/CPCPFA** for the Calling Number Identification feature as it provides a clearer display of the CPN information.

The Redirecting Number Delivery Feature is assigned using the preconstructed RND feature, **/RND**. These features are assigned to the user in View 23.8, Field 109.

DN2 Translations (Note: DSL information was built with DN1)

Fields that must be populated on Screens 1, 2, 3 and 4:

1. DSL TN <C plus second *Telephone number*>
- 9 ASSOC <U>
11. OE <enter OE and type>
42. USPID <enter value>
43. MAXBCHL <2>
44. ACT USER <Y>

Fields that must be populated on Screens 4, 5, and 6:

48. CKT TN <enter TN>
49. CKT LCC <enter LCC>
50. CKT RAX <enter RAX value>
55. TERMTYP <TYPEA>
56. DISPLAY <Y>
60. CSV <1>
61. CSV CHL <ANY>
63. CSV LIMIT <1>
69. CSD <2>
70. CSD CHL <ANY>
72. CSD LIMIT <2>
126. CPN SCRIN <Y>
140. PIC <enter PIC>

The Calling Number Identification feature is assigned using the standard BRCS preconstructed features **/LICNDA** and **/CPCOFA**. If it is possible, request **/CPCPFA** for the Calling Number Identification feature as it provides a clearer display of the CPN information.

The Redirecting Number Delivery Feature is assigned using the preconstructed RND feature, **/RND**. These features are assigned to the user in View 23.8, Field 109.

Series Completion Feature Translations

The sample screens shown below illustrate the translations for alternate voice and data hunting on one main DSL and three DNs forming a linear series completion group. Voice hunting is provided via Series Completion (Field 87, **SERHLN**). Data hunting is provided via Call Forward Data Busy Line (**ICFDBLAC**).

The 5ESS limits the number of members of a series completion group to 16 DNs, and the number of lines forwarded via **ICFDBLAC** to the value specified on Screen 9, Field 176 (**SIMINTRA**). This value is currently set to 99 series completion groups, but can be changed.

5ESS SWITCH LABNSC1
SCREEN 1 OF 14

RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT

(*)1. DSL TN C 2228700	SERVICES AND FEATURES	SCREENS
(*)4. MLHG _____	-----	-----
(*)5. TERM _____	BRCS FEATURE LIST	6
(*)6. DSL OE _ _____	BRCS FEATURE PARAMETERS	7 to 9
(*)9. ASSOC U _____	CKT	4 & 5
	DELFEAT LIST	14
	DPKT	10
	DSL INFO	2
	ODB	11
	PPB1	12
	PPB2	13
	USER INFO	3

5ESS SWITCH LABNSC1

SCREEN 2 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (DSL INFO)

>11. OE	I 00101209	25. CUT DGTS2228
14. D ISCN	007096	26. ACSR GRP_____
15. D SERV	SX	27. DFLT SRV_____
16. B1 SERV	DMD	
17. B2 SERV	DMD	
18. NT1 TYPE	AULC	
19. PM GRP	PMDEF	
20. DSL CLS	STD	
21. RSTR MP	N	
22. ACSR INH	Y	
23. MDPKT	8	
24. MTERM	2	

5ESS SWITCH LABNSC1

SCREEN 3 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (USER INFO)

>28. USPID	0122287000
29. MAXB CHL	1
30. ACT USER	Y
31. PPB1 USR	N
32. PPB2 USR	N
33. AGI	—

5ESS SWITCH LABNSC1

SCREEN 4 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (CKT)

>34. CKT TN	2228700	CIRCUIT VOICE (CSV)	CIRCUIT DATA (CSD)
35. CKT LCC	DSL	46. CSV	1 55. CSD 1
36. CKT RAX	1	47. CSV CHL	ANY 56. CSD CHL ANY
37. CKT MLHG	—	48. CSV ACO	57. CSD ACO
38. CKT TERM	—	49. CSV LIMIT	1 58. CSD LIMIT 1
39. NEW TN	—	50. CSV NBLIMIT	59. CSD NBLIMIT —
40. CONFIG GRP	NI17507B	51. SP DNA	60. K56 DNA
41. TERMTYP	TYPEA	52. SP DNA QTY	61. K56 DNA QTY
42. DISPLAY	Y	53. AU DNA	62. K64 DNA
43. EKTS	—	54. AU DNA QTY	63. K64 DNA QTY
44. CA	—		
45. CA QTY	—		

SCREEN 5 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (CKT)

>64. TKS	N	72. SAR QTY__	82. BUSY MONITORN
65. TAUTO	N	73. SAR ORIGN	83. ATT MLHG_____
66. SHARED	N	74. SAR TERMN	84. RBV TGN_____
67. SAUTO	N	75. INCOMINGN	85. ERCS ASGN
68. PRIVACY	N	76. INTERCOMN	86. ERCS ACTN
69. ICP	N	77. ORIG CWN	87. SERHLN2228701
70. SUSO	N	78. PP N	88. BCK LNK N
71. SUST	N	79. CA PREFI	89. ACD POS NUM_____
		80. AUTO HOLDN	90. CIDIALALLOW
		81. ONE TOUCHN	91. PIC _____
			92. PTC _____
			95. E911 PSAP N

SCREEN 6 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT

>106. BFGN _____ 109. FEATURE LIST (FL)

ROW	FEATURE	A	P	C	R	FEATURE	A	P	C	R	FEATURE	A	P	C	R	FEATURE	A	P	C	R	
1	/LIDLXA	Y	N	N		10	_____	-	-	-	19	_____	-	-	-	28	_____	-	-	-	-
2	/CPCPFA	Y	N	N		11	_____	-	-	-	20	_____	-	-	-	29	_____	-	-	-	-
3	/CFDBLAC	Y	N	N		12	_____	-	-	-	21	_____	-	-	-	30	_____	-	-	-	-
4	_____	-	-	-	-	13	_____	-	-	-	22	_____	-	-	-	31	_____	-	-	-	-
5	_____	-	-	-	-	14	_____	-	-	-	23	_____	-	-	-	32	_____	-	-	-	-
6	_____	-	-	-	-	15	_____	-	-	-	24	_____	-	-	-	33	_____	-	-	-	-
7	_____	-	-	-	-	16	_____	-	-	-	25	_____	-	-	-	34	_____	-	-	-	-
8	_____	-	-	-	-	17	_____	-	-	-	26	_____	-	-	-	35	_____	-	-	-	-
9	_____	-	-	-	-	18	_____	-	-	-	27	_____	-	-	-	36	_____	-	-	-	-

SCREEN 7 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>134. TG:GRPID	0	146. ACSR GRPNM	_____	158. QALWD	__
135. MOH ALW	__	147. EDS:GRPNM	_____	159. PRIORITY Q	__
136. IDP NAME	_____	148. BCLID GRP	_____	160. ARSSI	__
137. DPAT CAT	0	149. PFA:VGRPNM	_____	161. DIALPLN	__
138. ICR SFG	0	150. PFA:DGRPNM	_____	162. ALWMDR	__
139. SC1NAME	_____	151. ATH:VGRPNM	_____	163. ACSR PINREQ	__
140. SC1S	__	152. ATH:DGRPNM	_____	164. DRING	__
141. SC2NAME	_____	153. MDR:GRPNM	_____	165. DCW DRING	__
142. SC2S	__	154. ACCT:GRPNM	_____	166. CWO DRING	__
143. CPU0:SELQ1	0	155. ARS:VGRPNM	_____	167. MWY DRING	__
144. CPU0:SELQ2	0	156. ARS:DGRPNM	_____		
145. CPUT:TPREDQ	0	157. FRL	_____		

SCREEN 8 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>172. MESSAGE SERVICE (MSS) 175. MW:DCNDN _____

ROW	FEATURE	GRPNM
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

5ESS SWITCH LATs. While MERLIN LEGEND Release 3.0 permits a barrier code of up to 11 digits, systems prior to Release 3.0 permit barrier codes of up to only four digits.

If Remote Access is used, an upgrade to MERLIN LEGEND Communications System Release 3.0 is encouraged to take advantage of the longer barrier code.

Other Security Hints xe "Security Hints:description"

Make sure that the Autom0

3	_____	_____	0	0	0
4	_____	_____	0	0	0
6	_____	_____	0	0	0
6	_____	_____	0	0	0

SCREEN 10 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (DPKT)

>183. DPKT TN	_____	192. IECP DNIC	_____	198. H PVC LCN	_____
184. LCC	_____	193. PB GRP	_____	199. L IN LCN	_____
185. RAX	_____	194. NOTIF NO	_____	200. H IN LCN	_____
186. MLHG	_____	195. ICP N	_____	201. L 2W LCN	_____
187. TERM	_____	196. HUNT NOTIF	_____	202. H 2W LCN	_____
188. LNR HNT TN	_____	197. TCID	_____	203. L OUT LCN	_____
189. HUNT DEACT	_____			204. H OUT LCN	_____
190. CHL SEL	N			205. BUSY LIMIT	_____
191. NEW TN	_____			206. PMDR GRP	_____
				207. PMDR ACT	_____
				208. DNA	_____
				209. DNA QTY	_____

SCREEN 11 OF 14		5ESS SWITCH LABNSC1			
		RECENT CHANGE 23.8			
		DSL/BRCS ASSIGNMENT (ODB)			
>210. ODB TN	_____	222. RATE	234. L IN LCN _____		
211. LCC	_____	223. N2	235. H IN LCN _____		
212. RAX	0	224. T1	236. L 2W LCN _____		
213. MLHG	-	225. T3	237. H 2W LCN _____		
214. TERM	_____	226. WNDSZ	238. L OUT LCN _____		
215. LNR HNT TN	_____	227. NEW TN	239. H OUT LCN _____		
216. HUNT DEACT	-	228. IECN DNIC	240. BUSY LIMIT _____		
217. CHL SEL	N	229. PB GRP	241. PMDR GRP _____		
218. ISCN1	_____	230. NOTIF	242. PMDR ACT _____		
219. ISCN2	_____	231. T3XX	0	243. DNA	_____
220. BAND	0	232. ICP	N	244. DNA QTY	-
221. ODB	-	233. HUNT NOTIF	_____		

SCREEN 12 OF 14		5ESS SWITCH LABNSC1			
		RECENT CHANGE 23.8			
		DSL/BRCS ASSIGNMENT (PPB1)			
>245. PPB1 TN	_____	254. RATE	264. H PVC LCN _____		
246. LCC	_____	255. N2	265. L IN LCN _____		
247. RAX	0	256. T1	266. H IN LCN _____		
248. MLHG	_____	257. T3	267. L 2W LCN _____		
249. TERM	_____	258. WNDSZ	268. H 2W LCN _____		
250. LNR HNT TN	_____	259. NEW TN	269. L OUT LCN _____		
251. HUNT DEACT	-	260. IECN DNIC	270. H OUT LCN _____		
252. CHL SEL	N	261. PB GRP	271. BUSY LIMIT _____		
253. ISCN	_____	262. ICP	N	272. PMDR GRP	_____
		263. HUNT NOTIF		273. PMDR ACT	-

SCREEN 13 OF 14		5ESS SWITCH LABNSC1	
		RECENT CHANGE 23.8	
		DSL/BRCS ASSIGNMENT (PPB2)	
>274. PPB2 TN	—	283. RATE	— 293. H PVC LCN —
275. LCC	—	284. N2	— 294. L IN LCN —
276. RAX	0	285. T1	— 295. H IN LCN —
277. MLHG	—	286. T3	— 296. L 2W LCN —
278. TERM	—	287. WNSZ	— 297. H 2W LCN —
279. LNR HNT TN	—	288. NEW TN	— 298. L OUT LCN —
280. HUNT DEACT	—	289. IECN DNIC	— 299. H OUT LCN —
281. CHL SEL	N	290. PB GRP	— 300. BUSY LIMIT —
282. ISCN	—	291. ICP	N 301. PMDR GRP —
		292. HUNT NOTIF	— 302. PMDR ACT —

SCREEN 14 OF 14	5ESS SWITCH LABNSC1
	RECENT CHANGE 23.8
	DSL/BRCS ASSIGNMENT

WARNING: These fields delete features currently on the view or in a BFG.
Deletion of a feature in BFG may invoke BFG reselection.

303. DELFEAT

ROW FEATURE

1	_____
2	_____
3	_____

No Messages

5ESS SWITCH LABNSC1

SCREEN 1 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT

(*)1. DSL TN C 2228701	SERVICES AND FEATURES	SCREENS
(*)4. MLHG _____	-----	-----
(*)5. TERM _____	BRCS FEATURE LIST	6
(*)6. DSL OE _ _____	BRCS FEATURE PARAMETERS	7 to 9
(*)9. ASSOC U	CKT	4 & 5
	DELFEAT LIST	14
	DPKT	10
	DSL INFO	2
	ODB	11
	PPB1	12
	PPB2	13
	USER INFO	3

5ESS SWITCH LABNSC1

SCREEN 2 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (DSL INFO)

>11. OE	I 00101209	25. CUT DGTS2228
14. D ISCN	007096	26. ACSR GRP_____
15. D SERV	SX	27. DFLT SRV_____
16. B1 SERV	DMD	
17. B2 SERV	DMD	
18. NT1 TYPE	AULC	
19. PM GRP	PMDEF	
20. DSL CLS	STD	
21. RSTR MP	N	
22. ACSR INH	Y	
23. MDPKT	8	
24. MTERM	2	

5ESS SWITCH LABNSC1

SCREEN 3 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (USER INFO)

>28. USPID	0122287001
29. MAXB CHL	1
30. ACT USER	Y
31. PPB1 USR	N
32. PPB2 USR	N
33. AGI	_

SCREEN 4 OF 14

5ESS SWITCH LABNSC1

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (CKT)

>34. CKT TN	2228701	CIRCUIT VOICE (CSV)	CIRCUIT DATA (CSD)
35. CKT LCC	DSL	46. CSV 1	55. CSD 1
36. CKT RAX	1	47. CSV CHL ANY	56. CSD CHL ANY
37. CKT MLHG	___	48. CSV ACO	57. CSD ACO
38. CKT TERM	___	49. CSV LIMIT 1	58. CSD LIMIT 1
39. NEW TN	___	50. CSV NBLIMIT	59. CSD NBLIMIT ___
40. CONFIG GRP	NI17507B	51. SP DNA	60. K56 DNA
41. TERMTYP	TYPEA	52. SP DNA QTY	61. K56 DNA QTY
42. DISPLAY	Y	53. AU DNA	62. K64 DNA
43. EKTS	___	54. AU DNA QTY	63. K64 DNA QTY
44. CA	___		
45. CA QTY	___		

SCREEN 5 OF 14

5ESS SWITCH LABNSC1

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (CKT)

>64. TKS	N	72. SAR QTY	___	82. BUSY MONITOR	N
65. TAUTO	N	73. SAR ORIG	N	83. ATT MLHG	___
66. SHARED	N	74. SAR TERM	N	84. RBV TGN	___
67. SAUTO	N	75. INCOMING	N	85. ERCO ASGN	N
68. PRIVACY	N	76. INTERCOM	N	86. ERCO ACT	N
69. ICP	N	77. ORIG CW	N	87. SERHLN	2228701
70. SUSO	N	78. PP	N	88. BCK LNK	N
71. SUST	N	79. CA PREF	I	89. ACD POS NUM	___
		80. AUTO HOLD	N	90. CIDIAL	ALLOW
		81. ONE TOUCH	N	91. PIC	___
				92. PTC	___
				95. E911 PSAP	N

SCREEN 6 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT

>106. BFGN					109. FEATURE LIST (FL)															
					A					A					A					
ROW	FEATURE	A	P	C	R	FEATURE	A	P	C	R	FEATURE	A	P	C	R	FEATURE	A	P	C	R
1	/LIDLXA	Y	N	N	10						19					28				
2	/CPCPFA	Y	N	N	11						20					29				
3	/CFDBLAC	Y	N	N	12						21					30				
4					13						22					31				
5					14						23					32				
6					15						24					33				
7					16						25					34				
8					17						26					35				
9					18						27					36				

5ESS SWITCH LABNSC1
SCREEN 7 OF 14

RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>134. TG:GRPID	0	146. ACSR GRPNM	_____	158. QALWD	_____
135. MOH ALW	_____	147. EDS:GRPNM	_____	159. PRIORITY Q	_____
136. IDP NAME	_____	148. BCLID GRP	_____	160. ARSSI	_____
137. DPAT CAT	0	149. PFA:VGRPNM	_____	161. DIALPLN	_____
138. ICR SFG	0	150. PFA:DGRPNM	_____	162. ALWMDR	_____
139. SC1NAME	_____	151. ATH:VGRPNM	_____	163. ACSR PINREQ	_____
140. SC1S	_____	152. ATH:DGRPNM	_____	164. DRING	_____
141. SC2NAME	_____	153. MDR:GRPNM	_____	165. DCW DRING	_____
142. SC2S	_____	154. ACCT:GRPNM	_____	166. CWO DRING	_____
143. CPU0:SELQ1	0	155. ARS:VGRPNM	_____	167. MWY DRING	_____
144. CPU0:SELQ2	0	156. ARS:DGRPNM	_____		
145. CPUT:TPREDQ	0	157. FRL	_____		

SCREEN 8 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>172. MESSAGE SERVICE (MSS) 175. MW:DCNDN _____

ROW	FEATURE	GRPNM
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

SCREEN 9 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>176. CALL FORWARDING FEATURE PARAMETERS (CF)

ROW	FEATURE	FWD TO DN	TIMEOUT	BSRING	SIMINTER	SIMINTRA
1	/CFDBLAC	2228701	0	N	1	99
2	_____	_____	0	0	0	
3	_____	_____	0	0	0	
4	_____	_____	0	0	0	
5	_____	_____	0	0	0	
6	_____	_____	0	0	0	

5ESS SWITCH LABNSC1
SCREEN 1 OF 14

RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT

(*)1. DSL TN C 2228702SERVICES AND FEATURES SCREENS
(*)4. MLHG _____ -----
(*)5. TERM _____ BRCS FEATURE LIST 6
(*)6. DSL OE _ _____ BRCS FEATURE PARAMETERS 7 to 9
(*)9. ASSOC U _____ CKT 4 & 5
DELFEAT LIST 14
DPKT 10
DSL INFO 2
ODB 11
PPB1 12
PPB2 13
USER INFO 3

5ESS SWITCH LABNSC1

SCREEN 2 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (DSL INFO)

>11. OE	I 00101209	25. CUT DGTS2228
14. D ISCN	007096	26. ACSR GRP_____
15. D SERV	SX	27. DFLT SRV_____
16. B1 SERV	DMD	
17. B2 SERV	DMD	
18. NT1 TYPE	AULC	
19. PM GRP	PMDEF	
20. DSL CLS	STD	
21. RSTR MP	N	
22. ACSR INH	Y	
23. MDPKT	8	
24. MTERM	2	

5ESS SWITCH LABNSC1

SCREEN 3 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (USER INFO)

>28. USPID	0122287002
29. MAXB CHL	1
30. ACT USER	Y
31. PPB1 USR	N
32. PPB2 USR	N
33. AGI	—

5ESS SWITCH LABNSC1

SCREEN 4 OF 14

RECENT CHANGE 23.8

DSL/BRCS ASSIGNMENT (CKT)

>34. CKT TN	2228702	CIRCUIT VOICE (CSV)	CIRCUIT DATA (CSD)
35. CKT LCC	DSL	46. CSV 1	55. CSD 1
36. CKT RAX	1	47. CSV CHL ANY	56. CSD CHL ANY
37. CKT MLHG	—	48. CSV ACO	57. CSD ACO
38. CKT TERM	—	49. CSV LIMIT 1	58. CSD LIMIT 1
39. NEW TN	—	50. CSV NBLIMIT	59. CSD NBLIMIT —
40. CONFIG GRP	NI17507B	51. SP DNA	60. K56 DNA
41. TERMTYP	TYPEA	52. SP DNA QTY	61. K56 DNA QTY
42. DISPLAY	Y	53. AU DNA	62. K64 DNA
43. EKTS	—	54. AU DNA QTY	63. K64 DNA QTY
44. CA	—		
45. CA QTY	—		

SCREEN 5 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (CKT)

>64. TKS	N	72. SAR QTY__	82. BUSY MONITORN
65. TAUTO	N	73. SAR ORIGN	83. ATT MLHG ____
66. SHARED	N	74. SAR TERMN	84. RBV TGN ____
67. SAUTO	N	75. INCOMINGN	85. ERCO ASGN N
68. PRIVACY	N	76. INTERCOMN	86. ERCO ACT N
69. ICP	N	77. ORIG CWN	87. SERHLN 2228701
70. SUSO	N	78. PP N	88. BCK LNK N
71. SUST	N	79. CA PREFI	89. ACD POS NUM__
		80. AUTO HOLDN	90. CIDIAL ALLOW
		81. ONE TOUCHN	91. PIC ____
			92. PTC ____
			95. E911 PSAP N

SCREEN 6 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT

>106. BFGN _____ 109. FEATURE LIST (FL)

A A A A

ROW	FEATURE	A	P	C	R	FEATURE	A	P	C	R	FEATURE	A	P	C	R	FEATURE	A	P	C	R
1	/LIDLXA	Y	N	N	10	_____	_____	_____	_____	19	_____	_____	_____	_____	28	_____	_____	_____	_____	
2	/CPCPFA	Y	N	N	11	_____	_____	_____	_____	20	_____	_____	_____	_____	29	_____	_____	_____	_____	
3	/CFDBLAC	Y	N	N	12	_____	_____	_____	_____	21	_____	_____	_____	_____	30	_____	_____	_____	_____	
4	_____	_____	_____	_____	13	_____	_____	_____	_____	22	_____	_____	_____	_____	31	_____	_____	_____	_____	
5	_____	_____	_____	_____	14	_____	_____	_____	_____	23	_____	_____	_____	_____	32	_____	_____	_____	_____	
6	_____	_____	_____	_____	15	_____	_____	_____	_____	24	_____	_____	_____	_____	33	_____	_____	_____	_____	
7	_____	_____	_____	_____	16	_____	_____	_____	_____	25	_____	_____	_____	_____	34	_____	_____	_____	_____	
8	_____	_____	_____	_____	17	_____	_____	_____	_____	26	_____	_____	_____	_____	35	_____	_____	_____	_____	
9	_____	_____	_____	_____	18	_____	_____	_____	_____	27	_____	_____	_____	_____	36	_____	_____	_____	_____	

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
SCREEN 7 OF 14
DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>134. TG:GRPID	0	146. ACSR GRPNM	_____	158. QALWD	_____
135. MOH ALW	_____	147. EDS:GRPNM	_____	159. PRIORITY Q	_____
136. IDP NAME	_____	148. BCLID GRP	_____	160. ARSSI	_____
137. DPAT CAT	0	149. PFA:VGRPNM	_____	161. DIALPLN	_____
138. ICR SFG	0	150. PFA:DGRPNM	_____	162. ALWMDR	_____
139. SC1NAME	_____	151. ATH:VGRPNM	_____	163. ACSR PINREQ	_____
140. SC1S	_____	152. ATH:DGRPNM	_____	164. DRING	_____
141. SC2NAME	_____	153. MDR:GRPNM	_____	165. DCW DRING	_____
142. SC2S	_____	154. ACCT:GRPNM	_____	166. CWO DRING	_____
143. CPU0:SELQ1	0	155. ARS:VGRPNM	_____	167. MWY DRING	_____
144. CPU0:SELQ2	0	156. ARS:DGRPNM	_____		
145. CPUT:TPREDQ	0	157. FRL	_____		

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
SCREEN 8 OF 14
DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>172. MESSAGE SERVICE (MSS) 175. MW:DCNDN _____

ROW	FEATURE	GRPNM
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

SCREEN 9 OF 14

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (HIGH RUNNER FEATURE PARAMETERS)

>176. CALL FORWARDING FEATURE PARAMETERS (CF)

ROW	FEATURE	FWD TO DN	TIMEOUT	BSRING	SIMINTER	SIMINTRA
1	/CFDBLAC	2228701	0	N	1	99
2	_____	_____	0	0	0	
3	_____	_____	0	0	0	
4	_____	_____	0	0	0	
5	_____	_____	0	0	0	
6	_____	_____	0	0	0	

Northern Telecom DMS-100 Switch Translations

For the Northern Telecom DMS-100 switch, Capability Package "S" (2B) includes alternate voice/circuit-switched data on two B-channels. Data and voice capabilities include Calling Number Identification. Please note that the assignment of two DNS is required for this package.

