



AT&T 555-640-140
March 1996

MERLIN LEGEND®
Communications
System
Releases 3.1
and 4.0

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. AT&T 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. AT&T 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."

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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."

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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.

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For more information about AT&T documents, refer to the section entitled, "Related Documents" in "*About This Book*."

Support Telephone Number

In the continental U.S., AT&T provides a toll-free customer helpline 24 hours a day. Call the AT&T Helpline at **1 800 628-2888** or your AT&T authorized dealer if you need assistance when installing, programming, or using your system. Outside the continental U.S., contact your local AT&T authorized representative.

AT&T Corporate Security

Whether or not immediate support is required, *all* toll fraud incidents involving AT&T products or services *should be reported* to AT&T Corporate Security at **1 800 821-8235**. In addition to recording the incident, AT&T Corporate Security is available for consultation on security issues, investigation support, referral to law enforcement agencies, and educational programs.

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If you *suspect you are being victimized* by toll fraud and you need technical support or assistance, call GBCS National Service Assistance Center at **1 800 628-2888**.

Warranty

AT&T provides a limited warranty on this product. Refer to "Limited Warranty and Limitation of Liability" in Appendix A, "Customer Support Information," which follows *Maintenance and Troubleshooting* in this binder.

Contents

About This Book

■ Intended Audience	xix
■ How to Use This Book	xix
■ Terms and Conventions Used	xxi
■ Product Safety Labels	xxii
■ Security	xxiii
■ Related Documents	xxiv
■ How to Comment on This Document	xxv

1 Introduction

■ Installation Sequence	1-1
■ System Forms	1-2
■ Programming the System	1-4
■ Upgrading the System	1-5

2 Installing the Control Unit

■ Overview	2-1
■ AC Power and Grounding	2-5
■ Unit Loads	2-16
■ Installing the Basic Carrier	2-17
■ Installing the Power Supply	2-19
■ Installing the Auxiliary Power Unit	2-25

Contents

Installing the Control Unit, *Continued*

- Installing Expansion Carriers 2-27
- Installing the Processor 2-29
- Installing the Modules 2-32
- Replacing a Module 2-40
- Connecting the Control Unit to an AC Outlet 2-43
- Powering Up the System 2-44
- Powering Down the System 2-45

3 Installing Telephones and Adjuncts

- Installing Multi-Function Modules 3-1
- Installing Adjuncts 3-22
- Installing Direct Station Selectors 3-43
- Assembling MLX Telephones 3-48
- Installing Cordless or Cordless/Wireless Telephones 3-57
- Connecting Telephones to the Control Unit 3-58

4 Connecting the Control Unit to the Network Interface

- Wiring 4-2
- Testing Trunks 4-12
- Labeling Trunks 4-14
- Installing the Channel Service Unit 4-15

Contents

5 Installing the PC, CAT, or Printer

- Connecting a PC to the Control Unit 5-1
 - Connecting a CAT to the Control Unit 5-7
 - Connecting a Printer to the Control Unit 5-7
-

6 Connecting Data Equipment

- Data Stations 6-1
 - Analog Voice and Modem Data Stations 6-5
 - Modem Data-Only Stations 6-8
 - MLX Voice and Modem Data Stations 6-10
 - MLX Voice and Terminal Adapter Data Stations 6-12
 - Terminal Adapter Data-Only Stations 6-14
 - Video Conferencing Data Stations 6-17
-

7 Initializing and Testing the System

- Initializing the System 7-1
- Setting the Time and Date 7-3
- Testing the System 7-3
- Installing the Control Unit's Housing 7-20

Contents

8 Installing Applications

- Voice Messaging Systems and Touch-Tone Receivers 8-2
- Automated Document Delivery System 8-4
- Call Accounting System 8-5
- Call Accounting Terminal 8-8
- Call Management System 8-9
- CONVERSANT 8-12
- Integrated Solution III 8-14
- AT&T Attendant 8-17
- MERLIN MAIL 8-18
- MERLIN PFC 8-21
- PassageWay Direct Connect Solution 8-23
- System Programming and Maintenance (SPM) 8-25

9 Upgrading the System

- Backing up System Programming 9-2
- Removing the Control Unit Housing 9-3
- Powering Down the System 9-5
- Upgrading the Control Unit 9-7
- Modifying the Processor for Key Mode 9-12
- Completing the Upgrade 9-16
- Upgrading from the MERLIN II Communications System 9-16
- Replacing the Control Unit Housing 9-18

Contents

A System Numbering Forms

Form 2a, System Numbering: Extension Jacks	A-2
Form 2b, System Numbering: Digital Adjuncts	A-4
Form 2c, System Numbering: Line/Trunk Jacks	A-5
Form 2d, System Numbering: Special Renumbers	A-6

B Unit Load Calculation Worksheet

Unit Load Worksheet	B-2
---------------------	-----

Index

IN-1

Figures

2	Installing the Control Unit	
2-1.	AC Grounding Requirements	2-7
2-2.	Measuring the AC Outlet Voltages	2-9
2-3.	Central Office and AC Grounds	2-11
2-4.	Installing 146A and 147A Protectors	2-15
2-5.	Marking the Basic Carrier Screw Holes	2-18
2-6.	Installing a Copper Shield in the Power Supply	2-22
2-7.	Installing the Ferrite Cores	2-24
2-8.	Installing an Auxiliary Power Unit	2-26
2-9.	Connecting the Carriers	2-28
2-10.	Installing the Processor into the Carrier	2-31
2-11.	400EM Module Sample Dip Switch Settings for Signaling Types 1C and 5	2-37
2-12.	Line/Trunk and Telephone Jack Locations on Each Module	2-39
2-13.	Removing Modules from the Carrier	2-42
3	Installing Telephones and Adjuncts	
3-1.	Multi-Function Module Packing List	3-3
3-2.	Removing the User Card Tray and Line Cable	3-4
3-3.	Releasing the Deskstand	3-5
3-4.	Removing the Deskstand	3-6
3-5.	Releasing the Module Cover Screw	3-7
3-6.	Releasing the Module Cover	3-8
3-7.	Removing the Module Cover	3-9
3-8.	Removing an MFM Module	3-10

Figures

Installing Telephones and Adjuncts, *Continued*

3-9.	Installing an MFM Module	3-11
3-10.	Setting and Adjusting the MFM Jumpers	3-12
3-11.	Removing the Jack Guard	3-13
3-12.	Placing the Module Cover into the Locating Slot	3-14
3-13.	Lowering and Locking the Module Cover	3-15
3-14.	Replacing and Tightening the Module Cover Screw	3-16
3-15.	Replacing the Deskstand	3-17
3-16.	Lowering the Deskstand and Locking into Place	3-18
3-17.	Replacing the User Card Tray and Line Cable	3-19
3-18.	Adjusting the Deskstand Height	3-20
3-19.	Powering Up the Telephone after Installing the MFM	3-21
3-20.	Routing the Cord(s) Through the Cord Channel	3-23
3-21.	Manual and One-Touch Headset Operation	3-29
3-22.	Single-Zone Paging with PagePac Plus	3-31
3-23.	Single-Zone Paging with Customer-Supplied Amplifier	3-32
3-24.	Single-Zone Paging with UPAM	3-33
3-25.	Single-Zone Paging with Background Music and Magic on Hold	3-36
3-26.	Multizone Paging with Background Music, Magic on Hold, and Bidirectional Paging (Talk-Back)	3-37
3-27.	Installing the Supplemental Alert Adapter	3-39
3-28.	Connecting One or More DSSs	3-45
3-29.	Wiring for Auxiliary Power	3-46
3-30.	Adjusting or Removing the Deskstand	3-49
3-31.	Connecting the Line Cords	3-50
3-32.	Removing the Extension Label	3-51

Figures

Installing Telephones and Adjuncts, *Continued*

3-33. Labeling the Extension	3-52
3-34. Removing the Handset Holder	3-53
3-35. Rotating the Handset Holder	3-53
3-36. Replacing the Extension Label	3-54
3-37. Mounting the Backplate	3-55
3-38. Routing the Cord Through the Backplate	3-56
3-39. Connecting Two Voice Pairs to a Telephone Using a Bridging Adapter (BR-241-B1)	3-61
3-40. Removing the Connecting Block	3-63

4 Connecting the Control Unit to the Network Interface

4-1. RJ21X Network Interface Connector	4-5
4-2. RJ21X Wiring Field Hardware	4-6
4-3. RJ21X Wiring Field Tools	4-7
4-4. Using the D-Impact Tool to Seat the Conductors	4-8
4-5. RJ11 and RJ14 Interfaces	4-10
4-6. 3150 Front Panel	4-17
4-7. 3150 Back Panel	4-17

Figures

5 Installing the PC, CAT, or Printer

5-1.	Connecting a PC Within 50 ft. (15.2 m)	5-3
5-2.	Connecting a PC More Than 50 ft. (15.2 m) Away	5-6
5-3.	Connecting a CAT and Printer on the Same AC Outlet	5-10
5-4.	Connecting a CAT and Printer on Different AC Outlets: Control Unit Connections	5-13
5-5.	Connecting a Printer Within 50 ft. (15.2 m)	5-16
5-6.	Connecting a Printer More Than 50 ft. (15.2 m) Away	5-19
5-7.	Connecting the 248B Adapter and the 2012D Transformer	5-20

6 Connecting Data Equipment

6-1.	Analog Voice and Modem Data Equipment Configuration	6-7
6-2.	Modem Data-Only Equipment Configuration	6-9
6-3.	Modem Data and MLX Voice Equipment Configuration	6-10
6-4.	MLX Voice and Terminal Adapter Data Equipment Configuration	6-13
6-5.	Terminal Adapter Data-Only Equipment Configuration	6-16
6-6.	Video Conferencing Configuration	6-19

Figures

7 Initializing and Testing the System

- | | | |
|------|---|------|
| 7-1. | Ground-Start Button | 7-18 |
| 7-2. | Installing the Control Unit Top Cover | 7-21 |
| 7-3. | Installing the Control Unit Front Cover | 7-22 |
-

9 Upgrading the System

- | | | |
|------|---|------|
| 9-1. | Removing the Control Unit Housing | 9-4 |
| 9-2. | Powering Down the System | 9-6 |
| 9-3. | Removing a Module from the Carrier | 9-9 |
| 9-4. | Replacing a Module in the Carrier | 9-11 |
| 9-5. | Removing the Processor Module Cover | 9-13 |
| 9-6. | Removing the Processor Module Circuit Board | 9-14 |
| 9-7. | Changing the Key Mode Switch Position to Closed | 9-15 |
| 9-8. | Installing the Control Unit Housing | 9-18 |
-

A System Numbering Forms

- | | | |
|------|--|-----|
| A-1. | Form 2a, System Numbering: Extension Jacks | A-2 |
| A-2. | Form 2b, System Numbering: Digital Adjuncts | A-4 |
| A-2. | Form 2c, System Numbering: Line/Trunk Jacks | A-5 |
| A-4. | Form 2d, System Numbering: Special Renumbers | A-6 |

Tables

2 Installing the Control Unit

2-1.	Environmental Requirements	2-2
2-2.	AC Power Requirements	2-8
2-3.	Heavy Lightning Protection	2-14
2-4.	Setting the 400EM (Tie Trunk) Module DIP Switches	2-35
2-5.	Signaling Formats for the 400EM (Tie Trunk) Module	2-36

3 Installing Telephones and Adjuncts

3-1.	Unsupported Telephones and Adjuncts	3-40
3-2.	Single-Line Telephones	3-41
3-3.	Single-Line Telephones Supported by Release 3.0 and Later	3-42

4 Connecting the Control Unit to the Network Interface

4-1.	Network Interfaces	4-2
4-2.	Central Office Network Interface Codes	4-3

Tables

5 Installing the PC, CAT, or Printer

5-1.	AT&T 572 Printer Options	5-22
5-2.	AT&T 475/476 Printer DIP Switch Settings	5-24
5-3.	AT&T CAT Printer DIP Switch Settings	5-25

6 Connecting Data Equipment

6-1.	Data Station Configurations	6-2
6-2.	Terminal Adapter Settings	6-21

8 Installing Applications

8-1.	TTRs Required by VMS	8-3
8-2.	MERLIN MAIL Ports Required	8-19



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.

IMPORTANT SAFETY INSTRUCTIONS

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 AT&T-manufactured MERLIN LEGEND Communications System circuit modules, carrier assemblies, and power units in the MERLIN LEGEND Communications System control unit.
- Use only AT&T-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 is intended for qualified field technicians who install and upgrade the system.

How to Use This Book

Qualified technicians can use this book as a guide to installation and upgrading procedures. The technician is given specific steps for installing all units of the control unit, telephones, adjuncts and data equipment.

Refer to the following documentation for additional information:

- *Equipment and Operations Reference* provides detailed information on system hardware, telephones, and other equipment.
- *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 U.S.A. only, AT&T provides a toll-free customer Helpline (1 800 628-2888) 24 hours a day. Call the Helpline, or your AT&T 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 what 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 toll fraud security hazard. Toll fraud is the unauthorized use of your telecommunications system by an unauthorized party (e.g., 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 AT&T GBCS Publications Fulfillment Center by calling 1 800 457-1235.

Document No.	Title
	System Documents
555-640-110	<i>Feature Reference</i>
555-640-111	<i>System Programming</i>
555-640-112	<i>System Planning</i>
555-640-113	<i>System Planning Forms</i>
555-640-116	<i>Pocket Reference</i>
555-640-118	<i>System Manager's Guide</i>
	Telephone User Support
555-640-122	<i>MLX-10D™, MLX-10DP™, MLX-16DP™, MLX-28D™, and MLX-20L™ Display Telephones User's Guide</i>
555-630-150	<i>MLX-10D Display Telephone Tray Cards (5 cards)</i>
555-630-153	<i>MLX-28D and MLX-20L Telephone Tray Cards (5 cards)</i>
555-640-124	<i>MLX-10™ Nondisplay Telephone User's Guide</i>
555-630-151	<i>MLX-10 Nondisplay Telephone Tray Cards (6 cards)</i>
555-640-120	<i>Analog Multiline Telephones User's Guide</i>
555-640-126	<i>Single-Line Telephones User's Guide</i>
555-640-138	<i>MDC 9000 and MDW 9000 Telephones User's Guide</i>
	System Operator Support
555-640-134	<i>MLX Direct-Line Consoles Operator's Guide</i>
555-640-132	<i>Analog Direct-Line Consoles Operator's Guide</i>
555-640-136	<i>MLX Queued Call Console Operator's Guide</i>
	Miscellaneous User Support
555-640-130	<i>Calling Group Supervisor's Guide</i>
555-640-105	<i>Data and Video Reference</i>

Document No.	Title
	Documentation for Qualified Technicians
555-640-140	<i>Installation, Programming & Maintenance (IP&M) Binder [consists of Installation, System Programming & Maintenance (SPM), Maintenance & Troubleshooting]</i>
	Toll Fraud Security
555-025-600	<i>GBCS Products Security Handbook</i>

How to Comment on This Document

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Documentation Manager
AT&T
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 Form 1b, 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 4.0 from Release 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 12 in. (30.48 cm) minimum, 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.

2-2 Installing the Control Unit

Electrical Noise/Radio-Frequency Interference

In most cases, electrical noise is introduced to 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 ($\sqrt{\quad}$) 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,” below, must be met.

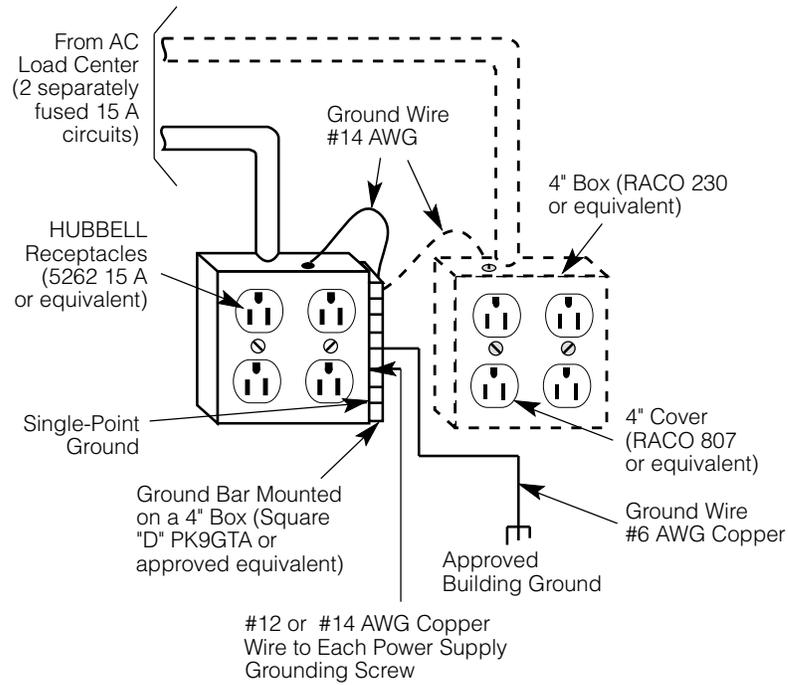


Figure 2-1. AC Grounding Requirements



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.

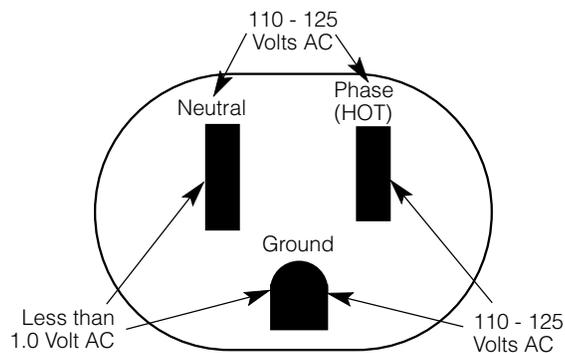


Figure 2–2. Measuring the AC Outlet Voltages



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. Figures 2-1 and 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 #12 AWG or a #14 AWG solid copper wire.

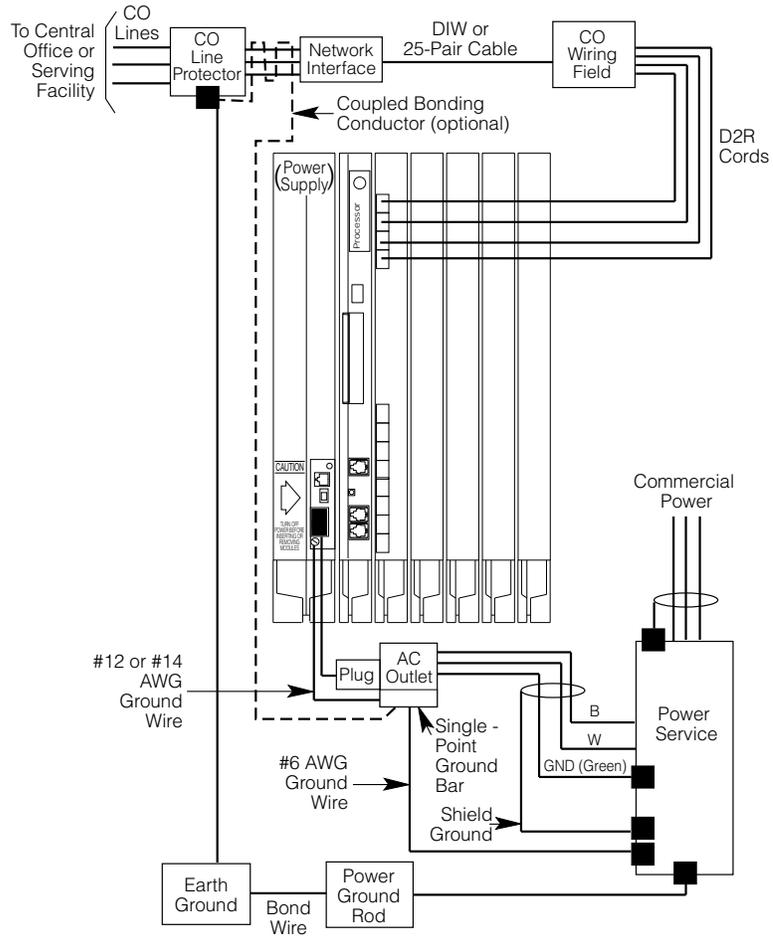


Figure 2-3. Central Office and AC Grounds



WARNING:

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 ½ 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 5/8-in. (1.58-cm) solid rod or ¼-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 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 a 146A
9-12	147A and two 146As
13-16	147A and three 146As
17-20	Second 147A
21-24	Second 147A and one 146A

NOTES:

1. When you use the second 147A, you can connect the 146As in any combination, up to a maximum of three 146As per 147A.
2. For detailed installation instructions, see the documentation packaged with the protectors.

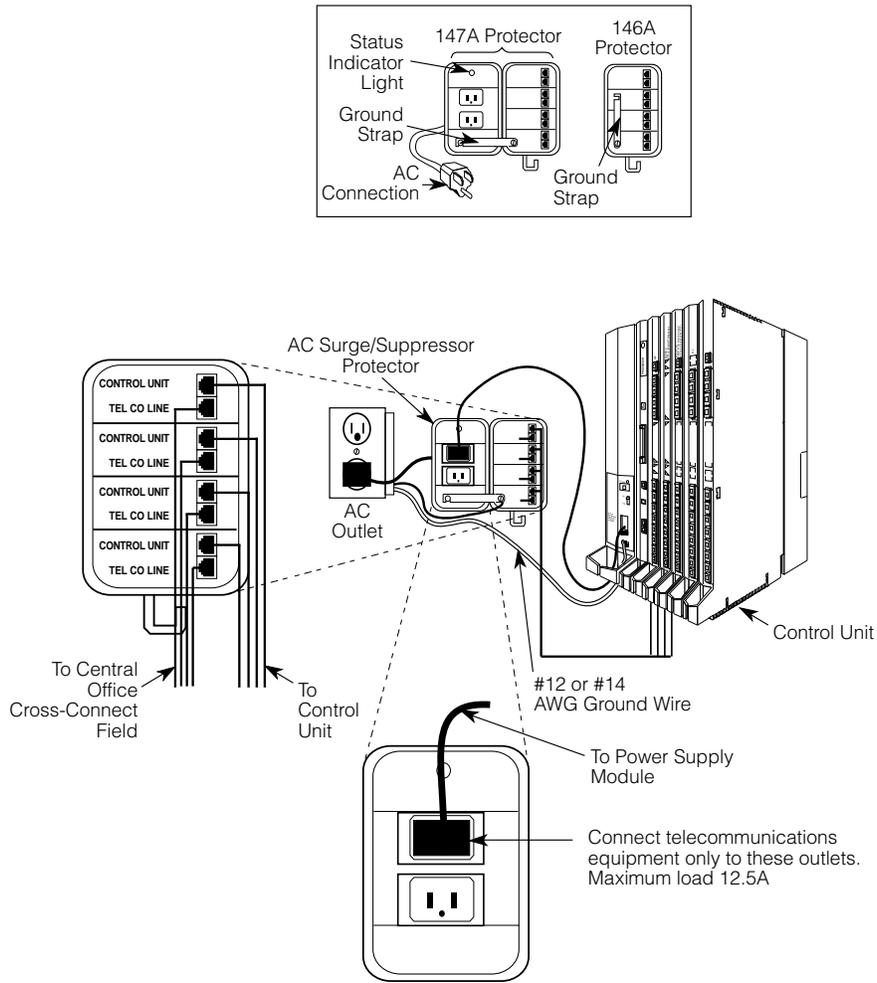


Figure 2-4. Installing 146A and 147A Protectors

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 supports 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 supports 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 the total length of up to three carriers.

Installing the Basic Carrier

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.

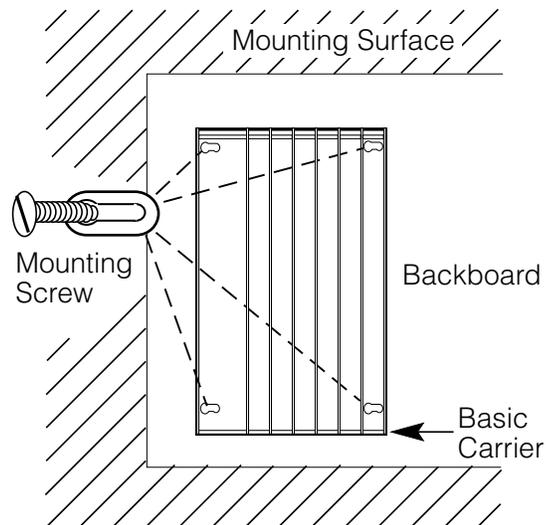


Figure 2-5. Marking the Basic Carrier Screw Holes

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) modules or new 008 (apparatus code 517D28 or later letter). 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.