The DMS-100 switch also provides for alternate voice and data hunting on one DN via the Multi-Line Hunt Group feature.

ISDN Capability Package "S"

The information listed below provides the DN translations that define Capability Package "S", and the commands that must be executed.

ISDN Ordering Code: Capability S

Provision DN1 using the following translations

Define a new Logical Terminal Identifier (LTID) using the SLT command:

SONUMBER <<cr> or \$>

LTID <enter identifier value>

FUNCTION <ADD>

LTCLASS <BRAFS>

CS <Y>

PS <N>

MAXKEYS <64>

TEI_TYPE <DTEI>

ABS <NOPMD>

ABS <\$>

EKTS <N>
SPIDSFX option
 SPID_SUFFIX *<enter spid suffix value>*
PVC option
 VERSION <FUNCTIONAL>
 ISSUE <2>

Associate new DN with LTID using the NEW command:

SONUMBER <<cr> or \$>
DN *<enter DN>*
LCC <ISDNKSET>
GROUP *<enter group name>*
SUBGRP *<enter subgrp value>*
NCOS *<enter ncos value>*
SNPA *<enter NXX value>*
KEY <1>
RINGING <Y>
LATANAME *<enter value>*
LTG *<enter value>*
LEN_OR_LTID *<enter assigned value>*

DMS100 normally delivers the Calling Party Number and the Redirecting Number, if available.

Attach LTIDs to LEN using SLT command:

SONUMBER <<cr> or \$>
LTID *<enter value>*
FUNCTION <ATT>
LEN *<enter LEN to which LTID will be attached>*

Provision DN2 using the following translations

Define a new Logical Terminal Identifier (LTID) using the SLT command:

```
SONUMBER <<cr> or $>
LTID <enter identifier value>
FUNCTION <ADD>
LTCLASS <BRAFS>
CS <Y>
PS <N>
MAXKEYS <64>
TEI_TYPE <DTEI>
ABS <NOPMD>
ABS <$>
EKTS <N>
SPIDSFX option
        SPID_SUFFIX <enter spid suffix value>
PVC option
        VERSION <FUNCTIONAL>
        ISSUE <2>
```

Associate new DN with LTID using the NEW command:

```
SONUMBER <<cr> or $>
DN <enter DN>
LCC <ISDNKSET>
GROUP <enter group name>
SUBGRP <enter subgrp value>
NCOS <enter ncos value>
SNPA <enter NXX value>
```

KEY <1>
RINGING <Y>
LATANAME <enter value>
LTG <enter value>
LEN_OR_LTID <enter assigned value>

DMS100 normally delivers the Calling Party Number and the Redirecting Number, if available.

Attach LTIDs to LEN using SLT command:

SONUMBER <<cr> or \$>
LTID <enter value>
FUNCTION <ATT>
LEN <enter LEN to which LTID will be attached>

Multi-Line Hunt Group Feature Translations

The sample screens shown below illustrate the translations for alternate voice and data hunting on three DSLs and six DNS forming a circular hunt group. This hunting is provided via the Multi-Line Hunt Group feature.

The screens shown in this section are examples. DNS shown on these screens should be replaced with applicable data.

QDN 2257141

DN: 2257141
TYPE: PILOT OF DNH HUNT GROUP
SNPA: 201SIG: N/A LNATTIDX: N/A
HUNT GROUP: 22 HUNT MEMBER: 0
LTID: PSATS 141
LTCLASS: BRAFS
LINE CLASS CODE: ISDNKSET
KEY: 1
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
OPTIONS:
SFC
GROUP OPTIONS:
CIR RCVD
MEMBER INFO:
1 2257146
2 2257145
3 2257144
4 2257143
5 2257142

QLT PSATS 141

LTID: PSATS 141
SNPA: 201
DIRECTORY NUMBER: 2257141
LT GROUP NO: 13
LTCLASS: BRAFS DEFAULT LOGICAL TERMINAL: N
EKTS: N CACH: N
BEARER SERVICE RESTRICTIONS: NOPMD
CS: Y PS: N
VERSION: FUNCTIONAL ISSUE: 2
SPID-SUFFIX: 01
LEN: HOST 01 1 10 01 TEI: DYNAMIC
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: ORING: Y
LINE CLASS CODE: ISDNKSET
MAXKEYS: 64
DN IS ASSIGNED AS A DNH HUNT PILOT.
HUNT GROUP: 22 HUNT MEMBER: 0
OPTIONS:
SFC

KEY	DN	
---	--	
1	DN	2257141

KEY	FEATURE
---	-----
	NONE

GROUP OPTIONS:
CIR RCVD
MEMBER INFO:_
1 2257146
2 2257145
3 2257144
4 2257143
5 2257142

QLT PSATS 142

LTID: PSATS 142
SNPA: 201
DIRECTORY NUMBER: 2257142
LT GROUP NO: 13
LTCLASS: BRAFS DEFAULT LOGICAL TERMINAL: N
EKTS: N CACH: N
BEARER SERVICE RESTRICTIONS: NOPMD
CS: Y PS: N
VERSION: FUNCTIONAL ISSUE: 2
SPID-SUFFIX: 01
LEN: HOST 01 1 10 02 TEI: DYNAMIC
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
LINE CLASS CODE: ISDNKSET
MAXKEYS: 64
DN IS ASSIGNED AS A DNH HUNT MEMBER (NOT PILOT).
HUNT GROUP: 22 HUNT MEMBER: 5
OPTIONS:
SFC

KEY	DN
---	--
1	DN 2257142

KEY	FEATURE
---	-----
	NONE

PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

DN: 2257143
TYPE: MEMBER OF DNH HUNT GROUP
SNPA: 201 SIG: N/A LNATTIDX: N/A
HUNT GROUP: 22 HUNT MEMBER: 4
LTID: PSATS 143
LTCLASS: BRAFS
LINE CLASS CODE: ISDNKSET
KEY: 1
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

LTID: PSATS 143
SNPA: 201
DIRECTORY NUMBER: 2257143
LT GROUP NO: 13
LTCLASS: BRAFS DEFAULT LOGICAL TERMINAL: N
EKTS: N CACH: N
BEARER SERVICE RESTRICTIONS: NOPMD
CS: Y PS: N
VERSION: FUNCTIONAL ISSUE: 2
SPID-SUFFIX: 01
LEN: HOST 01 0 07 01 TEI: DYNAMIC
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
LINE CLASS CODE: ISDNKSET
MAXKEYS: 64
DN IS ASSIGNED AS A DNH HUNT MEMBER (NOT PILOT).
HUNT GROUP: 22 HUNT MEMBER: 4
OPTIONS:
SFC

KEY	DN
---	--
1 DN	2257143

KEY FEATURE
--- -----
NONE

PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

QDN 2257144;QLT PSATS 144

DN: 2257144
TYPE: MEMBER OF DNH HUNT GROUP
SNPA: 201 SIG: N/A LNATTIDX: N/A
HUNT GROUP: 22 HUNT MEMBER: 3
LTID: PSATS 144
LTCLASS: BRAFS
LINE CLASS CODE: ISDNKSET
KEY: 1
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

LTID: PSATS 144
SNPA: 201
DIRECTORY NUMBER: 2257144
LT GROUP NO: 13
LTCLASS: BRAFS DEFAULT LOGICAL TERMINAL: N
EKTS: N CACH: N
BEARER SERVICE RESTRICTIONS: NOPMD
CS: Y PS: N
VERSION: FUNCTIONAL ISSUE: 2
SPID-SUFFIX: 01
LEN: HOST 01 1 10 01 TEI: DYNAMIC
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
LINE CLASS CODE: ISDNKSET
MAXKEYS: 64
DN IS ASSIGNED AS A DNH HUNT MEMBER (NOT PILOT).
HUNT GROUP: 22 HUNT MEMBER: 3
OPTIONS:
SFC

KEY	DN
---	--
1	DN 2257144

KEY FEATURE
--- -----
NONE

PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

QDN 2257145;QLT PSATS 145

DN: 2257145
TYPE: MEMBER OF DNH HUNT GROUP
SNPA: 201 SIG: N/A LNATTIDX: N/A
HUNT GROUP: 22 HUNT HENBER: 2
LTID: PSATS 145
LTCLASS: BRAFS
LINE CLASS CODE: ISDNKSET
KEY: 1
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

LTID: PSATS 145
SNPA: 201
DIRECTORY NUMBER: 2257145
LT GROUP NO: 13
LTCLASS: BRAFS DEFAULT LOGICAL TERMINAL: N
EKTS: N CACH: N
BEARER SERVICE RESTRICTIONS: NOPMD
CS: Y PS: N
VERSION: FUNCTIONAL ISSUE: 2
SPID-SUFFIX: 01
LEN: HOST 01 1 10 02 TEI: DYNAMIC
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
LINE CLASS CODE: ISDNKSET
MAXKEYS: 64
DN IS ASSIGNED AS A DNH HUNT MEMBER (NOT PILOT).
HUNT GROUP: 22 HUNT MEMBER: 2
OPTIONS:
SFC

KEY	DN
---	--
1	DN 2257145

KEY	FEATURE
---	-----
	NONE

PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

QDN 2257146;QLT PSATS 146

DN: 2257146
TYPE: MEMBER OF DNH HUNT GROUP
SNPA: 201 SIG: N/A LNATTIDX: N/A
HUNT GROUP: 22 HUNT MEMBER: 1
LTID: PSATS 146
LTCLASS: BRAFS
LINE CLASS CODE: ISDNKSET
KEY: 1
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

LTID: PSATS 146
SNPA: 201
DIRECTORY NUMBER: 2257146
LT GROUP NO: 13
LTCLASS: BRAFS DEFAULT LOGICAL TERMINAL: N
EKTS: N CACH: N
BEARER SERVICE RESTRICTIONS: NOPMD
CS: Y PS: N
VERSION: FUNCTIONAL ISSUE: 2
SPID-SUFFIX: 01
LEN: HOST 01 0 07 01 TEI: DYNAMIC
CUSTGRP: MDCSCA SUBGRP: 0 NCOS: 0 RING: Y
LINE CLASS CODE: ISDNKSET
MAXKEYS: 64
DN IS ASSIGNED AS A DNH HUNT MEMBER (NOT PILOT).
HUNT GROUP: 22 HUNT MEMBER: 1
OPTIONS:
SFC

KEY	DN
---	--
1	DN 2257146

KEY FEATURE
--- -----
 NONE

PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

QLEN 1 1 10 1;QLEN 1 1 10 2;QLEN 1 0 7 1

LEN: HOST 01 1 10 01
ISG: 0 DCH: 1 ISG BRA Channel: 21
CARCODE: BX27AA PADGRP: NPDGP
PM MODE NUMBER : 32
PM TERMINAL NUMBER: 322

TEI	LTID	CS	PS	BCH/ISG Bd
---	-----	--	--	-----
DYNAMIC	PSATS 141	Y N		-
DYNAMIC	PSATS 144	Y N		-

LEN: HOST 01 1 10 02
ISG: 0 DCH: 1 ISG BRA Channel: 21
CARCODE: BX27AA PADGRP: NPDGP
PM NODE NUMBER : 32
PM TERMINAL NUMBER: 323

TEI	LTID	CS	PSBCH/ISG	Bd
---	-----	--	--	-----
DYNAMIC	PSATS	142	Y N -	
DYNAMIC	PSATS	145	Y N -	

LEN: HOST 01 0 07 01
ISG: 0 DCH: 1 ISG BRA Channel: 24
CARCODE: BX27AA PADGRP: NPDGP
PM NODE NUMBER : 31
PM TERMINAL NUMBER: 226

TEI	LTID	CS	PSBCH/ISG	Bd
---	-----	--	--	-----
DYNAMIC	PSATS	143	Y N -	
DYNAMIC	PSATS	146	Y N -	

STOP2

Siemens SSC EWSD Switch Translations

For the Siemens SSC EWSD switch, Capability Package "S" (2B) includes alternate voice/circuit-switched data on two B-channels. Data and voice capabilities include Calling Number Identification. Please note that the assignment of two DNS is required for this package.

The Siemens SSC EWSD switch provides for either voice or data hunting on one DN via the Series Completion feature. The same provisioning is used for either a voice or data series completion group.

ISDN Capability Package "S"

The information listed below provides the DN translations that define Capability Package "S", and the screens and fields that must be populated.

The information provided shows the translations for one DSL and two DNS. For multiple DSLs/DNs, the CO will duplicate these screens and enter the applicable DSL and DN values as needed.

ISDN Ordering Code: Capability S

DISPACCESS:EQN=20-0-5-4;	EXEC'D
ACCESS DATA	MASKNO:04328
	MASKNO:00000

EQN =20-0-5-4,
CLOSS = 0,
BCHEQN =2,
BCEQN = SP & AU3 & C56 & C64,
CPDDN = 2156855917-VI & 2156855917-CMD,
CPVDN2 = 2156855917,
COE = CLASS1,
LINKOPT = DYNNOPAL,
BAPROF = 0;
DISPSUB:DN=6855917;

NPA = 215	DN = 6855917	EQN = 20-0-5-4	MASKNO:03800
	CAT = IBA		MASKNO:03774
	BCHDN = 2		MASKNO:03798
	BCDN = SP	&AU3 &C56 &C64	MASKNO:04535
CT = VI			MASKNO:04396
	LCC = BVCE	RAX = 1	MASKNO:03785
	BCHCT = 2		MASKNO:06282
	IBCHCT = 2		MASKNO:06288
	OBCHCT = 2		MASKNO:06291
	PIC = 0288-SP		MASKNO:04398
		& 0288-AU3	
	CHRG = FRSA1		MASKNO:03775
	COS = ICND & RND		MASKNO:03777
	CRBLIM = 2		MASKNO:03798
CT = CMD			MASKNO:04396
	LCC = BCMD	RAX = 1	MASKNO:03785
	BCHCT = 2		MASKNO:06282
	IBCHCT = 2		MASKNO:06288
	OBCHCT = 2		MASKNO:06291
	PIC = 0288-C56		MASKNO:04398
		& 0288-C64	
	CHRG = FRSA1		MASKNO:03775
	COS = ICND	&RND	MASKNO:03777
	CRBLM = 2		MASKNO:03798
DISPTSP:TSPID=215685591701			MASKNO:04383
EQN: 20-0-5-4			
USID: 5			
TSPID: 215685591701			
TERMLIM: 1			MASKNO:04386
DN: 6855917			MASKNO:04382
CT: VI			MASKNO:04385
DN: 6855917			MASKNO:04382
CT: CMD			MASKNO:04385
DISPSUB:DN=6855919;			

NPA = 215	DN = 6855919	EQN = 20-0-5-4	MASKNO:03800
	CAT = IBA		MASKNO:03774
	BCHDN = 2		MASKNO:03798
	BCDN = SP	&AU3 &C56 &C64	MASKNO:04535
CT = VI			MASKNO:04396
	LCC = BVCE	RAX = 1	MASKNO:03785
	BCHCT = 2		MASKNO:06282
	IBCHCT = 2		MASKNO:06288
	OBCHCT = 2		MASKNO:06291
	PIC = 0288-SP		MASKNO:04398
		& 0288-AU3	
	CHRG = FRSA1		MASKNO:03775
	COS = ICND & RND		MASKNO:03777
	CRBLIM = 2		MASKNO:03798
CT = CMD			MASKNO:04396
	LCC = BCMD	RAX = 1	MASKNO:03785
	BCHCT = 2		MASKNO:06282
	IBCHCT = 2		MASKNO:06288
	OBCHCT = 2		MASKNO:06291
	PIC = 0288-C56		MASKNO:04398
		& 0288-C64	
	CHRG = FRSA1		MASKNO:03775
	COS = ICND	&RND	MASKNO:03777
	CRBLIM = 2		MASKNO:03798
DISPTSP:TSPID=215685591901;			MASKNO:04383
EQN: 20-0-5-4			
USID: 1			
TSPID: 215685591901			
TERMLIM: 1			MASKNO:04386
DN: 6855919			MASKNO:04382
CT: VI			MASKNO:04385
DN: 6855919			MASKNO:04382
CT: CMD			MASKNO:04385

Series Completion Feature Translations

The information listed below provides the translation for either voice or data hunting on three DSLs and six DN's forming a circular series completion group.

The screens shown in this section are examples. DN's shown on these screens should be replaced with applicable data.

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:05
0959 OMT-00/LEONLY2816/04328

DISPSDNDAT:EQN=20-0-0-1&20-0-5-0&40-0-2-4:
EXEC'D

ISDN ACCESS DATA MASKNO:04328
MASKNO:00000

VIEW = EQN.
EQN = 20-0-00-01.
BCHEQN = 2.
BCEQN = SP.
BCEQN = AU3.
BCEQN = C56.
BCEQN = C64.
CPDDN = 2156851189-VI.
CPDDN = 2156851189-CMD.
COE = CLASS1.
LINKOPT = DYNNOPAL.
NCCSL = D1--4.
NCCSL = D2--4.
NPCSL = P1--0.
NPCSL = P2--0.
NSL = 10.
L2TIM = T200-10.
L2TIM = T201-10.
L2TIM = T203-3.
L2COUNT = N200-3.
L2COUNT = OIFDCC-1.
L2COUNT = OIFDPC-3.
CPVDN2 = 2156851189.
CPVDN2 = 2156851289:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0001

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:08
0959 OMT-00/LEONLY2816/04328

SUBSCRIBER

MASKNO:04328

MASKNO:00000

VIEW = DN.

NPA = 215.

DN = 6851189.

EQN = 20-0-00-01.

BCHDN = 2.

BCDN = SP.

BCDN = AU3.

BCDN = C56.

BCDN = C64.

BCHCT = 2-VI.

BCHCT = 2-CMD.

BCHCT = 0-PMD.

IBCHCT = 2-VI.

IBCHCT = 2-CMD.

IBCHCT = 0-PMD.

OBCHCT = 2-VI.

OBCHCT = 2-CMD.

OBCHCT = 0-PMD.

CT = VI.

C1 = CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0002

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000	96-01-18	16:22:31
M	0959	OMT-00/LEONLY2816/04328	
	SUBSCRIBER	MASKNO:04328	
		MASKNO:00000	
	VIEW = DNCT.		
	NPA = 215.		
	DN = 6851189.		
	EQN = 20-0-00-01.		
	CT = VI.		
	CAT = IBA.		
	LCC = PKGSV.		
	RAX = 1.		
	COS = ICND.		
	COS = RND.		
	COSDAT = SERCOMP-6851289.		
	PIC = 222-SP.		
	PIC = 288-AU3.		
	CRBLIM = 1:		

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0003

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:22:15
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER

MASKNO:04328

MASKNO:00000

VIEW = DNCT.

NPA = 215.

DN = 6851189.

EQN = 20-0-00-01.

CT = CMD.

CAT = IBA.

LCC = PKGSD.

RAX = 1.

COS = ICND.

COS = RND.

COSDAT = SERCOMP-6851289.

PIC = 222-C56.

PIC = 288-C64.

CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0004

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000	96-01-18	16:22:19
M	0959	OMT-00/LEONLY2816/04328	

SUBSCRIBER

MASKNO:04328

MASKNO:00000

VIEW = DN.

NPA = 215.

DN = 6851289.

EQN = 20-0-00-01.

BCHDN = 2.

BCDN = SP.

BCDN = AU3.

BCDN = C56.

BCDN = C64.

BCHCT = 2-VI.

BCHCT = 2-CMD.

BCHCT = 0-PMD.

IBCHCT = 2-VI.

IBCHCT = 2-CMD.

IBCHCT = 0-PMD.

OBCHCT = 2-VI.

OBCHCT = 2-CMD.

OBCHCT = 0-PMD.

CT = VI.

CT = CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0005

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:22:22
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER

MASKNO:04328

MASKNO:00000

VIEW = DNCT.

NPA = 215.

DN = 6851289.

EQN = 20-0-00-01.

CT = VI.

CAT = IBA.

LCC = PKGSV.

RAX = 1.

COS = ICND.

COS = RND.

COSDAT = SERCOMP-6852199.

PIC = 222-SP.

PIC = 288-AU3.

CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0006

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000	96-01-18	16:22:26
M	0959	OMT-00/LEONLY2816/04328	

SUBSCRIBER

MASKNO:04328

MASKNO:00000

VIEW = DNCT.

NPA = 215.

DN = 6851289.

EQN = 20-0-00-01.

CT = CMD.

CAT = IBA.

LCC = PKGSD.

RAX = 1.

COS = ICND.

COS = RND.

COSDAT = SERCOMP-6852199.

PIC = 222-C56.

PIC = 288-C64.

CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0007

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000	96-01-18	16:22:29
M	0959 OMT-00/LEONLY2816/04328		

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSP.
EQN = 20-0-00-01.
USID = 1.
TSPID = 2156851189.
TERMLIM = 1.
TSPCOS = CHDBCHR:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0008

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000	96-01-18	16:22:32
M	0959 OMT-00/LEONLY2816/04328		

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSPDNCT.
EQN = 20-0-00-01.
TSPID = 2156851189.
NPA = 215.
DN = 6851189.
CT= VI:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0009

NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:35
M 0959 OMT-00/LEONLY2816/04328

TERMINAL SERVICE PROFILE DATA MASKNO:04328
MASKNO:00000

VIEW = TSPDNCT.
EQN = 20-0-00-01.
TSPID = 2156851189.
NPA = 215.
DN = 6851189.
CT= CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0010

NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:38
M 0959 OMT-00/LEONLY2816/04328

TERMINAL SERVICE PROFILE DATA MASKNO:04328
MASKNO:00000

VIEW = TSP.
EQN = 20-0-00-01.
USID = 2.
TSPID = 2156851289.
TERMLIM = 1.
TSPCOS = CHDBCHR:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0011

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:22:40
M	0959 OMT-00/LEONLY2816/04328	

ISDN ACCESS DATA	MASKNO:04328
	MASKNO:00000

VIEW = EQN.
EQN = 20-0-05-01.
BCHEQN = 2.
BCEQN = SP.
BCEQN = AU3.
BCEQN = C56.
BCEQN = C64.
CPDDN = 2156852199-VI.
CPDDN = 2156852199-CMD.
COE = CLASS1.
LINKOPT = DYNNOPAL.
NCCSL = D1--4.
NCCSL = D2--4.
NPCSL = P1--0.
NPCSL = P2--0.
NSL = 10.
L2TIM = T200-10.
L2TIM = T201-10.
L2TIM = T203-3.
L2COUNT = N200-3.
L2COUNT = OIFDCC-1.
L2COUNT = OIFDPC-3.
CPVDN2 = 2156852199.
CPVDN2 = 2156852299:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0012

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:22:44
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DN.
NPA = 215.
DN = 6852199.
EQN = 20-0-05-00.
BCHDN = 2.
BCDN = SP.
BCDN = AU3.
BCDN = C56.
BCDN = C64.
BCHCT = 2-VI.
BCHCT = 2-CMD.
BCHCT = 0-PMD.
IBCHCT = 2-VI.
IBCHCT = 2-CMD.
IBCHCT = 0-PMD.
OBCHCT = 2-VI.
OBCHCT = 2-CMD.
OBCHCT = 0-PMD.
CT = VI.
CT = CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0013

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:22:48
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DNCT.
NPA = 215.
DN = 6852199.
EQN = 20-0-05-00.
CT = VI.
CAT = IBA.
LCC = PKGSV.
RAX = 1.
COS = ICND.
COS = RND.
COSDAT = SERCOMP-6852299.
PIC = 222-SP.
PIC = 288-AU3.
CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0014

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:22:51
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DNCT.
NPA = 215.
DN = 6852199.
EQN = 20-0-05-00.
CT = CMD.
CAT = IBA.
LCC = PKGSD.
RAX = 1.
COS = ICND.
COS = RND.
COSDAT = SERCOMP-6852299.
PIC = 222-C56.
PIC = 288-C64.
CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0015

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	6:22:55
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DN.
NPA = 215.
DN = 6852299.
EQN = 20-0-05-00.
BCHDN = 2.
BCDN = SP.
BCDN = AU3.
BCDN = C56.
BCDN = C64.
BCHCT = 2-VI.
BCHCT = 2-CMD.
BCHCT = 0-PMD.
IBCHCT = 2-VI.
IBCHCT = 2-CMD.
IBCHCT = 0-PMD.
OBCHCT = 2-VI.
OBCHCT = 2-CMD.
OBCHCT = 0-PMD.
CT = VI.
CT = CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0016

NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18

16:22:58

M 0959 OMT-00/LEONLY2816/04328

SUBSCRIBER

MASKNO:04328

MASKNO:00000

VIEW = DNCT.

NPA = 215.

DN = 6852299.

EQN = 20-0-05-00.

CT = VI.

CAT = IBA.

LCC = PKGSV.

RAX = 1.

COS = ICND.

COS = RND.

COSDAT = SERCOMP-6853119.

PIC = 222-SP.

PIC = 288-AU3.

CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0017

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:01
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DNCT.
NPA = 215.
DN = 6852299.
EQN = 20-0-05-00.
CT = CMD.
CAT = IBA.
LCC = PKGSD.
RAX = 1.
COS = ICND.
COS = RND.
COSDAT = SERCOMP-6853119.
PIC = 222-C56.
PIC = 288-C64.
CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0018

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:05
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSP.
EQN = 20-0-05-00.
USID = 1.
TSPID = 2156852199.
TERMLIM = 1.
TSPCOS = CHDBCHR:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0019

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:07
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSPDNCT.
EQN = 20-0-05-00.
TSPID = 2156852199.
NPA = 215.
DN = 6852199.
CT= VI:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0020

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:11
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSPDNCT.
EQN = 20-0-05-00.
TSPID = 2156852199.
NPA = 215.
DN = 6852199.
CT= CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0021

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:13
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSP.
EQN = 20-0-05-00.
USID = 2.
TSPID = 2156852299.
TERMLIM = 1.
TSPCOS = CHDBCHR:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0022

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:16
M	0959 OMT-00/LEONLY2816/04328	

ISDN ACCESS DATA	MASKNO:04328
	MASKNO:00000

VIEW = EQN.
EQN = 40-0-02-04.
BCHEQN = 2.
BCEQN = SP.
BCEQN = AU3.
BCEQN = C56.
BCEQN = C64.
CPDDN = 2156853119-VI.
CPDDN = 2156853119-CMD.
COE = CLASS1.
LINKOPT = DYNNOPAL.
NCCSL = D1--4.
NCCSL = D2--4.
NPCSL = P1--0.
NPCSL = P2--0.
NSL = 10.
L2TIM = T200-10.
L2TIM = T201-10.
L2TIM = T203-3.
L2COUNT = N200-3.
L2COUNT = OIFDCC-1.
L2COUNT = OIFDPC-3.
CPVDN2 = 2156853119.
CPVDN2 = 2156853219:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0023

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:20
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DN.
NPA = 215.
DN = 6853119.
EQN = 40-0-02-04.
BCHDN = 2.
BCDN = SP.
BCDN = AU3.
BCDN = C56.
BCDN = C64.
BCHCT = 2-VI.
BCHCT = 2-CMD.
BCHCT = 0-PMD.
IBCHCT = 2-VI.
IBCHCT = 2-CMD.
IBCHCT = 0-PMD.
OBCHCT = 2-VI.
OBCHCT = 2-CMD.
OBCHCT = 0-PMD.
CT = VI.
CT = CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0024

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:23
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DNCT.
NPA = 215.
DN = 6853119.
EQN = 40-0-02-04.
CT = VI.
CAT = IBA.
LCC = PKGSV.
RAX = 1.
COS = ICND.
COS = RND.
COSDAT = SERCOMP-6853219.
PIC = 222-SP.
PIC = 288-AU3.
CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0025

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:27
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DNCT.
NPA = 215.
DN = 6853119.
EQN = 40-0-02-04.
CT = CMD.
CAT = IBA.
LCC = PKGSD.
RAX = 1.
COS = ICND.
COS = RND.
COSDAT = SERCOMP-6853219.
PIC = 222-C56.
PIC = 288-C64.
CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0026

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:30
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DN.
NPA = 215.
DN = 6853219.
EQN = 40-0-02-04.
BCHDN = 2.
BCDN = SP.
BCDN = AU3.
BCDN = C56.
BCDN = C64.
BCHCT = 2-VI.
BCHCT = 2-CMD.
BCHCT = 0-PMD.
IBCHCT = 2-VI.
IBCHCT = 2-CMD.
IBCHCT = 0-PMD.
OBCHCT = 2-VI.
OBCHCT = 2-CMD.
OBCHCT = 0-PMD.
CT = VI.
CT = CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0027

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:34
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DNCT.
NPA = 215.
DN = 6853219.
EQN = 40-0-02-04.
CT = VI.
CAT = IBA.
LCC = PKGSV.
RAX = 1.
COS = ICND.
COS = RND.
COSDAT = SERCOMP-6851189.
PIC = 222-SP.
PIC = 288-AU3.
CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0028

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:37
M	0959 OMT-00/LEONLY2816/04328	

SUBSCRIBER	MASKNO:04328
	MASKNO:00000

VIEW = DNCT.
NPA = 215.
DN = 6853219.
EQN = 40-0-02-04.
CT = CMD.
CAT = IBA.
LCC = PKGSD.
RAX = 1.
COS = ICND.
COS = RND.
COSDAT = SERCOMP-6851189.
PIC = 222-C56.
PIC = 288-C64.
CRBLIM = 1:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0029

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:40
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSP.
EQN = 40-0-02-04.
USID = 1.
TSPID = 2156853119.
TERMLIM = 1.
TSPCOS = CHDBCHR:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0030

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:43
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSPDNCT.
EQN = 40-0-02-04.
TSPID = 2156853119.
NPA = 215.
DN = 6853119.
CT= VI:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0031

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:46
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSPDNCT.
EQN = 40-0-02-04.
TSPID = 2156853119.
NPA = 215.
DN = 6853119.
CT= CMD:

INTERRUPTION TEXT JOB 0959

CONTINUATION TEXT 0032

	NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18	16:23:49
M	0959 OMT-00/LEONLY2816/04328	

TERMINAL SERVICE PROFILE DATA	MASKNO:04328
	MASKNO:00000

VIEW = TSP.
EQN = 40-0-02-04.
USID = 2.
TSPID = 2156853219.
TERMLIM = 1.
TSPCOS = CHDBCHR:

END JOB 0959 EXEC'D

Glossary

Numerics

- 7500B data module** See [ISDN terminal adapter](#).
- 7500B data station** See [ISDN terminal adapter data station](#).

A

- account code** Code used to associate incoming and outgoing calls with corresponding accounts, employees, projects, and clients.
- Accunet** AT&T's switched digital service for 56-kbps, 64-kbps restricted, and 64-kbps clear circuit-switched data calls.
- address** A coded representation of the destination of data or of the data's originating terminal, such as the dialed extension number assigned to the data terminal. Multiple terminals on one communication line must each have a unique address.
- ADDS** (Automated Document Delivery System)
Computer-based application that stores documents in a database and automatically faxes them on request.

adjunct	Optional equipment used with the communications system, such as an alerting device or modem that connects to a multiline telephone or to an extension jack.
ALS	(Automatic Line Selection) Programmed order in which the system makes outside lines available to a user.
AMI	(alternate mark inversion) Line coding format in which a binary one is represented by a positive or negative pulse, a binary zero is represented by no line signal, and subsequent binary ones must alternate in polarity; otherwise, a bipolar violation occurs. AMI is used in the DS1 interface.
analog transmission	Mode of transmission in which information is represented in continuously variable physical quantities such as amplitude, frequency, phase, or resistance. <i>See also</i> digital transmission .
analog data station	<i>See</i> modem data station .
ANI	(automatic number identification) Process of automatically identifying a caller's billing number and transmitting that number from the caller's local central office to another point on or off the public network.
application	Software and/or hardware that adds functional capabilities to the system. For example, MERLIN Identifier is an application that provides caller identification information (if available in the local area or jurisdiction).
ARS	(Automatic Route Selection) System feature that routes calls on outside trunks according to the number dialed and trunk availability.

ASCAP	(American Society of Composers, Artists, and Producers)
ASN	(AT&T Switched Network) AT&T telecommunications services provided through an Integrated Digital Services Network Primary Rate Interface (ISDN-PRI) trunk, Accunet switched digital service, Megacom , Megacom 800 , Software Defined Network (SDN), Multiquest, and Shared Access for Switch Services (SASS).
asynchronous data transmission	A method of transmitting a short bitstream of digital data, such as printable characters represented by a 7- or 8-bit ASCII code. Each string of data bits is preceded by a start bit and followed by a stop bit, permitting data to be transmitted at irregular intervals. <i>See also</i> synchronous data transmission .
Lucent Technologies Attendant	Application with equipment that connects to one or more tip/ring extension jacks and automatically answers incoming calls with a recorded announcement; directs calls in response to touch tones.
AT&T Switched Network	<i>See</i> ASN .
AUDIX Voice Power	A voice-processing application, part of IS II/III , that provides Automated Attendant, Call Answer, Information Service, Message Drop, Voice Mail, and, optionally, Fax Attendant System for use with the system.
Automated Attendant	IS II/III , MERLIN MAIL , and Lucent Technologies Attendant application that automatically answers incoming calls with a recorded announcement and directs callers to a department, an extension, or the system operator.

Automatic Line Selection See [ALS](#).

Automatic Number Identification See [ANI](#).

automatic ring-down tie-trunk See [automatic-start tie trunk](#).

Automatic Route Selection See [ARS](#).

automatic-start tie trunk **Tie trunk** on which incoming calls are routed to an operator or other designated destination without a start signal, as soon as the trunk is seized; the destination is specified during programming. Also called “automatic ringdown” or “auto-in” tie trunk.

auxiliary power unit Device that provides additional power to the system.

B

B8ZS	(bipolar 8 zero substitution) Line-coding format that encodes a string of eight zeros in a unique binary sequence to detect bipolar violation . See also bipolar signal .
backup	Procedure for saving a copy of system programming onto a floppy disk or <i>memory card</i> . See also restore .
bandwidth	Difference, expressed in hertz, between the highest and lowest frequencies in a range that determines channel capacity.
barrier code	Password used to limit access to the Remote Access feature of the system.
basic carrier	Hardware that holds and connects the processor , power supply , and up to five modules in the system. See also expansion carrier .
baud rate	Strictly speaking, a measurement of transmission speed equal to the number of signal level changes per second. In practice, often used synonymously with bit rate and bps .
B-channel	(Bearer-channel) 64-kbps channel that carries a variety of digital information streams, such as voice at 64 kbps, data at up to 64 kbps, wideband voice encoded at 64 kbps, and voice at less than 64 kbps, alone or combined.
Bearer-channel	See B-channel .

Behind Switch mode	One of three modes of system operation, in which the control unit is connected to (behind) another telephone switching system, such as Centrex or DEFINITY , which provides features and services to telephone users. <i>See also</i> Hybrid/PBX mode and Key mode .
binary code	Electrical representation of quantities or symbols expressed in the base-2 number system, which includes zeros and ones.
bipolar 8 zero substitution	<i>See</i> B8ZS .
bipolar signal	Digital signal in which pulses (ones) alternate between positive and negative. <i>See also</i> AMI , B8ZS , and bipolar violation .
bipolar violation	Condition occurring when two positive or two negative pulses are received in succession. <i>See also</i> AMI and B8ZS .
BIS	(Built-In Speakerphone) Part of the model name of some analog multiline telephones.
bit	(binary digit) One unit of information in binary notation; it can have one of two values, zero or one.
bit rate	Speed at which bits are transmitted, usually expressed in bps . Also called "data rate." <i>See also</i> baud rate .
blocking	Condition in which end-to-end connections cannot be made on calls because of a full load on all possible services and facilities. <i>See also</i> glare .
BMI	(Broadcast Music Incorporated)

board	A module , for example, 100D or 408 MLX GS/LS, that allows you to connect lines/trunks and extensions to the communications system or holds the processor or power supply.
board assignment	SPM procedure for assigning line/trunk and extension modules to slots on the control unit .
board renumbering	System programming procedure for renumbering line/trunk and extension modules that have already been assigned to specific slots on the control unit .
BRI	(Basic Rate Interface) Standard interface that specifies the protocol used between two or more communications systems. BRI provides two 64-kbps B-channels for voice and/or data and one 16-kbps D-channel , which carries multiplexed signaling information for the other 2 channels.
bus	Multiconductor electrical path used to transfer information over a common connection from any of several sources to any of several destinations.
button	Key on the face of a telephone that is used to access a line, activate a feature, or enter a code on a communications system.
byte	Sequence of <i>bits</i> (usually eight) processed together. Also called "octet."

C

Call Accounting System See [CAS](#).

Call Accounting Terminal See [CAT](#).

Caller ID In Release 3.0 and later, a system feature that supports a caller identification service provided by some local telephone companies (if local regulations allow) supplying the calling party telephone number. An 800 GS/LS-ID module on the system can capture this information and display it on the screens of MLX telephones. See also [ANI](#).

Calling group Team of individuals who answer the same types of calls.

Call Management System See [CMS](#).

campus cable Cable that runs between buildings connected to the same communications system.

CAS (Call Accounting System) DOS- or UNIX System-based application that monitors and manages telecommunications costs.

CAT (Call Accounting Terminal) Stand-alone unit with a built-in microprocessor and data buffer that provides simple call accounting at a low cost.

CCS	(common-channel signaling) Signaling in which one channel of a group of channels carries signaling information for each of the remaining channels, permitting each of the remaining channels to be used to nearly full capacity. In the system's 100D module, channel 24 can be designated as the signaling channel for channels 1–23.
centralized telephone programming	Programming of features on individual telephones; performed at a central location by the system manager . See also system programming and extension programming .
central office	See CO .
Centrex	Set of system features to which a user can subscribe on telephone lines/trunks from the local telephone company.
channel	Telecommunications transmission path for voice and/or data.
channel service unit	See CSU .
checksum	Sum of ones in a sequence of ones and zeros used to detect or correct errors in data transmission.
circuit-switched data call	Data call made through an exclusively established and maintained connection between data stations .
class of restriction	See COR .
clock synchronization	Operation of digital facilities from a common clock.
CMS	(Call Management System) DOS-based application that simulates the actions of a system operator by answering and distributing calls. Also produces reports for call analysis.

CO	(central office) Location of telephone switching equipment that provides local telephone service and access to toll facilities for long-distance calling.
coaxial cable	Cable consisting of one conductor, usually a small copper tube or wire within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.
codec	(coder-decoder) Device used to convert analog signals, such as speech, music, or television, to digital form for transmission over a digital medium and back to the original analog form.
common channel signaling	See CCS .
communications system	Software-controlled processor complex that interprets dialing pulses, tones, and/or keyboard characters and makes the proper interconnections both inside and outside. Consists of a computer, software, a storage device, and carriers with special hardware to perform the actual connections. Provides voice and/or data communications services, including access to public and private networks, for telephones and other equipment. Also referred to in this guide as "system," short for MERLIN LEGEND Communications System.
control unit	Processor module, power supply modules, line/trunk and extension modules, carriers, and housing of the system.
console	Refers to telephone and adjuncts (if any) at an operator or system programmer extension.
CONVERSANT	Voice response application that automatically answers and routes calls and executes telephone transactions.

**conversion
resource**

See [modem pool](#).

COR

(class of restriction) Various types of restrictions that can be assigned to **remote access** trunks or barrier codes. These restrictions consist of calling restrictions, **ARS** Facility Restriction Levels (**FRLs**), Allowed Lists, Disallowed Lists, and pool dial out restrictions.

Coverage

Set of system features that can determine how extensions' calls are covered when the person at the extension is busy or not available.

CRC

(cyclic redundancy check) An error-detection code used on *DS1* facilities with the extended superframe format (**ESF**).

CSU

(channel service unit) Equipment used on customer premises to provide *DS1* facility terminations and signaling compatibility.

CTI link

(Computer Telephony Integration) link. Part of the PassageWay Telephony Services application that allows a link to a LAN running Novell NetWare software for worktop software application control of **SA** button calls in a **Hybrid/PBX mode** system. See also [screen pop](#).

**cyclic redundancy
check**

See [CRC](#).

D

D4 framing format	Framing format consisting of a sequence of individual frames of 24 eight-bit slots and one signal bit (193 bits) in a 12-frame superframe. <i>See also</i> ESF .
Data-channel	<i>See</i> D-channel .
data communications equipment	<i>See</i> DCE .
data hunt group	<i>See</i> DHG .
data module	<i>See</i> ISDN terminal adapter .
data rate	<i>See</i> bps .
data station	Special type of extension where data communications take place; includes DTE and DCE . Sometimes a telephone is also part of a data station.
data terminal	An input/output (I/O) device (often a personal computer) that can be connected to the control unit via an interface.
data terminal equipment	<i>See</i> DTE and data terminal .
DCE	(data communications equipment) Equipment such as modems or data modules used to establish, maintain, and terminate a connection between the system and data terminal equipment (DTE), such as printers, personal computers, host computers, or network workstations.

D-channel	(Data-channel) 64-kbps channel that carries signaling information or data on a PRI or 16-kpbs channel to carry signaling information on BRI .
dedicated feature buttons	The imprinted feature buttons on a multiline telephone: Conf or Conference , Drop , Feature , HFAI (Hands Free Answer on Intercom), Hold , Message , Mute or Microphone , Recall , Speaker or Speakerphone , and Transfer .
delay-dial start tie trunk	See dial-repeating tie trunk .
DFT	(direct facility termination) See personal line .
DHG	(data hunt group) Group of modem or ISDN terminal adapters which have a common access code. Calls are connected in a round-robin fashion to the first available data station in the group.
dial access	See feature code .
Dialed Number identification Service	See DNIS .
dial-out code	Digit (usually a 9) or digits dialed by telephone users to get an outside line.
dial plan	Numbering scheme for system extensions, lines, and trunks.
dial-repeating tie trunk	Tie trunk on which the originating end of the tie trunk transmits an off-hook signal to the receiving end and waits for the receiving end to send an off-hook signal followed by an on-hook signal. Also called "delay dial start tie trunk."

DID	(Direct Inward Dialing) Service that transmits from the telephone company central office and routes incoming calls directly to the called extension, calling group , or outgoing trunk pool , bypassing the system operator.
DID trunk	Incoming trunk that receives dialed digits from the local exchange, allowing the system to connect directly to an extension without assistance from the system operator.
digital	Representation of information in discrete elements such as off and on or zero and one. <i>See also</i> analog transmission .
Digital Communications Protocol	<i>See</i> DCP .
digital data station	<i>See</i> ISDN terminal adapter data station .
Digital Signal 0	<i>See</i> DS0 .
Digital Signal 1	<i>See</i> DS1 .
digital switch element	<i>See</i> DSE .
digital transmission	Mode of transmission in which the information to be transmitted is first converted to digital form and then transmitted as a serial stream of pulses. <i>See also</i> analog transmission .
DIP switch	(dual in-line package) Switch on a 400EM module used to select the signaling format for tie-line transmission. Also used on other equipment for setting hardware options.
direct facility termination	(DFT) <i>See</i> personal line .

Direct Inward Dialing	See DID .
Direct-Line Console	See DLC .
Direct Station Selector	See DSS .
display buttons	Buttons on an MLX display telephone used to access the telephone's display.
DLC	(Direct-Line Console) Telephone used by a system operator to answer outside calls (not directed to an individual or a group) and inside calls, transfer calls, make outside calls for users with outward calling restrictions, set up conference calls, and monitor system operation.
DNIS	(Dialed Number Identification Service) Service provided by the AT&T Switched Network (ASN); it routes incoming 800 or 900 calls according to customer-selected parameters, such as area code, state, or time of call.
door answering unit	Device connected to a basic telephone jack and used at an unattended extension or front desk.
DOS	(disk operating system)
DS0	(Digital Signal 0) Single 64-kbps voice or data channel .
DS1	(Digital Signal Level 1) <i>Bit</i> -oriented signaling interface that multiplexes twenty-four 64-kbps channels into a single 1.544-Mbps stream.

DSS	(Direct Station Selector) 60-button adjunct that enhances the call-handling capabilities of an MLX-20L or MLX-28D telephone used as an operator console.
DTE	(data terminal equipment) Equipment that makes the endpoints in a connection over a data connection, for example, a data terminal, personal computer, host computer, or printer.
DTMF signaling	(dual-tone multifrequency signaling) Touch-tone signaling from telephones using the voice transmission path. DTMF signaling provides 12 distinct signals, each representing a dialed digit or character, and each composed of two voiceband frequencies.

E

E&M signaling	Trunk supervisory signaling, used between two communications systems, in which signaling information is transferred through two-state voltage conditions (on the Ear and Mouth leads) for analog applications and through two bits for digital applications. <i>See also</i> tie trunk .
EIA	(Electronic Industries Association)
EIA-232-D	Physical interface, specified by the EIA , that transmits and receives asynchronous data at speeds of up to 19.2-kbps over cable distances of 50 ft. (15 m.)
Electronic Switching System	<i>See</i> ESS .

endpoint	Final destination in the path of an electrical or telecommunications signal.
ESF	(extended superframe format) Framing format consisting of individual frames of 24 eight-bit slots and one signal bit (193 bits) in a 24-frame extended superframe. <i>See also</i> D4 framing format .
ESS	(Electronic Switching System) Class of central office (CO) switching systems developed by Lucent Technologies in which the control functions are performed principally by electronic data processors operating under the direction of a stored program.
expansion carrier	Carrier added to the control unit when the basic carrier cannot house all of the required modules. Houses a power supply and up to six additional modules.
extension	An endpoint on the internal side of the communications system. An extension can be a telephone with or without an adjunct. Also called "station." <i>See also</i> data station .
extension jack	An analog, digital, or tip/ring physical interface on a module in the control unit for connecting a telephone or other device to the system. Also called "station jack."
extension programming	Programming performed at an extension to customize telephones for personal needs; users can program features on buttons, set the telephone ringing pattern, and so on. <i>See also</i> centralized telephone programming and system programming .
extended super-frame format	<i>See</i> ESF .

F

facility	Equipment (often a trunk) constituting a telecommunications path between the system and the telephone company central office (CO).
Facility Restriction Level	See FRL .
factory setting	Default state of a device or feature when an optional setting is not programmed by the user or system manager.
fax	(facsimile) Scanning and transmission of a graphic image over a telecommunications facility, or the resulting reproduced image, or the machine that does the scanning and transmitting.
Fax Attendant System	Fax-handling and -processing application available with AUDIX Voice Power .
FCC	(Federal Communications Commission)
feature	Function or service provided by the system.
feature code	Code entered on a dialpad to activate a feature.
feature module	Prior to Release 3.0, a circuit pack inserted into the processor module , used to provide system features and replaced when the system is upgraded.
Feature screen	Display screen on MLX display telephones; provides quick access to commonly used features.
ferrite core	Attachment to the AC power cord and ground wire of the carrier power supply for compliance with FCC, part 15 requirements.

Flash ROM	Beginning with Release 3.0, a type of read-only memory provided on the processor module , used to supply system features.
foil shield	Copper foil sheet (for power units) used to prevent excessive noise on the module.
forced idle	Condition of the system during certain programming or maintenance procedures; system prevents initiation of new calls.
foreign exchange	See FX .
frame	One of several segments of an analog or digital signal that has a repetitive characteristic. For example, a <i>DS1</i> frame consists of a framing bit and 24 bytes, which equals 193 bits.
framing format	Pattern of frames used in transmissions.
frequency generator	See ring generator .
FRL	(Facility Restriction Level) ARS calling restriction type that restricts outgoing calls to certain specified routes.
FX	(foreign exchange) Central office (CO) other than the one that is providing local access to the public telephone network.

G

General-Purpose Adapter

See [GPA](#).

glare

Condition that occurs when a user tries to call out on a **loop-start** trunk at the same time that another call arrives on the same trunk.

GPA

(General-Purpose Adapter) Device that connects an analog multiline telephone to optional equipment such as an answering machine or a fax machine.

ground-start trunk

Trunk on which the communications system, after verifying that the trunk is idle (no ground on tip lead), transmits a request for service (puts ground on ring lead) to the telephone company central office (**CO**).

Group IV (G4) fax machine

A fax unit, offering 400 by 100 dots per inch (DPI) in fine mode, that can operate at any speed for communication with a Group III (G3) fax machine or another Group IV (G4) fax machine.