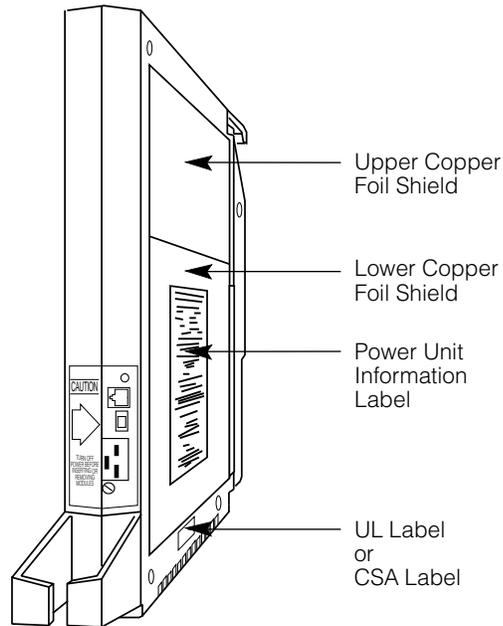


Figure 2-6. Installing a Copper Shield in the Power Supply

- 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 there should be no cables or power cords 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.

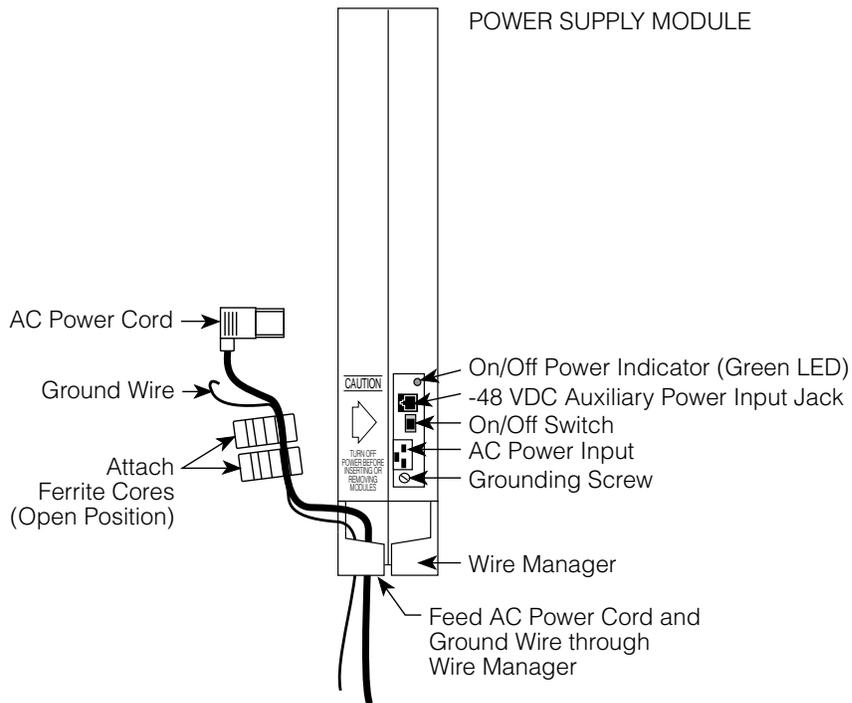


Figure 2-7. Installing the Ferrite Cores

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.

Installing the Auxiliary Power Unit

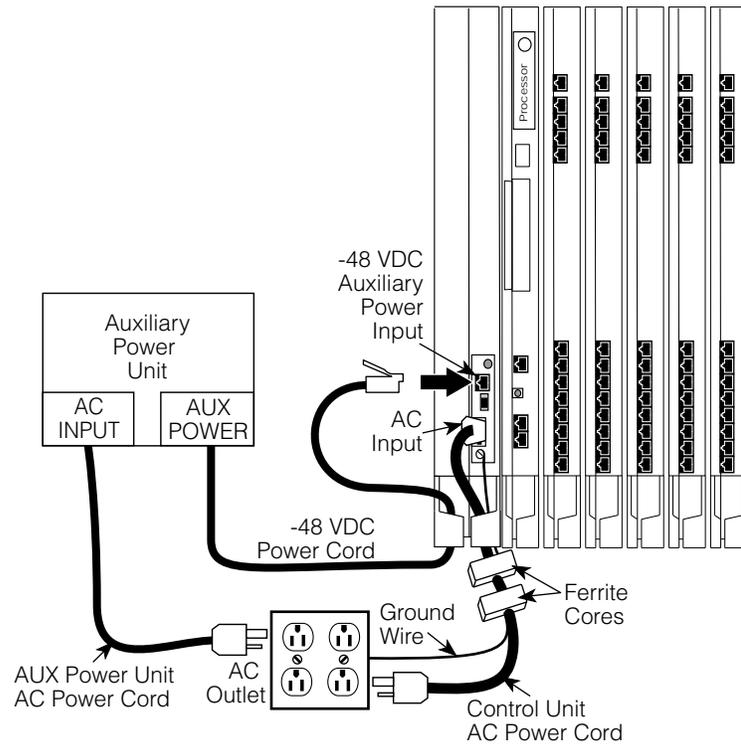


Figure 2–8. Installing an Auxiliary Power Unit

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 that the housing clips extend as far as possible from the right side of the carrier.

11 Tighten the screws.

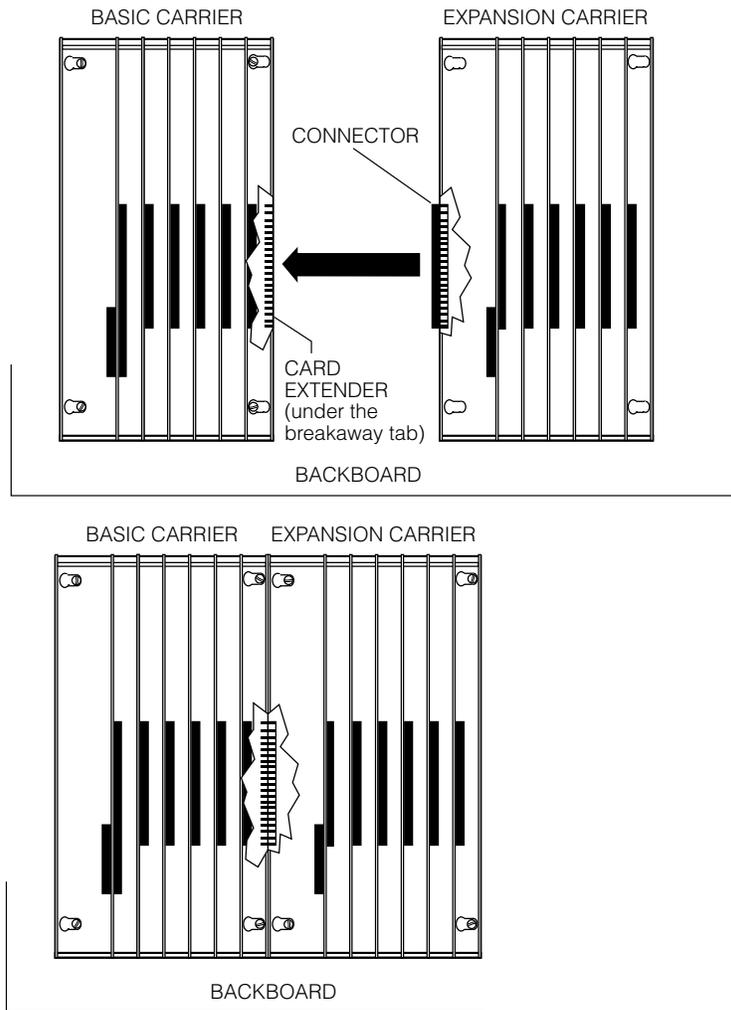


Figure 2-9. Connecting the Carriers

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.

NOTES:

1. 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.)

2. 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 backup 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.

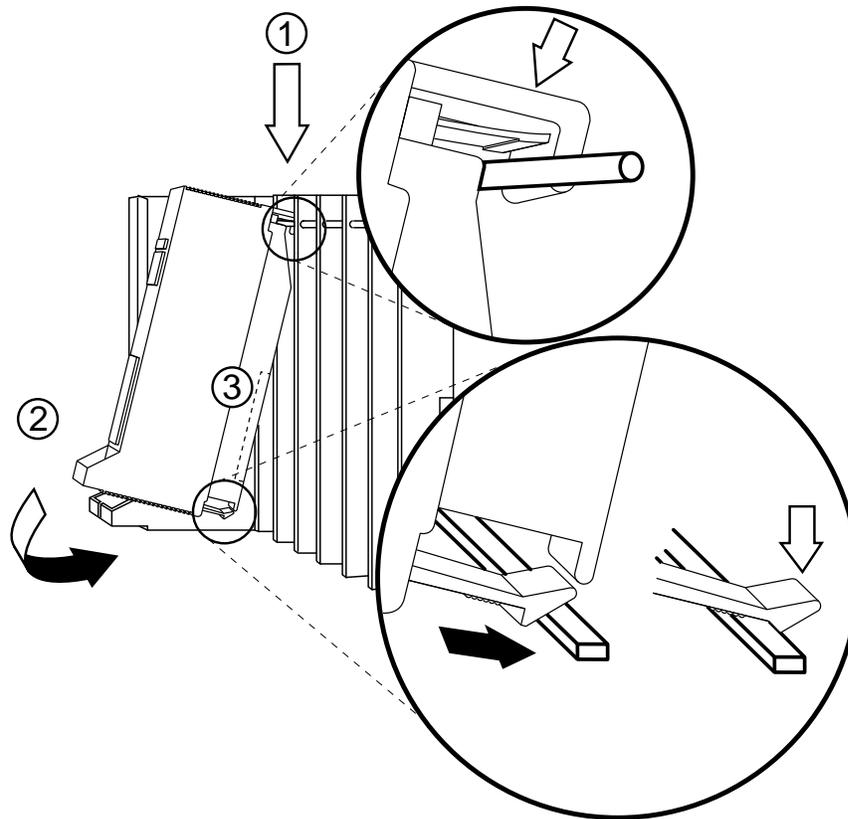


Figure 2-10. Installing the Processor into the Carrier

Installing the Modules



CAUTION:

Use a properly grounded wrist strap to prevent damage from electrostatic discharge (ESD) when installing the modules, 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 telephone company facilities.
 - Type 1 Compatible**. This setting connects two systems directly (without using 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 the 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

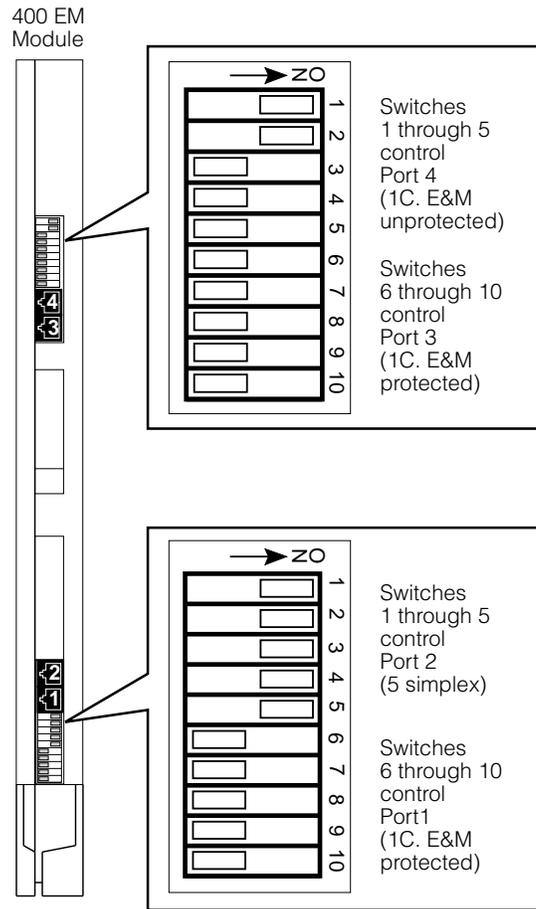


Figure 2-11. 400EM Module Sample Dip Switch Settings for Signaling Types 1C and 5

Labeling

1 After all modules have been installed, label all jacks with 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.

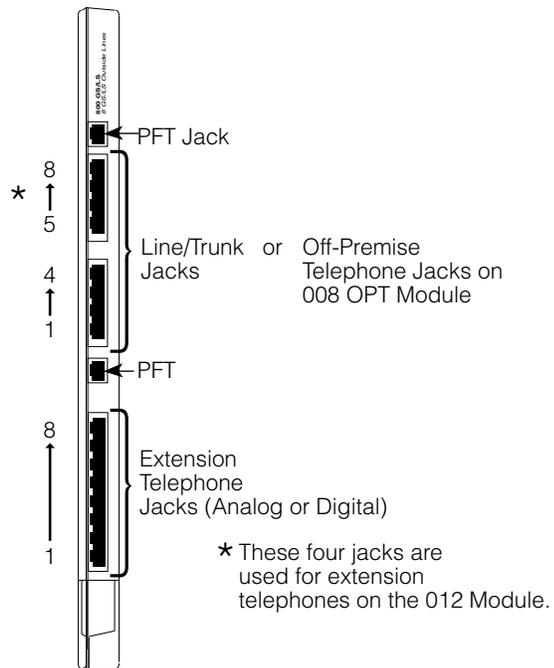


Figure 2-12. Line/Trunk and Telephone Jack Locations on Each Module

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 *Maintenance 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.**

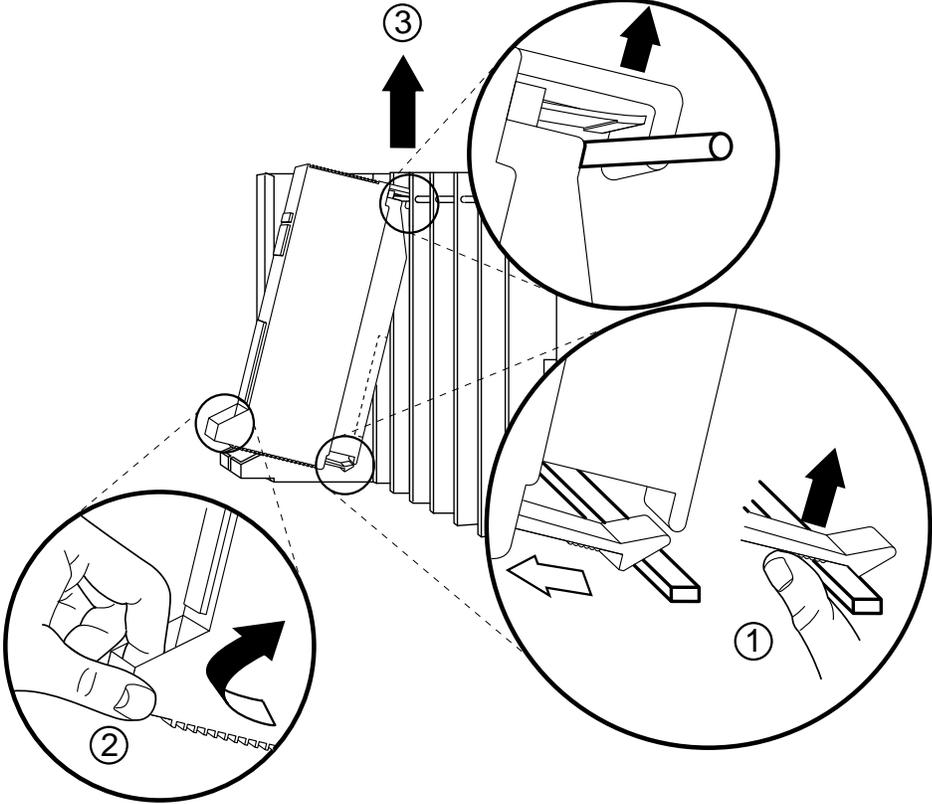


Figure 2-13. Removing Modules from the Carrier

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 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-10, MLX-10D, MLX-10DP, 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

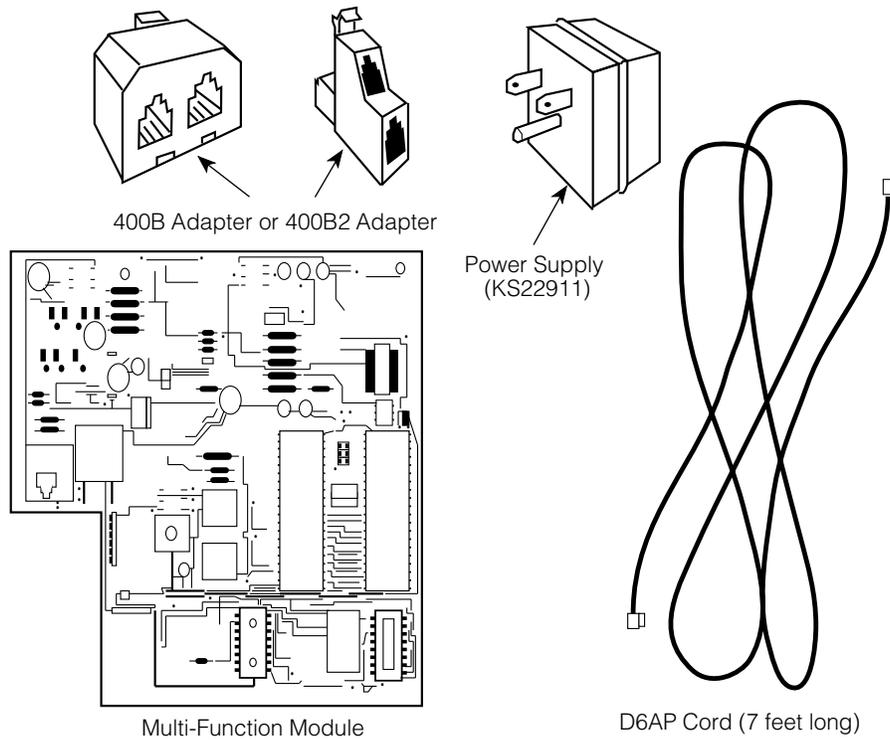


Figure 3-1. Multi-Function Module Packing List



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.

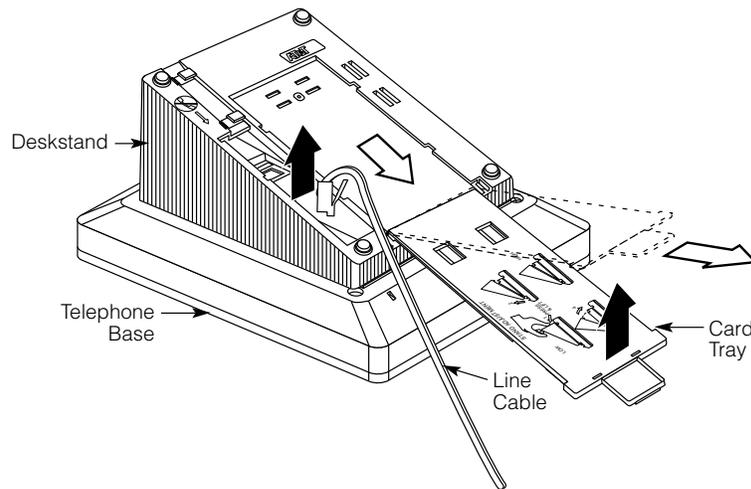


Figure 3–2. Removing the User Card Tray and Line Cable

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.**

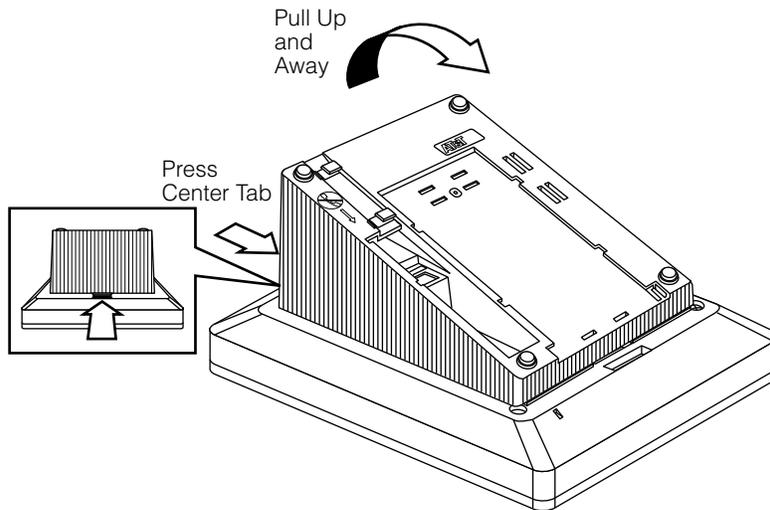


Figure 3-3. Releasing the Deskstand

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.

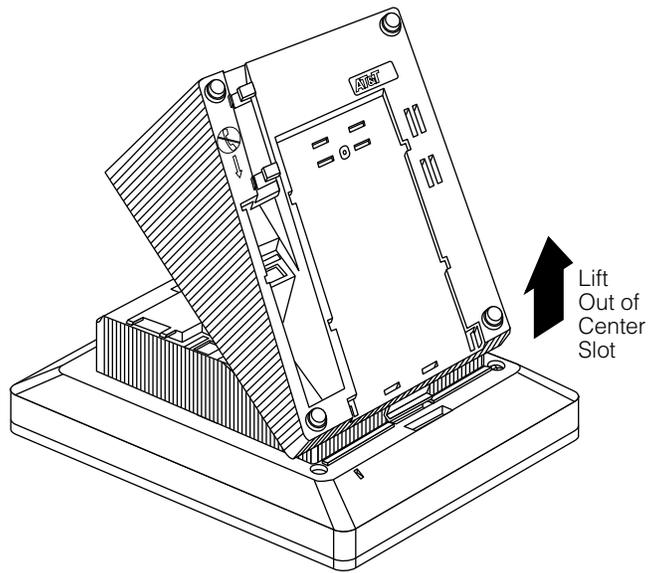


Figure 3-4. Removing the Deskstand

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

3-6 Installing Telephones and Adjuncts

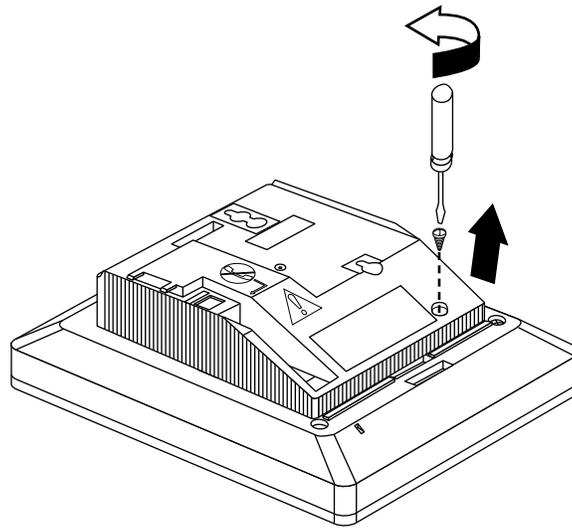


Figure 3–5. Releasing the Module Cover Screw

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 righthand corner of the module cover.

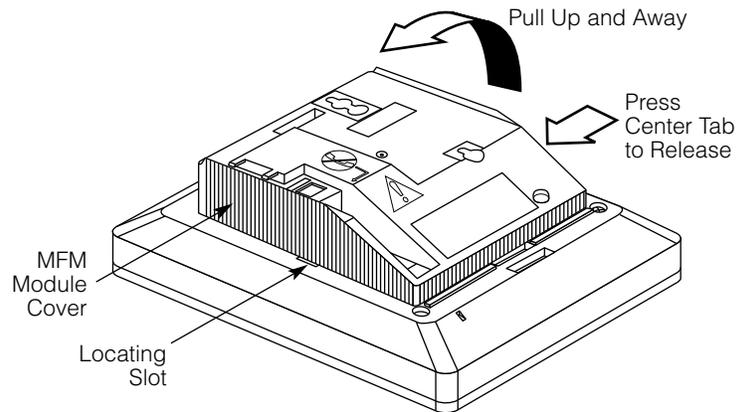


Figure 3–6. Releasing the Module Cover

- 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.

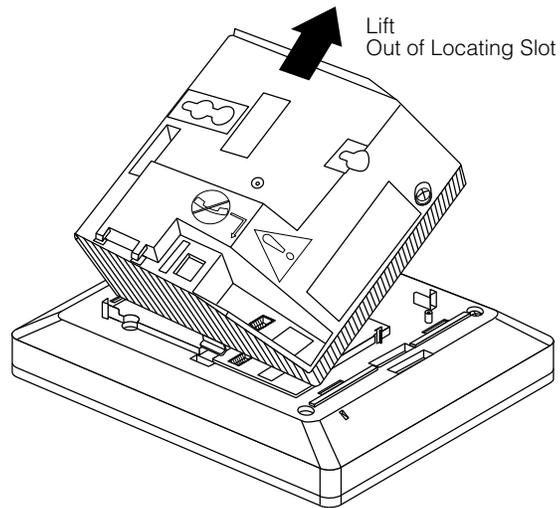


Figure 3–7. Removing the Module Cover

- d Lift module cover out of locating slot and place to one side.

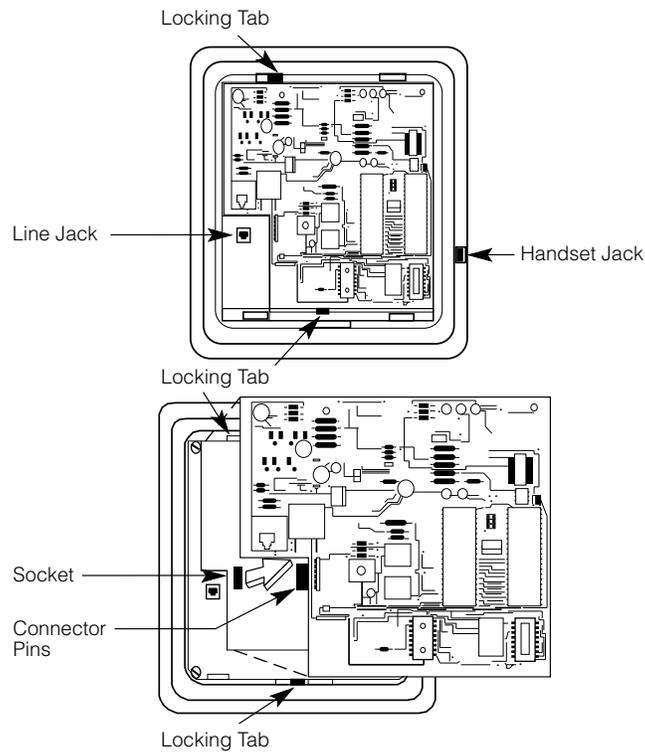


Figure 3–8. Removing an MFM Module

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).

- a Disconnect any cords attached to the phone and note the connections so that you can reconnect the cords to the appropriate jacks later.
- b Locate the MFM locking tabs on the top and bottom of the telephone base, then spread the tabs apart to release the MFM.
- c Grasp the MFM by the edges and pull it up to free the connector pins. *Do not touch the connector pins.*
- d Set the MFM aside on a clean surface.

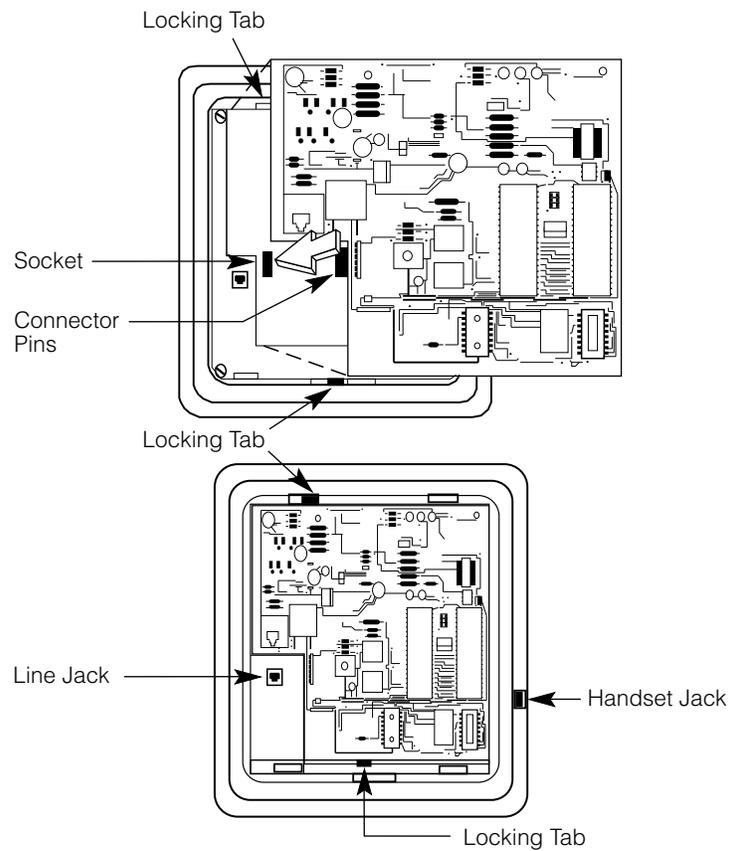


Figure 3–9. Installing an MFM Module

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.*

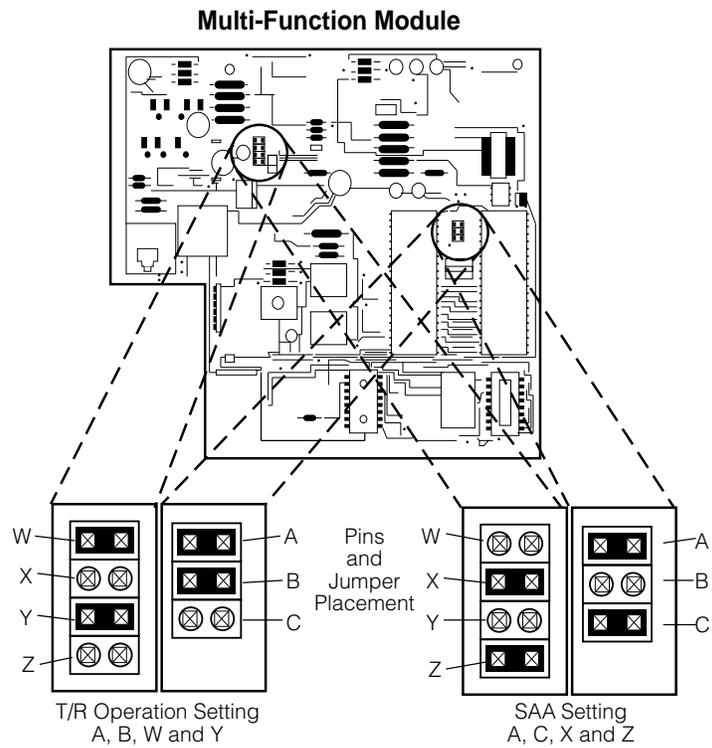


Figure 3–10. Setting and Adjusting the MFM Jumpers

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 of the MFM module.
- b Place the connectors over the appropriate pins for the required operation, and push down to secure into place.

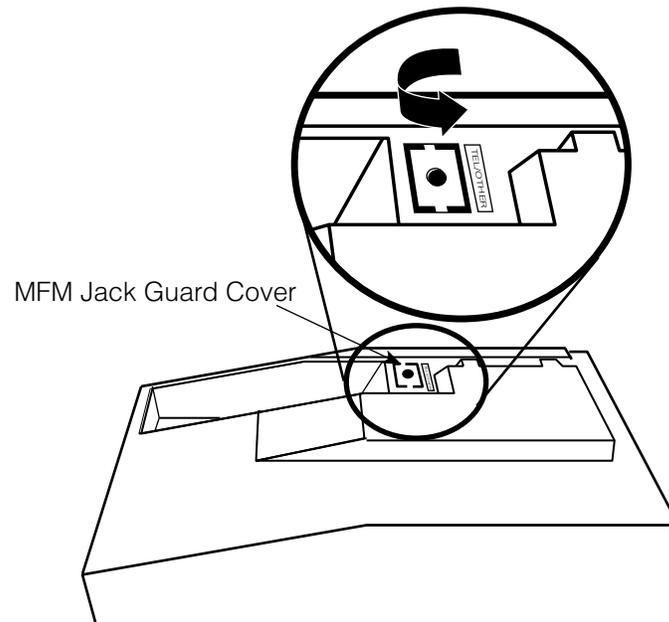


Figure 3–11. Removing the Jack Guard

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.

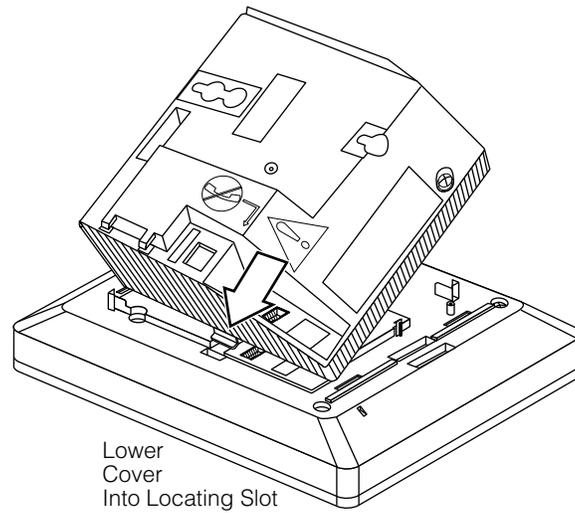


Figure 3–12. Placing the Module Cover into the Locating Slot

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.

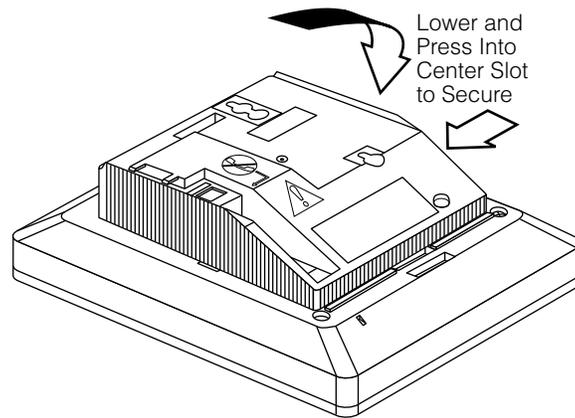


Figure 3–13. Lowering and Locking the Module Cover

- 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.*

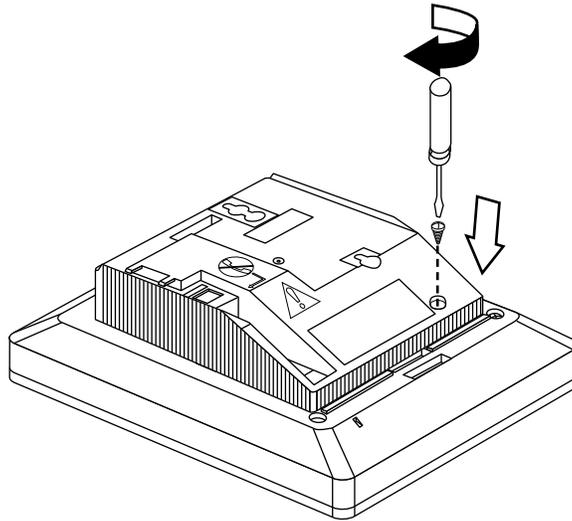


Figure 3–14. Replacing and Tightening the Module Cover Screw

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

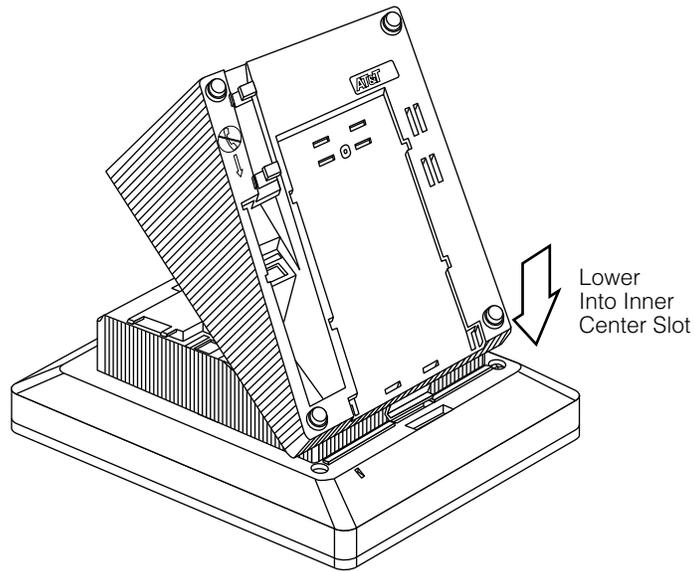


Figure 3–15. Replacing the Deskstand

9 Replace the deskstand. See Figure 3–15. 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.

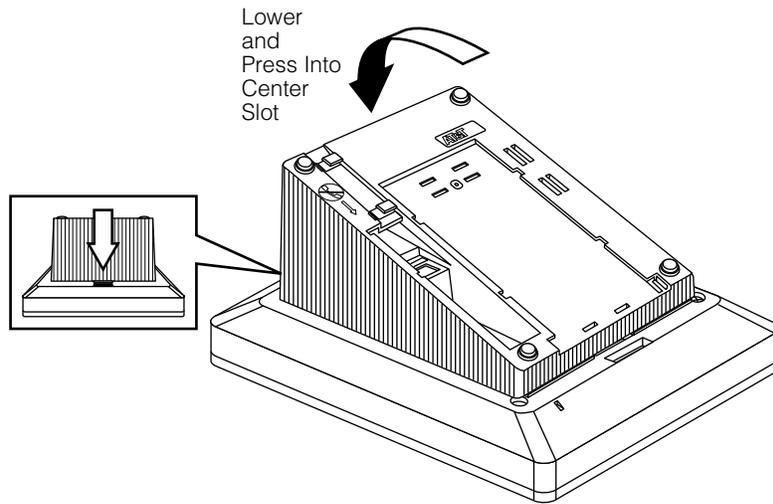


Figure 3-16. Lowering the Deskstand and Locking into Place

- b Lower the deskstand and lock into place.

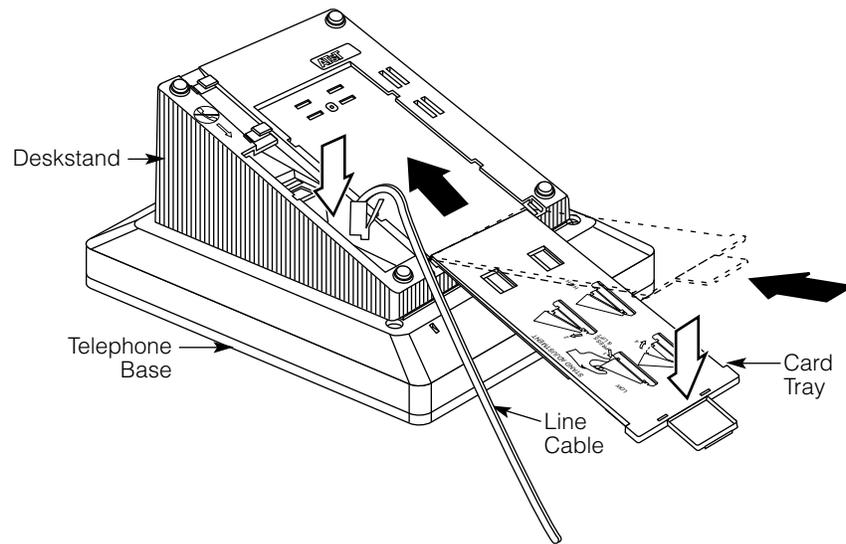


Figure 3–17. Replacing the User Card Tray and Line Cable

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.

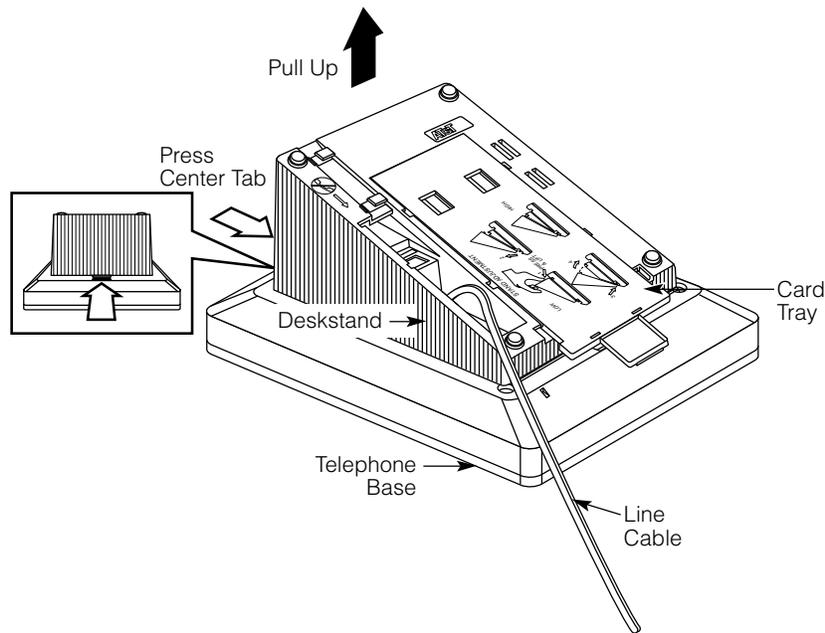


Figure 3–18. Adjusting the Deskstand Height

11 Adjust the deskstand height. See Figure 3–18.

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

12 Power up the telephone. See Figure 3–19.

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

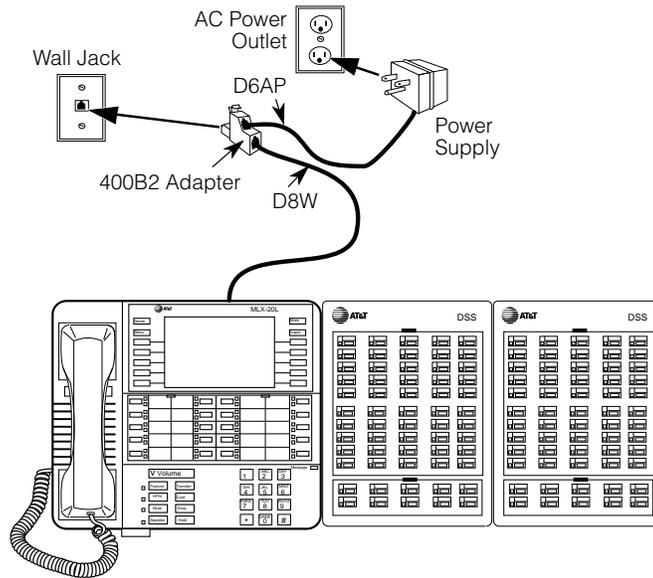


Figure 3–19. Powering Up the Telephone after Installing the MFM

- 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.

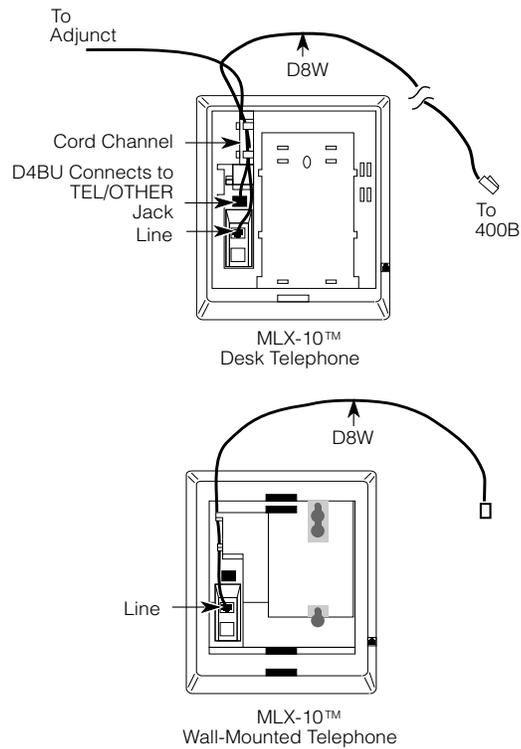


Figure 3–20. Routing the Cord(s) Through the Cord Channel

4 To connect an adjunct to a single-line telephone:

- a Connect a 26A2 bridging adapter to the telephone.
- b Connect the cord from the adjunct to the bridging adapter.
- c Reconnect the cord from the control unit to the bridging adapter.
- d 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.

NOTES:

1. 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.
2. The GPA cannot be used with a MERLIN II System Display Console.
3. 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 that is 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* connect such equipment through a UPAM, however, 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 AT&T 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.)

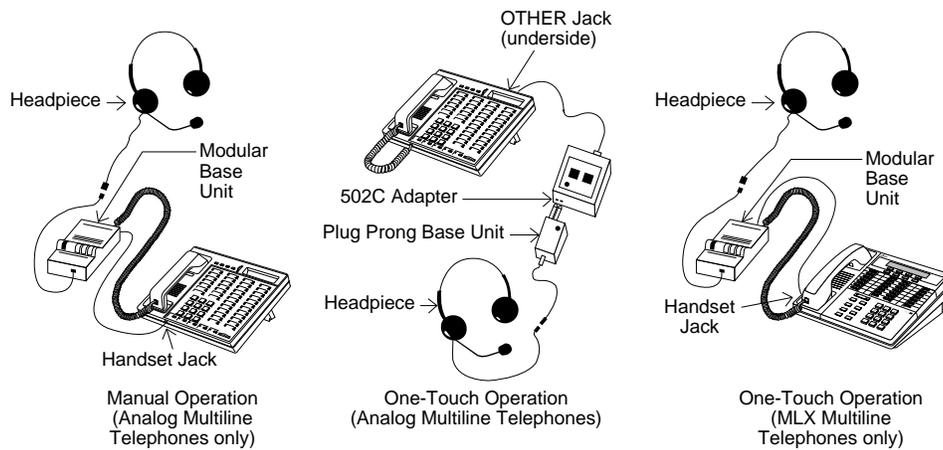


Figure 3–21. Manual and One-Touch Headset Operation

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 multizone 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.