H

Hands Free Answer on Intercom

See [HFAI](#).

hands-free unit

See [HFU](#).

headset

Lightweight earpiece, microphone, and adapter used for hands-free telephone operation.

HFAI	(Hands Free Answer on Intercom) Feature that allows a user to answer a voice-announced call.
HFU	(Hands-Free Unit) Unit for older analog multiline telephones that allows users to make and receive calls on the speakerphone without using the handset.
Home screen	Display normally shown on an MLX display telephone; shows time, date, and call information, and shows when some features are in use.
host	Telephone company or other switch providing features and services to the system users, usually when the system is operating in <i>Behind Switch mode</i> .
Hybrid/PBX mode	One of three modes of system operation, in which the system uses trunk pools and ARS in addition to <i>personal lines</i> . Provides a single interface (SA buttons) to users for both inside and outside calling. <i>See also</i> Behind Switch mode and Key mode .

I

ICLID	(Incoming Call Line Identification) <i>See</i> Caller ID .
ICOM buttons	(intercom buttons) Telephone buttons that provide access to inside system lines for calling other extensions or receiving calls from them.
immediate-start tie trunk	<i>Tie trunk</i> on which no start signal is necessary; dialing can begin immediately after the trunk is seized.

in-band signaling	See robbed-bit signaling .
inside dial tone	A tone users hear when they are off-hook on an SA or ICOM button .
Inspect screen	Display screen on an MLX display telephone that allows the user to preview incoming calls and see a list of the features programmed on line buttons.
Integrated Administration	Capability of IS III that simplifies the programming of common information for the system, AUDIX Voice Power , and, if it is also installed, Fax Attendant System .
Integrated Services Digital Network	See ISDN .
Integrated Solution II/III	See IS II/III .
Integrated Voice Power Automated Attendant	IS II application that automatically answers incoming calls with a recorded announcement and directs callers to a department, an extension, or the system operator.
intercom buttons	See ICOM buttons .
interface	Hardware and/or software that links systems, programs, or devices.
IROB protector	(In-Range Out-of-Building protector) Surge-protection device for off-premises telephones at a location within 1000 feet (305 m) of cable distance from the control unit.
IS II/III	(Integrated Solution II or Integrated Solution III) Set of UNIX System-based applications that augments and provides additional services using the system.

ISDN	(Integrated Services Digital Network) Public or private network that provides end-to-end digital connectivity for all services to which users have access by a limited set of standard multipurpose user and network interfaces ; provides digital circuit-switched or packet-switched connections within the network and to other networks for national and international digital connectivity.
ISDN terminal adapter	A type of data communications equipment that transmits digital signals over digital telephone company facilities, for example, PRI. A digital data station uses an ISDN Terminal Adapter (such as the Express-Route 1000 or ISDN 7500B data module) as its DCE.
ISDN terminal adapter data station	A type of data station that includes an ISDN terminal adapter as its DCE. It may also include an MLX telephone for simultaneous voice and data. These data stations connect to MLX extension jack modules for digital transmission of data over a DS1 facility.

J

jack	Physical connection point to the system for a telephone, trunk, or other device. Also called "port."

K

kbps	Kilobits per second.
Key mode	One of three modes of system operation, in which the system uses personal lines on line buttons for outside calls, with a separate interface (<i>ICOM buttons</i>) for internal calling. See also Behind Switch mode and Hybrid/PBX mode .

L

LAN	(local area network) Arrangement of interconnected personal computers or terminals, sometimes accessing a host computer, sometimes sharing resources like files and printers.
LDN	(Listed Directory Number)
LED	(light-emitting diode) Semiconductor device that produces light when voltage is applied; light on a telephone.
line	Connection between extensions within the communications system or loop-start communications path with CO ; often, however, used synonymously with trunk .
line and trunk assignment	Assignment of lines and trunks connected to the system control unit to specific buttons on each telephone.

line coding	Pattern that data assumes as it is transmitted over a communications channel.
line compensation	Adjustment for the amount of cable loss in decibels (dB), based on the length of cable between a 100D module and a channel service unit (CSU) or other far-end connection point.
line/trunk	Refers to inside system lines and outside trunks in general terms. <i>See also</i> line and trunk .
line/trunk jack	Physical interface on a module in the control unit for connecting an outside trunk to the communications system. Also called "trunk jack."
line/trunk and extension module	Module on which the jacks for connecting central office lines/trunks and/or the jacks for connecting the extensions are located.
local host computer access	A method for connecting an extension jack to an on-site computer for data-only calls through a modem or data module.
local loop	<i>See</i> access line .
logical ID	Unique numeric identifier for each extension and line/trunk jack in the system control unit.
loop-start trunk	Trunk on which a closure between the tip and ring leads is used to originate or answer a call. High-voltage 20-Hz AC ringing current from the central office signals an incoming call.

M

Magic on Hold	A Lucent Technologies Music on Hold enhancement that promotes a company's products or services or provides custom music selection.
Mbps	megabits per second
Megacom	Lucent Technologies' tariffed digital WATS offering for outward calling.
Megacom 800	Lucent Technologies' tariffed digital 800 offering for inward calling.
memory card	Storage medium, similar in function to a floppy disk, that allows information to be added to or obtained from the communication system through the PCM-CIA interface slot on the processor module.
MERLIN Identifier	Adjunct that allows users to receive, store, and use information provided by caller identification services provided by the local telephone company.
MERLIN Mail Voice Messaging System	Application that provides automated attendant, call answering, and voice-mail services on the system.
MFM	(Multi-Function Module) Adapter that has a tip/ring mode for answering machines, modems, fax machines, and tip/ring alerts, and an SAA mode for -48 VDC alerts. an MFM is installed inside an MLX telephone, and is used to connect optional equipment to the telephone. The optional equipment and the telephone operate simultaneously and independently.

MLX-5 or MLX-5D telephone	5-line button digital telephone offered with (MLX-5D) or without (MLX-5) a two-line by 24-character display.
MLX-10 or MLX-10D telephone	10-line button digital telephone offered with (MLX-10D) or without (MLX-10) a two-line by 24-character display.
MLX-10DP	Same as an MLX-10D except it has an adjunct in the back for connecting the Passageway Direct Connect Solution application.
MLX-20L telephone	20-line button digital telephone with a seven-line by 24-character display.
MLX-28D telephone	28-line button digital telephone with a two-line by 24-character display.
mode codes	Streams of touch-tone codes used by voice messaging applications to communicate with the system's control unit.
modem	(modulator-demodulator) device that converts digital data signals to analog signals for transmission over a telephone line, and analog signals received on a telephone line to digital signals.
modem data station	A type of data station that includes a modem as its DCE. It may also include an MLX telephone for simultaneous voice and data (MLX voice and modem data station), an analog multiline telephone (analog voice and modem data station), or a single-line telephone for dialing only (modem data-only station). These data stations connect, respectively, to MLX, analog, or tip/ring extension jack modules. They provide analog transmission of data.

modem pool	Pair, or group of pairs, of modems and data modules with interconnected RS-232 interfaces that converts digital signals to analog, or analog signals to digital, thereby allowing users with ISDN terminal adapter data stations to communicate with users who have analog modem data stations .
module	Circuit pack in the control unit that provides the physical jacks for connection of telephones and/or outside lines/trunks to the communications system. In the name of a module, the first digit indicates the number of line/trunk jacks it contains; the last digit indicates the number of extension jacks it contains. If no letters appear after the number, a line/trunk module provides loop-start trunks or an extension jack module provides analog or tip/ring jacks. For example, a 408 GS/LS MLX module contains four line/trunk jacks and eight digital (MLX) extension jacks, provides either loop-start (LS) or ground-start (GS)trunks . There are also modules for the processor and power supply.
Multi-Function Module	See MFM .
multiline telephone	An analog or digital (MLX) telephone that provides multiple line buttons for making or receiving calls or programming features.
multiplexing	The division of a transmission channel into two or more independent channels, either by splitting the frequency band into a number of narrower bands or by dividing the channel into successive time slots.
Music On Hold	Customer-provided music source or Magic On Hold connected to the system through a loop-start jack.

N

network	Configuration of communications devices and software connected for information interchange.
network interface	Hardware, software, or both that links two systems in an interconnected group of systems, for example, between the local telephone company and a PBX.

O

off-hook	Telephone is said to be off-hook when the user has lifted the handset, pressed the Speaker button to turn on the speakerphone, or used a headset to connect to the communications system or the telephone network.
off-premises telephone	See OPT .
ones density	Requirement for channelized DS1 service to the public network that eight consecutive zeroes cannot occur in a digital data stream.
on-hook	Telephone is said to be on-hook when the handset is hung up, the speakerphone is turned off, and the user is not using a headset to connect either to the communications system or the telephone network.

OPT (off-premises telephone) **Single-line telephone** or other **tip/ring** device connected to the system by an 008 OPT module in the control unit. Appears as an inside extension to the system, but may be physically located away from the system.

OPX (off-premises extension)

out-of-band signaling Signaling that uses the same path as voice-frequency transmission and in which the signaling is outside the band used for voice frequencies.

P

parity The addition of a **bit** to a bit string so that the total number of ones is odd or even; used to detect and correct transmission errors.

PassageWay Direct Connect Solution Set of software applications to provide an interface between a personal computer and the system: card-file, telephone programming application, call log and viewer, incoming call management, and identification and applications manager.

pass-through Connection from the internal **modem** to an attached IS II/IS III application on the system.

PBX	(private branch exchange) Local electronic telephone switch that serves local stations (for example, extensions within a business) and provides them with access to the public network.
PC	(personal computer)
PCMCIA memory card	(Personal Computer Memory Card International Association memory card) See memory card .
personal line	Central office trunk that terminates directly on one or more telephones. In Hybrid/PBX mode , a personal line cannot be part of a trunk pool . Also called “DFT” (direct facility termination). Also refers to lines represented on line buttons in Key Mode .
PFT	(Power Failure Transfer) Feature that provides continuity of telephone service during a commercial power failure by switching some of the system’s trunk connections to telephones connected to specially designated extension jacks.
pool	In Hybrid/PBX mode , a group of outside trunks that users can access with a Pool button or by dialing an access code on an SA button . Also used by the ARS feature when choosing the least expensive route for a call.
port	See jack . Also, refers to extension or line jacks before these are numbered according to the dial plan during programming. The lowest jack on a module is always Port 1.
Power Failure Transfer	See PFT .

power supply module	Device that directs electricity to modules and telephones on the system. One power supply module is needed for each carrier, and an auxiliary power unit is added if the module exceeds capacity.
PRI	(Primary Rate Interface) Standard interface that specifies the protocol used between two or more communications systems. As used in North America, provides 23 64-kbps B-channels for voice and/or data and one 64-kbps D-channel , which carries multiplexed signaling information for the other 23 channels.
primary system operator position	First jack on the first MLX or analog multiline extension module in the control unit; that is, the extension jack with the lowest logical ID in the system.
prime line	Individual extension number assigned to a telephone in a system operating in Behind Switch mode . Each telephone user has his or her own prime line and is automatically connected to that line when he or she lifts the handset.
processor module	Module in the second slot of the control unit (Slot 0, to the right of the power supply module). Includes the software and memory that runs the system.
programming port reassignment	Reassignment of the system programming jack position to any of the first five extension jacks on the first MLX module in the control unit.
protocol	Set of conventions governing the format and timing of message exchanges between devices, such as an MLX telephone and the control unit.
public network	Network that is commonly accessible for local or long-distance calling. Also called "public switched telephone network."

Q

QCC (Queued Call Console) MLX-20L telephone used by a system operator in **Hybrid/PBX mode** only. Used to answer outside calls (directed to a system operator position) and inside calls, direct inside and outside calls to an extension or an outside telephone number, serve as a message center, make outside calls for users with outward calling restrictions, set up conference calls, and monitor system operation.

R

RAM (random-access memory) Computer memory in which an individual **byte** or range of bytes can be addressed and read or changed without affecting other parts of memory.

read-only memory See [ROM](#).

Remote Access System feature that allows an outside caller to gain access to the system, almost as if at a system extension.

restore Procedure whereby saved and archived system programming is reinstated on the system, from a floppy disk or **memory card**. See also [backup](#).

ring generator Circuit pack added to the power supply that generates a high-voltage, 20–30-Hz signal to ring a telephone.

riser cable	Cable that runs between floors in a multistory building and connects wiring closets.
RS-232	Physical interface, specified by the Electronics Industries Association (<i>EIA</i>), that transmits and receives <i>asynchronous</i> data at distances of up to 50 feet (15 m).
robbed-bit signaling	Signaling in which the least significant <i>bit</i> of every sixth frame per channel is used for signaling in that channel.
ROM	(read-only memory) Computer memory that can be read but cannot be changed.

S

SAA	(Supplemental Alert Adapter) Device that permits -48-VDC alerting equipment to be connected to an analog multiline telephone jack so that people working in noisy or remote areas of a building can be alerted to incoming calls.
SA buttons	Telephone buttons that provide a single interface to users for both inside and outside calling.
screen pop	Refers to a computer-telephony software application that takes caller information (for example, provided by Caller ID service), queries a database, and displays a screen with information about the caller at the user's PC screen. Screen pop requires that an identifying number or code be available to identify the calling party. <i>See also</i> CTI link .

SDN	(Software Defined Network) Lucent Technologies private networking service created by specialized software within the public network.
SID	(station identification)
simplex signaling	Transmission of signals, in one direction only, across a telecommunications channel.
signaling	Sending of control and status information between devices to set up, maintain, or cease a connection such as a telephone call.
single-line telephone	Industry-standard touch-tone or rotary-dial telephone that handles only one call at a time and is connected to the system via an extension jack on a basic 012 or 008 OPT module.
slot	Position in a carrier for a module; numbered from 0 (processor module).
SMDR	(Station Message Detail Recording) Feature that captures detailed usage information on incoming and outgoing voice and data calls.
SMDR printer	Printer used to produce SMDR reports. Connected to the system via an RS-232 jack on the <i>processor</i> module.
Software Defined Network	See SDN .
special character	Pause, Stop, or End-of-Dialing signal in a programmed dialing sequence such as an Auto Dial or Personal Speed Dial number.
SPM	(System Programming and Maintenance) DOS - or UNIX system-based application for programming and maintaining the system.

square key	Configuration in Key mode operation in which all outside lines appear on all telephones.
station	See extension .
station jack	See extension jack .
Station Message Detail Recording	See SMDR .
Supplemental Alert Adapter	See SAA .
switchhook flash	Momentary (320 ms to 1 second) on-hook signal used as a control signal. May be directed either to the control unit or to a <i>host</i> switch outside the system. Also called "Recall" or "timed flash."
synchronous data transmission	Method of transmitting a continuous digital data stream in which the transmission of each binary bit is synchronized with a master clock. See also asynchronous data transmission .
system acceptance test	Test of all trunks, telephones, data terminals, and features after installation to ensure that they are working correctly.
System Access buttons	See SA buttons .
system date and time	Date and time that appear on MLX display telephones and SMDR reports.

system programming Programming of system functions and features that affect most users, performed from an **MLX-20L telephone** or a **PC** using **SPM**. See also [extension programming](#) and [centralized telephone programming](#).

System Programming and Maintenance See [SPM](#).

system renumbering Procedure used to change the numbers assigned to telephones, adjuncts, **calling groups**, paging groups, park zones, **remote access**, and lines/trunks.

T

T1 Type of digital transmission facility that in North America transmits at the **DS1** rate of 1.544 Mbps.

TSAPI CTI link See [CTI link](#).

TDM (time-division multiplex) Process where the transmission channel is divided into time slots.

telephone power supply unit Equipment that provides power to an individual telephone.

tie trunk Private trunk directly connecting two telephone switches. See also [automatic-start tie trunk](#), [delay-dial start tie trunk](#), [immediate-start tie trunk](#), and [wink-start tie trunk](#).

timed flash See [switchhook flash](#).

tip/ring	Contacts and associated conductors of a single-line telephone plug or jack.
touch-tone receiver	See TTR .
T/R	See tip/ring .
trunk	A telecommunications path between the communications system and the telephone company central office (CO) or another switch. Often used synonymously with line .
trunk jack	See line/trunk jack .
trunk pool	See pool .
TTR	(touch-tone receiver) Device used to decode DTMF touch-tones dialed from single-line telephones or Remote Access telephones.

U

uninterruptible power supply	See UPS .
unit load	Measure of the power load drain of a module, telephone, or adjunct .
UPS	(uninterruptible power supply) Device that connects to the system to provide 117 VAC to the equipment when the commercial power source fails.

V

VAC	Alternating-current voltage.
VDC	Direct-current voltage.
VMI	(voice messaging interface) An enhanced tip/ring port.
voice-band channel	A transmission channel, generally in the 300–3400-Hz frequency band.
voice mail	Application that allows users to send messages to other extensions in the system, forward messages received with comments, and reply to messages.
voice messaging interface	See VMI .

W

WATS	(Wide Area Telecommunications Service) Service that allows calls to certain areas for a flat-rate charge based on expected usage.
wink-start tie trunk	Tie trunk on which the originating end transmits an off-hook signal and waits for the remote end to send back a signal (a wink) that it is ready for transmission.

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Lucent Technologies
Bell Labs Innovations



MERLIN LEGEND[®]
Communications System
Release 5.0

System Programming and Maintenance (SPM)

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Notice

Every effort was made to ensure that the information in this book was complete and accurate at the time of printing. However, information is subject to change.

See Appendix A, "Customer Support Information," for important information. It follows *Maintenance and Troubleshooting* in this binder.

Your Responsibility for Your System's Security

Toll fraud is the unauthorized use of your telecommunications system by an unauthorized party, for example, persons other than your company's employees, agents, subcontractors, or persons working on your company's behalf. Note that there may be a risk of toll fraud associated with your telecommunications system, and if toll fraud occurs, it can result in substantial additional charges for your telecommunications services.

You and your system manager are responsible for the security of your system, such as programming and configuring your equipment to prevent unauthorized use. The system manager is also responsible for reading all installation, instruction, and system administration documents provided with this product in order to fully understand the features that can introduce risk of toll fraud and the steps that can be taken to reduce that risk. Lucent Technologies does not warrant that this product is immune from or will prevent unauthorized use of common-carrier telecommunication services or facilities accessed through or connected to it. Lucent Technologies will not be responsible for any charges that result from such unauthorized use. For important information regarding your system and toll fraud, see Appendix A, "Customer Support Information."

Federal Communications Commission Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. For further FCC information, see Appendix A, "Customer Support Information."

Canadian Department of Communications (DOC)**Interference Information**

This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the radio interference regulations of the Canadian Department of Communications.

Le Présent Appareil Numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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IMPORTANT SAFETY INSTRUCTIONS



The exclamation point in an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

When installing telephone equipment, always follow basic safety precautions to reduce the risk of fire, electrical shock, and injury to persons, including:

- Read and understand all instructions.
- Follow all warnings and instructions marked on or packed with the product.
- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone wiring has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Use only Lucent Technologies-manufactured MERLIN LEGEND Communications System circuit modules, carrier assemblies, and power units in the MERLIN LEGEND Communications System control unit.
- Use only Lucent Technologies-recommended/approved MERLIN LEGEND Communications System accessories.

IMPORTANT SAFETY INSTRUCTIONS

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- If equipment connected to the analog extension modules (008, 408, 408 GS/LS) or to the MLX telephone modules (008 MLX, 408 GS/LS-MLX) is to be used for in-range out-of-building (IROB) applications, IROB protectors are required.
- Do not install this product near water, for example, in a wet basement location.
- Do not overload wall outlets, as this can result in the risk of fire or electrical shock.
- The MERLIN LEGEND Communications System is equipped with a 3-wire grounding-type plug with a third (grounding) pin. This plug will fit only into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact an electrician to replace the obsolete outlet. Do not defeat the safety purpose of the grounding plug.
- The MERLIN LEGEND Communications System requires a supplementary ground.
- Do not attach the power supply cord to building surfaces. Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.
- Slots and openings in the module housings are provided for ventilation. To protect this equipment from overheating, do not block these openings.
- Never push objects of any kind into this product through module openings or expansion slots, as they may touch dangerous voltage points or short out parts, which could result in a risk of fire or electrical shock. Never spill liquid of any kind on this product.
- Unplug the product from the wall outlet before cleaning. Use a damp cloth for cleaning. Do not use cleaners or aerosol cleaners.
- Auxiliary equipment includes answering machines, alerts, modems, and fax machines. To connect one of these devices, you must first have a Multi-Function Module (MFM).

- Do not operate telephones if chemical gas leakage is suspected in the area. Use telephones located in some other safe area to report the trouble.

 WARNING:

- *For your personal safety, DO NOT install an MFM yourself.*
- *ONLY an authorized technician or dealer representative shall install, set options, or repair an MFM.*
- *To eliminate the risk of personal injury due to electrical shock, DO NOT attempt to install or remove an MFM from your MLX telephone. Opening or removing the module cover of your telephone may expose you to dangerous voltages.*

SAVE THESE INSTRUCTIONS

About This Book

System Programming and Maintenance (SPM) is a software tool developed specifically for the MERLIN LEGEND Communications system to allow programming, administration, and maintenance tasks to be done on a PC.

Intended Audience

This book is intended for anyone who uses a PC to perform programming or maintenance tasks for the communications system. It is especially aimed at system managers and support personnel.

[“Related Documents”](#) later in this section, provides a complete list of system documentation together with ordering information.

In the USA only, Lucent Technologies provides a toll-free customer Helpline (1 800 628-2888) 24 hours a day. Call the Helpline, or your Lucent Technologies representative, if you need assistance when installing, programming, or using your system.

Terms and Conventions Used

In this document, the terms in the following list are used in preference to other, equally acceptable terms for describing communications systems.

Lines, Trunks and Facilities

Facility is a general term that designates a communications path between a telephone system and the telephone company central office. Technically a *trunk* connects a switch to a switch, for example the MERLIN LEGEND Communications System to the central office. Technically, a *line* is a loop-start facility or a communications path that does not connect two switches (for example, an intercom line or a Centrex line). However, in actual usage, the terms *line* and *trunk* are often applied interchangeably. In this book, we use *line/trunk* and *lines/trunks* to refer to facilities in general. Specifically, we refer to *digital facilities*. We also use terms such as personal line, ground-start trunk, Direct Inward Dialing (DID) trunk, and so on. When you talk to your local telephone company central office, ask them which terms they use for the specific facilities they connect to your system.

Some older terms have been replaced with newer terms. The following list shows the old term on the left and the new term on the right:

trunk module	line/trunk module
trunk jack	line/trunk jack
station	extension
station jack	extension jack
analog data station	modem data station
digital data station	terminal adapter
7500B data station	terminal adapter
analog voice and analog data station	analog voice and modem data
digital voice and analog data station	MLX voice and modem data
analog data only station	modem data only station
digital data only station	terminal adapter only station
7500B data only station	terminal adapter only station
digital voice and digital data station	MLX voice and terminal adapter station

MLX voice and 7500B data station

MLX voice and terminal
adapter station

Typographical Conventions

Certain type fonts and styles act as visual cues to help you rapidly understand the information presented:

Example	Purpose
It is <i>very</i> important that you follow these steps. You <i>must</i> attach the wristband before touching the connection.	Italics indicate emphasis.
The part of the headset that fits over one or both ears is called a <i>headpiece</i> .	Italics also set off special terms.
If you press the Feature button on an MLX display telephone, the display lists telephone features you can select. A programmed Auto Dial button gives you instant access to an inside or outside number.	The names of fixed-feature, factory-imprinted buttons appear in bold. The names of programmed buttons are printed as regular text.
Choose Ext Prog from the display screen.	Plain constant-width type indicates text that appears on the telephone display or personal computer (PC) screen.
To activate Call Waiting, dial <i>*11</i> .	Constant-width type in italics indicates characters you dial at the telephone or type at the PC.

Product Safety Labels

Throughout these documents, hazardous situations are indicated by an exclamation point inside a triangle and the word **CAUTION** or **WARNING**.

 WARNING:

Warning indicates the presence of a hazard that could cause death or severe personal injury if the hazard is not avoided.

 CAUTION:

Caution indicates the presence of a hazard that could cause minor personal injury or property damage if the hazard is not avoided.