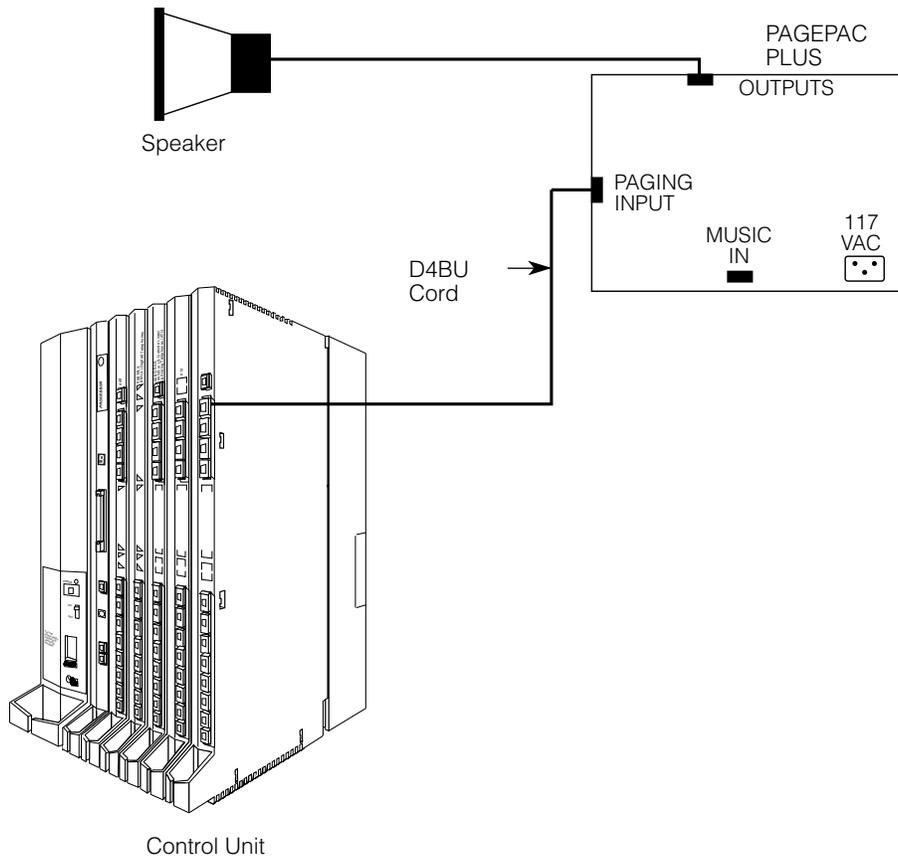
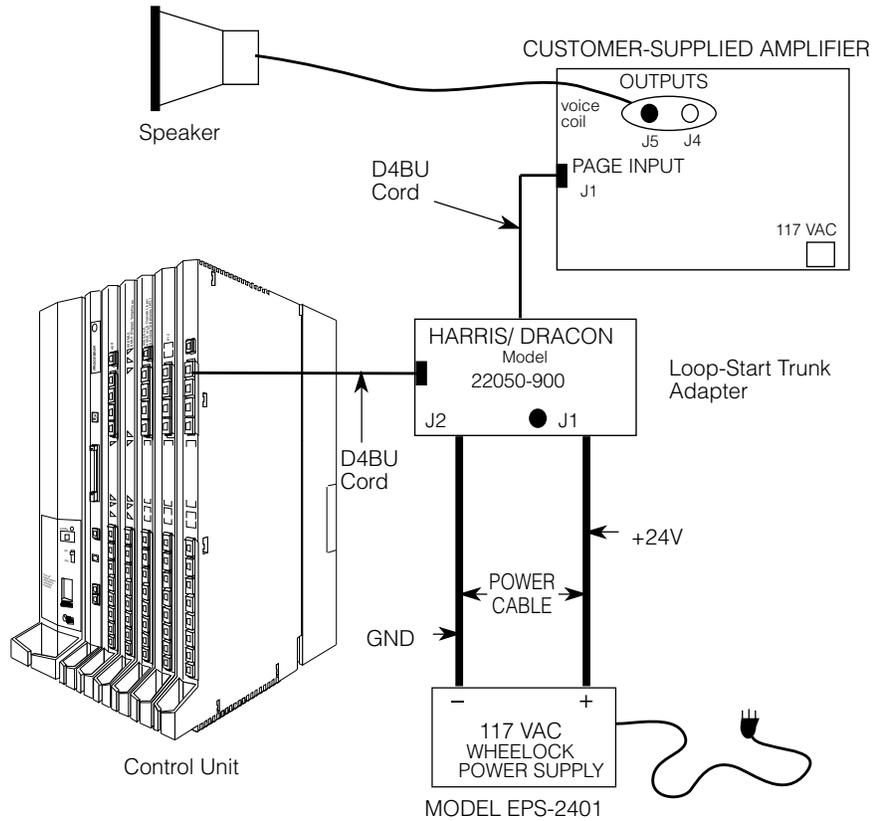


Figure 3–22. Single-Zone Paging with PagePac Plus



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

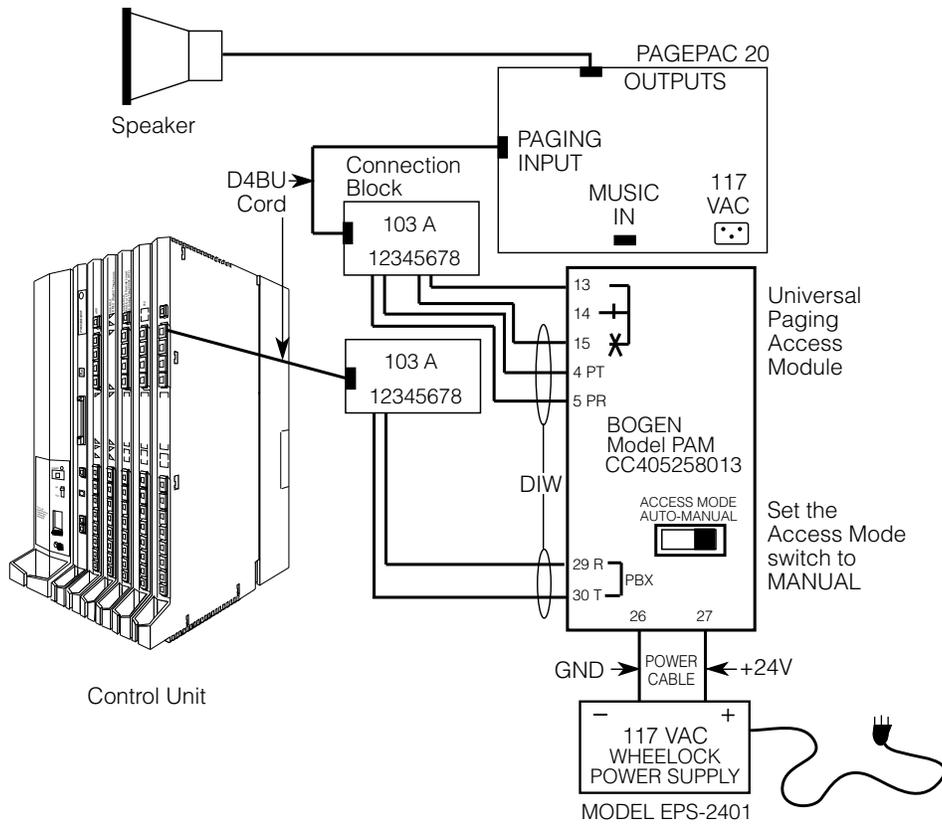


Figure 3–24. Single-Zone Paging with UPAM

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 are 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.

NOTES:

1. PagePac Plus equipment can be used with a loudspeaker system to provide music. Or it can provide paging without a music coupler.
2. 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 AT&T, which does not require such a license.

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

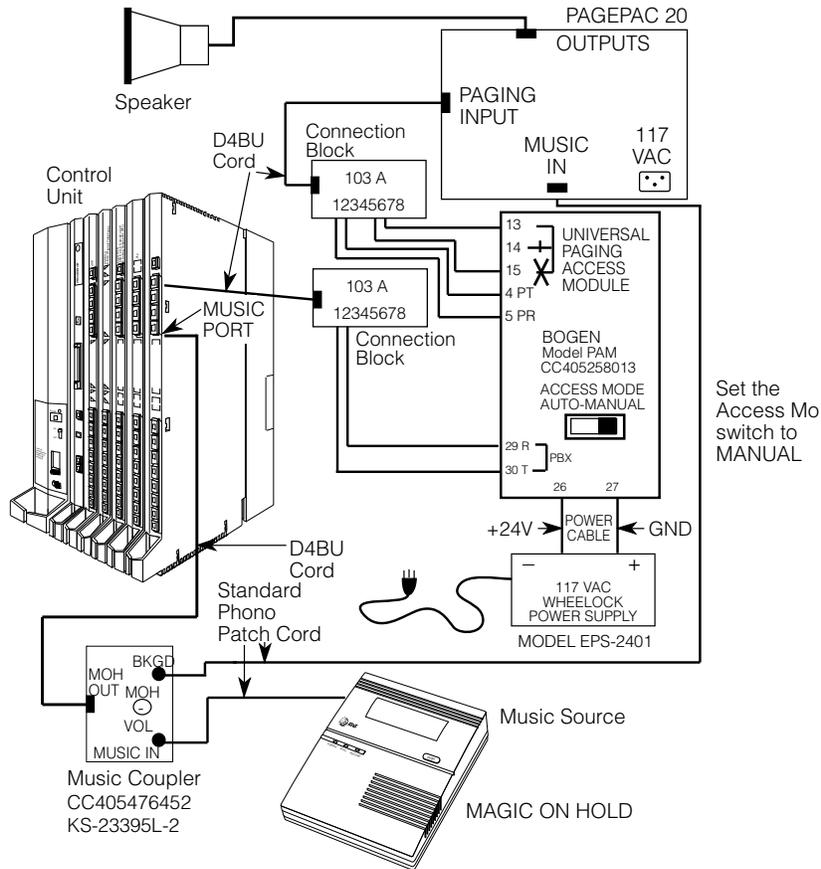


Figure 3-25. Single-Zone Paging with Background Music and Magic on Hold

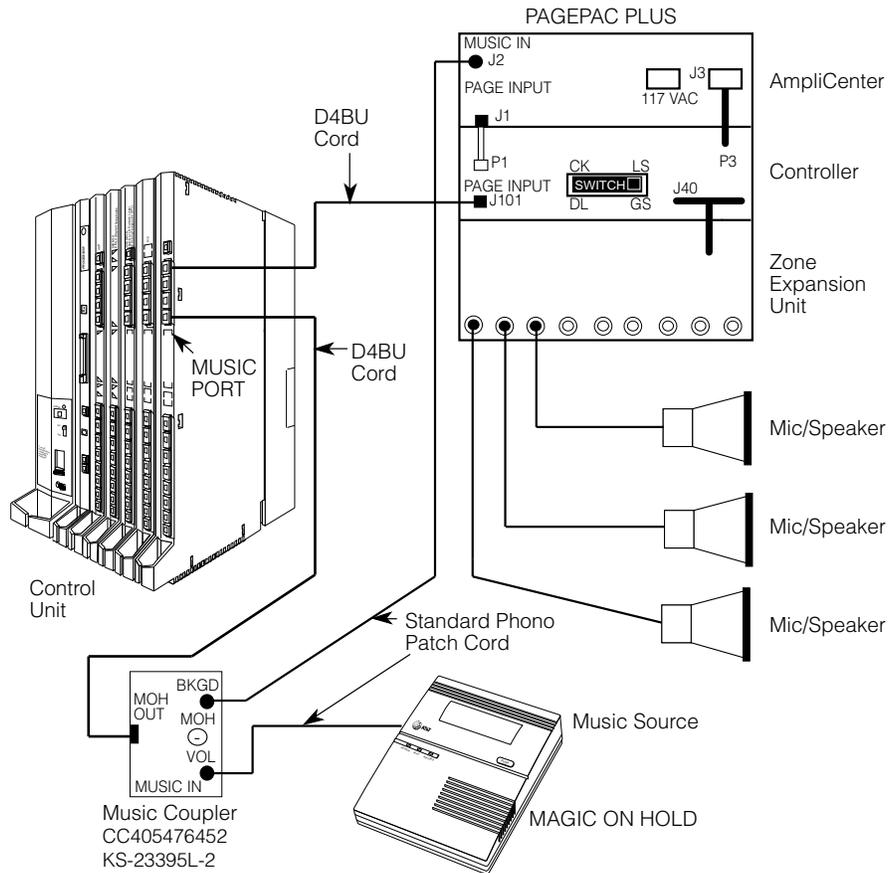


Figure 3-26. Multizone Paging with Background Music, Magic on Hold, and Bidirectional Paging (Talk-Back)

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 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.**

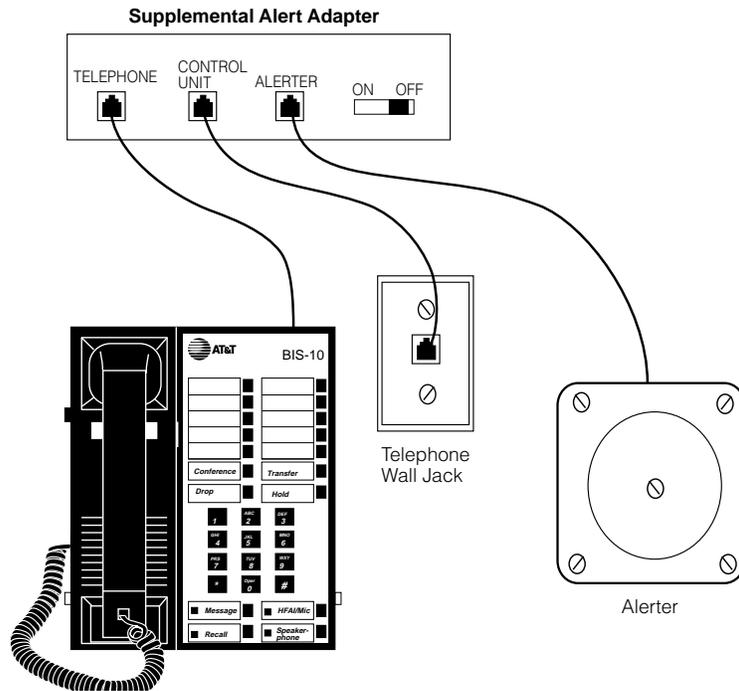


Figure 3–27. Installing the Supplemental Alert Adapter

Unsupported Telephones, Adjuncts, and Adapters

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*	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†	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.

* Vintage telephone, no longer available for sale or lease

† 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 which 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 that is provided with the MFM.
 - An MLX telephone with one DSS and an MFM requires a 406943837 power unit, 400B adapter, and the D6AP cord that is 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.

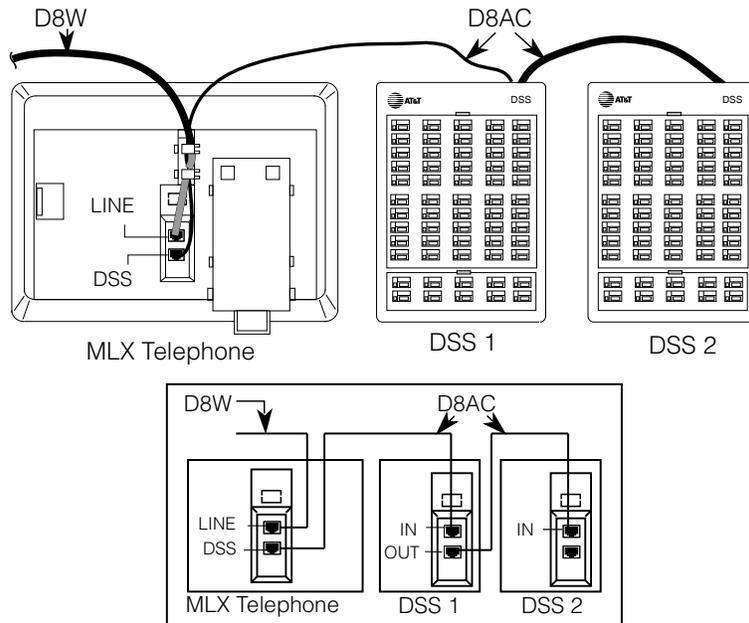


Figure 3–28. Connecting One or More DSSs

4 Wire the telephone to the DSS unit(s). See Figure 3–28.

- a 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).
- b 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.
- c 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.

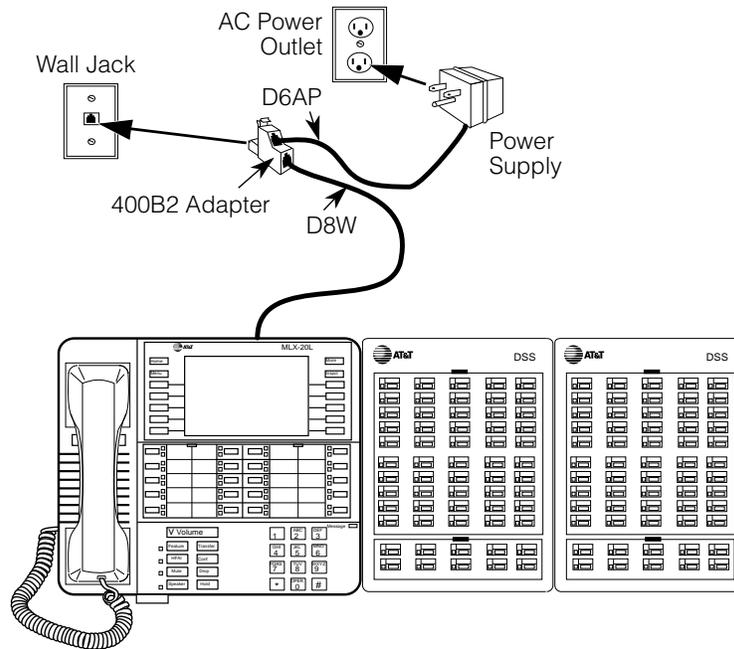


Figure 3–29. Wiring for Auxiliary Power

- 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-10, MLX-10D, or MLX-10DP telephone, you must remove the deskstand first. (Wall-mounting an MLX-10D or 10DP 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.

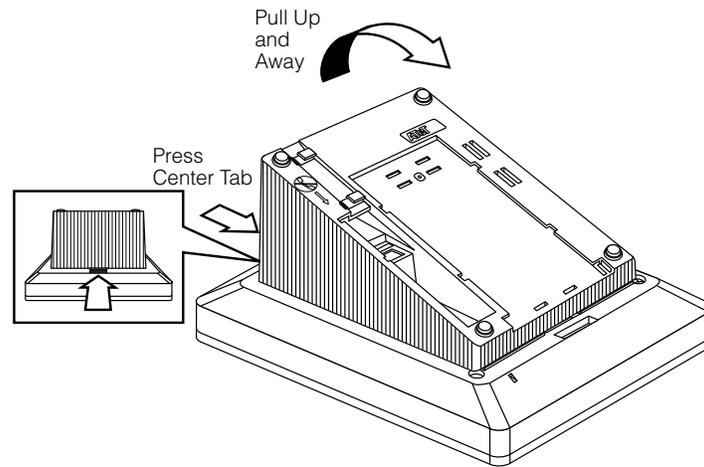


Figure 3–30. Adjusting or Removing the Deskstand

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.

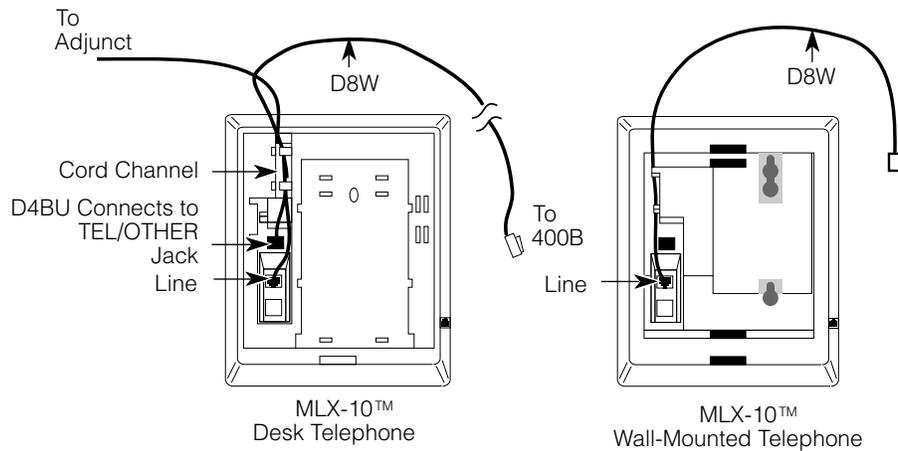


Figure 3–31. Connecting the Line Cords

2 Connect the line cords. See Figure 3–31.

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

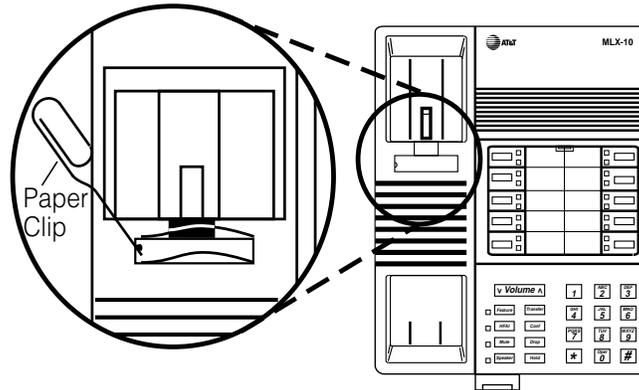


Figure 3–32. Removing the Extension Label

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.

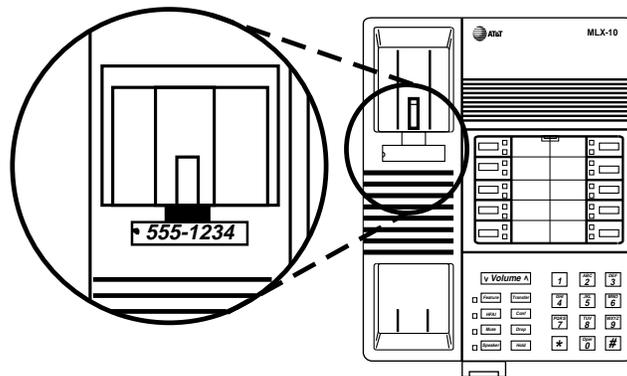


Figure 3–33. Labeling the Extension

- 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.

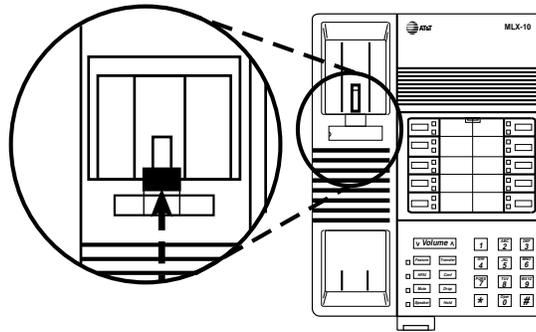


Figure 3-34. Removing the Handset Holder

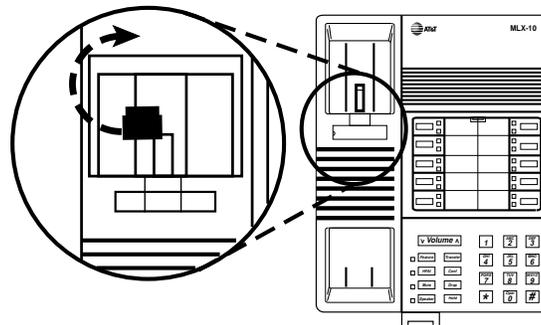


Figure 3-35. Rotating the Handset Holder

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.

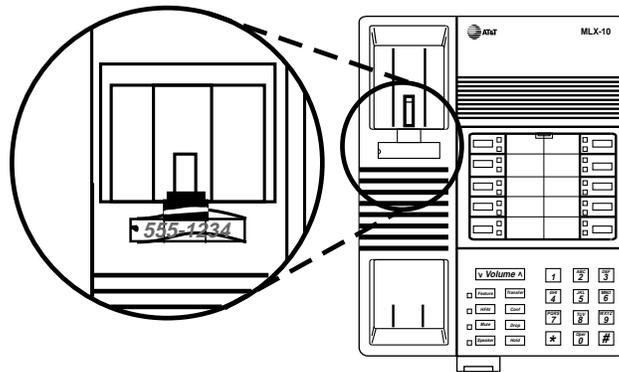


Figure 3–36. Replacing the Extension Label

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.

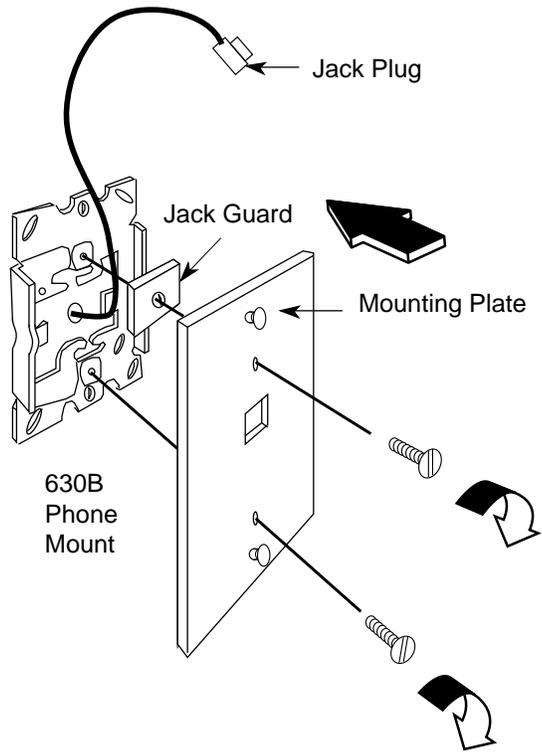


Figure 3–37. Mounting the Backplate

- 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.