Security

Certain features of the system can be protected by passwords to prevent unauthorized users from abusing the system. You should assign passwords wherever you can and limit knowledge of such passwords to three or fewer people.

Nondisplaying authorization codes and telephone numbers provide another layer of security. For more information, see Appendix A, "Customer Support Information" following *Maintenance and Troubleshooting*.

Throughout this document, toll fraud security hazards are indicated by an exclamation point inside a triangle and the words **Security Alert**.

 Security Alert:

Security Alert indicates the presence of a toll fraud security hazard. Toll fraud is the unauthorized use of your telecommunications system by an unauthorized party (for example, persons other than your company's employees, agents, subcontractors, or persons working on your company's behalf). Be sure to read "Your Responsibility for Your System's Security" on the inside front cover of this book and "Security of Your System: Preventing Toll Fraud" in Appendix A, "Customer Support Information."

Related Documents

In addition to this book, the documents listed below are part of the documentation set. Within the continental United States, these documents can be ordered from the Lucent Technologies BCS Publications Center by calling 1 800 457-1235.

Document No.	Title
	System Documents
555-650-110	<i>Feature Reference</i>
555-650-111	<i>System Programming</i>
555-650-112	<i>System Planning</i>
555-650-113	<i>System Planning Forms</i>
555-650-116	<i>Pocket Reference</i>
555-650-118	<i>System Manager's Guide</i>
	Telephone User Support
555-650-122	<i>MLX-5D*, MLX-10D*, MLX-10DP*, MLX-28D*, and MLX-20L* Display Telephones User's Guide</i>
555-630-150	<i>MLX-5D, MLX-10D and MLX-10DP Display Telephone Tray Cards (5 cards)</i>
555-630-152	<i>MLX-28D and MLX-20L Telephone Tray Cards (5 cards)</i>
555-650-124	<i>MLX 10* Nondisplay Telephone User's Guide</i>
555-630-151	<i>MLX-5 and MLX 10 Nondisplay Telephone Tray Cards (6 cards)</i>
555-630-155	<i>MLX-16DP Display Telephone Tray Cards (5 cards)</i>
555-650-120	<i>Analog Multiline Telephones User's Guide</i>
555-650-126	<i>Single-Line Telephones User's Guide</i>
555-650-138	<i>MDC 9000 and MDW 9000 Telephones User's Guide</i>
	System Operator Support
555-650-134	<i>MLX Direct-Line Consoles Operator's Guide</i>
555-650-132	<i>Analog Direct-Line Consoles Operator's Guide</i>
555-650-136	<i>MLX Queued Call Console Operator's Guide</i>
	Miscellaneous User Support
555-650-130	<i>Calling Group Supervisor's Guide</i>
555-640-105	<i>Data and Video Reference</i>

Document No.	Title
	Documentation for Qualified Technicians
555-650-140	<i>Installation, Programming & Maintenance (IP&M) Binder [consists of Installation, System Programming & Maintenance (SPM), Maintenance & Troubleshooting]</i>
	Toll Fraud Security
555-025-600	<i>BCS Products Security Handbook</i>

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Lucent Technologies
211 Mount Airy Road
Room 2W226
Basking Ridge, NJ 07920

System Programming and Maintenance

The System Programming and Maintenance (SPM) software package offers an alternate method of programming the MERLIN LEGEND Communications System using a PC. This method frees the system programming console for other uses and also provides the additional functions listed below:

- Backing up system programming information
- Restoring system programming information from a backup
- Converting system programming information from one release to another (part of the upgrade procedure)
- Upgrading the communications system to a newer release
- Printing, viewing, and storing reports
- Programming the communications system remotely
- Programming in surrogate mode

SPM runs on a DOS-based PC as a standalone program or on a UNIX System platform as part of Intuity, Integrated Solution II, or Integrated Solution III (IS II/III). It is available on a 3.5-inch diskette for DOS or UNIX, or on a 5.25 inch diskette for DOS.

NOTE:

SPM software can be used directly from the floppy disks on a DOS machine; however, if your PC has a hard disk, you should install SPM onto the hard disk.

This book describes the use of SPM on a PC with a DOS operating system. If your system has the Intuity or IS II/III application, you have the UNIX System version of SPM.

For information about accessing SPM from the IS II/III application, refer to the following books:

- Integrated Solution III System Manager's Guide, order no. 555-601-010
- Integrated Solution III Installation and Maintenance Guide, order no. 555-601-011
- Integrated Solution II System Manager's Guide, order no. 555-600-726
- Integrated Solution II Installation and Maintenance Guide, order no. 555-600-720

System Requirements

To use SPM for system programming, you need the SPM diskette and an approved PC with version 3.3 (or later) of MS-DOS®. At a minimum, your PC should support and include the following items:

- At least 640 kbytes of RAM
- A floppy disk drive that will accommodate the SPM diskette (3.5-inch or 5.25-inch)
- A monochrome or color monitor
- A serial port that can use either a DB-9 or DB-25 connector
- For a DB-9 connector, use a 9-pin to 25-pin adapter to attach the 25-pin connector of the RS-232 interface cable.
- An RS-232 interface cable of appropriate length for your site connection(s)

Depending on how you connect the PC to the control unit, you also need the following items:

- Direct local connection, if the PC is within 50 ft. of the control unit.
 - Either a 355AF modular adapter (if there is a male connector on the interface cable) or a 355A modular adapter (if there is a female connector on the interface cable)
 - A four-pair modular cord (D8W)
- Direct local connection, if the PC is more than 50 ft. from the control unit.
 - 355AF adapter
 - EIA crossover cable
 - Two Z3A2 Asynchronous Data Units (ADUs)
 - ADU crossover cable
 - 400B2 power adapter
 - 2012D transformer
 - BR1A-4P adapter and either a 102 connecting block or 103 connecting block
 - 248B adapter
 - eight-position wall jacks
 - four-pair plug-ended cable
 - D8W cords
 - D6AP power cord
 - EIA-23D cables
- Modem (local or remote) connection
 - A modem that supports 1200- or 2400-bps connections

In addition, a parallel printer is useful for reports (the PC needs a parallel port for the connection).

⇒ NOTE:

SPM uses Interrupt 4 and I/O address 3F8 for COM1. It uses Interrupt 3 and I/O address 2F8 for COM2.

Installing the SPM Software

Before you install or run SPM, use diskcopy on a DOS PC (see your operating system guide) to make a backup copy of the SPM diskette and store the original in a safe place. Use the backup copy to run the installation program.

For installing SPM on a DOS PC, follow the appropriate instructions in the next section of this book.

⇒ NOTE:

If your PC does not have a hard disk, you do not need to run the installation program. Go to "Initializing the SPM Software."

DOS Installation

Use the following procedure to install SPM on the hard drive of a DOS PC.

⇒ NOTE:

If you are updating SPM, you do not need to remove the current SPM files. The new files will overwrite your current SPM files.

Considerations

Review the following items before you begin the installation procedure.

The installation program automatically performs the following:

- Checks available space on the hard disk. If space is insufficient, the installation is terminated and an error message is generated.

- Checks the autoexec.bat and config.sys files. If either file is write-protected, the installation is terminated and an error message is generated. SPM must make changes to these files.
- Saves a copy of autoexec.bat as autoexec.old.
- Saves a copy of config.sys as config.old.
- If autoexec.bat has not already been configured for SPM, performs the following:
 - Adds c:\spm to the path statement
 - Adds the line SET AMS_PATH=C:
 - Adds the background print command

```
PRINT /D:PRN /B:4096 /U:3 /M:200 /S:1
>NUL
```
- Adds the following line to config.sys if it is not already present
DEVICE=C:\ANSI.SYS.
- Copies the ansi.sys file from the floppy disk to c:\.
- Creates the directory c:\spm.
- Copies the following files from the floppy disk into c:\spm:
 - spm.exe
 - ams_hlp.eng (English language help file)
 - ams_hlp.fre (French language help file)
 - ams_hlp.spa (Spanish language help file)
- Creates the following directories if they do not already exist:
 - c:\spm\backup
 - c:\spm\reports
 - c:\spm\tmp

- Does one of the following:
 - Creates the SPM configuration file `c:\spm\ams.cfg`, if it does not already exist. In this case, the `ams.cfg` file consists of only one line, in which the language attribute is specified: `LANG 1` if you specified English or did not specify a language with the `install` command;
 - Modifies the `ams.cfg` file, if it already exists, by adding or changing the `LANG` value.

Follow the steps below to install SPM on the PC's hard disk.

► **1. Switch to Drive A, if it is not already the current drive.**

A:> appears on the screen.

► **2. Insert the backup copy of the SPM diskette into Drive A.**

► **3. Type one of the commands shown below and press Enter ↵.**

- `install`
- `install french`
- `install spanish`

Because English is the default language, `install` and `install english` have the same result. If you do use the language argument (`english`, `french`, or `spanish`), you must type it in lowercase letters as shown. The command `install` may be uppercase or lowercase.

► **4. Wait for the message shown below to appear.**

SPM HARD DISK INSTALLATION PROGRAM
Strike a key when ready

► **5. Press any key to begin the installation.**

When the installation is finished, the following message appears:

```
SPM HARD DISK INSTALLATION IS NOW COMPLETE  
YOU MUST REBOOT YOUR SYSTEM BEFORE USING SPM
```

► **6. Remove the SPM diskette from Drive A and reboot your system.**

The installation procedure is complete. Go to "Initializing the SPM Software."

DOS Installation with Windows 95

Using DOS SPM with Windows 95 improves the interaction of SPM with the operating system as compared to Windows 3.x installation. For example, the interaction with the print driver is improved. If an online printer is not available when you try to print while using SPM, you see a message box explaining the problem. You can correct the problem by bringing the printer on-line and continuing, or you can cancel the print operation. SPM operation is not affected by the error message or the action you take to correct the problem.

Use the following procedure to install SPM. You do not need to remove the current SPM files. The new files automatically overwrite your current SPM files.

Considerations

Review the following items before you begin the installation procedure.

The installation program automatically performs the following:

- If you typed `install` (the command for DOS installation) instead of `instal95`, checks if your PC has Windows 95 installed. If Windows 95 is detected, you see an error message that tells you to run the `Instal95` program.
- Creates the directory `c:\spm` if it does not already exist.

- Checks if the print.exe file is present in any directory listed in the PATH environment variable.
- Runs the DOS SETVER command to set the version table for print.exe to 6.22. This is required to enable print.exe to run on Windows 95.
- Creates an spm.bat file in the directory c:\spm. The spm.bat file contains the ams_path and print statements required to run SPM.
- Unzips and copies the remaining files into the directory c:\spm.
- Instructs you to refer to this document for details on using the PIF Editor to configure an SPM PIF file to work with the spm.exe file.

Installation

With Windows 95 running on your PC, follow these steps to install SPM on the PC's hard drive:

1. Insert a backup copy of SPM in any floppy disk drive (usually the A drive).
2. Choose *one* of the following two methods to install SPM:

Method 1- Install DOS SPM with French, Spanish, or English Language:

- a. Open a DOS Window from the Windows Explorer.
- b. At the DOS prompt, switch to the drive with the backup copy of SPM diskette (usually the A drive).
- c. At the DOS prompt, type one of the commands shown below and press ☐
 - instal95 or instal95 english
 - instal95 french
 - instal95 spanish



NOTE:

Because English is the factory-set language, *instal95* and *instal95 english* have the same result. If you do use the language argument (english, french or spanish), you must type it in lowercase letters as shown. The command *instal95* may be in uppercase or lowercase letters.

Method 2- Install DOS SPM with French, Spanish, or English Language:

- a. From the Windows Explorer, select the floppy drive that contains the backup copy of SPM diskette.
 - b. Select and run Instal95 (either by double clicking on the file name or single clicking on the file name and using the menu choice **File:Open**).
3. After you start DOS SPM installation using either method, the following message appears:
- SPM WINDOWS 95 HARD DISK INSTALLATION PROGRAM
Press any key to continue.
4. Press any key to begin the installation.
5. If your PC does not have a copy of PRINT.EXE in any directory listed in your system's PATH environment, the following message appears:

Copying print.exe to directory c:\spm
file(s) copied

WARNING - The application you are adding to the Windows version table may not have been verified by Microsoft in this version of Windows. Please contact your software vendor for information on whether this application will operate properly under this version of Windows. If you execute this application by instructing Windows to report a different

MS-DOS version number, you may lose or corrupt data, or cause system instabilities. In that circumstance, Microsoft is not responsible for any loss or damage.

```
Version table successfully updated.  
The version change will take effect the next time you  
restart your system.
```

```
*****
```

```
SPM Note: The warning message seen above was produced by  
the SETVER command. This command was used in the SPM  
install program to set the proper version of PRINT.EXE  
file in the DOS version table. Please note that in Windows  
95, running SETVER always produces the warning message  
seen above, even when the command is run properly.
```

```
*****
```

```
Press any Key to continue . . .
```

6. Press any key to continue installation. When SPM installation is complete the following message appears:

```
Installation of SPM for DOS on your Windows 95 hard drive  
is now complete. For easy access to SPM from Windows 95,  
configure an SPM.PIF file. See the SPM Manual for details.  
Press any key to continue . . .
```

7. Press any key

- If you installed DOS SPM using Method 1 in Step 2, close the DOS Window by typing `exit` at the DOS prompt and pressing . If the window does not close, then the Close on Exit option for the DOS window is not set. In this case, close the window by clicking on the upper right window icon (the box with an **x** in it).
- If you installed DOS SPM using Method 2 in Step 2, the DOS window closes automatically.

8. If the `print.exe` file was copied to your PC in Step 5, you must reboot your PC.
9. You should now configure a PIF file for SPM. Use the instructions that follow

Configuring a PIF file for DOS SPM

Refer to the Windows 95 help topic on "PIF" for details on using the PIF editor to implement an SPM PIF file to work with the spm.exe file.

Configure a PIF file for DOS SPM by doing the following:

1. In the Windows Explorer, select the SPM application file. Then select the menu item **File:Properties**. The screen that pops up will have tabs along the top.
2. In **Program Tab:**, put the following line in the **Working Directory** entry:
C:\SPM
3. In **Program Tab:**, put the following line in the **Batch File** entry:
C:\SPM\SPM.BAT
4. In **Program Tab:**, make sure the **Close on Exit** checkbox is checked.

You can now double click on either the SPM application icon or the SPM "Shortcut to MS-DOS" icon to run SPM. When you quit SPM (by pressing the **Home** key), the window closes automatically.

Hiding the spm.exe and spm.bat Files

If you want to hide the spm.exe and spm.bat files, use the following steps:

1. In the Windows 95 Explorer, select each file.
2. Click **File** from the menu bar, then select **Properties**.
3. In the Properties dialog box, click on the **Hidden** checkbox located under the **General Tab** in the **Attributes** section.

Initializing the SPM Software

To run correctly, the DOS version of SPM requires certain information (transmission speed, type of monitor, and so on). You need to supply this information only once, the first time you run SPM.

The information you provide during the initialization process is written to the SPM configuration file (ams.cfg). If you need to change this information at some later time, you can do so in either of the following ways:

- Use any of the options in [Table 1](#) to change the information in ams.cfg.
- Edit the ams.cfg file. (If you are unsure about editing the file, you can remove it. You are prompted to reinitialize the next time you invoke SPM. The file is created at that time.)

⇒ NOTE:

The DEBUG attribute is also specified in ams.cfg as DEBUG=0 (off), the default setting, or DEBUG=1 (on). This attribute is used to enable the Escape-to-Shell feature of SPM, activated by pressing **Ctrl** + **9**. To turn DEBUG on, you must edit the ams.cfg file; it is not part of the initialization process. The DEBUG attribute is for use by qualified service personnel only.

Table 1. SPM Configuration File (ams.cfg) Options

Option	Use
<i>spm -com1</i>	Specifies COM1 as the serial communications port used by SPM
<i>spm -com2</i>	Specifies COM2 as the serial communications port used by SPM
<i>spm -s1200</i>	Specifies modem speed of 1200 bps
<i>spm -s2400</i>	Specifies modem speed of 2400 bps
<i>spm -color</i>	Specifies color monitor
<i>spm -mono</i>	Specifies monochrome monitor
<i>spm -1 english</i>	Specifies English as the PC language
<i>spm -1 french</i>	Specifies French as the PC language
<i>spm -1 spanish</i>	Specifies Spanish as the PC language

Follow the steps below to perform the SPM initialization.

► **1. Type *spm* and press to display the SPM Welcome screen shown in Step 2.**

- *Make your entry at the c:> prompt if your PC has a hard disk.*
- *Make your entry at the A:> prompt if you are using the floppy drive.*

► **2. Press any key.**

```
Welcome to SPM

The MERLIN LEGEND

System Programming
& Maintenance Utility

Please press any key

to continue

Version X.XX
```

X.XX = current version of SPM

The screens shown in Steps 3 through 7 appear only if the system has not been initialized. Otherwise, the screen shown in Step 8 appears.

► **3. Select the serial communications port used for SPM and press .**

```
COMM PORT:

1.  Comm 1

2.  Comm 2

Enter selection #
```

Type *1* for serial port 1 (COM1).

Type *2* for serial port 2 (COM2).

► 4. Select the communications port speed and press .

Speed:

1. 1200

2. 2400

Enter selection #

Type 1 for 1200 bps.

Type 2 for 2400 bps.

► 5. Respond to the color prompt and press .

COLOR

Enter selection (y/n):

Type *y* if you have a color monitor.

Type *n* if you do not have a color monitor.

► 6. Select a language and press .

Language:

1. English

2. French

3. Spanish

Enter selection #:

Type 1 for English.

Type 2 for French.

Type 3 for Spanish.

The language you select here becomes the SPM (PC) language.

► 7. Review your selections.

SPM CONFIGURATION:	
Comm Port:	x
Speed:	x
Color:	x
Desire change (y/n)?	

x = the values entered for each
entry in Steps 3 through 6

- To change any of the information shown, type **Y** and press **Enter↵**. The screen shown in Step 3 appears. Repeat Steps 3 through 6.
- To save the information shown, type **N** and press **Enter↵**.
 - If the PC is connected to the processor, the SPM Main Menu appears as shown in Step 8.
 - If the PC is not connected, go to “Connecting the PC.”

► 8. Press the function key that corresponds to the option you want.

SPM Main Menu			
Menu: Select Function			
F1	Sys Program	Maintenance	F6
F2	Backup	Restore	F7
F3	Boards	Pass-Thru	F8
F4	Print Opts	Password	F9
F5	Monitor	Language	F10

► NOTE:

The function keys shown on either side of the display are included here for quick reference. See [“SPM Screens”](#) for details on using the PC keys in SPM.

Connecting the PC

There are three ways to connect the PC to the control unit. Choose the method below that is most useful for your installation.

- Direct local connection
- Local modem connection
- Remote modem connection

Direct Local Connection

For a direct local connection, you must connect the PC to the system programming jack. This is the lower modular RS-232 jack on the processor module, as shown in [Figure 1](#). (The upper jack is reserved for the SMDR printer.)

To connect a PC more than fifty feet from the control unit, see [Figure 2](#).

For direct local connections, the system supports speeds of 1200 and 2400 bps.

NOTE:

You must use a direct local connection to program in surrogate mode.

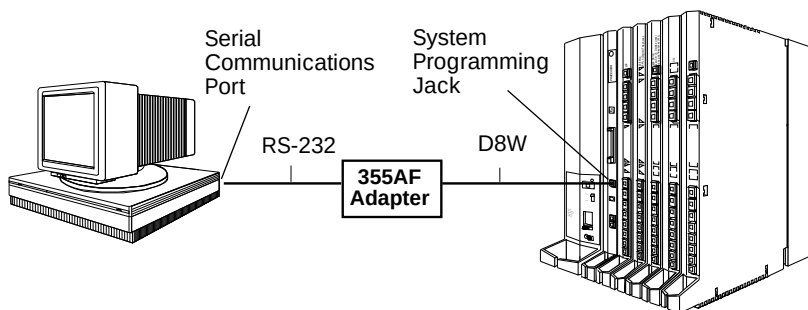


Figure 1. Direct Local Connection

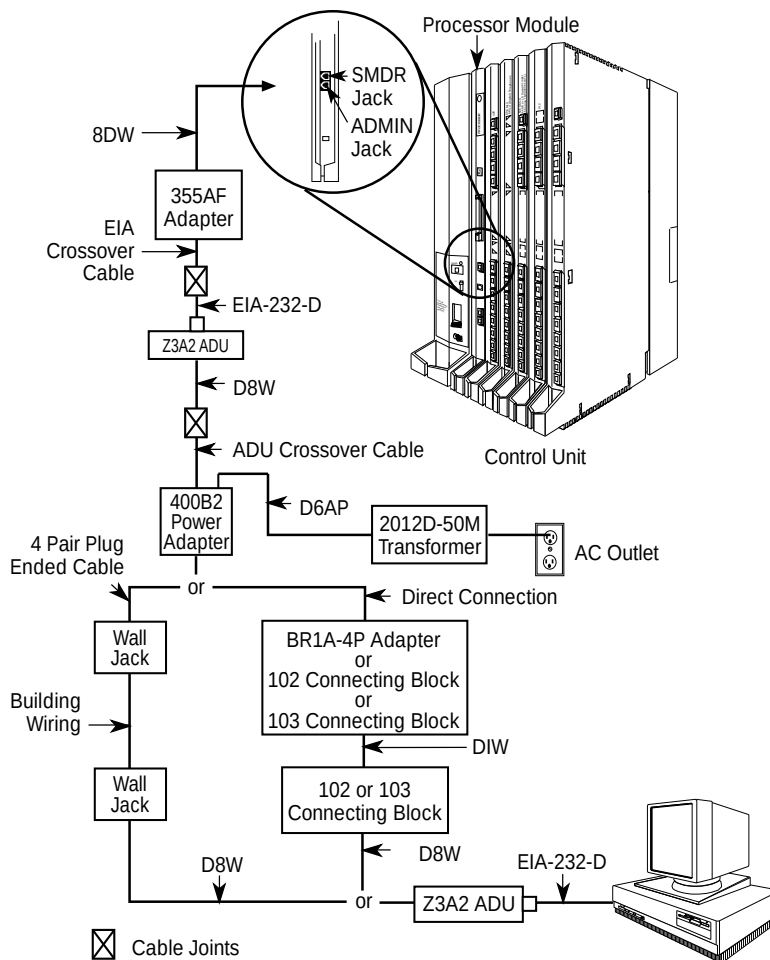


Figure 2. Direct Local Connection, PC More Than 50 ft. Away

Local Modem Connection

For a local modem connection, you must use a modem (either connected to, or built into, the PC) to access the internal modem in the control unit. Connect the modem to an 012 or 016 module in the control unit, as shown in [Figure 3](#).

The internal modem operates at speeds of 1200 and 2400 bps.

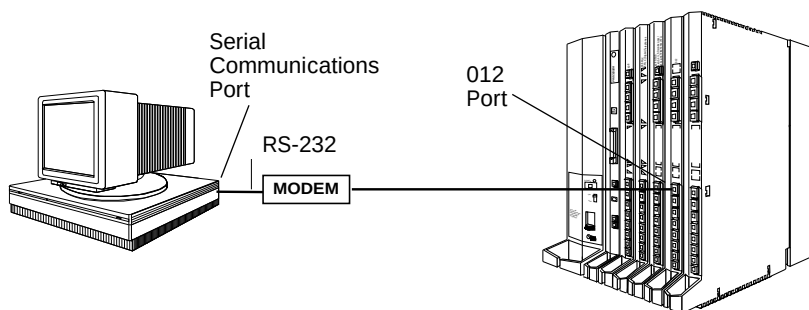


Figure 3. Local Modem Connection

Remote Modem Connection

For a remote modem connection, you must use a modem (either connected to, or built into, the PC) to access the internal modem in the control unit. You must also use a dial-up connection, as shown in [Figure 4](#). See [“Accessing SPM”](#) for details on accessing SPM with a remote modem connection.

The internal modem operates at speeds of 1200 and 2400 bps.

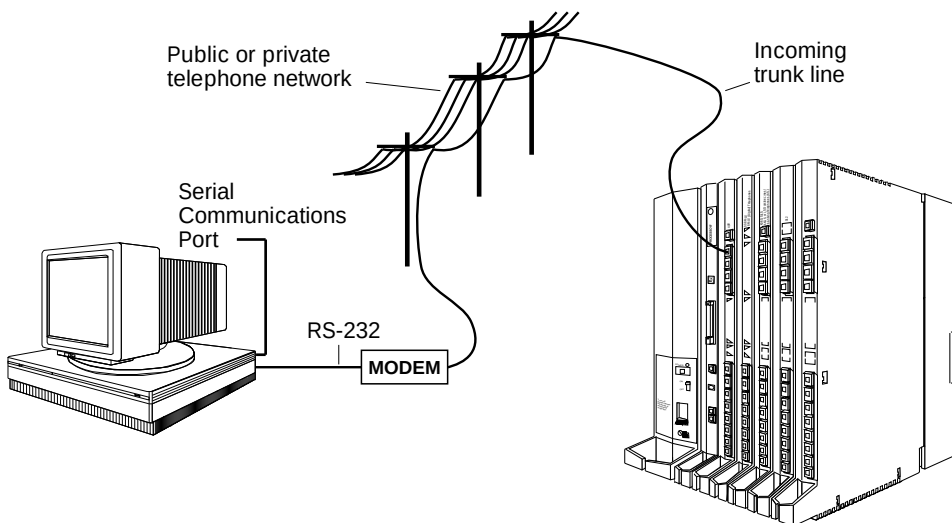


Figure 4. Remote Modem Connection

NOTE:

Remote access (modem connection) has priority over local access (direct connection), unless a backup or restore procedure is in progress through a direct local connection. If a modem connection is attempted while any other type of on-site programming is in progress (either at the system or at a directly-connected PC), the system sends a message to the on-site programmer. The message indicates that a modem connection is being established and the on-site programming session is terminated.

Accessing SPM

The procedure for accessing SPM depends on whether your PC is connected to the control unit with a modem (either local or remote) or without a modem (direct). This section covers both of these access procedures.

With a Direct Local Connection

To access SPM when your PC is connected directly to the control unit, follow the steps below.

- ▶ **1. Set up the appropriate physical connections between the PC and the control unit.**

See ["Connecting the PC"](#).

- ▶ **2. If you installed SPM on the hard disk of the PC, go to Step 5.**
- ▶ **3. If the PC does not have a hard disk, insert the SPM diskette into Drive A.**
- ▶ **4. Type `a:` and press `[Enter]`.**

A:> appears on the screen.

- ▶ **5. Type `spm` and press `[Enter]` to display the SPM Welcome screen shown below.**

```
Welcome to SPM
The MERLIN LEGEND
System Programming
& Maintenance Utility
Please press any key
to continue
Version X.XX
```

X.XX current version of SPM

► 6. Press any key to display the SPM Main Menu shown below.

SPM Main Menu			
Menu: Select Function			
F1	Sys Program	Maintenance	F6
F2	Backup	Restore	F7
F3	Boards	Pass-Thru	F8
F4	Print Opts	Password	F9
F5	Monitor	Language	F10



NOTE:

The function keys shown on either side of the display are included here for quick reference. See [“SPM Screens”](#) for details on using the PC keys in SPM.

- If the SPM Main Menu does not appear or if the information on the screen is garbled, press any key again.
- If the COM Port (communications port) screen appears instead of the SPM Main Menu, it indicates that the SPM software has not been initialized. See [“Initializing the SPM Software”](#).

► 7. To select an option, press the function key that corresponds to the option you want. For example, to select Language press F10.

With a Local or Remote Modem Connection

The method you use to access SPM by modem depends on whether you are programming on site (locally) or from a remote location.

- If you are on site, the modem must be connected to an 012 or 016 module on the control unit. To establish a connection to the control unit's internal modem, dial *10.
- If you are at a remote location, do one of the following:

- Place a call to the system on a Remote Access line, enter the barrier code (if required), and dial the code for the internal modem (*10).
- Place a voice call to the system using the line to which the modem is connected and ask the operator to transfer you to the modem (by pressing **Transfer**, dialing *10, then hanging up the telephone). When you hear the modem answer tone, switch to data mode.

Considerations

Review the following items before you begin the modem connection procedure.

Set the Programming Language

If you prefer to program in a language other than the current SPM language setting, see [“Language”](#).

Modem Connections

You must make a data connection to a modem. The following modem dialing commands are for Hayes® and Hayes-compatible modems. These may not be the commands your modem uses—refer to the user guide that came with your modem for specific information.

- If the PC is in the same location as the control unit, type *10.
- If the PC is in a remote location and your system has activated the Remote Access feature, type the following and press :
 - Without barrier codes type:

ATDT ; the remote access telephone number; and w*10.
For example: ATDT12015551234 w*10 .
 - With barrier codes type:

ATDT; the remote access telephone number; the barrier code preceded by a "W" and *W*10*. The barrier code in the example below is 555555.

For example: *ATDT12015551234 W555555 W*10* .

- The password prompt appears on the screen when the connection is made. (You may have to press more than once to get the password prompt.)
- If the PC is in a remote location and your system has not activated the Remote Access feature, do the following:
 - Use the main telephone number to place a voice call to the system on the line to which the modem is connected.
 - Instruct the operator to transfer you to the modem (by pressing **Transfer**, dialing **10*, then hanging up the telephone).
 - To put the modem on line, type *ATH1* and press , then hang up the telephone.

 NOTE:

If you enter a telephone number of fewer than 11 digits, you must end it with a pound sign (#).

To access SPM through a local or remote modem connection, follow the steps below.

- 1. Set up the appropriate physical connections between the PC and the control unit. See ["Connecting the PC"](#).

- **2. Type *spm* and press  to display the SPM Welcome screen shown below.**

```
welcome to SPM  
  
The MERLIN LEGEND  
  
System Programming  
& Maintenance Utility  
  
Please press any key  
to continue  
  
Version X.XX
```

X.XX = current version of SPM

If you wish to program in a language other than the current language set for SPM, see ["Set the Programming Language"](#).

- **3. Press any key to display a blank screen on which you can enter modem commands. (You may have to press the key several times.)**
- **4. Make a data connection to the modem of the control unit.**

See ["Modem Connections"](#). When the connection is made, the password prompt appears as shown in Step 4.

- **5. Type the SPM password to display the SPM Main Menu shown in Step 6.**

```
Enter Password:
```

The password does not display as you type it.

- 6. To select an option, press the function key that corresponds to the option you want. For example, to select Language press **F10**.

SPM Main Menu			
Menu: Select Function			
F1	Sys Program	Maintenance	F6
F2	Backup	Restore	F7
F3	Boards	Pass-Thru	F8
F4	Print Opts	Password	F9
F5	Monitor	Language	F10

► **NOTE:**

The function keys shown on either side of the display are included here for quick reference. See [“SPM Screens”](#) for details on using the PC keys in SPM.

Using SPM

This section describes how to use the SPM screens, SPM Help, and the SPM options listed below.

- Backup
- Boards
- Browse
- Convert
- Language
- Maintenance
- Monitor
- Pass-Thru
- Password
- Print Options

- Restore
- System Programming

⇒ NOTE:

Some of the procedures described in this section should be performed by qualified service personnel only.

SPM Screens

SPM screens simulate the system programming console. Each SPM screen includes a 7-line by 24-character console simulation window that corresponds to the display area of the MLX-20L telephone. To the right and left of this console simulation window are columns that list the keys corresponding to similarly-located buttons on the MLX-20L telephone. If you are working with Version 2.0 or higher, the version number appears in the upper left corner of the screen (for example, v5). [Figure 5](#) illustrates the SPM display screen.

U4	QUIT MENU	Home End F1 F2 F3 F4 F5	Welcome to SPM The MERLIN LEGEND System Programming & Maintenance Utility Please press any key to continue. Version 4.15				PgUp PgDn F6 F7 F8 F9 F10	MORE INSP	Drop ALT-P
Shift F5	LINE 05	LINE 10	Shift F10	Alt F5	LINE 15	LINE 20	Alt F10		Pause ALT-H
Shift F4	LINE 04	LINE 09	Shift F9	Alt F4	LINE 14	LINE 19	Alt F9		CONVERT ALT-U
Shift F3	LINE 03	LINE 08	Shift F8	Alt F3	LINE 13	LINE 18	Alt F8		HELP CTL-F1
Shift F2	LINE 02	LINE 07	Shift F7	Alt F2	LINE 12	LINE 17	Alt F7		RESET CTL-F5
Shift F1	LINE 01	LINE 06	Shift F6	Alt F1	LINE 11	LINE 16	Alt F6		BROWSE CTL-F8

Figure 5. SPM Display

[F1] through **[F5]**, and **[F6]** through **[F10]** display on either side of the console simulation window. They represent the function keys to use when you select screen options. When a screen contains several choices, press the function key identified by the label next to your choice. (If you were programming on the console, you would press the telephone button next to your choice.)

Below the console simulation window are 20 simulated line buttons. The 20 line buttons can be selected using the arrow keys to position the cursor on the appropriate button. Using **[PgDn]** (the Inspect feature), you can determine the status of each line and the features programmed on each line according to the letter that appears next to the line number (see below).

On the PC screen, the letters R and G represent the ON state of the red and green LEDs, respectively, that are on the console. For example, if a line, trunk, or pool is assigned to a line button, on the console a green LED lights next to the button. On the PC screen, the letter G (for green) displays next to the button. Similarly, if a line, trunk, or pool is not assigned to a line button, neither G nor R display next to the button on the PC screen. If a trunk is assigned to a pool, an R (for red) displays on the PC screen.

The labels in the column on the right side of the screen show key combinations that correspond to buttons on the MLX-20L telephone. [Table 2](#) describes the function of PC keys in SPM.

Table 2. Function of PC Keys in SPM

PC Key	Console	SPM Function
Home	Home	Quit. Exit from SPM and return to the DOS prompt when you finish with system programming. If you are using a modem, the call is disconnected.
End	Menu	Return to the SPM Main Menu.
PgUp	More	Display more menu items (when there is another screen and the > symbol appears next to the key).
PgDn	Inspct	Show the current information that has been programmed for a feature or button.
Alt + P	Drop	Enter a stop in a speed dialing sequence. This combination also deletes an entry in a field on any screen except one in which you are entering a speed dialing sequence.
Alt + F	Conf	Flash. Enter a switchhook flash in a speed dialing sequence.
Alt + C	n/a	TopSP. Return to the top of the System Programming menu.
Alt + H	Hold	Pause. Enter a pause in a speed dialing sequence.
Alt + U	n/a	Convert. Convert a backup file from its original Release format to a different Release format.
Alt + N	n/a	Toggle modem speed between 1200 and 2400 bps.
Ctrl + F1	n/a	Help. Display a help screen about SPM operations. To exit from Help, press End .
Ctrl + F5	n/a	Reset. Reset the communications port. For example, if the information on the screen is garbled, try exiting from and then re-entering the screen. If the screen remains garbled, use Ctrl + 5 to clear the screen and return to the SPM Welcome screen. Note that using Ctrl + 5 drops the modem connection.
Ctrl + F8	n/a	Browse. View print reports saved with Print Opts.

Continued on Next Page

Table 2. Function of PC Keys in SPM — *Continued*

PC Key	Console	SPM Function
 + 	n/a	Escape to shell. To use this key sequence, you must set DEBUG=1 in the configuration file ams.cfg. You can then use this key sequence to execute DOS (or UNIX System) commands. To return to SPM, type <i>exit</i> .
	Enter	The  key on your PC can be used instead of  when Enter appears as a choice in the console simulation window.
	Backspace	The  key on your PC can be used instead of  (Backspace) when it appears as a choice in the console simulation window.
	Delete	The  key on your PC can be used instead of  (De l e t e) when it appears as a choice in the console simulation window.
   	n/a	The up, down, left, and right arrow keys can be used to highlight selections in a menu and to select the 20 line buttons below the console simulation window.

SPM Main Menu Options

The SPM Main Menu provides access to system programming and to the SPM functions listed in [Table 3](#).

Table 3. SPM Main Menu Options

SPM Menu Option	Function
Sys Program	To program the system
Backup*	To make a backup copy of your system programming and store it on diskette or on hard disk
Boards*	Shows which modules (port boards) are in each slot of the control unit and allows you to assign boards to slots
Print Opts*	Directs reports to the printer or to the PC for storage on diskette or hard disk
Monitor*	Restricted to use by your technical support organization
Maintenance	Restricted to use by your technical support organization and qualified technicians
Restore*	To restore your system programming from diskette or hard disk
Pass-Thru ¹	(IS II/III only) To make a remote connection, through the control unit, to an IS II/III PC to administer applications on the IS II/III PC.
Password*	To change the password for remote entry into the system.
Language	To select a language (English, French, or Spanish) for the console simulation window on the PC. (There is also a Language option available on the System Programming menu that allows you to set the system language.)

-
1. SPM option only. Not available on the MLX-20L system programming console. To be used only by qualified service personnel.

SPM Help

To access the SPM help screens, press **Ctrl** + **F1**.

To review the help screens press, **[PgUp]** and **[PgDn]**.

To return to the first help screen, press **[Home]**.

To exit from SPM help, press **[End]**.

A typical help screen is shown in [Figure 6](#).

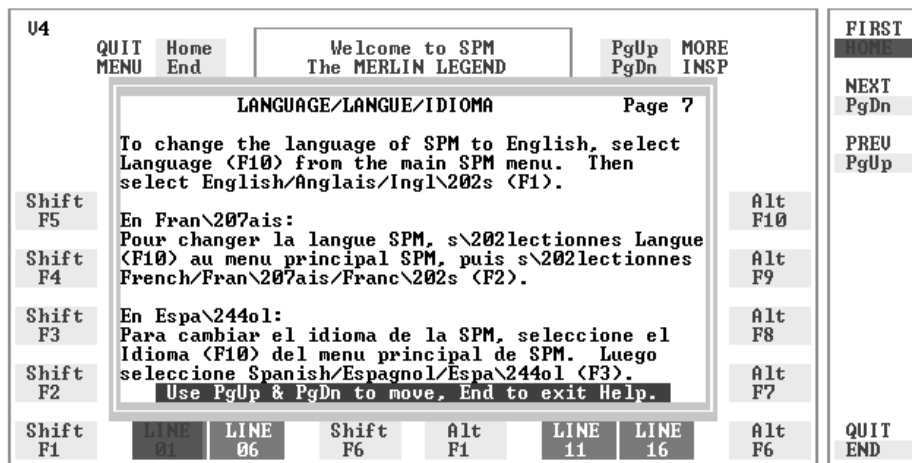


Figure 6. SPM Help

Backup

The Backup procedure is used by qualified service personnel to create a file of system programming information either in the \spm\backup directory (on the hard drive of the PC) or in the root directory of a diskette (on the floppy disk drive of the PC).

⇒ NOTE:

Back up your system programming information on a regular basis. A current backup file allows you to quickly and easily restore your system, if the need arises.

Determining the Release Number of a Backup File

If you have a backup diskette but do not know its release number, you may be able to find this information in the backup header. Beginning with later versions of Release 1.1, the backup file contains a backup header 128 bytes long. Approximately 59 of these bytes are currently used. Bytes 55 through 59 of the header contain the MERLIN Legend Communication System Release number, as shown in [Table 4](#). (Release 1.0 and early versions of Release 1.1 do not contain this information in readable form.)

Table 4. Backup Header: Release Number

	Release No.	Build No.	System Size	Mode
Size	2 bytes	12 bytes	1 byte	1 byte
Examples	03 00	32	01	01 - Key
	02 01			02 - Behind Switch
				03 - Hybrid/PBX

The release number is found in the first two bytes (four characters) of the identification number. For example, 0300 = 3.0, 0201 = 2.1.

If the backup file is compressed, you can read the header but you cannot read the data area following the header. Use *type* [backup filename] to read the header on a DOS system or *cat* [backup filename] to read the header on a UNIX System.

Note that the communication system release number, not the version number of SPM, reflects whether the backup file is compressed or uncompressed.

Release 1.0 backups are uncompressed and Release 1.1 and later backups are compressed. Uncompressed files take longer to restore.

Considerations

Review the following items before you begin the backup procedure:

- The communications system does not have to be idle during backup; however, extension programming is blocked.
- Any objects that are in a maintenance-busy state are stored in that state. When you restore system programming, these objects are busied out, even if they have since been released from the maintenance-busy state.
- If you plan to store your backup file on a diskette, format a DOS diskette. (DOS formatting can be done on either a UNIX System PC or a DOS PC).
- Uncompressed backup files are 100,000 to 210,000 bytes in size; compressed files are about 70,000 to 85,000 bytes.
- Maintenance data (error logs and other data used by qualified service technicians) is not saved in the backup file.

Follow the steps below to perform the backup procedure.

- 1. **At the SPM Main Menu, press F2 to select Backup.**

SPM Main Menu

Menu: Select Function

Sys Program Maintenance

Backup Restore

Boards Pass-Thru

Print Opts Password

Monitor Language

F2

► **2. Follow the instructions for a floppy or a hard disk.**

A second window appears which displays the GOTO FLOPPY and MAKE NEW FILE options and a directory listing for the C:\spm\backup directory.

- If you are saving the backup file to a floppy disk, go to Step 3.
- If you are saving the backup file to the hard disk, go to Step 4.

► **3. Remove the SPM diskette and insert a formatted diskette. Use the arrow keys to highlight GOTO FLOPPY and press `[Enter↵]`.**

```
Make a selection for
the BACKUP file.
MAKE NEW FILE will
create a new file
on selected device.
```

```
Press ESC to abort.
```

```
GOTO FLOPPY
MAKE NEW FILE
backup.ams
file.1
file.2
```

After you press `[Enter↵]`, the GOTO FLOPPY statement shown above changes to GOTO HARD DISK and the directory listing for A:\ is displayed. Continue with Step 4.

The screen displays the default name for the backup file (backup.ams).

► **4. Specify a backup filename.**

- To select the default filename, use the arrow keys to highlight backup.ams and press `[Enter↵]`. Go to Step 6.
- To enter a different filename, use the arrow keys to select MAKE NEW FILE and press `[Enter↵]`. Go to Step 5.

► 5. Type the new filename and press **Enter**.

```
Press ESC to Abort.

Enter filename:

(default is backup.ams)
```

If you are working from the floppy drive,
A:\ appears on the screen.

You can specify a drive letter with the filename but no path information.

► 6. Verify that the filename chosen does not already exist.

The following screen appears only if the filename chosen already exists.
Continue with Step 7 if this screen does not appear.

```
The file already exists.
If you continue, the old
version will be deleted.
Press ESC to abort.
or c to continue.
```

Press **Esc** to abort the backup. Go to
Step 1 to create a different backup file.

Press **C** to continue. Go to Step 7.

► 7. Observe the backup status screen.

```
Press ESC to Abort.
Est. Blocks: xxx - xxxx

filename

BACKUP IN PROGRESS
Received Block xx
```

filename = the backup filename specified
in Step 5

SPM indicates the status of the backup by displaying the number of the last block received (xx). Line 2 of the display screen shows the estimated number of blocks to be sent from the control unit (xxx-xxxx). This line is blank if you are backing up from Release 1.0.

If you abort the backup, the partial backup file is deleted to prevent restoration from a corrupted file and you see the screen shown in Step 8.

When the backup is complete, you see the screen shown in Step 9.

- **8. To abort the backup press `[Esc]` to return to the SPM Main Menu.**

```
Press ESC to Abort.  
Est. Blocks: xxx - xxxx  
  
filename  
  
BACKUP IN PROGRESS  
XMODEM ABORT - User
```

- **9. When the backup is complete, press `[Enter ↵]` to return to the SPM Main Menu.**

```
Backup successful.  
Please press Enter  
to see the Main Menu  
  
Received xxx Blocks
```

xxx = total number of blocks received

Boards

The Boards option allows qualified service personnel to add a board to the next available slot. The system must be idle to use this option. This option is not available from the system programming console.

The Boards option is also available in surrogate mode. In surrogate mode, you can assign trunk and extension modules (boards) to slots, even though the boards have not actually been installed. This type of board is referred to as a “phantom” or “null” board.

You cannot use the Boards option to change an actual board type. All boards assigned with the Boards option, including phantom boards, are cleared (unassigned) if you perform a board renumber (System→Board Renum).

NOTE:

You must assign phantom boards to higher slot numbers than those you assign to any real boards. If you assign a phantom board to a lower slot number than a real board, the control unit does not recognize the real board(s) that follow the phantom board.

NOTE:

If you remove a board but do not replace it, and then perform a board renumber, the control unit will not recognize any boards that follow the empty slot. You must reseal all of the boards to fill the empty slot before you perform the board renumber.

The Inspect function (PgDn) lets you see which modules have been assigned to slots on the control unit. Note that both phantom boards and real boards display if you use the Inspect function. To see only real board assignments, you must print the System Information report:

System→**More**→Print→SysSet-up.

[Table 5](#) shows the type of boards that you can select.

Table 5. Board Types

Board Type	Description
400LSR	4 loop-start line jacks with 4 touch-tone receivers
400GLR	4 ground-start/loop-start line jacks with 4 touch-tone receivers
800LS	8 loop-start line jacks
800GLID	8 ground-start/loop-start line jacks with Caller ID capability available on the loop-start lines and 2 touch-tone receivers
800GLS	8 ground-start/loop-start line jacks
408LSA	4 loop-start line jacks and 8 ATL analog extension jacks
408GLA	4 ground-start/loop-start line jacks and 8 ATL analog extension jacks
408GLM	4 ground-start/loop-start line jacks and 8 MLX extension jacks (16 endpoints)
008ATL	8 analog extension jacks
008MLX	8 MLX-20L extension jacks (16 endpoints)
012TR/OPT	12 tip/ring extension jacks with 2 touch-tone receivers or 008 OPT jacks
016TR	16 tip/ring extension jacks with 4 touch-tone receivers
800DID	8 DID trunk jacks with 2 touch-tone receivers
400E&M	4 E&M tie trunk jacks
100D	1 DS1 jack (24 channels)
800BRI	8 BRI trunk jacks (16 channels)

Follow the steps below to assign modules.

- 1. At the SPM Main Menu, press **[F3]** to select Boards.

[F3]

SPM Main Menu	
Menu: Select Function	
Sys Program	Maintenance
Backup	Restore
Boards	Pass-Thru
Print Opts	Password
Monitor	Language

- 2. Press the function key that corresponds to the module you want to select.

[F1]

[F2]

[F3]

[F4]

[F5]

Boards: >	
Make a selection	
408LSA	800LS
012TR/OPT	008ATL
800DID	008MLX
800GLS	400GLR
Exit	400LSR

[F6]

[F7]

[F8]

[F9]

[F10]

[F1]

[F2]

[F3]

[F4]

[F5]

Boards:	
Make a selection	
400E&M016TRR	
408GLA800GLID	
100D800BRI	
408GLM	
Exit	

[F6]

[F7]

[F8]

If the module you want to assign is not shown on the first screen of the Boards menu, press **[PgUp]** to display the next menu screen.

- 3. Type the control unit slot number (01 through 17) in which the module is to be installed.

module name	
Enter slot numbers	
(01-17)	
	Delete
Backspace	Next
Exit	Enter

module name = option selected in Step 2

► 4. Assign or remove the module from the slot entered in Step 3.

module name	
Enter slot numbers	
(01-17)	
nn	
Delete	F8
Backspace	Next
Exit	Enter

module name = option selected in Step 2

nn = slot entered in Step 3

To remove the module type from the specified slot number, press **F8** (Delete). The Boards menu reappears.

To assign the module type to the specified slot number and assign that same module type to another slot, press **F9** (Next).

To assign the module type to the specified slot number and assign a different module type to another slot, press **F10** (Enter).

To terminate the procedure and assign a different module, press **F5** (Exit) and repeat Steps 2 through 4.

To view types of modules assigned to all slots, press **PgDn** (Inspect).

► 5. Save your entry.

Select Exit. **F5**

The programming session terminates and the system restarts.

Browse

The Browse option allows you to browse through reports saved in the Reports directory (\spm\reports) on the hard disk of the PC or on a floppy.

- 1. At the SPM Main Menu press **[Ctrl] + [F8]**.

```
Please enter file name

Press ESC to Abort.
```

```
GOTO FLOPPY
FILENAME.XXX
FILENAME.YYY
```

FILENAME.XXX and *FILENAME.YYY* from the \spm\reports directory

- 2. Use the arrow keys to highlight the source (hard disk or floppy) from which you want to view the reports and press **[F10]**.