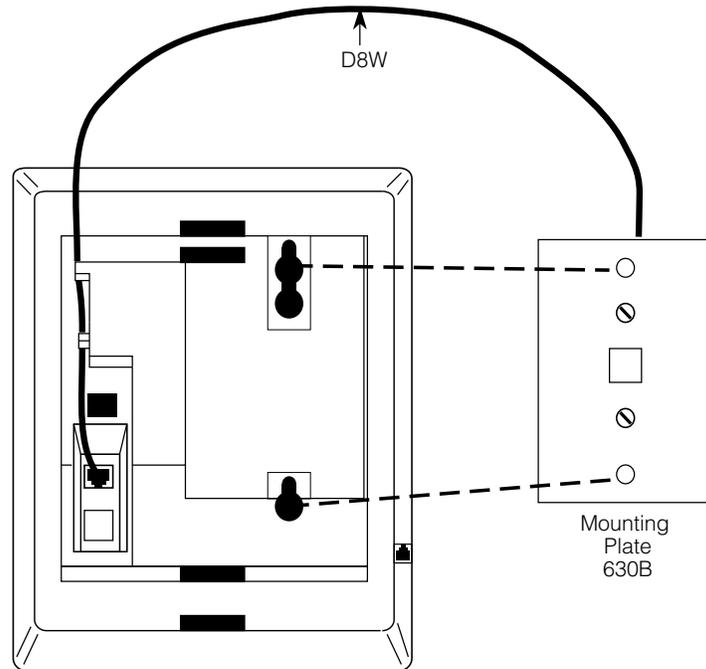


Figure 3–38. Routing the Cord Through the Backplate

- 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.
- **Systemax.** 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.

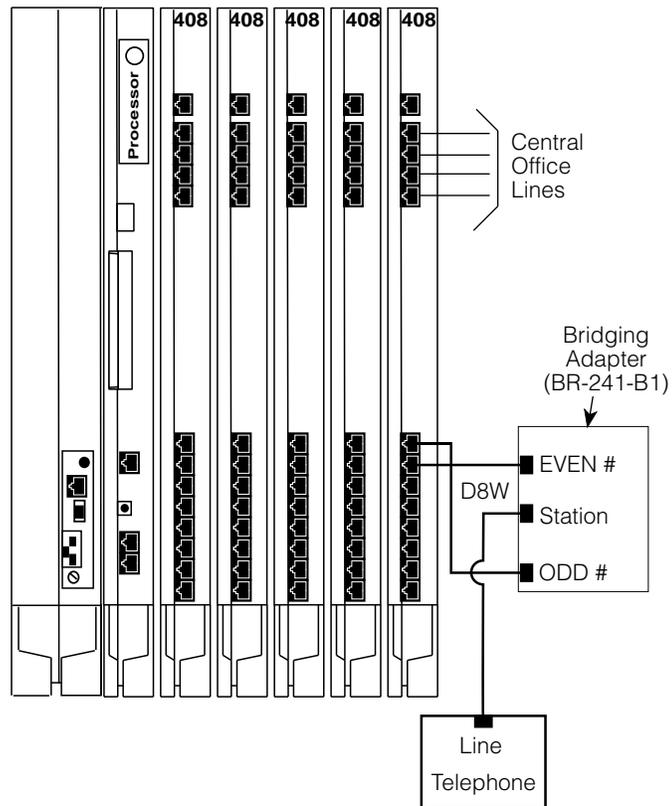


Figure 3-39. Connecting Two Voice Pairs to a Telephone Using a Bridging Adapter (BR-241-B1)

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 Systemax 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 Systemax wiring, attach the patch cord to the connecting block.

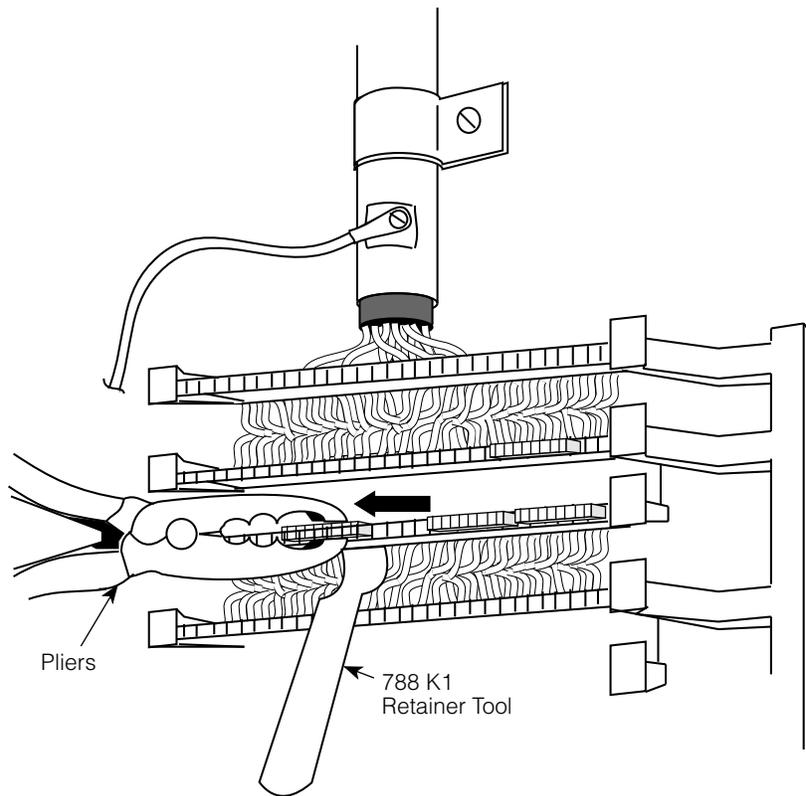


Figure 3–40. Removing the Connecting Block

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 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 telecommunication 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.

4–2 Connecting the Control Unit to the Network Interface

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.

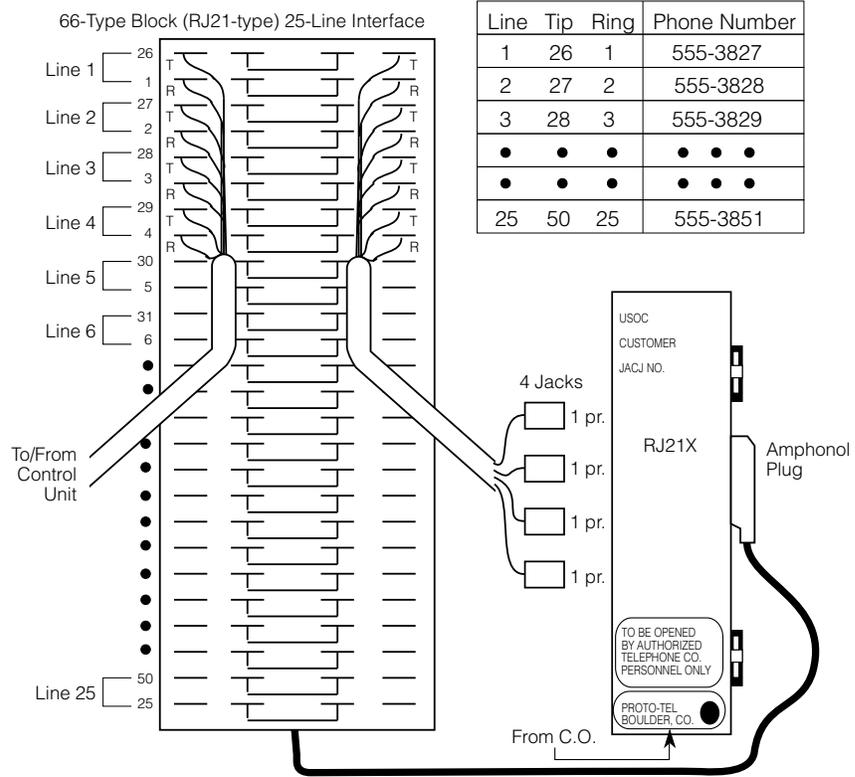


Figure 4-1. RJ21X Network Interface Connector

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.

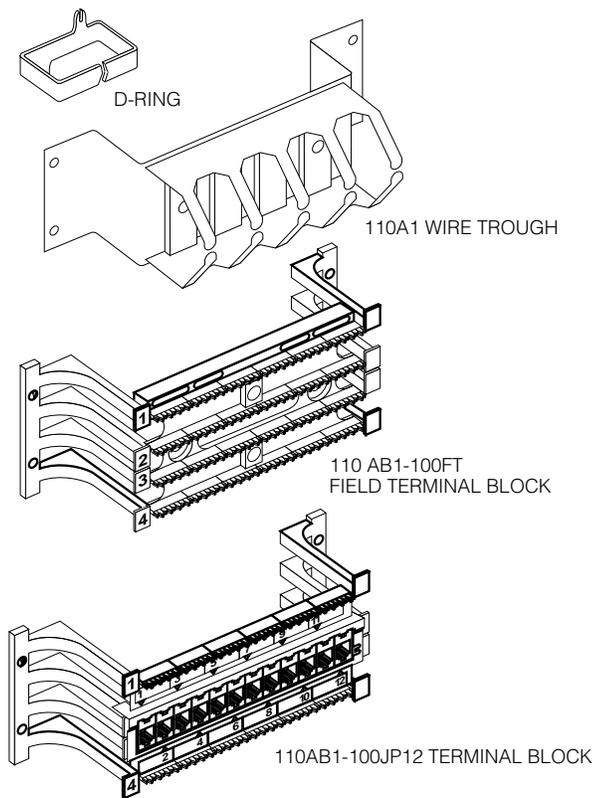


Figure 4-2. RJ21X Wiring Field Hardware

4-6 Connecting the Control Unit to the Network Interface

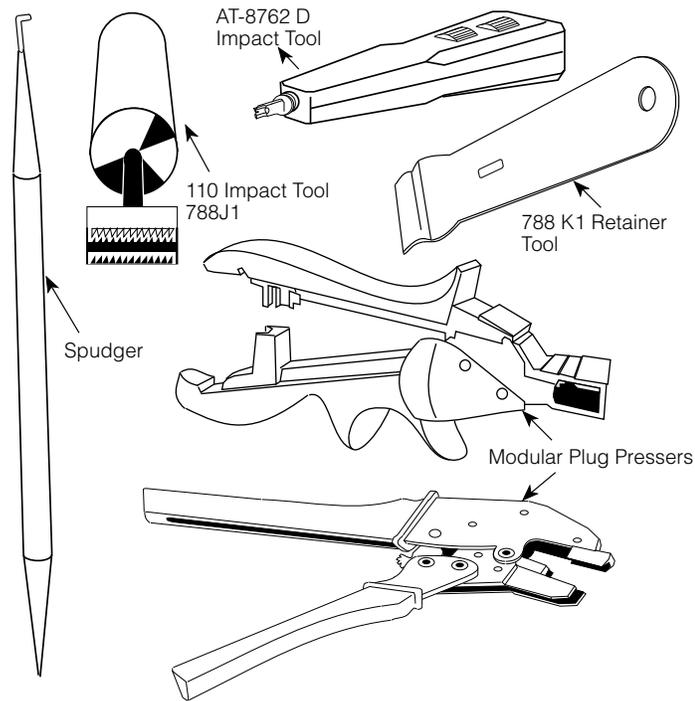


Figure 4–3. RJ21X Wiring Field Tools

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.

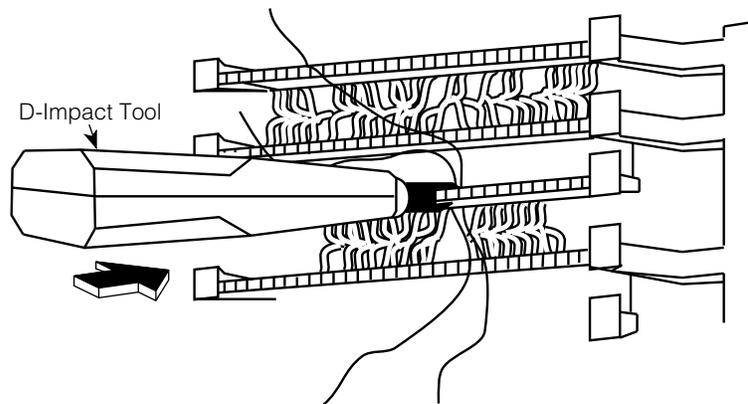


Figure 4–4. Using the D-Impact Tool to Seat the Conductors

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.

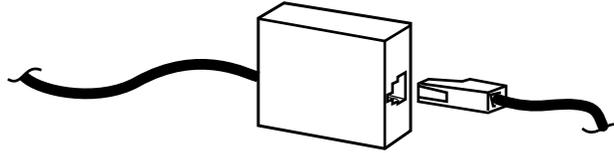
RJ11 and RJ14 Interfaces

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)

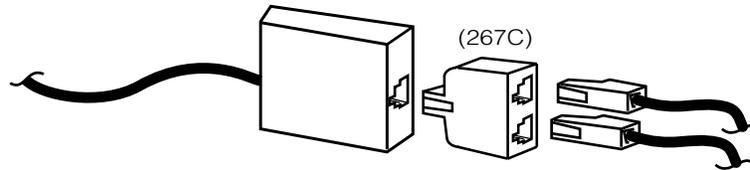


Figure 4–5. RJ11 and RJ14 Interfaces



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 AT&T 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 AT&T 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 AT&T Service Center acting as the customer's agent.

7 If you cannot dial out on any of the trunks, notify the AT&T 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 AT&T 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.

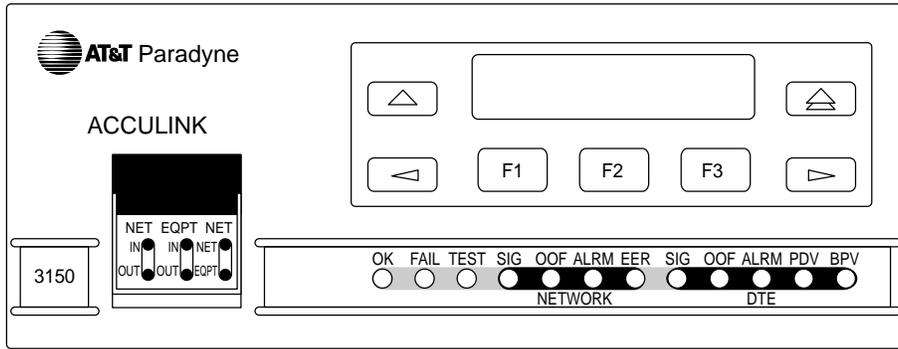


Figure 4-6. 3150 Front Panel

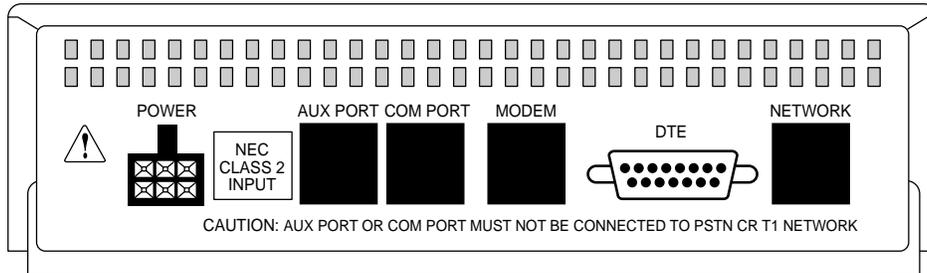


Figure 4-7. 3150 Back Panel

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 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.

Connecting a PC to the Control Unit

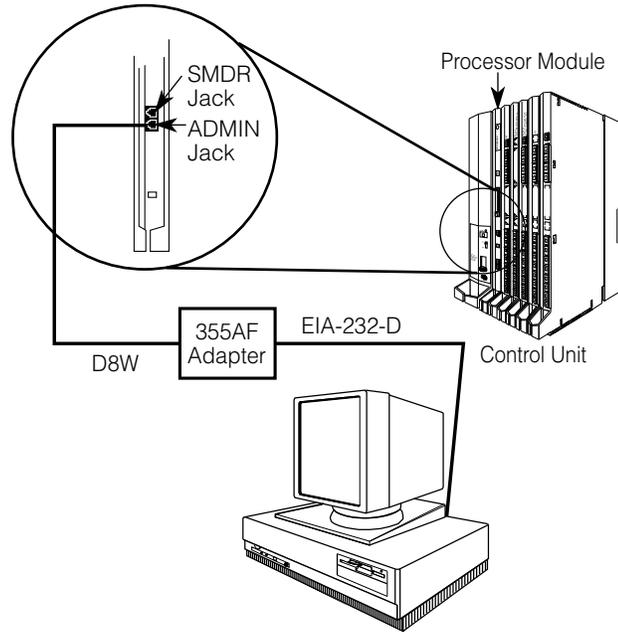


Figure 5-1. Connecting a PC Within 50 ft. (15.2 m)

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.

Connecting a PC to the Control Unit

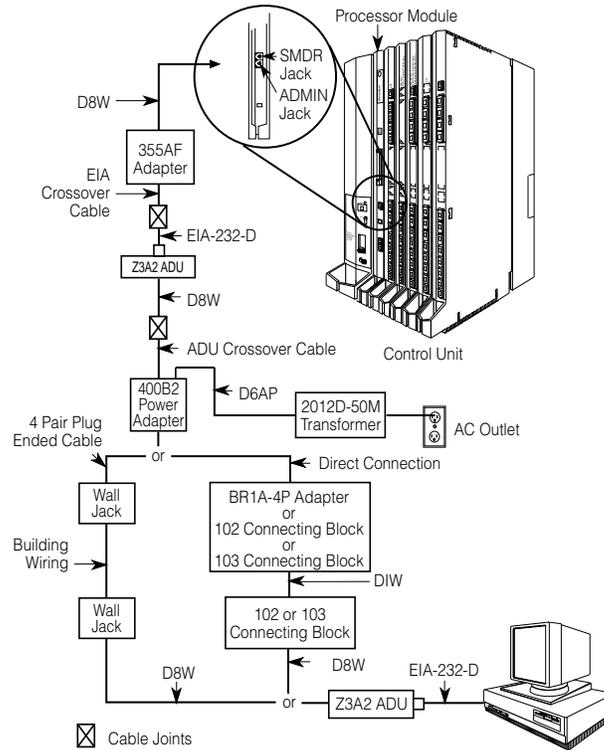


Figure 5–2. Connecting a PC More Than 50 ft. (15.2 m) Away

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.

5–6 Installing the PC, CAT, or Printer

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 AT&T printers:

- AT&T 572 Printer
- AT&T 475/476 Printer

- AT&T Call Accounting Terminal (CAT) Printer
- AT&T Call Accounting System Printer
- AT&T Applications Printer

NOTE:

The AT&T 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.

Connecting a Printer to the Control Unit

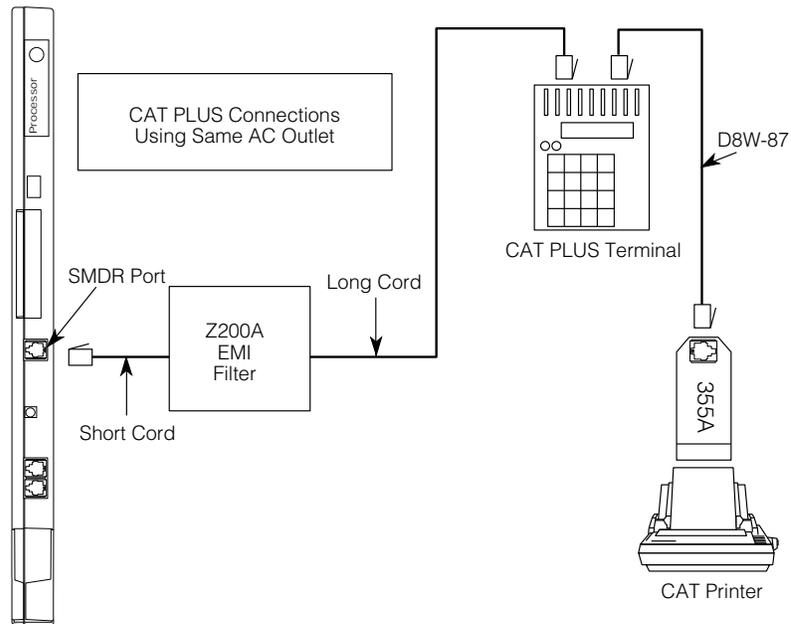


Figure 5-3. Connecting a CAT and Printer on the Same AC Outlet

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.

5-10 Installing the PC, CAT, or Printer

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.

Connecting a Printer to the Control Unit

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.

Connecting a Printer to the Control Unit

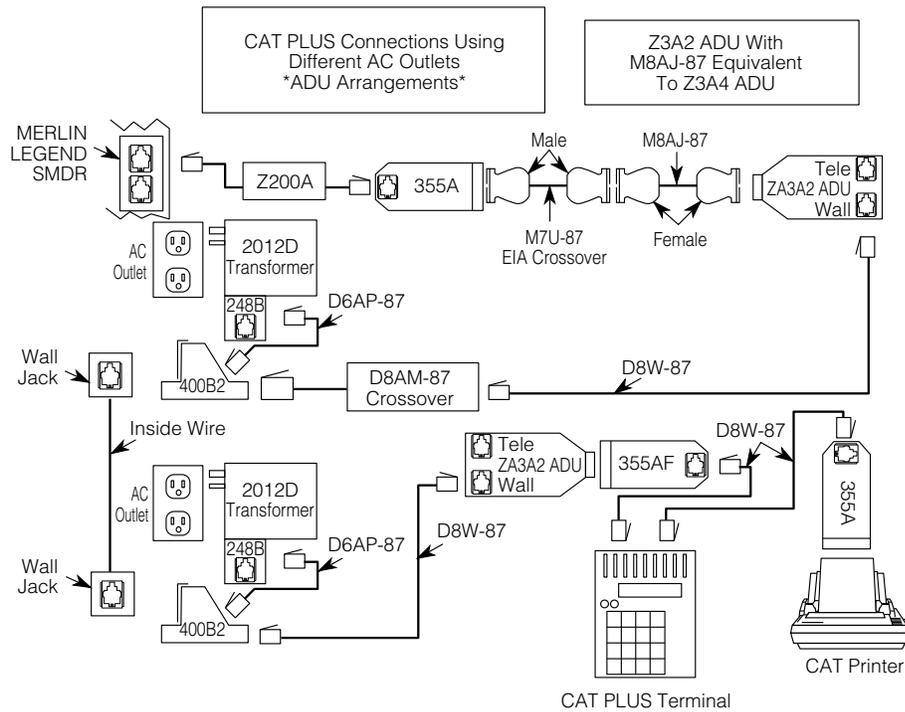


Figure 5-4. Connecting a CAT and Printer on Different AC Outlets: Control Unit Connections

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, 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

Connecting a Printer to the Control Unit

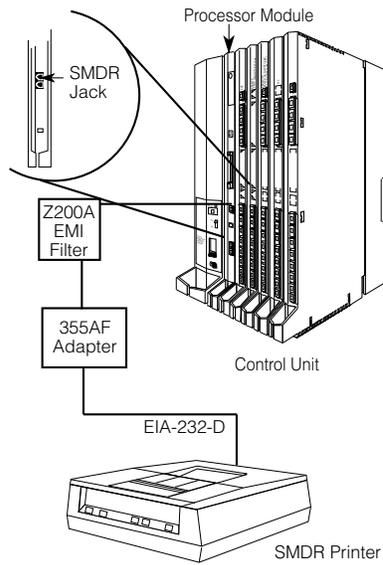


Figure 5-5. Connecting a Printer Within 50 ft. (15.2 m)

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 the 25-pin male connector on the printer's interface cable, or into 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.

Connecting a Printer to the Control Unit

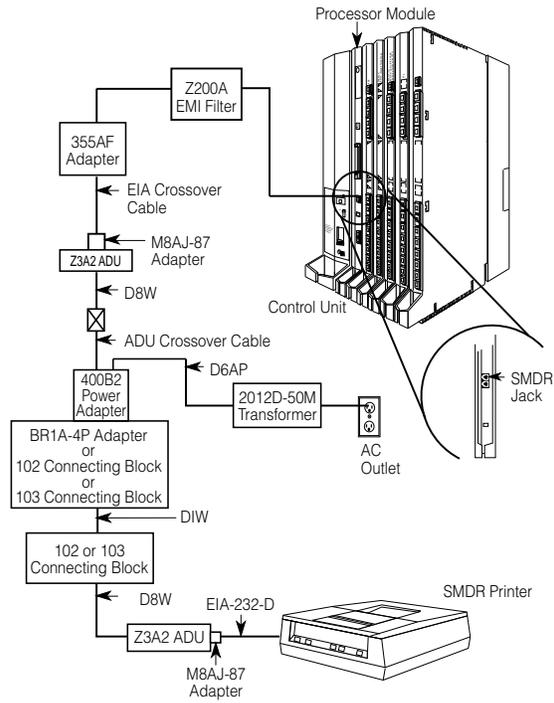


Figure 5-6. Connecting a Printer More Than 50 ft. (15.2 m) Away

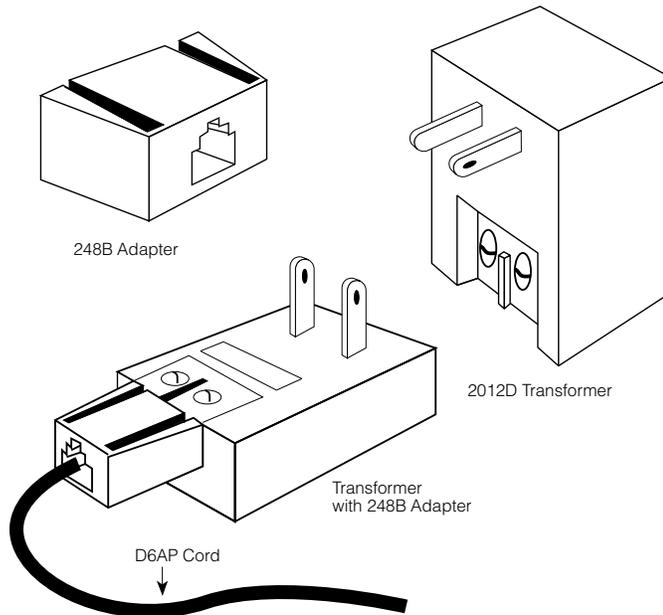


Figure 5–7. Connecting the 248B Adapter and the 2012D Transformer

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 AT&T 572, AT&T 475/476, CAT, or AT&T 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. AT&T 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*
94	STOP BIT	01	2
95	PARITY	01	NON
96	BPS	04	1200

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

Table 5-2. AT&T 475/476 Printer DIP Switch Settings*

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

* Open = off; Closed = on

Table 5-3. AT&T CAT Printer DIP Switch Settings*

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

* 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	A PC with video applications

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

6-2 Connecting Data Equipment

NOTES:

1. The analog voice and modem data station requires a bridging adapter to connect the telephone to the two adjacent analog extension jacks.
2. The terminal adapter data-only station requires a terminating resistor adapter to connect the terminal adapter to the MLX extension jack.
3. See "Video Conferencing Data Stations," later in this chapter, for configuration details on stations including video codecs.
4. The cord length from the terminal adapter to the telephone cannot be more than 80 ft. (24 m).
5. 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, 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, data terminal, and an MLX telephone.
- **Terminal Adapter Data-Only.** This station includes a terminal adapter, data terminal, and 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
- Originate 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 that is 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.

Analog Voice and Modem Data Stations

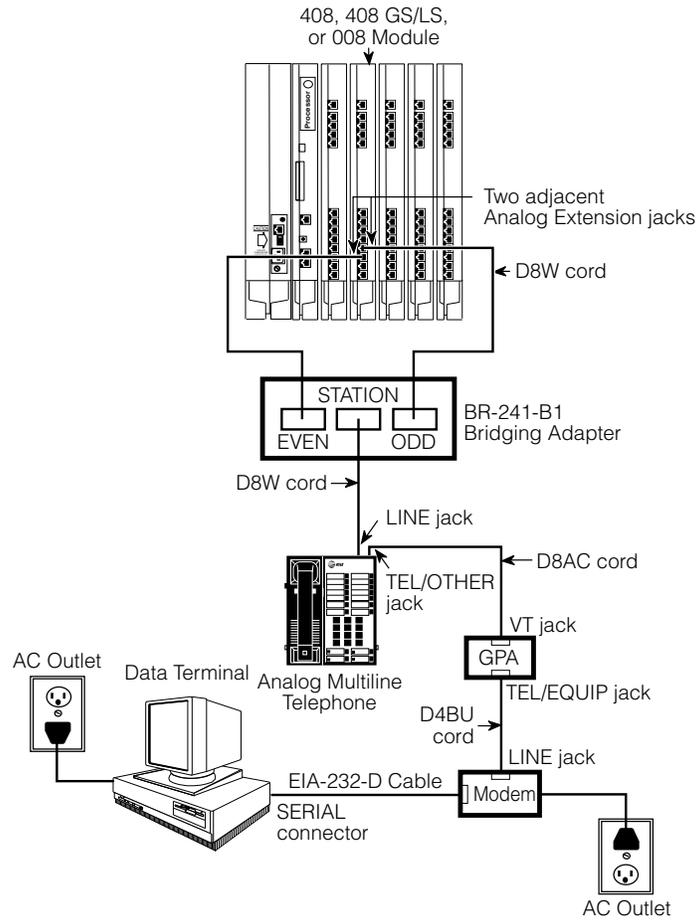


Figure 6-1. Analog Voice and Modem Data Equipment Configuration

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.

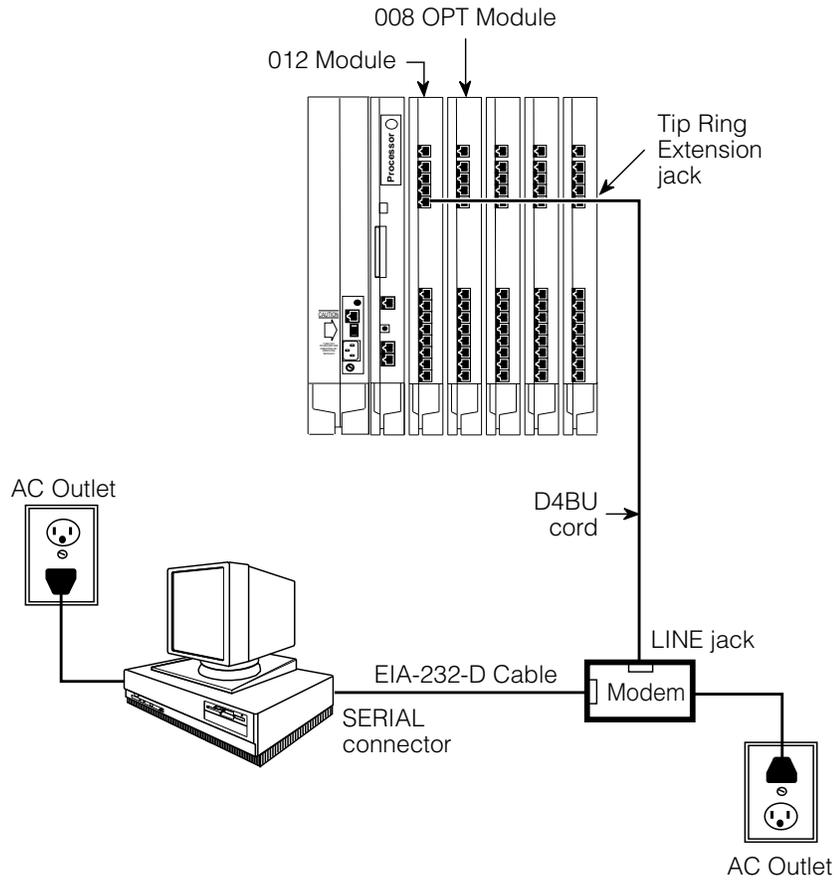


Figure 6-2. Modem Data-Only Equipment Configuration

MLX Voice and Modem Data Stations

Figure 6–3 shows the equipment configuration for an MLX voice and modem data station.

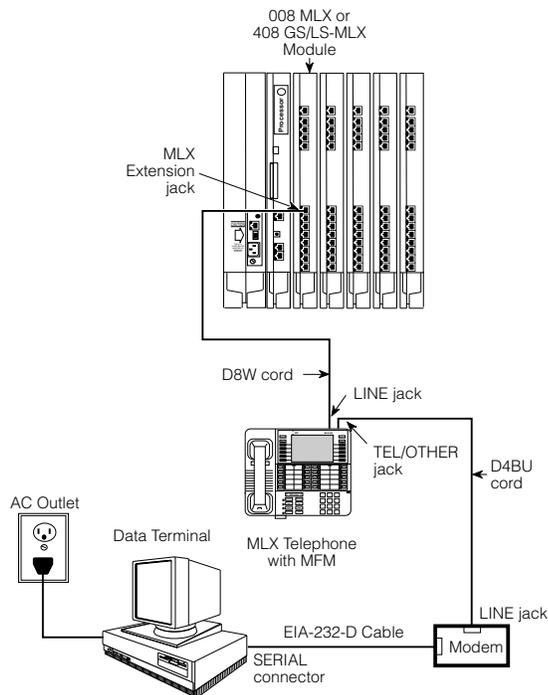


Figure 6–3. Modem Data and MLX Voice Equipment Configuration

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.

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

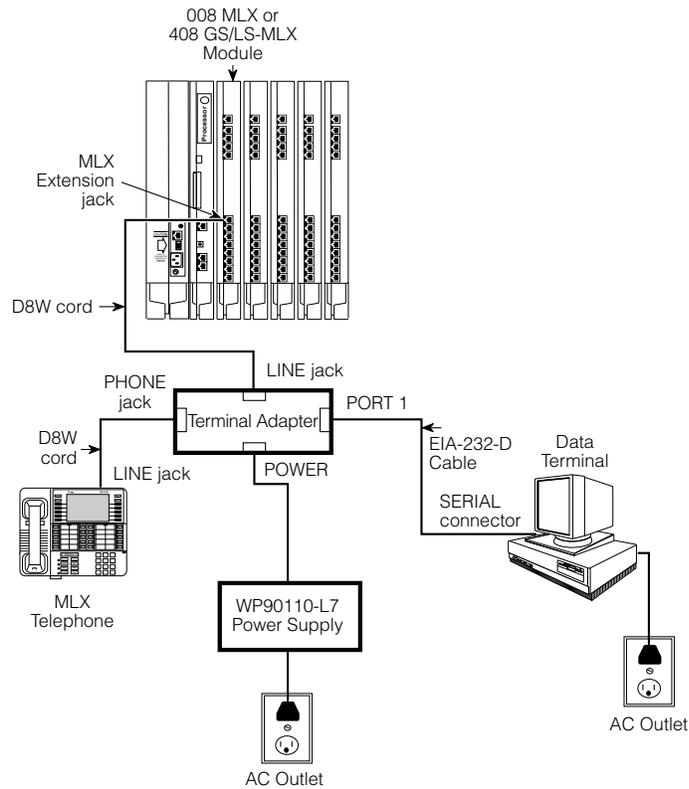


Figure 6-4. MLX Voice and Terminal Adapter Data Equipment Configuration

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.

Terminal Adapter Data-Only Stations

- 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.

Terminal Adapter Data-Only Stations

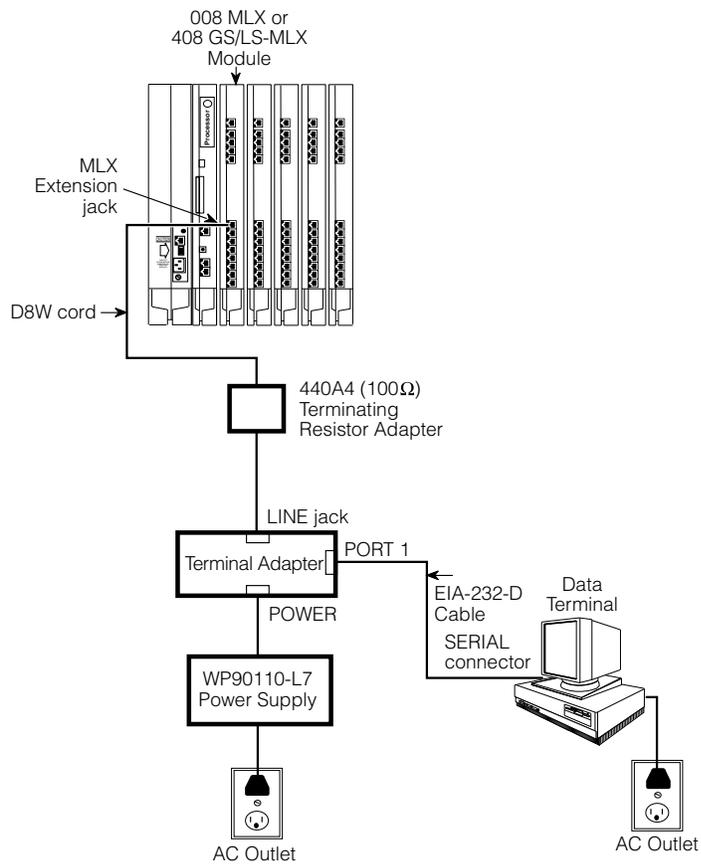


Figure 6-5. Terminal Adapter Data-Only Equipment Configuration

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.

NOTES:

1. If you are connecting MLX telephones, omit both 440A4 terminating resistors.
2. The maximum cord length from the terminal adapters to the telephone is 80 ft. (24.38 m).

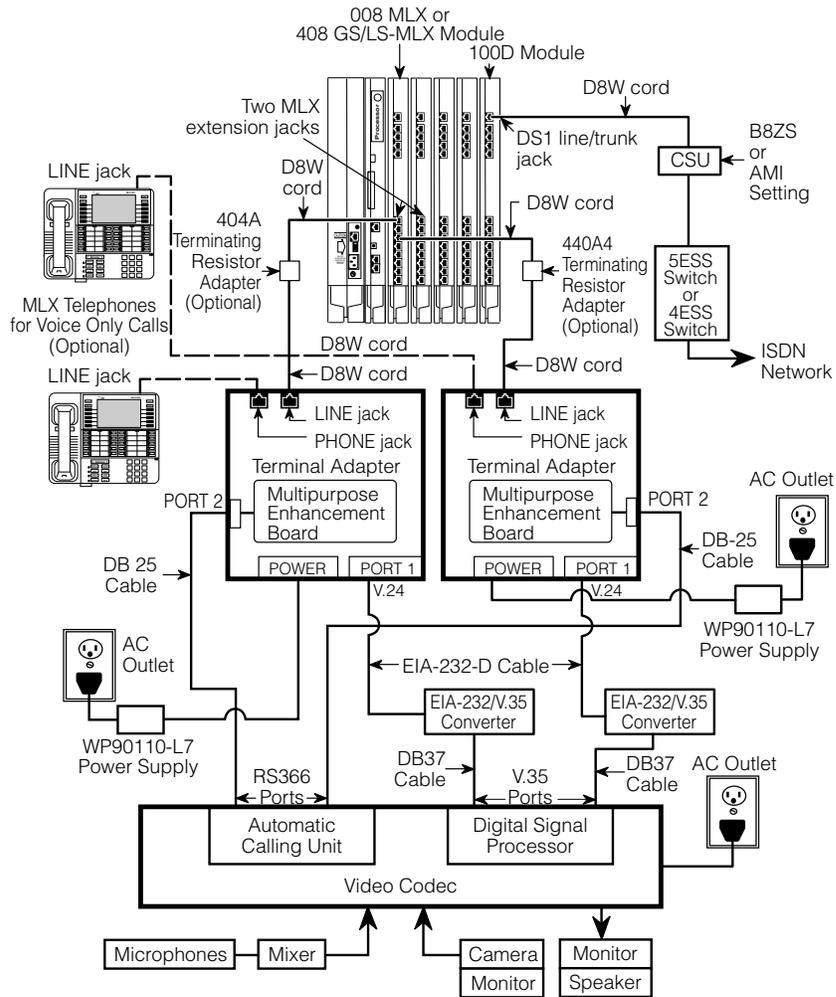


Figure 6-6. Video Conferencing Configuration

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 4.0 system, use one of the following methods:

- Restore from a 4.0 system programming disk or Translation memory card.
- Upgrade to Release 4.0 from Release 1.0, 1.1, 2.0, 2.1, 3.0, or 3.1. 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*, 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 4.0 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 4.0 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 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 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.

NOTE:

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 will 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 *37*.)

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 and pay license fees from 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 the customer to obtain such a license, from an AT&T representative.

Testing the Power Failure Transfer Jacks

To test a power failure transfer (PFT) jack for proper operation, the outside line numbers to the module's line/trunk jacks must be assigned 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.

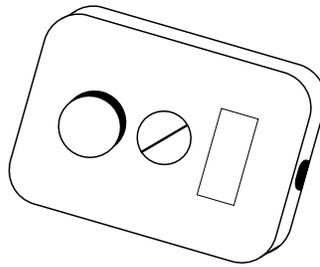


Figure 7-1. Ground-Start Button

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, tell 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 through 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, 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.

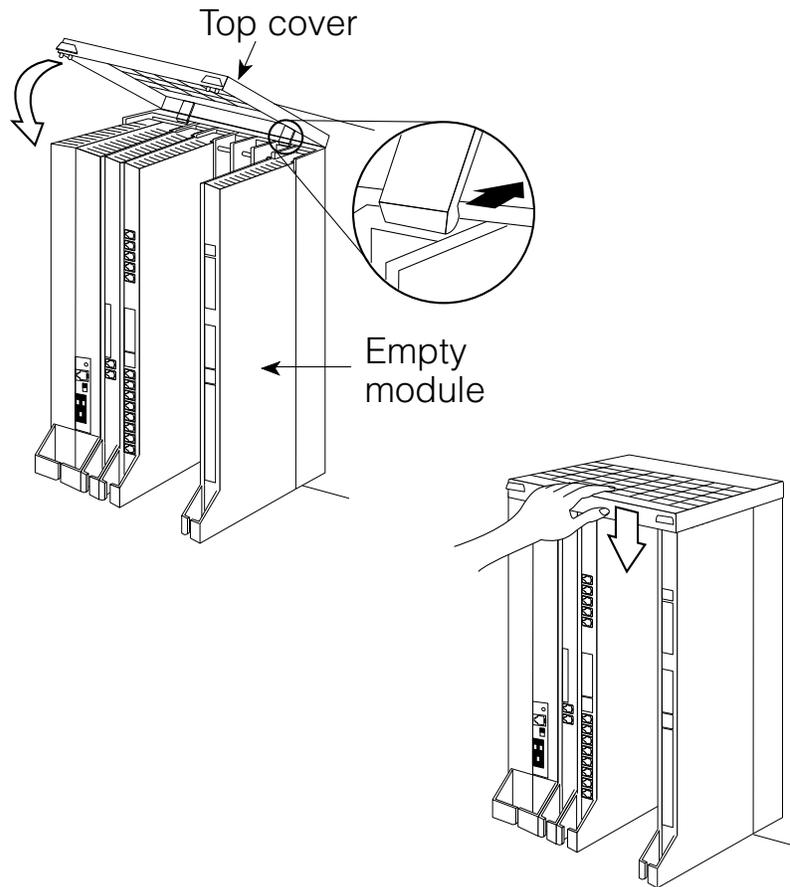


Figure 7-2. Installing the Control Unit Top Cover

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.**

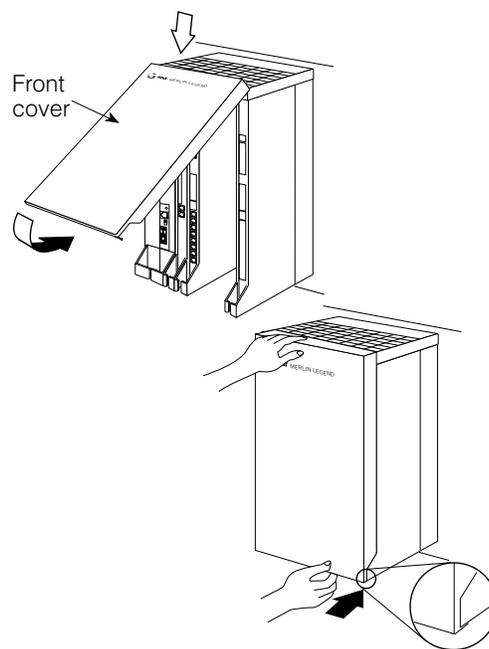


Figure 7-3. Installing the Control Unit Front Cover

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
 - AT&T 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



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
- AT&T 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 AT&T 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:

- AT&T 705 MT Multitasking Terminal
- AT&T 6386/SX WGS (or compatible) with ProComm Plus® software.

See the *AT&T 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 AT&T 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 a 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 (AT&T 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.

AT&T 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 AT&T.

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

CONVERSANT

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 following Maintenance and Troubleshooting for more information.

Consideration

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.
- AT&T 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 following Maintenance and Troubleshooting for more information.

Considerations

IS III uses AT&T 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*.

AT&T Attendant

AT&T Attendant is a stand-alone application that provides operator-like services through the use of prerecorded 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 following Maintenance and Troubleshooting for more information.

Considerations

You cannot connect AT&T Attendant to a system that operates in Behind Switch mode.

You cannot connect AT&T 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 AT&T 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.
- AT&T 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

AT&T 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 AT&T Attendants.

If you use all eight jacks on an 012 module for AT&T 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:

- AT&T 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 *AT&T 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 following 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 is 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 AT&T Attendant should not be used on the same system.

Programming of MERLIN MAIL is 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:

- **AT&TCall.** A card file application that enables a user to maintain names, addresses, telephone numbers and other information.
- **AT&TSet.** 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 AT&TCall.
- **AT&TConnect.** Management software that provides the basis for all the other PassageWay applications. AT&TConnect also provides autodialing using the command set used by most modems.

- **AT&T 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.

Upgrading the System

9

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 version 2.09 or higher of SPM.*
- *To back up system programming from Release 2.1, you must use version 2.16 or higher of SPM.*
- *To back up system programming from Release 3.0 or 3.1, you must use version 3.18 or higher of SPM.*

Removing the Control Unit Housing

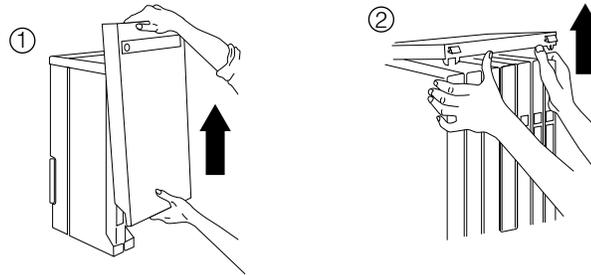
Remove the control unit housing as described below. See Figure 9–1.

- 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.

Removing the Control Unit Housing

MERLIN II and
MERLIN LEGEND 2.1 and later
Communications System



MERLIN LEGEND 2.0
and earlier
Communications System

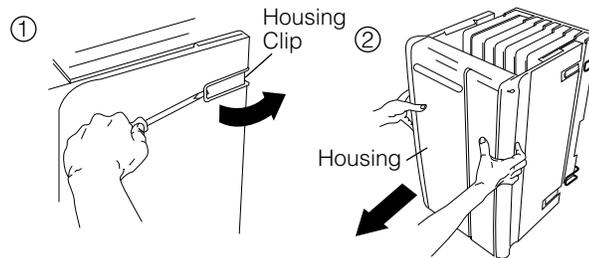


Figure 9-1. Removing the Control Unit Housing

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.