A list of the current reports appears.

- 3. Use the arrow keys to highlight the report you want to view and press **[F10]**.

The report appears.

- To view the next page of a report, press **[PgDn]**.
- To view the previous page of a report, press **[PgUp]**.
- To return to the beginning of a report, press **[Home]**.
- To exit from the Browse option and return to the SPM Main Menu, press **[Esc]**.

Convert

The Convert option (which can be used remotely) simplifies upgrading from an earlier release to a later release of the communications system. (See "Upgrading the Communications System.") This procedure should be done only by qualified service personnel.

Convert uses two files: the existing backup file (the “convert from” file) and the converted file (the “convert to” file), which is created when you run the Convert option. The converted file contains system programming information in an uncompressed form. The “convert from” file is unchanged. Because uncompressed files take longer to process than compressed files, you may want to restore this uncompressed backup to the old control unit and then create a new backup. This new backup is in compressed form and does not have to be converted. For more information about compressed and uncompressed files see [“Backup”](#).

To convert system programming to Release 4.0 format, Version 4.15 of SPM is required. This version can be easily identified by the version number, v4, in the upper left corner of the screen.

Help screens are available to guide you through the Convert procedure. See [“SPM Help”](#).

Before you use the Convert option, you must complete the following tasks:

- If your PC has a hard disk, install the appropriate version of the SPM software. See [“Upgrading the System”](#).
- Back up system programming. See [“Backup”](#).
- Make sure you know the name of the backup file that you have created.

 NOTE:

Once the actual file conversion begins, you cannot stop the process; pressing **[Esc]** has no effect.

Follow the steps below to perform the conversion.

- 1. At the SPM Main Menu, press **[Alt] + [U]** to begin the conversion.

```
SPM Main Menu
Menu: Select Function
Sys Program      Maintenance
Backup           Restore
Boards           Pass-Thru
Print Opts       Password
Monitor          Language
```

- 2. Follow the instructions for a floppy or a hard disk.

A second window appears which displays the **GOTO FLOPPY** option and a directory listing for the **C:\spm\backup** directory.

- If the backup file is stored on a floppy disk, go to Step 3.
- If the backup file is stored on a hard disk, go to Step 4.

- 3. Use the arrow keys to highlight **GOTO FLOPPY** and press **[Enter]**.

```
Please select file name
to convert from,
then press Enter

Press ESC to abort.
```

```
GOTO FLOPPY
FILENAME.XXX
FILENAME.YYY
```

FILENAME.XXX and *FILENAME.YYY* are from the **\spm\backup** directory.

After you press **Enter**, the `GOTO FLOPPY` statement shown above changes to `GOTO HARD DISK` and a directory listing from the root directory of the floppy disk appears. Go to Step 4.

```
Please select file name
      to convert from,
      then press Enter

Press ESC to abort.
```

```
GOTO HARD DISK
FILENAME.XXX
FILENAME.YYY
```

`FILENAME.XXX` and `FILENAME.YYY` are from the root directory of the disk in Drive A.

► **4. Use the arrow keys to highlight the name of the backup file to be converted and press **Enter**.**

- If the backup file you select is a 4.0 backup, it can not be converted and the following message appears:

```
File has already been converted.
Press Enter to continue.
```

Press **Enter** to select another filename, or press **Esc** to abort the convert procedure.

- If the backup file you select can be converted, go to Step 6.

► **5. Observe the updated file selection screen and press **Enter**.**

```
Please select file name
      to convert from,
      then press Enter

N: FILENAME.XXX
Press ESC to abort.
```

`FILENAME.XXX` = the backup filename
selected in Step 4
`N` = drive

- **6. If converting from Release 1.0 or 1.1, select the CONVERT TO release. To convert from Release 1.2, 2.0, or 2.1 go to Step 7.**

```
Please enter your
CONVERT TO release
and press ENTER.

1.2i          1.4i
2.0           2.1
3.0           4.0/5.0

Enter number:x.x
```

All characters must be entered as they appear on the screen, including the decimal point.

The screen below appears when converting from Release 1.0 or 1.1.

- **7. Follow the instructions for a floppy or a hard disk.**
- If the CONVERT TO file will be saved to a floppy disk, go to Step 8.
 - If the CONVERT TO file will be saved to the hard disk, go to Step 9.
- **8. Use the arrow keys to highlight GOTO FLOPPY and press .**

```
Please select file name
to convert to, or select
NEW FILE to create a new
file on selected drive.

Enter Filename:
```

```
GOTO FLOPPY
MAKE NEW FILE
FILENAME.XXX
FILENAME.YYY
```

After you press **Enter**, the GOTO FLOPPY statement shown above changes to GOTO HARD DISK and the directory listing from the root directory of the disk in Drive A appears. Continue with Step 9.

```
Please select file name
to convert to, or select
NEW FILE to create a new
file on selected drive.

Enter Filename:

Press ESC to abort.
```

```
GOTO HARD DISK
MAKE NEW FILE
FILENAME.XXX
FILENAME.YYY
```

► **9. Specify a filename for the converted file.**

- Highlight the name of the file you want to convert to, press **Enter**, and go to Step 11.
- To enter a different filename, use the arrow keys to select MAKE NEW FILE and press **Enter**.

► **10. Enter the new filename and press **Enter**.**

```
Please select file name
to convert to, or select
NEW FILE to create a new
file on selected drive.

Enter Filename:
A:\filename.new
(default is RESTORE.NEW )
```

The converted file cannot have the same name as the file from which you converted. If you specify the same filename, the following screen appears:

```
The file selected to
convert to is the same
as the file selected to
convert from. Please
choose a different file.

Press Enter to continue
```

Press  and repeat this step.

► **11. Check the updated file screen and press .**

```
Please select file name
to convert to, or select
NEW FILE to create a new
file on selected drive.

Enter Filename:

N: FILENAME.NEW
(default is RESTORE.NEW)
```

FILENAME.NEW = name entered in
Step 10
N = drive

Observe the conversion progress screen.

```
CONVERSION IN PROGRESS

Converting From:

N: FILENAME.XXX

Converting To:

N: FILENAME.NEW
```

FILENAME.XXX = name entered at Step 4
FILENAME.NEW = name entered at
Step 10
N = drive

When the conversion completes, the screen shown in Step 13 appears.

► **12. Press any key to return to the SPM Main Menu.**

Language

A language attribute in the SPM configuration file `\spm\ams.cfg` (DOS version) or `/usr/ams/ams.cfg` (UNIX System version) specifies whether SPM menus, pop-up windows, and other messages are presented in English, French, or Spanish. A second language selection option affects messages from the control unit to SPM and controls the display on the console simulation window for the duration of the session. These two language options operate independently of each other.

The following discussion refers to the language specified in the SPM configuration file as the *PC language* and the language used by the control unit as the *console window language*.

PC Language

During SPM installation, you select a language that is recorded in the SPM configuration file. Any time thereafter, SPM can be started with the `-l` option to specify a different language, using one of the following command lines:

- `spm -l english`
- `spm -l french`
- `spm -l spanish`

Note that the option is a lowercase letter L and not the number 1.

Use of the `-l` option changes the language attribute in the `ams.cfg` file. The language specified becomes the new PC language, used whenever SPM is started without the `-l` option.

Console Window Language

By default, the language used in the console simulation window is the language specified in the `ams.cfg` file; however, you can select a different language for this window for the duration of the current session.

To select a different language, follow the steps below.

- **1. At the SPM Main Menu press F10 to select Language.**

SPM Main Menu	
Menu: Select Function	
Sys Program	Maintenance
Backup	Restore
Boards	Pass-Thru
Print Opts	Password
Monitor	Language

F10

- **2. Press the function key that corresponds to your language selection.**

Display Language
Make a Selection:
English
French
Spanish
Exit

The Display Language screen reappears, with the language you selected.

- **3. Press F5 to return to the SPM Main Menu or select another language.**

Maintenance



CAUTION:

This option is for use by qualified technicians only. Maintenance procedures are provided in the documentation for qualified technicians. See "Related Documents."

Monitor



CAUTION:

This is a password-protected option and is for use by your technical support organization only.

Pass-Thru

The Pass-Thru option allows qualified service personnel to administer IS II/III applications on a remote PC. It permits you to establish a remote connection with the control unit to which the IS II/III PC is directly connected. [Figure 7](#) illustrates the relationship of the SPM PC, the communications system control unit, and the IS II/III PC.

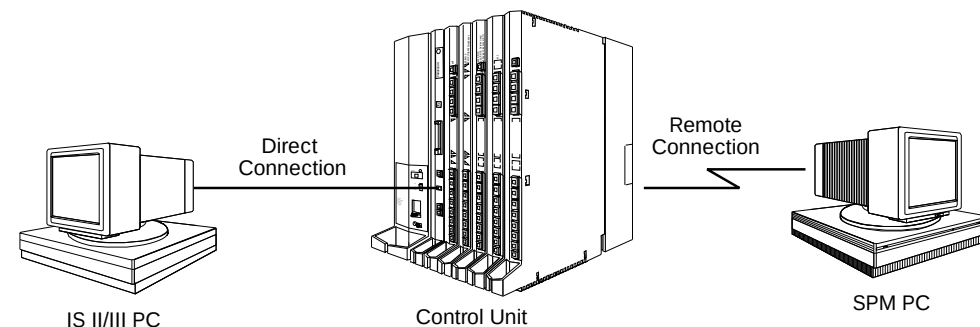


Figure 7. Pass-Thru

A Pass-Thru request must be initiated at a DOS PC; it is not available from a UNIX System PC; that is, Pass-Thru cannot be established between two IS II/III PCs. The local admin PC must be in an idle state.

A Pass-Thru request to a locally-connected IS II/III system causes the modem to fall back to 1200 bps if the speed is set to 2400 bps and the modem call to the control unit is at 1200 bps. If necessary, the communications system adjusts its speed to that of the local SPM PC.

Once the Pass-Thru connection is established, you can program in any of the following IS II/III applications from your SPM PC:

- AUDIX Voice Power™
- Call Accounting System
- Fax Attendant System® (IS III only)
- CONVERSANT Intro® (IS III only)

 NOTE:

You cannot program the SPM application on the IS II/III PC because the remote call (from your SPM PC) uses the IS II/III PC's COM1 port; therefore, the system programming jack cannot be used for system programming. For the same reason, a user at the IS II/III PC end of the connection cannot use SPM while your Pass-Thru is in effect. If use of SPM is attempted, the user at the IS II/III end sees the following message:

```
PRE-EMPT IN PROGRESS
Please try again.
```

To initiate Pass-Thru, establish a modem connection between the SPM PC and the control unit.

If the IS II/III PC does not respond to the Pass-Thru request from the control unit (for example, because the PC is turned off), you see the following message:

```
Pass-thru failed.
Please try again.
```


If the connection between the control unit and the IS II/III PC fails, the connection between the control unit and the SPM PC is dropped. You see the following message:

```
Pass-through Session
unexpectedly terminated.
Please press Enter
to continue.
```

When you press you return to the SPM Main Menu.

Follow the steps below to initiate the Pass-Thru.

- 1. At the SPM Main Menu press to select Pass-Thru.

SPM Main Menu	
Menu: Select Function	
Sys Program	Maintenance
Backup	Restore
Boards	Pass-Thru F8
Print Opts	Password
Monitor	Language

The display area changes to 24-lines by 80-characters, which is much larger than the display area on the console simulation window (7-lines by 24-characters).

- 2. Type your login name and press .

```
Welcome to
IS-II/III
```

```
login:
```

► 3. Type the IS II/III password and press .

Password:

► 4. Type *ams* for the terminal emulation type and press .

Unix disk usage
information

Term=

- If you are working with IS II, the IS II main menu appears.
- If you are working with IS III, the system prompts you for your login registration. After you enter your login and press , the IS III main menu appears.

► 5. To exit from IS II/III programming, press (Exit).

The system prompts you for confirmation that you want to exit. After confirmation the following message appears.

Returning to SPM

Password

The Password option is used by qualified service personnel to change the modem connection password. A password is always required to establish a connection with the built-in modem. The password always consists of seven characters. You can perform remote system programming only if you enter the password correctly. A default password is set at the factory. You must obtain this password from your system consultant (SC).

Follow the steps below to change the modem connection password.

- ▶

▶

- ▶

▶

If you type the old password incorrectly, the bottom of the screen displays the message **Not Equal**. Repeat Step 2. If you fail to enter the password correctly after three attempts, the bottom of the screen displays the message **Old Password in Use** and the procedure terminates. Press  to return to the SPM Main Menu.

- Password

Enter New Password

Enter New Password again

- **5. Press F5 to return to the SPM Main Menu.**

Print Options

The Print Opts option allows qualified service personnel to direct the output of system programming reports either to the PC (where you can save them, browse through them, or print them with the system programming Print option) or to the SMDR printer.

Follow the procedure below to direct the output of the system programming reports.

- 1. At the SPM Main Menu press **F4** to select Print Opts.

F4

SPM Main Menu	
Menu: Select Function	
Sys Program	Maintenance
Backup	Restore
Boards	Pass-Thru
Print Opts	Password
Monitor	Language

- 2. Select the target device for the reports.

F1

F2

Printer Options	
Make a selection	
SMDR Port	
PC Port	
Exit	

- 3. Press **F5** to return to the SPM Main Menu.

SMDR Port Output

See “Printing System Reports” in Chapter 3 for more information about the print procedure using the system console and the SMDR port.

PC Port Output

See [“Printing Reports”](#) for more information about the print procedure using SPM and the PC port.

Restore

The Restore option allows qualified service personnel to load system programming from either a diskette or from the hard disk into the processor module memory.

This procedure is used either to program a new system if a disk was created through surrogate mode programming, or to restore information (using a backup disk) lost through system failure. It is also part of the upgrade procedure.

Considerations

Review the following items before you begin the restore procedure.

- The system will be forced idle during a restore procedure.
- You must have a backup file containing system programming before you use this procedure. See [“Backup”](#).
- Features that were not programmed when the backup file was created are reset to factory defaults.
- The data restored reflects the number of extensions and lines available on the system at the time the backup was created. The remaining extensions and lines are set to the default values that are initialized during a Restart (cold start).

■ Restore is terminated under the following conditions:

If fewer boards are listed on the disk than on the control unit

If any real board is out of sequence with the boards listed on the disk

If phantom boards are not listed last

If the operating mode of the system being restored is Hybrid/PBX, but the control unit processor module has been modified to operate only in Key mode

■ A successful restore is followed automatically by a Restart (cold start)



WARNING:

An unsuccessful or terminated restore results in a System Erase (frigid start). All calls are dropped. The system configuration is erased. All system programming is lost and the system returns to the factory settings. If the restore is being done remotely, the connection is dropped immediately. If this happens, attempt to reconnect to the control unit and immediately perform another restore. If this is not successful, programming must be restored on site.

Follow the steps below to perform a restore.

► 1. At the SPM Main Menu, press **F7** to select Restore.

SPM Main Menu	
Menu: Select Function	
Sys Program	Maintenance
Backup	Restore
Boards	Pass-Thru
Print Opts	Password
Monitor	Language

F7

► 2. Follow the instructions for a floppy or a hard disk.

A second window appears which displays the GOTO FLOPPY option and a directory listing for C:\spm\backup.

- If you are performing a Restore with a file saved on a floppy disk, go to Step 3.
- If you are performing a Restore with a file saved on the hard disk, go to Step 4.

► **3. Use the arrow keys to highlight GOTO FLOPPY and press .**

```
Make a selection for
the RESTORE file.

If upgrading, convert
files before restoring.

Press ESC to Abort.
```

```
GOTO FLOPPY
backup.ams
file.1
file.2
```

After you press , the GOTO FLOPPY statement shown above changes to GOTO HARD DISK. Go to Step 5.

► **4. Specify the filename to restore from.**

- To select the default backup filename, use the arrow keys to highlight backup.ams and press  .
- If you used a different backup filename, use the arrow keys to select one of the other filenames and press .

If the file you select is not in the same format as the communications system, the screen below appears. Press **[Enter ↵]** to return to the SPM Main Menu. See [“Convert”](#) for details about converting a backup file.

```
File must be converted
before restoring.
```

```
Please press Enter
to see the main menu:
```

► **5. Observe the restore progress screen.**

```
Press CTRL-F5 to Abort
Est. total time: xx min
```

```
filename
```

```
RESTORE IN PROGRESS
```

```
Blocks Sent    Remaining
```

```
xxxx
```

```
xxxx
```

xx = approximate number of minutes

filename = name entered in Step 5

xxxx = number of blocks

To abort the restore press **[Ctrl]+[F5]**. You return to the SPM Main Menu.

► **6. When the restore completes, press **[Enter ↵]** to return to the SPM Main Menu.**

```
Restore successful.
```

```
Please press Enter
to see the Main Menu
```

```
Sent xxxx Blocks
```

xxxx = number of blocks sent

System Programming

A primary function of SPM is to provide a method for programming the communications system. The Sys Program option gives you access to all of the system programming features available from the system programming console.

Basic Programming Information

To begin programming, you must perform one of the following to display the System Programming menu on the console or PC:

On the console:

Menu→Sys Program →Exit

On the PC:

Type *spm*→ →*Press any key*→ →

In most cases, you can press Exit or 5 to exit from a screen without making any changes. Exceptions to this are noted as part of a procedure. When you complete a procedure and press Exit (), you usually move up one screen in the menu hierarchy. Occasionally, when you press Exit (), you return to the previous screen. *In a few cases*, pressing Exit brings you back to the System Programming menu where you can select another option to program or exit from system programming.

To complete a procedure and save the information you have programmed, press Enter ().

If you are programming a group of sequentially numbered extensions or trunks, you may have the option of pressing Next (). This saves your entry and automatically provides the number of the next extension or trunk in the sequence, thus saving you a couple of steps. If Next displays on the screen, you can use it with the current option.

In most cases, you will be at an intermediate step in the procedure you have just completed. At that point, you can select one of the options shown on the screen and continue programming, or you can press Exit () again. This

usually takes you back to the System Programming menu. If not, you again can continue programming on the current screen or press Exit (**F5**) again.

Idle States

A few of the programming procedures can be started only when the entire system or some part of it, such as a trunk or an extension, is idle (not in use). Some procedures require that the trunk or extension be idle only at the instant of programming. Other procedures, which take longer, require the system, trunk, or extension to be forced into remaining idle until programming is completed. These procedures wait for the system, trunk, or extension to become idle and then prevent the initiation of any new calls. This condition is called *forced idle*.

NOTE:

If a procedure requires an idle condition, perform the programming outside of normal business hours.

If a procedure requires that the system be in an idle state and the system is busy when you begin, you see the screen shown below.

System Busy Pls Wait

Dial Code: *nnnn*

Slot/Port: *ss/pp*

Exit

The screen changes to the appropriate programming screen when the system is no longer busy.

System Forced Idle

When the entire system is forced idle, no calls can be made or received. The procedures listed below can be performed only when the entire system (every line and every extension) is idle:

- Select system mode
- Identify system operator positions
- Renumber boards
- Renumber system
- Identify telephones with voice signal pairs for the Voice Announce to Busy feature
- Identify telephones that need the Simultaneous Voice and Data feature
- Restore system programming information
- Identify the Music On Hold jack

When the system is forced idle, the following occurs: multiline telephone users hear a reminder tone that indicates the telephone cannot be used; display telephone users see the message `Wait: System Busy`; single-line telephone users do not hear a dial tone.

Line or Trunk Idle

Since these procedures require the line or trunk to be idle *only* at the instant of programming, the line or trunk is not forced idle. The following procedures can be performed only when the line or trunk being programmed is idle:

- Identify loudspeaker paging line jack
- Assign trunks to pools
- Specify incoming or outgoing DID- or tie-trunk type
- Specify tie-trunk direction
- Specify tie-trunk E&M signal

Extension Forced Idle

When an extension or data terminal is forced idle, no calls can be made or received on that extension or data terminal. The following procedures can be performed only when the extension or data terminal being programmed is idle:

- Assign call restrictions
- Assign pool dial-out restrictions
- Copy extension assignments
- Assign lines, trunks, or pools to extensions
- Assign labels to a personal directory
- Use centralized telephone programming

When the extension is forced idle, the following occurs: multiline telephone users hear a reminder tone that indicates the telephone cannot be used; display telephone users see the message `wait: System Busy`; single-line telephone users do not hear a dial tone.

Forced Idle Reminder Tone

The forced idle reminder tone is a high-low “door-phone” tone—400 ms of 667 Hz tone followed by 400 ms of 571 Hz tone. The tone is provided under the following circumstances:

- At the extension, to remind the user that the system or the extension is in the forced idle state
- At the programming console or at a PC running SPM, to remind the system manager that the system (or at least one extension) is in the forced idle state because of administrative activity

In Release 1.1 and higher of the communications system, forced idle reminder tones occur every 20 seconds. You can adjust the volume of these tones with the volume control on the system console.

Accessing System Programming

Follow the steps below to access system programming.

- 1. At the SPM Main Menu press **F1** to select Sys Program.

F1

SPM Main Menu	
Menu: Select Function	
Sys Program	Maintenance
Backup	Restore
Boards	Pass-Thru
Print Opts	Password
Monitor	Language

- 2. Press the function key next to the option you want.

F1

F2

F3

F4

F5

System Programming: >	
Make a selection	
System	Extensions
SysRenumbr	Options
Operator	Tables
LinesTrunks	AuxEquip
Exit	NightSrvce

F6

F7

F8

F9

F10

F1

F2

F3

F4

F5

System Programming:	
Make a selection	
Labeling	Language
Data	
Print	
Cntr-Prg	
Exit	

F6

If the option you want does not appear on the first screen of the System Programming menu, press **PgUp** to display the second screen of the menu.

Printing Reports

Use the following procedure to print system reports using SPM at the PC. The SPM Print Opts must be set to PC Port. See ["Print Options"](#) for details about setting the printer output port.

- 1. At the second page of the System Programming menu, press **F3** to select Print.

	System Programming:	>
	Make a selection	
F1	Labeling	
F2	Data	
F3	Print	
F4	Cntr-Prg	
F5	Exit	

- 2. Press the function key that corresponds to the report to be printed.

	Print (English):	>
	Make a selection	
F1	All	Trunk Info F6
F2	SysSet-up	T1 Info F7
F3	Dial Plan	Pri Info F8
F4	Labels	RmoteAccess F9
F5	Exit	Oper Info F10

- **3. Use one of the methods shown after this procedure to print the report(s).**

```
Please enter file name
      to store print
(default is print.ams)

Press Esc to Abort.
```

```
LPT1:
GOTO FLOPPY
MAKE NEW FILE
PRINT.AMS
```

- **4. Observe the print status screen.**

```
Print in Progress ...

Exit
```

5

You can press **F5** to interrupt printing and return to the SPM Main Menu.

Print Hard Copy

To print a hard copy of the report, use the arrow keys to highlight LPT1: and press **Enter**.

Print to Hard Disk

To print the reports to the hard disk if the print file does not exist, use the arrow keys to highlight MAKE NEW FILE and press **Enter**.

- To save to the default print filename (print.ams), press **Enter**.

- To save to the filename of your choice, type `[filename]` and press `[Enter↵]`.

To print the reports to the hard disk if the print file already exists, use the arrow keys to highlight the `[filename]` and press `[Enter↵]`.

Print to Floppy Disk

Use the arrow keys to highlight `GOTO FLOPPY:` and press `[Enter↵]`. Use one of the methods shown below.

- To print the reports to a floppy disk if the print file does not exist, use the arrow keys to highlight `MAKE NEW FILE` and press `[Enter↵]`.
 - To save to the default print filename (`print.ams`), press `[Enter↵]`.
 - To save to the filename of your choice, type `[filename]` and press `[Enter↵]`.
- To print the reports to a floppy disk if the print file already exists, use the arrow keys to highlight the `[filename]` and press `[Enter↵]`.

Upgrading the System

WARNING:

The following procedures are to be used by qualified technicians or service personnel only. Installation or maintenance of this product by anyone other than qualified personnel may damage or impair the product; your limited warranty does not cover such damage. For details, see your limited warranty in the Customer Support Information in the back of this book. Hazardous electrical voltages are present inside this product.