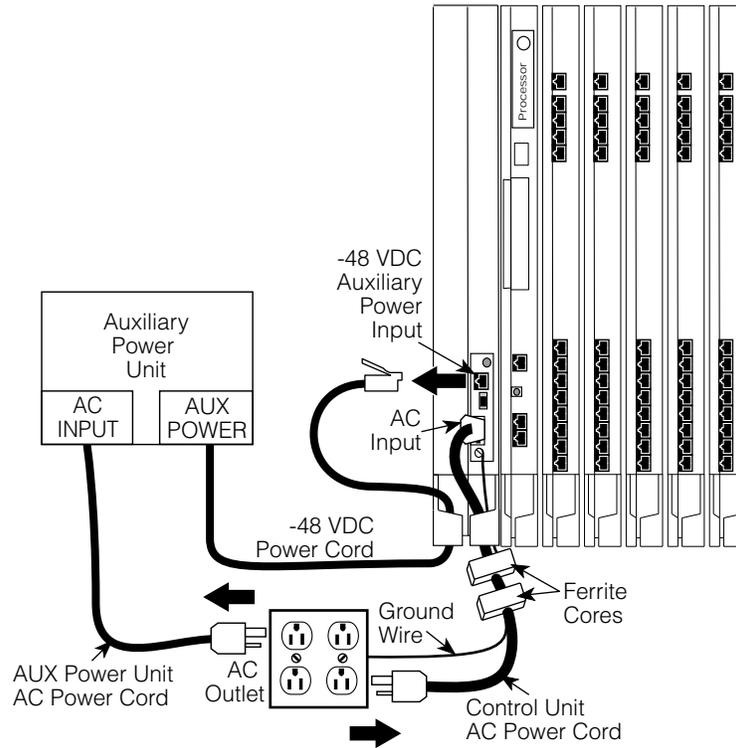


Figure 9–2. Powering Down the System

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 put 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 Renum after completing the upgrade. See *System Programming* for more information about Board Renum.

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, and 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/Inst11**→**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.*”

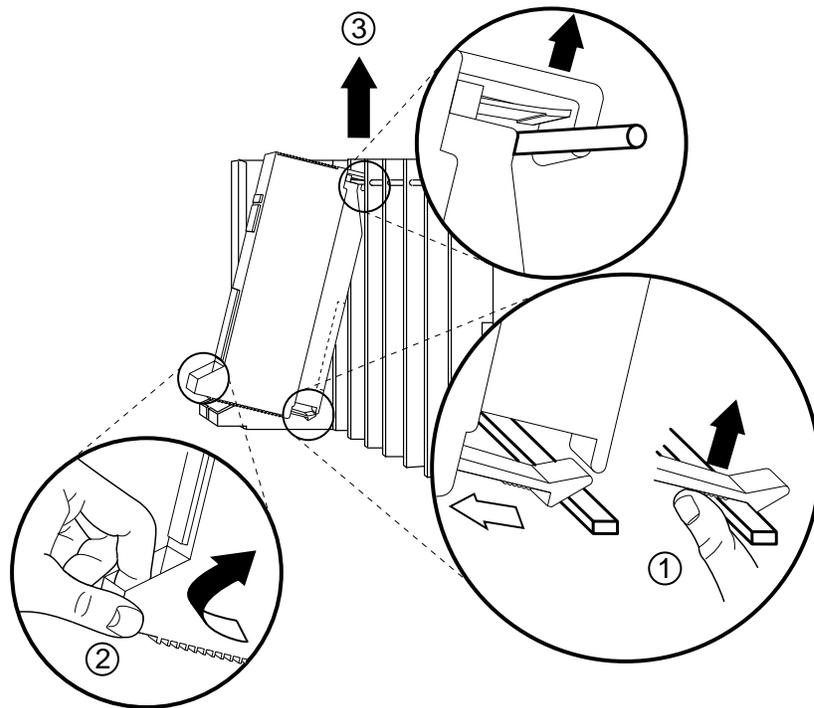


Figure 9-3. Removing a Module from the Carrier

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, and 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.

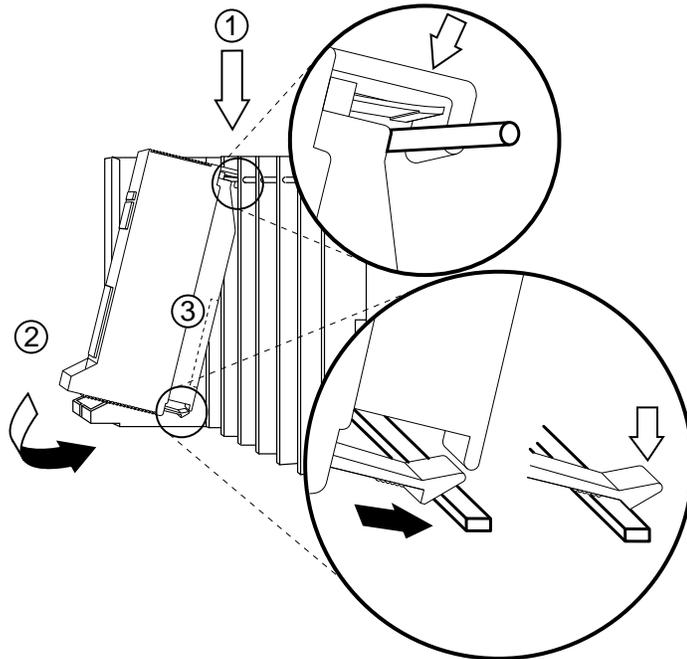


Figure 9-4. Replacing a Module in the Carrier

- 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.**

Modifying the Processor
for Key Mode

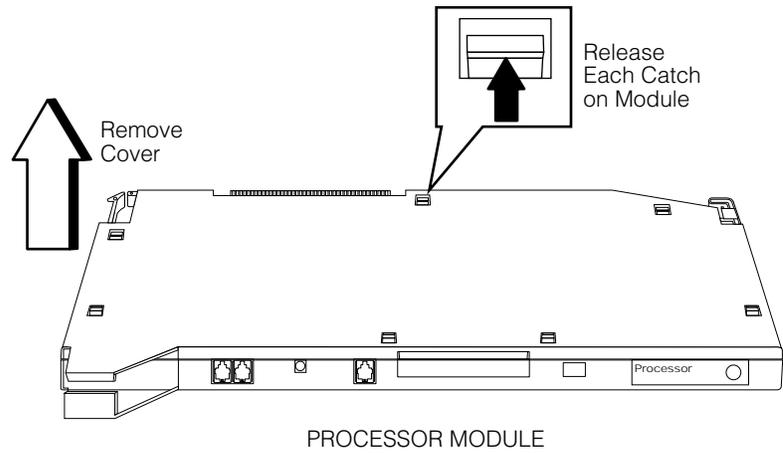


Figure 9-5. Removing the Processor Module Cover

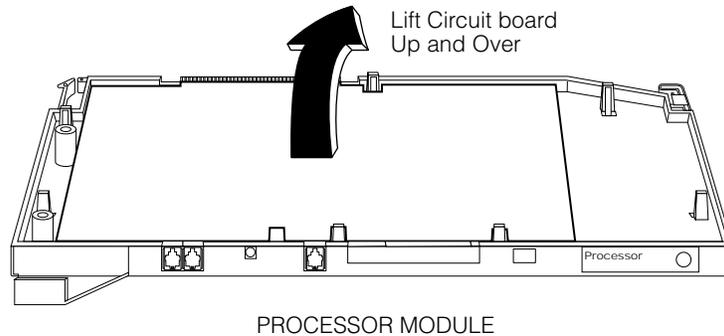


Figure 9–6. Removing the Processor Module Circuit Board

- 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 the 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.

Modifying the Processor
for Key Mode

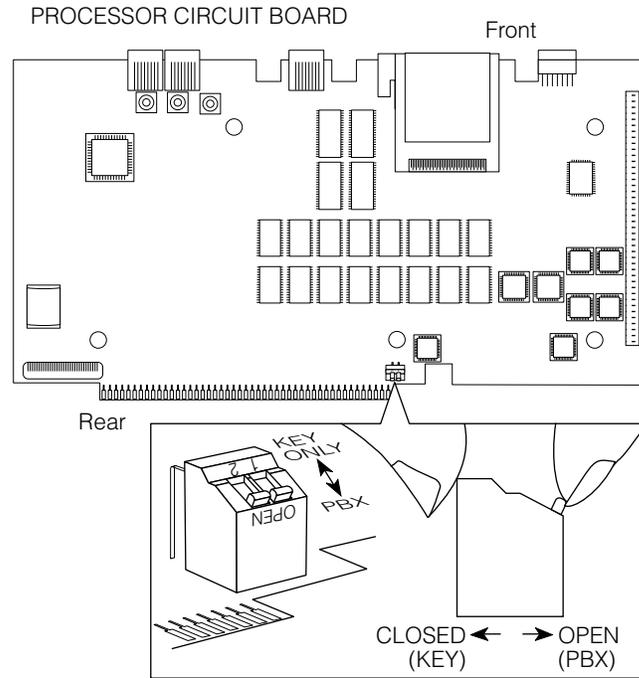


Figure 9-7. Changing the Key Mode Switch Position to Closed

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, and it cannot be used for the duration of the procedure. Refer to “Restoring from the System Programming Diskette” 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 “Installing the Control Unit” in Chapter 2 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 “Installing the Control Unit” in Chapter 2 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's 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.

Replacing the Control Unit Housing

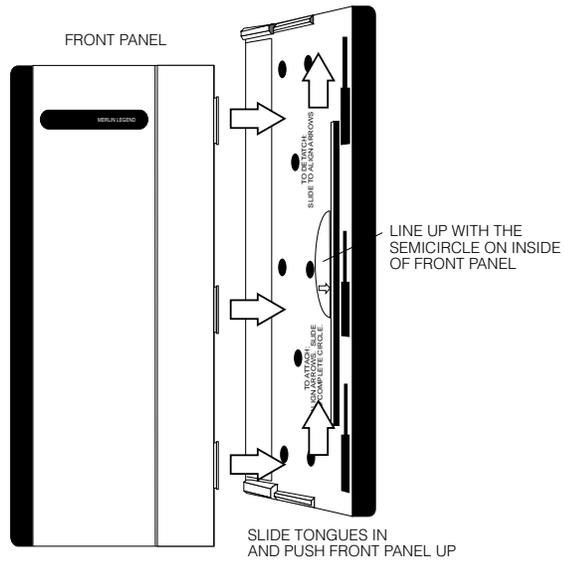
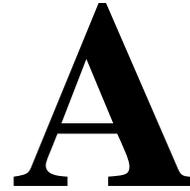


Figure 9–8. Installing the Control Unit Housing

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 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 A-1. Form 2a, System Numbering: Extension Jacks

The following explains how to complete Form 2a.

A-2 Installation

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						

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 \blacklozenge Yes

Module Type and Slot No.	Log. ID	Jack Type (L.S., G.S., 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		OCC Operator to Receive Calls† (No \blacklozenge)	OCC Queue Priority Level† (4 \blacklozenge)	Function
									TT \blacklozenge	R	Yes \blacklozenge	No	Short	Long \blacklozenge			
	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														

\blacklozenge 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.
 \ddagger 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 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 [‡]	

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	

Listed Directory Number* (QCC Queue)	Factory-Set Number	Renumber to
	800	

Remote Access Code (Form 3a)	Factory-Set Number	Renumber to
	889	

ARS Dial-Out Code [†]	Default	Renumber to
	9	

DSS Page Buttons	
PAGE 1	Beginning extension for range _____
PAGE 2	Beginning extension for range _____
PAGE 3	Beginning extension for range _____

* 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 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.

Unit Load Calculation Worksheet

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	
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.

Unit Load Calculation Worksheet

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-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>				

* Unit loads are computed per trunk for trunk-type network access lines.

Unit Load Calculation Worksheet

•	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Optional Equipment†				
Direct Station Selector‡			0.7	0.9
General Purpose Adapter			0.8	1.0
Hands-Free Unit			0.8	1.0
Headset Adapter				
Total Actual Unit Load				

† The MFM has its own wall power unit located at the telephone and therefore is not added to the unit load calculation.

‡ 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.

Unit Load Calculation Worksheet

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*				
DS1			0.0	0.0
GS/LS			0.0	0.0
Tie			1.4	1.4
Telephones				
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
MDW-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>				

* Unit loads are computed per trunk for trunk-type network access lines.

Unit Load Calculation Worksheet

	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Optional Equipment†				
Direct Station Selector‡			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 Unit Load for Slots 5 and 6				

† The MFM has its own individual wall power unit located at the telephone and therefore is not added to the unit load calculation.

‡ 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.

Index

#

- 146A protector, 2-15-2-16
- 147A protector, 2-15-2-16
- 400EM tie trunk module, 2-34-2-40
- 7500B data station
 - data only, 6-14-6-15
 - video conferencing
 - configuration diagram, 6-18-6-19
 - data module settings, 6-21
 - hardware required, 6-17-6-18
 - procedure, 6-20-6-21
 - with MLX voice
 - configuration diagram, 6-13
 - procedure, 6-12-6-13

A

- AC outlet test, 2-8-2-9
- Adapters
 - list of unsupported, 3-39-3-40
- ADDS, See Automated Document Delivery System (ADDS)
- Adjuncts
 - forms for, 1-3
 - installation procedure, 3-22-3-24
 - unsupported, 3-39-3-40
- Alerts, 3-38
- Analog telephones, testing, 7-7
- Applications supported, 8-1-8-2
- ARS, See Automatic Route Selection (ARS)
- AT&T Attendant, 8-17-8-18
- Automated Document Delivery System (ADDS), 8-3-8-5

- Automatic Route Selection (ARS)
 - testing, 7-13
- Automatic-start trunks testing
 - incoming, 7-9-7-10
 - outgoing, 7-10
 - two way, 7-9
- Auxiliary power unit
 - installation, 2-25-2-26

B

- Backboard, 2-2-2-3
- Background music
 - copyright release and license, 3-35
 - with multizone paging, Magic on Hold, and bidirectional paging, 3-36-3-37
 - with single-zone paging and Magic on Hold, 3-36
- Basic carrier, 2-17-2-18
- Bidirectional paging, 3-36-3-37

C

- Call Accounting System (CAS)
 - CAS for Windows, 8-6-8-7
 - CAS Plus V3, 8-6
 - documentation, 8-7-8-8
 - overview, 8-5
 - procedure, 8-7
- Call Accounting Terminal (CAT)
 - documentation, 8-9
 - hardware requirements, 8-9
 - overview, 8-8
 - procedure, 8-9

- Call Management System (CMS)
 - documentation, 8-12
 - hardware and software requirements, 8-11–8-12
 - overview, 8-9–8-11
- Carrier, 2-17–2-18
- CAS, See Call Accounting System (CAS)
- CAT, See Call Accounting Terminal (CAT)
- CMS, See Call Management System (CMS)
- Components, installation sequence, 1-1–1-2
- Connecting block removal, 3-62–3-63
- Control unit
 - backboard, 2-2–2-3
 - connecting to AC outlet, 2-43
 - dimensions, 2-3–2-4
 - environmental requirements, 2-2–2-3
 - forms for, 1-3
 - front cover, 7-22
 - grounding requirements, 2-5–2-8, 2-10–2-15
 - housing, 7-22, 9-18–9-20
 - installation forms, 1-3
 - interference, 2-3
 - location, 2-4
 - mounting hardware, 2-5
 - power requirements, 2-5–2-8
 - removing housing, 9-4–9-7
 - replacing housing clips, 9-9–9-12
 - top cover, 7-20
 - upgrading, 9-1–9-10
- CONVERSANT Intro
 - documentation, 8-14
 - hardware requirements, 8-13
 - overview, 8-12–8-13
 - software requirements, 8-13–8-14
- Copper shield installation, 2-20–2-22

- Copyright release and license, 3-35
- Coverage feature, testing, 7-14–7-15
- Credit card verification terminal
 - installation, 3-22–3-24, 3-26–3-27

D

- Data communications equipment (DCE)
 - 7500B data only, 6-14–6-15
 - 7500B data with MLX voice, 6-12–6-14
 - configuration table, 6-4–6-5
 - forms, 1-4
 - modem only, 6-7–6-9
 - modem with analog voice, 6-5–6-7
 - modem with MLX voice, 6-9–6-11
 - video conferencing, 6-17–6-21
- Data stations
 - 7500B data only, 6-14–6-15
 - analog voice and modem data
 - configuration diagram, 6-6–6-7
 - GPA settings, 6-5
 - procedure, 6-5–6-6
 - configuration table, 6-4–6-5
 - MLX voice and 7500B data
 - configuration diagram, 6-13
 - procedure, 6-12–6-13
 - MLX voice and modem data
 - configuration diagram, 6-10
 - procedure, 6-11
 - modem only
 - configuration diagram, 6-9
 - procedure, 6-8–6-9
 - overview, 6-1–6-4
 - video conferencing
 - configuration diagram, 6-18–6-19
 - CSU settings, 6-21
 - data module settings, 6-21
 - hardware required, 6-17–6-18
 - procedure, 6-20–6-21

Index

Date, 7-3
Dial dictation device
 installation, 3-22–3-24, 3-25
 testing, 7-16
Dial-repeating tie trunks, testing, 7-11–
 7-12
DID trunk testing, 7-8–7-9
DIP switch settings
 400EM tie trunk module, 2-34–2-36
Direct Station Selector (DSS)
 auxiliary power
 requirements, 3-43
 wiring, 3-46–3-47
 connection diagram, 3-45
 considerations, 3-43
 installation procedure, 3-43–3-48
 testing, 7-15
DOS-based products supported, 8-1–
 8-2
DSS, See Direct Station Selector (DSS)
Dual-tone multifrequency (DTMF)
 signaling, 3-30

E

Electrical noise, 2-3
Environmental requirements for control
 unit, 2-2–2-3
Expansion carrier, 2-27–2-28, 2-29

F

Fax machine installation, 3-22–3-24,
 3-26
Ferrite core installation, 2-23–2-25
Forms
 adjunct installation, 1-3
 control unit installation, 1-3
 data equipment connection, 1-4

 network interface connection, 1-3–
 1-4
 telephone installation, 1-3
Frigid start, 7-1
Front cover, 7-22

G

General Purpose Adapter (GPA), 3-24–
 3-25, 6-5
Ground-start (GS) button, 7-18
Ground-start trunk testing, 7-8
Grounding requirements, 2-5–2-8, 2-10–
 2-15
Grounds
 AC, 2-10–2-11
 central office, 2-10–2-11
Group calling delay announcement
 device, 3-22–3-24, 3-26
Group Calling feature testing, 7-13–7-14

H

Hardware supported, 8-1–8-2
Headsets, 3-27–3-29
Housing
 installation, 9-18–9-20
 removing, 9-4–9-7
 replacing clips, 9-9–9-12

I

In Range Out-of-Building (IROB)
 protector, 3-59
Initializing the system
 programming disk, 7-2–7-3
 Translation memory card, 7-2

Index

Installation
 summary of tasks, 1-1-1-2
 system forms and, 1-2-1-4
Integrated Solution III (IS III)
 hardware requirements, 8-15-8-16
 overview, 8-14-8-15
 procedure, 8-16
 UNIX-based products supported,
 8-2
Integrated Voice Response (IVR)
 applications, 8-12
Intercom dial tone testing, 7-6
Interference, 2-3
IROB, See In-Range Out-of-Building
 protector
IS III, See Integrated Solution III (IS III)
IVR, See Integrated Voice Response
 (IVR) applications

K

Key mode
 modifying processor for, 9-12-9-15
 Release 2.0 and earlier, 9-18

L

Lightning protection, 2-14-2-15
Line jack labeling, 2-39
Loop-start trunk testing, 7-8
Loudspeaker paging
 connection, 3-29
 DTMF signaling, 3-30
 multizone with background music,
 Magic on Hold, and bidirectional
 paging, 3-36-3-37
 single-zone with customer-supplied
 amplifier, 3-32
 single-zone with Music on Hold, 3-36

single-zone with PagePac Plus, 3-31
single-zone with UPAM, 3-32-3-33

M

Magic on Hold, 3-35, 3-36-3-37
MERLIN Identifier, 3-34
MERLIN MAIL
 hardware requirements, 8-20-8-21
 overview, 8-18-8-20
 ports required, 8-19
MERLIN PFC (Phone-Fax-Copier)
 Behind Switch mode, 8-22-8-23
 hardware requirements, 8-23
 Hybrid/PBX and Key modes, 8-22
 overview, 8-21-8-22
MFM, See Multi-Function Module (MFM)
Mirage headpiece, 3-27
MLX telephone
 assembly procedure, 3-49-3-57
 backplate, 3-54-3-56
 button assignment card, 3-56-3-57
 considerations, 3-48
 deskstand, 3-49
 display, 3-57, 7-5
 extension label, 3-51-3-52, 3-53-
 3-54
 handset holder, 3-52-3-53
 line cords, 3-49-3-51
 mounting, 3-54-3-56
 speakerphone, 7-4
 testing
 intercom dial tone, 7-6
 outside dial tone, 7-6-7-7
 with MFMs, 7-5-7-6

Index

- Modem data station
 - modem data only
 - configuration diagram, 6-9
 - procedure, 6-8–6-9
 - with analog voice
 - configuration diagram, 6-6–6-7
 - GPA settings, 6-5
 - procedure, 6-5–6-6
 - with MLX voice
 - configuration diagram, 6-10
 - procedure, 6-11
 - Module
 - installation
 - 400EM DIP switch settings, 2-34–2-36
 - guidelines, 2-32–2-33
 - line jacks, 2-39
 - power supply, 2-23
 - procedure, 2-37–2-40
 - settings for signaling types 1C and 5, 2-37–2-38
 - trunk jacks, 2-39
 - replacement, 2-41
 - Mounting hardware, 2-5
 - Multi-Function Module (MFM)
 - adjuncts supported by, 3-2
 - and Voice Announce to Busy, 3-2
 - connector pins, 3-10–3-12
 - definition, 3-1
 - installation
 - considerations, 3-2
 - procedure, 3-4–3-22
 - telephone power-up, 3-20–3-22
 - jack guard, 3-12–3-14
 - jack tab cover, 3-12–3-14
 - jumper settings, 3-12
 - locking tabs, 3-10–3-12
 - packing list, 3-2–3-3
 - removing, 3-10
 - SAA setting, 3-12
 - T/R operation setting, 3-12
 - testing telephones with, 7-5–7-6
 - Multizone paging, 3-36–3-37
 - Music on Hold
 - connection, 3-35
 - copyright release and license, 3-35
 - testing, 7-16–7-17
 - with single-zone paging, 3-36
-
- ## N
- Network interface installation forms, 1-3–1-4
 - Night Service feature, testing, 7-15–7-16
-
- ## O
- Outlet testing, 2-8–2-9
 - Outside dial tone testing, 7-6–7-7
 - Overview
 - installation sequence, 1-1–1-2
 - programming, 1-4
 - adjuncts installation, 1-3
 - control unit installation, 1-3
 - data equipment connection, 1-4
 - network interface connection, 1-3–1-4
 - telephone installation, 1-3
 - system upgrade, 1-5
-
- ## P
- Paging
 - connection, 3-29
 - DTMF signaling, 3-30
 - multizone with background music, Magic on Hold, and bidirectional paging, 3-36–3-37

- single-zone with background music and Magic on Hold, 3-36
- single-zone with customer-supplied amplifier, 3-32
- single-zone with PagePac Plus, 3-31
- single-zone with UPAM, 3-32–3-33
- testing, 7-16–7-17
- PassageWay Direct Connect Solution
 - hardware and software requirements, 8-24–8-25
 - overview, 8-23–8-24
- PFT, See Power failure transfer (PFT) jack
- Power
 - turning off, 2-45, 9-5
 - turning on, 2-44
- Power failure transfer (PFT) jack, testing, 7-18–7-19
- Power requirements, 2-5–2-8
- Power supply installation
 - copper shield, 2-20–2-22
 - ferrite cores, 2-23–2-25
 - power supply module, 2-23
 - ring generator, 2-20
 - turning power off, 2-20
- Powering down the system, 2-45, 9-5
- Powering up the system, 2-44
- Processor
 - installation, 2-29–2-30, 2-31
 - modifying for Key mode, 9-12–9-15
- Programming, 1-4
 - disk, 7-2–7-3
 - guides, 7-2
 - overview, 1-4
- Protector
 - 146A, 2-15–2-16
 - 147A, 2-15–2-16