This section describes upgrading your communications system to Release 5.0. You can use this procedure to perform the following upgrades:

- From Release 1.0 to Release 5.0
- From Release 1.1 to Release 5.0

- From Release 2.0 to Release 5.0
- From Release 2.1 to Release 5.0
- From Release 3.0 to Release 5.0
- From Release 3.1 to Release 5.0
- From Release 4.0 to Release 5.0
- From Release 4.1 to Release 5.0
- From Release 4.2 to Release 5.0

 NOTE:

You must have a version later than SPM 4.15 to upgrade from Release 3.1 to Release 4.0.

MERLIN II Communications System programming cannot be upgraded to this communications system. The new communications system must be completely reprogrammed.

Before You Begin

Before you begin the upgrade to Release 5.0, you will need the items listed below.

- SPM Version 5.15 or later to back up and convert system programming information and to restore system programming information after the processor module with PCMCIA memory card slot has been installed.
- One or both of the following:
 - Processor module with PCMCIA memory card slot (when converting from Release 2.1 or earlier).
 - A forced installation PCMCIA memory card with Release 5.0 system software (when converting from any release).
- DOS-formatted diskette

 NOTE:

If SPM is already installed, the welcome to SPM screen that appears when you start SPM identifies the version on both the last line of the console simulation window and in the upper left corner of the screen. If you are working with Version 5.15, v5 appears in the upper left-hand corner of the screen and Version 5.15 appears on the last line of the console simulation window.

Inter-Release Compatibility

It is important to understand compatibility between files created on each of the different versions of SPM, not only for upgrading but also for programming.

[Table 6](#) summarizes programming compatibility. (It is assumed that the majority of the programming is done in surrogate mode and backed up on disk).

Table 6. Programming Compatibility

SPM Version	Program Backup on	Restore on							
		1.0	1.1	2.0/2.1	3.0	3.1	4.0	4.1/4.2	5.0
1.13	1.0	yes	no	no	no	no	no	no	no
1.16	1.0	yes	yes	no	no	no	no	no	no
2.09	1.0	yes	yes	yes ¹	no	no	no	no	no
2.16	1.0	yes	yes	yes*	no	no	no	no	no
3.18	1.0	yes	yes	yes*	yes*	yes*	no	no	no
4.15	1.0	yes	yes	yes*	yes*	yes*	yes*	no	no
4.25	1.0	yes	yes	yes*	yes*	yes*	yes*	yes*	no
5.15	1.0	yes	yes	yes*	yes*	yes*	yes*	yes*	yes*
1.16	1.1	no	yes	no	no	no	no	no	no
2.09	1.1	no	yes	yes*	no	no	no	no	no
2.16	1.1	no	yes	yes*	no	no	no	no	no
3.18	1.1	no	yes	yes*	yes*	yes*	no	no	no
4.15	1.1	no	yes	yes*	yes*	yes*	yes*	no	no
4.25	1.1	no	yes	yes*	yes*	yes*	yes*	yes*	no
5.15	1.1	no	yes	yes*	yes*	yes*	yes*	yes*	yes*
2.09	2.0	no	no	yes	no	no	no	no	no
2.16	2.0	no	no	yes	no	no	no	no	no
3.18	2.0	no	no	yes	yes*	yes*	no	no	no
4.15	2.0	no	no	yes	yes*	yes*	yes*	no	no
4.25	2.0	no	no	yes*	yes*	yes*	yes*	yes*	no
5.15	2.0	no	no	yes*	yes*	yes*	yes*	yes*	yes*

1. The backup file must be converted before it is restored.

Table 6. Programming Compatibility – Continued

SPM Version	Program Backup on	Restore on							
		1.0	1.1	2.0/2.1	3.0	3.1	4.0	4.1/4.2	5.0
2.16	2.1	no	no	no	no	no	no	no	no
3.18	2.1	no	no	no	yes*	yes*	no	no	no
4.15	2.1	no	no	no	yes*	yes*	yes*	no	no
4.25	2.1	no	no	no	yes*	yes*	yes*	yes*	no
5.15	2.1	no	no	no	yes*	yes*	yes*	yes*	yes*
3.18	3.0	no	no	no	no	no	no	no	no
4.15	3.0	no	no	no	no	no	yes*	no	no
4.25	3.0	no	no	no	no	no	yes*	yes*	no
5.15	3.0	no	no	no	no	no	yes*	yes*	yes*
3.18	3.1	no	no	no	no	no	no	no	no
4.15	3.1	no	no	no	no	no	yes ¹	no	no
4.25	3.1	no	no	no	no	yes*	yes*	yes*	no
5.15	3.1	no	no	no	no	yes*	yes*	yes*	yes*
4.15	4.0	no	no	no	no	no	yes	no	no
4.25	4.0	no	no	no	no	no	yes*	yes*	no
5.15	4.0	no	no	no	no	no	yes*	yes*	yes*
4.25	4.1/4.2	no	no	no	no	no	no	yes*	no
5.15	4.1/4.2	no	no	no	no	no	no	yes*	yes*
5.15	5.0	no	no	no	no	no	no	no	yes*

1. The backup file must be converted before it is restored.

NOTE:

The default barrier code and any programmed barrier codes from Release 2.1 and earlier are carried over to Release 3.0 and later with no change and the barrier code length is four (4). It is the responsibility of the system manager to change the barrier code length and the barrier codes if so desired.

Upgrade Procedure

➡ NOTE:

The system upgrade procedure must follow the order of the steps shown below.

▶ 1. Install SPM.

To upgrade the system to Release 5.0, you need to install (or upgrade to) Version 5.15 of SPM. See [“Initializing the SPM Software”](#).

▶ 2. Back up your system programming.

This step creates a file containing system programming information. See [“Backup”](#).

▶ 3. Turn off AC power switches on the control unit in the following order:

- (1) Basic carrier
- (2) Expansion carrier 1, if present
- (3) Expansion carrier 2, if present

▶ 4. Replace the processor module (when upgrading from Release 2.1 and earlier).

- a. Unplug the interface cords from the SPM and SMDR printer ports on the processor module.
- b. Remove the processor module from Slot 0.
- c. Install the Release 4.0 processor module in Slot 0.
- d. Plug the interface cords into the SPM and SMDR printer ports on the processor module.

▶ 5. Insert the forced installation memory card into the PCMCIA interface slot on the processor module.

► **6. Turn on the AC power switches on the control unit in the following order:**

- (1) Expansion carrier 2, if present
- (2) Expansion carrier 1, if present
- (3) Basic carrier

► **7. Convert your backup file to Release 4.0 format.**

This procedure converts the backup file created in Step 2. See [“Convert”](#).

► **8. Restore your system programming.**

The system is forced idle and cannot be used during this procedure. See [“Restore”](#).

► **9. Program new features.**

If you wish to use the factory defaults for the new features available with Release 4.0, skip this step.

► **NOTE:**

After upgrading to Release 3.0 or 4.0 from Release 1.0, 1.1, 2.0, or 2.1 some programming will be lost. You must reprogram the following:

- Authorization Codes
Extensions→**More**→AuthCode
- SMDR Account Code Format
Options→SMDR→AuthCode
- Inter-digit Timers
Options→**More**→Interdigit

See Tables [7](#) through [14](#) which follow this procedure.

- [Table 7](#). Lists the features added with Release 1.1 of the communications system.

- [Table 8](#). Lists the features added with Release 2.0 or 2.1 of the communications system.
- [Table 9](#). Lists the features added with Release 3.0 of the communications system.
 - When you upgrade from Release 2.0 or 2.1 to Release 3.0, you must program these features as the last step of the upgrade procedure.
 - When you upgrade from Release 1.1 to Release 3.0, you must program the features listed in [Table 8](#), then the features listed in [Table 9](#).
 - When you upgrade from Release 1.0 to Release 3.0, you must first program the features listed in [Table 7](#), then the features listed in [Table 8](#), then the features listed in [Table 9](#).
- [Table 10](#). Lists the features added with Release 3.1 of the communications system.
 - When you upgrade from Release 3.0 to Release 3.1, you must program these features as the last step of the upgrade procedure.
 - When you upgrade from Release 2.0 or 2.1 to Release 3.1, you must program the features listed in [Table 9](#), then the features listed in [Table 10](#).
 - When you upgrade from Release 1.1 to Release 3.1, you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#).
 - When you upgrade from Release 1.0 to Release 3.1, you must first program the features listed in [Table 7](#), then the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#).
- [Table 11](#). Lists the features added with Release 4.0 of the communications system.
 - When you upgrade from Release 3.1 to Release 4.0, you must program these features as the last step of the upgrade procedure.

- When you upgrade from Release 3.0 to Release 4.0, you must program the features listed in [Table 10](#), then the features listed in [Table 11](#).
- When you upgrade from Release 2.0 or 2.1 to Release 4.0, you must program the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#).
- When you upgrade from Release 1.1 to Release 4.0, you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#).
- When you upgrade from Release 1.0 to Release 4.0, you must first program the features listed in [Table 7](#), then the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#).
- [Table 12](#). Lists the features added with Release 4.1 of the communications system.
 - When you upgrade from Release 4.0 to Release 4.1, you must program the features listed in [Table 12](#).
 - When you upgrade from Release 3.1 to Release 4.1, you must program the features listed in [Table 11](#), then the features listed in [Table 12](#).
 - When you upgrade from Release 3.0 to Release 4.1, you must program the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#).
 - When you upgrade from Release 2.0 or 2.1 to Release 4.1, you must program the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#).
 - When you upgrade from Release 1.1 to Release 4.1, you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#).

- When you upgrade from Release 1.0 to Release 4.1, you must first program the features listed in [Table 7](#), then you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#).
- [Table 13](#). Lists the features added with Release 4.2 of the communications system.
 - When you upgrade from Release 4.1 to Release 4.2, you must program the features listed in [Table 13](#).
 - When you upgrade from Release 4.0 to Release 4.2, you must program the features listed in [Table 12](#), then the features listed in [Table 13](#), then the features listed in [Table 14](#).
 - When you upgrade from Release 3.1 to Release 4.2, you must program the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#).
 - When you upgrade from Release 3.0 to Release 4.2, you must program the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#).
 - When you upgrade from Release 2.0 or 2.1 to Release 4.2, you must program the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#).
 - When you upgrade from Release 1.1 to Release 4.2, you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#).

- When you upgrade from Release 1.0 to Release 4.2, you must first program the features listed in [Table 7](#), then you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#).
- [Table 14](#). Lists the features added with Release 5.0 of the communications system.
 - When you upgrade from Release 4.2 to Release 5.0, you must program the features listed in [Table 14](#).
 - When you upgrade from Release 4.1 to Release 5.0, you must program the features listed in [Table 13](#), then the features listed in [Table 14](#).
 - When you upgrade from Release 4.0 to Release 5.0, you must program the features listed in [Table 12](#), then the features listed in [Table 13](#), then the features listed in [Table 14](#).
 - When you upgrade from Release 3.1 to Release 5.0, you must program the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#), then the features listed in [Table 14](#).
 - When you upgrade from Release 3.0 to Release 5.0, you must program the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#), then the features listed in [Table 14](#).
 - When you upgrade from Release 2.0 or 2.1 to Release 5.0, you must program the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#), then the features listed in [Table 14](#).

- When you upgrade from Release 1.1 to Release 5.0, you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#), then the features listed in [Table 14](#).
- When you upgrade from Release 1.0 to Release 5.0, you must first program the features listed in [Table 7](#), then you must program the features listed in [Table 8](#), then the features listed in [Table 9](#), then the features listed in [Table 10](#), then the features listed in [Table 11](#), then the features listed in [Table 12](#), then the features listed in [Table 13](#), then the features listed in [Table 14](#).

Table 7. Programming Needed after Upgrade to Release 1.1

Feature	Sequence
System language	SysProgram→ More →Language→SystemLang
Extension language	SysProgram→ More →Language→Extensions
SMDR language	SysProgram→ More →Language→SMDR
Printer language	SysProgram→ More →Language→Printer

Table 8. Programming Needed after Upgrade to Release 2.0

Feature	Sequence
Primary Rate	SysProgram→LinesTrunks→LS/GS/DS1→Type→PRI
Interface (PRI)	SysProgram→LinesTrunks→LS /GS/DS1→FrameFormat SysProgram→LinesTrunks→LS/GS/DS1→Suppression SysProgram→LinesTrunks→PRI→PhoneNumber SysProgram→LinesTrunks→PRI→B-ChannlGrp SysProgram→LinesTrunks→PRI→NumbrToSend SysProgram→LinesTrunks→PRI→Test TelNum SysProgram→LinesTrunks→PRI→Protocol SysProgram→LinesTrunks→PRI→DialPlanRtg SysProgram→LinesTrunks→PRI→OutgoingTbl SysProgram→Tables→ARS
DID Emulation on T1	SysProgram→LinesTrunks→LS/GS/DS1→Type→ More →DID/All DID
Night Service Calling Group	SysProgram→NightSrvce→GroupAssign→Calling Group
Coverage VMS Off	SysProgram→ More →Cntr-Prg→Program Ext
Data Status	SysProgram→ More →Cntr-Prg→Program Ext
Extension Copy	SysProgram→ More →Cntr-Prg→Copy Ext
Posted Message button on analog multiline and MLX-10 non-display telephones (for use with Do Not Disturb)	SysProgram→ More →Cntr-Prg→Program Ext

Table 9. Programming Needed after Upgrade to Release 3.0

Feature	Sequence
Automatic Backup	SysProgram→System→Back/Restore→Auto Backup
Incoming Call Line Identification Delay	LinesTrunks→ More →LS-ID Delay→ Drop →Dial trunk no.→Enter
Remote Access Barrier Codes	LinesTrunks→RemoteAccss→BarrierCode→Code Info→Code Length LinesTrunks→RemoteAccss→BarrierCode→Code Info→Code Entry
Authorization Codes	Extensions→ More →Auth Code

Table 10. Programming Needed after Upgrade to Release 3.1

Feature	Sequence
Trunk-to-Trunk Transfer	Extensions→ More → More →TrkTransfer→Toggle LED On/Off or Dial ext. no.→Enter→Exit→Exit
Second Dial Tone Timer	Options→ More →SecDT→dial second dial tone timer value→Enter

Table 11. Programming Needed after Upgrade to Release 4.0

Feature	Sequence
Delayed Call Forwarding	Extensions→ More →Delay Frwd→ Dial ext. no. →Enter→Dial no. of delay rings→Enter
Group Calling Overflow and Thresholds	Extensions→ More →Grp Calling→Overflow→Dial calling group ext. no.→Enter→Dial ext. no.→Enter→Number Based Overflow→ Drop →Dial no. of calls→Enter→Time Based Overflow→ Drop →Dial no. of seconds→Enter
Voice Announce on a QCC	Operator→Queued Call→ More →Voice Annc→Enabled or Disabled→Enter
2B Data	Data→2B Data→Dial adjunct ext. no.→Enter
Basic Rate Interface (BRI)	LinesTrunks→ More →BRI→SPID/DN.→Dial line/trunk no.→Enter→ Drop →Dial SPID→Enter→ Drop →Dial DN→Enter LinesTrunks→ More →BRI→Timers→Select timer→ Drop →Dial no. of seconds or ms→Enter
Clock Synchronization	LinesTrunks→ More →ClockSync→Primary→ Drop →Dial slot no.→Enter→Dial port no. OR Select source of synchronization→Enter→Secondary→Dial slot no.→Enter→Dial port no. OR Select source of synchronization→Enter→Tertiary→dial slot no.→Enter→Dial port no. OR Select source of synchronization→Enter
Ringing Frequency (016 module)	Options→ More →Ringing Freq→dial slot no.→Select 20Hz or 25Hz→Enter

Table 12. Programming Needed after Upgrade to Release 4.1

Feature	Sequence
Group Coverage Ring Delay	SysProgram→Extensions→ More → More →Cover Delay→ Group Cover→sender's extension→number of rings→Enter
Primary Cover Ring Delay	SysProgram→Extensions→ More → More →Cover Delay→ Primary→sender's extension→number of rings→Enter
Secondary Cover Ring Delay	SysProgram→Extensions→ More → More →Cover Delay→Secondary→sender's extension→number of rings→Enter
Night Service Group Line Assignment	SysProgram→NightSrvce→GroupAssign→Lines→ Night Service attendant position number→Enter→line number→Enter
Night Service Coverage Control	SysProgram→NightSrvce→CoverContrl→Enable or Disable→Enter
Board Renumber	System→Board Renum→Yes

(When an 012 module is replaced by an 016 module)

Continued on next page

Table 12. Programming Needed after Upgrade to Release 4.1 – Continued

Feature	Sequence
Switched 56 Data	To select T1- All Tie: Switched 56 Data: LinesTrunks→LS/GS/DS1→Dial slot no.→Enter→Type→T1→Enter→All TIE→Enter→S56→Enter→Dial channel no.→Enter→Exit→Exit→Exit→Exit To select T1- Tie: Switched 56 Data: LinesTrunks→LS/GS/DS1→Dial slot no.→Enter→Type→T1→Enter→TIE→Enter→S56→ Enter→Dial channel no.→Enter→Exit→Exit→Exit→Exit To select T1-All :Switched 56 Data: LinesTrunks→LS/GS/DS1→Dial slot no.→Enter→Type→T1→Enter→More→ALL S56 Data→Enter→Select Direction, Intype, Outtype, AnsSupv, Disconnect, Inmode, or Outmode→Program options→Enter→Exit→Exit→Exit→Exit To select T1:Switched 56 Data: LinesTrunks→LS/GS/DS1→Dial slot no.→Enter→Type→T1→Enter→More→S56 Data→Enter→Dial channel no.→Enter→Select Direction, Intype, Outtype, AnsSupv, Disconnect, Inmode, or Outmode→Program options→Enter→Exit→Exit→Exit→Exit

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Table 12. Programming Needed after Upgrade to Release 4.1 – Continued

Switched 56 Data Network Dial Plan Routing	To specify Expected Digits: LinesTrunks→MORE→T1 Data NW→S56 Dial Plan Routing→Expected Digits→Drop→Dial expected digits→Enter→Exit→Exit→Exit To specify Delete Digits: LinesTrunks→MORE→T1 Data NW→S56 Dial Plan Routing→Delete Digits→Drop→Dial delete digits→Enter→Exit→Exit→Exit To specify Add Digits: LinesTrunks→MORE→T1 Data NW→S56 Dial Plan Routing→Add Digits→Drop→Dial add digits→Enter→Exit→Exit→Exit

Table 13. Programming Needed after Upgrade to Release 4.2

Feature	Sequence
SMDR Talk Time	Options→SMDR→Talk Time→Enable or Disable →Enter→Exit→Exit
PRI Switch Types	To select the Nortel DMS-250 for MCI services: SysProgram→Exit→LinesTrunks→PRI→SwitchType →Slot Number→Enter→DMS-250→Enter To select the Digital Switch Corporation DEX600E for MCI services: SysProgram→Exit→LinesTrunks→PRI→SwitchType →Slot Number→Enter→DEX600E→Enter To select the Nortel DMS-100 for local exchange carrier services: SysProgram→Exit→LinesTrunks→PRI→SwitchType →Slot Number→Enter→DMS-100→Enter

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Table 13. Programming Needed after Upgrade to Release 4.2 – Continued

PRI Network Service	To select MCI Toll services for a DMS-250 or DEX600E switch type: SysProgram→Exit→LinesTrunks→PRI→B-ChannlGrp→NetworkServ→B-Channel group number→Enter→MCI Toll→MCI PRISM or MCI VNET or MCI 800 or MCI 900→Enter To select local exchange carrier services for a DMS-100 switch type: SysProgram→Exit→LinesTrunks→PRI→B-ChannlGrp→NetworkServ→B-Channel group number→Enter→DMS-100Local→DMS-Private or DMS-INWATS or DMS-OUTWATS or DMS-FX or DMS-TieTrk→Enter
PRI Dial Plan Routing	To specify MCI Toll Dial Plan Routing services for a DMS-250 or DEX600E switch type: SysProgram→Exit→LinesTrunks→PRI→DialPlanRtg→Service→Entry number→Enter→MCI Toll→MCI PRISM or MCI VNET or MCI 800 or MCI 900→Enter To specify local exchange carrier Dial Plan Routing services for a DMS-100 switch type: SysProgram→Exit→LinesTrunks→PRI→DialPlanRtg→Service→Entry number→Enter→DMS-100Local→DMS-Private or DMS-INWATS or DMS-OUTWATS or DMS-FX or DMS-TieTrk→Enter
PRI Call-by-Call Services Table	To select MCI Toll Call-by-Call Services for a DMS-250 or DEX600E switch type: SysProgram→Exit→LinesTrunks→PRI→OutgoingTbl→CBC Service→NetworkServ→List number→Enter→MCI Toll→MCI PRISM or MCI VNET→Enter To specify local exchange carrier Dial Plan Routing services for a DMS-100 switch type: SysProgram→Exit→LinesTrunks→PRI→OutgoingTbl→CBC Service→NetworkServ→List number→Enter→DMS-100Local→DMS-Private or DMS-OUTWATS or DMS-FX or DMS-TieTrk→Enter

Table 14. Programming Needed after Upgrade to Release 5.0

Feature	Sequence
CTI Link	Busy out the board first:* Menu→Maintenance→Slot→Dial the slot no.→Enter→Busy-Out→Yes * This is a Maintenance step. Start the procedure from the main menu, not the System Programming screen. Program the CTI Link (Note: The switch must be in Hybrid/PBX mode): AuxEquip→CTI Link→Dial extension number→Enter→Exit→Exit Restore the slot:* Menu→Maintenance→Slot→Dial the slot no.→Enter→Restore→Yes * This is a Maintenance step. Start the procedure from the main menu, not the System Programming screen.
 NOTE: If the MLX module containing the CTI Link is the first module, use the SPM program to busy-out the slot.	
Calling Group Alarm Thresholds	Extensions→More→Grp Calling→Queue Alarm→Dial calling group ext. no.→Enter→Alarm Threshold 1 or Alarm Threshold 2 or Alarm Threshold 3→Drop→Dial no. of calls→Enter→Exit→Exit
HotLine	Extensions→More→More→HotLine→Enter HotLine extension→Enter→Exit→Exit
Calling Group Hunt Type	Extensions→More→Grp Calling→Hunt Type→Dial calling group ext. no.→Enter→Circular, Linear, or Most Idle→Enter→Exit→Exit→Exit
Group Calling Delay Primary Announcement	Extensions→More→Grp Calling→DelayAnnce→Dial calling group ext. no.→Enter→Primary Announcement→Enter Exstension number of Announcent device→Enter (to program another Announcement device) or Exit (to end procedure)→Exit

Continued on next page

Table 14. Programming Needed after Upgrade to Release 5.0 – Continued

Feature	Sequence
Group Calling Delay Secondary Announcement	Extensions→ More →Grp Calling→DelayAnnce→Dial calling group ext. no.→Enter→Secondary Announcement →Enter Exstenion number of Announcent device→Enter →Exit→Exit
Group Calling Announcement Interval	Extensions→ More →Grp Calling→DelayAnnce→Dial calling group ext. no.→Enter→Announcement Interval→Enter Announcent Interval in seconds→Enter→Exit→Exit
Group Calling Repeat Announcement	Extensions→ More →Grp Calling→DelayAnnce→Dial calling group ext. no.→Enter→Repeat Announcement→Yes or No→Enter→Exit→Exit

Surrogate Mode Programming

Surrogate mode allows qualified service personnel to perform system programming at an off-site service location. The actual communications system hardware does not have to be installed—the programmer needs only a direct connection from the PC to the processor module. By following a customer's set of completed planning forms, the system can be programmed as if the appropriate modules, trunks, and telephones have been installed. When system programming is completed, a system backup is performed to save the information on disk. This backup disk is then taken to the new installation site and used with the Restore option to provide complete system programming for a new communications system.

You do not “select” surrogate mode programming—you enter it automatically under the following conditions:

- The PC is connected to the lower RS-232 port on a control unit (direct local connection).
- Only the processor and power modules are connected.

Once you enter surrogate mode programming, you must follow the sequence of procedures shown below.

- At the service location, perform the following:
 1. System Erase
 2. Program the Boards
 3. System Programming
 4. Backup
- At the installation site, perform a Restore.

While you are in surrogate mode, the Pass-Thru and Password options are not available.

 NOTE:

Surrogate mode is available only through the local programming port. You cannot access surrogate features through the system programming console.

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