R

- Radio-frequency interference (RFI), 2-3
- Ring generator, 2-20

S

- SAA, See Supplemental Alert Adapter (SAA)
- Single-zone paging, 3-36
- Software supported, 8-1–8-2
- Speakerphones, 7-4
- SPM, See System Programming and Maintenance (SPM)
- Stand-alone products supported, 8-1
- StarSet headpiece, 3-27
- Station Message Detail Recording (SMDR), testing, 7-13
- Supplemental alert adapter (SAA), 3-38–3-39
- Supplemental alerts, 3-38
- Supra Binaural headpiece, 3-28
- Supra Binaural Noise-Canceling (NC) headpiece, 3-28
- Supra Monaural headpiece, 3-27
- Supra Monaural Noise-Canceling (NC) headpiece, 3-27
- System Erase, 7-1
- System planning forms, 1-2–1-4
- System Programming and Maintenance (SPM) application, 8-25–8-26
- System Speed Dial, testing, 7-14

T

T/R, See Tip/ring (T/R) device

Talk-back, 3-36-3-37

Telephones

connecting to control unit

considerations, 3-58-3-59

direct wiring, 3-58-3-60

less than 25, 3-58-3-60

two voice pairs, 3-60-3-61

cord channel, 3-22-3-23

installation forms, 1-3

MLX

backplate, 3-54-3-56

button assignment card, 3-56-3-57

considerations, 3-48

deskstand, 3-49

display, 3-57, 7-5

extension label, 3-51-3-52, 3-53-3-54

handset holder, 3-52-3-53

line cords, 3-49-3-51

mounting, 3-54-3-56

power-up after MFM installation, 3-20-3-22

speakerphone, 7-4

supported, 3-1

unsupported, 3-39-3-40

wireless, 3-57-3-58

Terminal adapter data station

data only, 6-14-6-15

video conferencing

configuration diagram, 6-18-6-19

data module settings, 6-21

hardware required, 6-17-6-18

procedure, 6-20-6-21

with MLX voice

configuration diagram, 6-13

procedure, 6-12-6-13

Testing the system

analog telephones, 7-7

ARS, 7-13

Coverage feature, 7-14-7-15

dictation system, 7-16

DID trunks, 7-8-7-9

Direct Station Selector (DSS), 7-15

ground-start trunks, 7-8

Group Calling feature, 7-13-7-14

loop-start trunks, 7-8

MLX telephones

basic features, 7-4-7-5

display, 7-5

intercom dial tone, 7-6

outside dial tone, 7-6-7-7

overview, 7-3-7-4

speakerphones, 7-4

with MFMs, 7-5-7-6

Music On Hold feature, 7-16-7-17

Night Service feature, 7-15-7-16

paging system, 7-16-7-17

PFT jack, 7-18-7-19

SMDR, 7-13

System Speed Dial, 7-14

tie trunks

incoming automatic-start, 7-9-7-10

incoming dial-repeating, 7-11

outgoing automatic-start, 7-10

outgoing dial-repeating, 7-11-7-12

overview, 7-9

two-way automatic-start, 7-9

two-way dial-repeating, 7-11

touch-tone receivers (TTRs), 7-19-7-20

Tie trunks
400EM, 2-34-2-40
testing
 incoming automatic-start, 7-9-7-10
 incoming dial-repeating, 7-11
 outgoing automatic-start, 7-10
 outgoing dial-repeating, 7-11-7-12
 overview, 7-9
 two-way dial-repeating, 7-11
Time, 7-3
Tip/ring (T/R) device, connecting to MLX telephone, 3-1-3-2
Touch-tone receiver (TTR) testing, 7-19-7-20
Translation memory card, 7-2
Trunk
 jacks, labeling, 2-39
 protection, 2-13-2-14
 testing
 DID, 7-8-7-9
 ground-start, 7-8
 incoming dial-repeating, 7-11
 loop-start, 7-8
 outgoing automatic-start, 7-10
 outgoing dial-repeating, 7-11-7-12
 two-way automatic start, 7-9
 two-way dial-repeating, 7-11
TTR, See Touch-tone receiver (TTR)
 testing
Two voice pairs, 3-60-3-61

U

Unit load
 calculating, C-1
 checking, 2-16-2-17

Upgrading the system
 control unit, 9-1-9-10
 from MERLIN II system, 9-16-9-17
 from previous release, 9-15-9-16

V

Video conferencing
 configuration diagram, 6-18-6-19
 data module settings, 6-21
 hardware required, 6-17-6-18
 procedure, 6-20-6-21
VMS, See Voice messaging system (VMS)
Voice Announce to Busy, 3-2, 3-60-3-61
Voice messaging system (VMS), 8-2-8-3

W

Wireless telephone, 3-57-3-58



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MERLIN LEGEND®
Communications
System
Releases 3.1
and 4.0

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. AT&T 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. AT&T 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 class A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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Issue 1, March 1996

For more information about AT&T documents, refer to the section entitled, "Related Documents" in "*About This Book*."

Support Telephone Number

In the continental U.S., AT&T provides a toll-free customer helpline 24 hours a day. Call the AT&T Helpline at **1 800 628-2888** or your AT&T authorized dealer if you need assistance when installing, programming, or using your system. Outside the continental U.S., contact your local AT&T authorized representative.

AT&T Corporate Security

Whether or not immediate support is required, *all* toll fraud incidents involving AT&T products or services *should be reported* to AT&T Corporate Security at **1 800 821-8235**. In addition to recording the incident, AT&T Corporate Security is available for consultation on security issues, investigation support, referral to law enforcement agencies, and educational programs.

AT&T Fraud Intervention

If you *suspect you are being victimized* by toll fraud and you need technical support or assistance, call GBCS National Service Assistance Center at **1 800 628-2888**.

Warranty

AT&T provides a limited warranty on this product. Refer to "Limited Warranty and Limitation of Liability" in Appendix A, "Customer Support Information," which follows *Maintenance and Troubleshooting* in this binder.

Contents

About This Book

■ Intended Audience	xvii
■ How to Use This Book	xvii
■ Terms and Conventions Used	xviii
■ Product Safety Labels	xx
■ Security	xxi
■ Related Documents	xxii
■ How to Comment on This Document	xxiii

1 Introduction

■ Equipment	1-1
■ On-Site Programming Maintenance	1-3
■ Remote Programming Maintenance	1-6
■ Using SPM	1-8
■ Preparation for Hardware Maintenance	1-15
■ Maintenance Strategy	1-18
■ Unit Loads	1-26

2 Error Logs, Access Logs, and System Inventory

■ Error Logs	2-1
■ Access Log	2-23
■ System Inventory	2-25

Contents

3 Telephone Problems

- Fixing Telephone Problems 3-2
 - MLX Telephone Tests 3-6
 - System Requirements for Touch-Tone Receivers 3-8
-

4 Control Unit Problems

- Backing Up System Programming 4-1
 - Power Supply Problems 4-2
 - Processor Problems 4-12
 - Module Problems 4-33
 - 800 NI-BRI Module Problems 4-74
 - 100D Module Problems 4-92
 - Carrier Problems 4-106
 - Checking System and Slot Status 4-107
-

5 Central Office Problems

- Trunk Errors 5-1
- Checking Ports 5-8
- Conclusion of Hardware Maintenance 5-36

Contents

A Customer Support Information

- Support Telephone Number A-1
- Federal Communications Commission (FCC)
Electromagnetic Interference Information A-2
- Canadian Department of Communications (DOC)
Interference Information A-2
- FCC Notification and Repair Information A-3
- Installation and Operational Procedures A-5
- DOC Notification and Repair Information A-6
- Renseignements sur la notification du ministère
des Communications du Canada et la réparation A-8
- Security of Your System: Preventing Toll Fraud A-11
- Limited Warranty and Limitation of Liability A-13
- Limitation of Liability A-15
- Voice Mail Systems A-15
- Remote Administration and Maintenance A-17

B System Numbering Forms

- Form 2a, System Numbering: Extension Jacks B-2
- Form 2b, System Numbering: Digital Adjuncts B-4
- Form 2c, System Numbering: Line/Trunk Jacks B-5
- Form 2d, System Numbering: Special Renumbers B-6

Contents

C Unit Load Calculation Worksheet

Unit Load Worksheet C-2

D Backing Up with a Memory Card

- Card Types D-2
- Memory Card Formatting D-5
- Backup D-7
- Automatic Backup D-11
- Restore D-18

E Modifying a Release 2.1 or Earlier Processor for Key Mode

F NI-1 BRI Provisioning

- AT&T 5ESS Switch Translations F-2
- Northern Telecom DMS-100 Switch Translations F-20
- Siemens SSC EWSD Switch Translations F-32

Contents

GL Glossary

GL-1

IN Index

IN-1

Figures

1 Introduction

1-1.	Setting Up the MLX-20L Console	1-4
1-2.	Setting Up the PC	1-5
1-3.	External Modem Setup	1-7
1-4.	The SPM Display	1-12
1-5.	Removing the Control Unit Housing	1-16
1-6.	Disconnecting AC Power	1-17
1-7.	Maintenance Strategy	1-18

4 Control Unit Problems

4-2.	Replacing a Ring Generator	4-7
4-3.	Replacing an Auxiliary Power Supply	4-9
4-4.	Inserting a Memory Card	4-21
4-5.	Replacing the Feature Module	4-32
4-6.	Module Test Process	4-35
4-7.	Inserting the Upgrade Memory Card	4-65
4-8.	551 T1 CSU Loopback Connection	4-94
4-9.	ESF T1 CSU DTE Loopback Connection	4-95
4-10.	Acculink 3150 CSU Front Panel	4-95
4-11.	Acculink 3150 CSU DTE Loopback Commands 1	4-96
4-12.	Acculink 3150 CSU DTE Loopback Command 2	4-96
4-13.	Acculink 3150 CSU DTE Loopback Command 3	4-97
4-14.	Acculink 3150 CSU DTE Loopback Command 4	4-97

Figures

5 Central Office Problems

- | | | |
|------|---|------|
| 5-1. | Installing the Control Unit Top Cover (Release 2.1 and Later) | 5-38 |
| 5-2. | Installing the Control Unit Front Cover (Release 2.1 and Later) | 5-39 |
| 5-3. | Assembling the Control Unit Housing (Release 2.0 and Earlier) | 5-41 |
| 5-3. | Installing the Control Unit Housing (Release 2.0 and Earlier) | 5-42 |

B System Numbering Forms

- | | | |
|------|--|-----|
| B-1. | Form 2a, System Numbering: Extension Jacks | B-2 |
| B-2. | Form 2b, System Numbering: Digital Adjuncts | B-4 |
| B-3. | Form 2c, System Numbering: Line/Trunk Jacks | B-5 |
| B-4. | Form 2d, System Numbering: Special Renumbers | B-6 |

D Backing Up with a Memory Card

- | | | |
|------|---------------------------|-----|
| D-1. | PCMCIA Memory Card | D-3 |
| D-2. | Inserting the Memory Card | D-4 |

E Modifying a Release 2.1 or Earlier Processor for Key Mode

- | | | |
|------|--------------------------------------|-----|
| E-1. | Modifying the Processor for Key Mode | E-2 |
| E-2. | Installing the Control Unit Housing | E-5 |

Tables

1 Introduction

1-1. Function of PC Keys in SPM	1-13
---------------------------------	------

2 Error Logs, Access Logs, and System Inventory

2-1. Transient/Permanent Error Thresholds	2-2
2-2. Error Codes	2-6

3 Telephone Problems

3-1. Troubleshooting Telephone Problems	3-2
3-2. MLX Telephone Display Buttons	3-8
3-3. TTRs Required by VMS	3-9
3-4. System Requirement for TTRs	3-10
3-5. Modules with TTRs	3-10

4 Control Unit Problems

4-1. PEC and Apparatus Codes for 012 Modules	4-5
4-2. Codes Displayed on the Error/Status Display During Forced Installation of System Software	4-26
4-3. Internal Loopback Test Errors	4-51
4-4. Board Controller Test Errors	4-55
4-5. Channel Loopback Errors	4-60
4-6. NI BRI Provisioning Test Errors	4-78

Tables

4 Control Unit Problems (continued)

4-7.	NI-BRI Test Result Codes	4-80
4-8.	Internal Loopback Test Errors	4-100

5 Central Office Problems

5-1.	Troubleshooting Trunk Symptoms	5-2
------	--------------------------------	-----

Tables



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.

IMPORTANT SAFETY INSTRUCTIONS

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 AT&T-manufactured MERLIN LEGEND Communications System circuit modules, carrier assemblies, and power units in the MERLIN LEGEND Communications System control unit.
- Use only AT&T-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 initially 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.
- *Feature Reference* provides details on the features of the communications system.
- *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 U.S.A. only, AT&T provides a toll-free customer Helpline (1 800 628-2888) 24 hours a day. Call the Helpline, or your AT&T 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, DID trunk, and so on. When you talk to your local telephone company central office, ask them what terms they use for the specific facilities they connect to your system.

Terms and Conventions Used

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

It is *very* important that you follow these steps. You *must* attach the wristband before touching the connection.

The part of the headset that fits over one or both ears is called a *headpiece*.

Purpose

Italics indicate emphasis.

Italics also set off special terms.

Typographical Conventions (continued)

Example	Purpose
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 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."

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 AT&T GBCS Publications Fulfillment Center by calling 1 800 457-1235.

Document No.	Title
	System Documents
555-640-110	<i>Feature Reference</i>
555-640-111	<i>System Programming</i>
555-640-112	<i>System Planning</i>
555-640-113	<i>System Planning Forms</i>
555-640-116	<i>Pocket Reference</i>
555-640-118	<i>System Manager's Guide</i>
	Telephone User Support
555-640-122	<i>MLX-10D™, MLX-10DP™, MLX-16DP™, MLX-28D™, and MLX-20L™ Display Telephones User's Guide</i>
555-630-150	<i>MLX-10D Display Telephone Tray Cards (5 cards)</i>
555-630-153	<i>MLX-28D and MLX-20L Telephone Tray Cards (5 cards)</i>
555-640-124	<i>MLX-10™ Nondisplay Telephone User's Guide</i>
555-630-151	<i>MLX-10 Nondisplay Telephone Tray Cards (6 cards)</i>
555-640-120	<i>Analog Multiline Telephones User's Guide</i>
555-640-126	<i>Single-Line Telephones User's Guide</i>
555-640-138	<i>MDC 9000 and MDW 9000 Telephones User's Guide</i>
	System Operator Support
555-640-134	<i>MLX Direct-Line Consoles Operator's Guide</i>
555-640-132	<i>Analog Direct-Line Consoles Operator's Guide</i>
555-640-136	<i>MLX Queued Call Console Operator's Guide</i>
	Miscellaneous User Support
555-640-130	<i>Calling Group Supervisor's Guide</i>
555-640-105	<i>Data and Video Reference</i>

Document No.	Title
	Documentation for Qualified Technicians
555-640-140	<i>Installation, Programming & Maintenance (IP&M) Binder [consists of Installation, System Programming & Maintenance (SPM), Maintenance & Troubleshooting]</i>
	Toll Fraud Security
555-025-600	<i>GBCS Products Security Handbook</i>

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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.

Equipment

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.

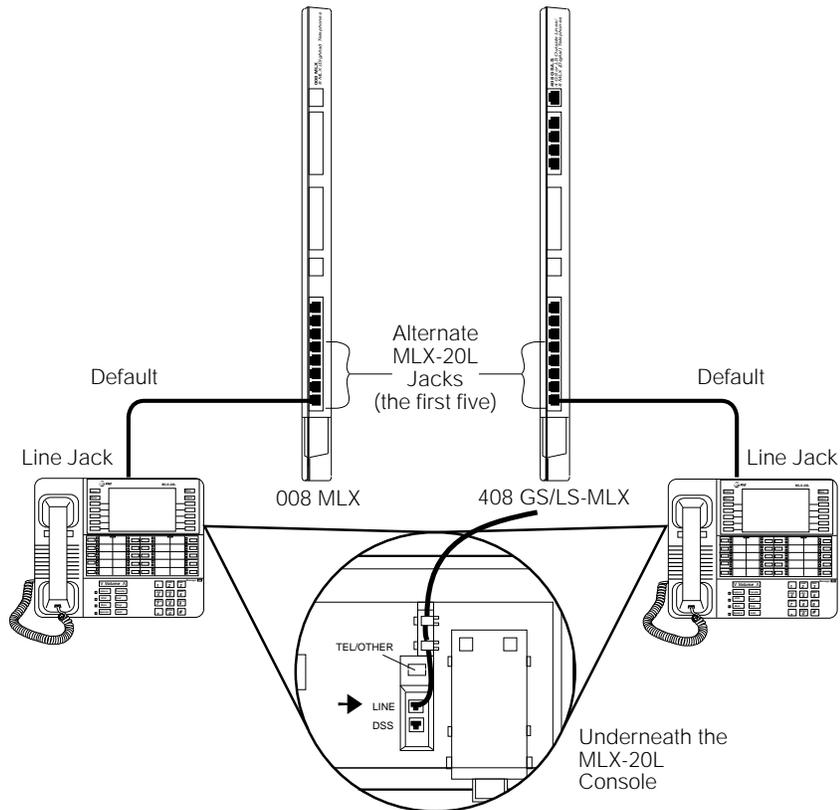


Figure 1-1. Setting Up the MLX-20L Console

Setting Up the PC

Plug a PC into the ADMIN jack on the processor module as shown in Figure 1-2. If you are using a remote PC for system programming, see "Remote Programming Maintenance."

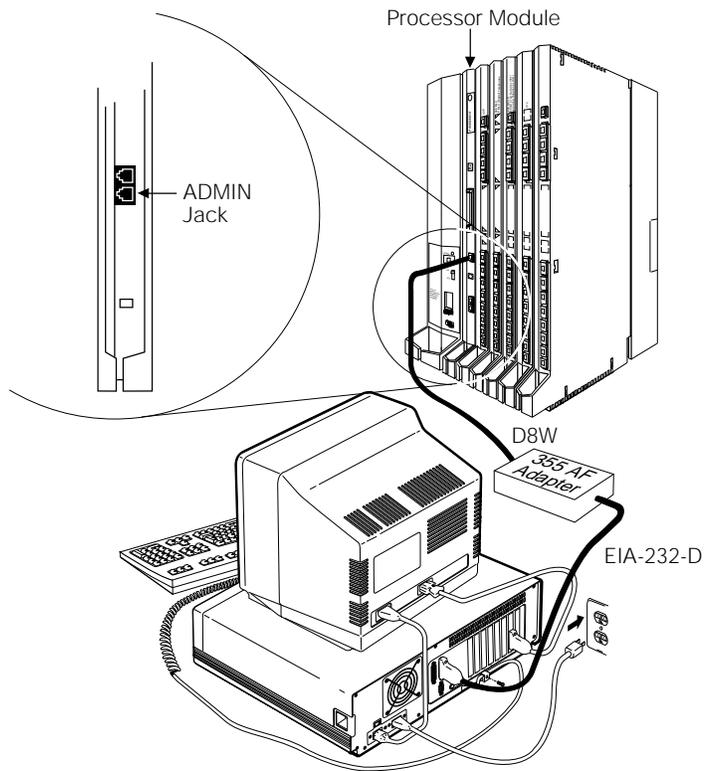


Figure 1-2. Setting Up the PC

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.

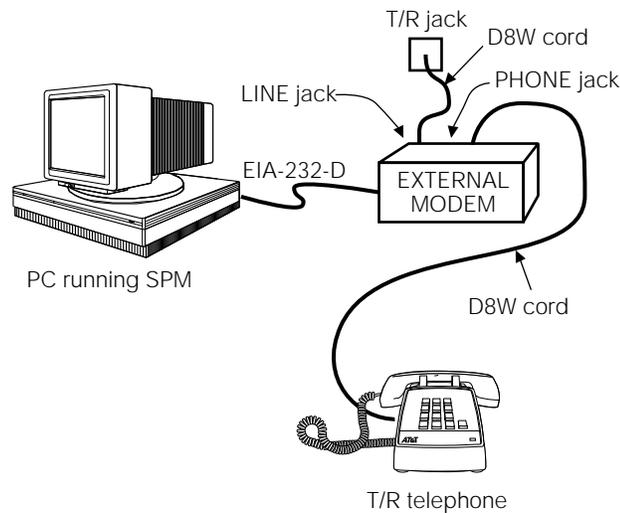


Figure 1-3. External Modem Setup

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 Program   Maintenance [F6]
[F2] Backup       Restore       [F7]
[F3] Boards       Pass-Thru   [F8]
[F4] Print Opts   Password    [F9]
[F5] Monitor      Language    [F10]
```

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 *117.**

NOTES:

1. If the password is not known, check the System Information Report or ask to speak with the system manager.
2. 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 **Enter**.

6 Enter the password.

When the **Password:** prompt appears, type the password (do not press **Enter**). 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 ***11**.

6 When you hear the modem tone, hang up.

If nothing appears on the SPM screen, press **Enter**.

Console Display/Instructions

Additional Information

PC

7 Enter the password.

Enter Password:

Type the remote access password.
The password you enter does not appear as you type it.

8 Select an option.

SPM Main Menu		
Menu: Select Function		
F1	Sys Program	Maintenance
F2	Backup	Restore
F3	Boards	Pass-Thru
F4	Print Opts	Password
F5	Monitor	Language

Press one of the function keys.

NOTES:

1. If you do not know the password, check the System Information Report or ask to speak with the system manager.
2. 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		Welcome to SPM The MERLIN LEGEND System Programming & Maintenance Utility Please press any key to continue. Version 4.15				PgUp PgDn		MORE INSP		Drop ALT-P	
		F1		F2						F6				Flash ALT-F	
		F3		F4						F7				TopSP ALT-C	
		F4		F5						F8				Pause ALT-H	
		F5				Shift F10		Alt F5		LINE 15		LINE 20		Alt F10	
Shift F5		LINE 05		LINE 10		Shift F10		Alt F5		LINE 15		LINE 20		Alt F10	
Shift F4		LINE 04		LINE 09		Shift F9		Alt F4		LINE 14		LINE 19		Alt F9	
Shift F3		LINE 03		LINE 08		Shift F8		Alt F3		LINE 13		LINE 18		Alt F8	
Shift F2		LINE 02		LINE 07		Shift F7		Alt F2		LINE 12		LINE 17		Alt F7	
Shift F1		LINE 01		LINE 06		Shift F6		Alt F1		LINE 11		LINE 16		Alt F6	
														CONVERT ALT-U	
														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	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.
End	Menu	Return to the SPM Main Menu.
PgUp	More	Display more menu items (when there is an additional 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 + Pause	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.
Alt + ⇧	Conf	Flash. Enter a switchhook flash in a speed dialing sequence.
Alt + CapsLock	n/a	TopSP. Return to the top of the System Programming menu.
Alt + Home	Hold	Pause. Enter a Pause in a speed dialing sequence.
Alt + PgUp	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

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 <code>DEBUG=1</code> in the SPM configuration file <code>ams.cfg</code> . 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	The ← 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 Program	Maintenance F6
F2	Backup	Restore F7
F3	Boards	Pass-Thru F8
F4	Print Opts	Password F9
F5	Monitor	Language F10

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 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.

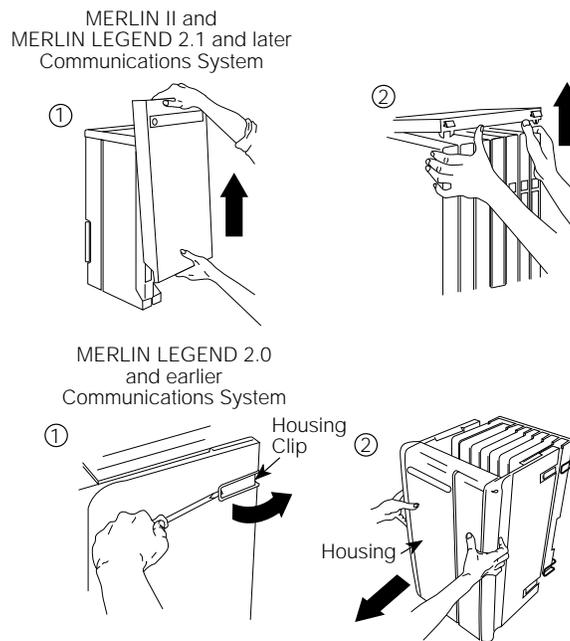


Figure 1-5. Removing the Control Unit Housing

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.**
-

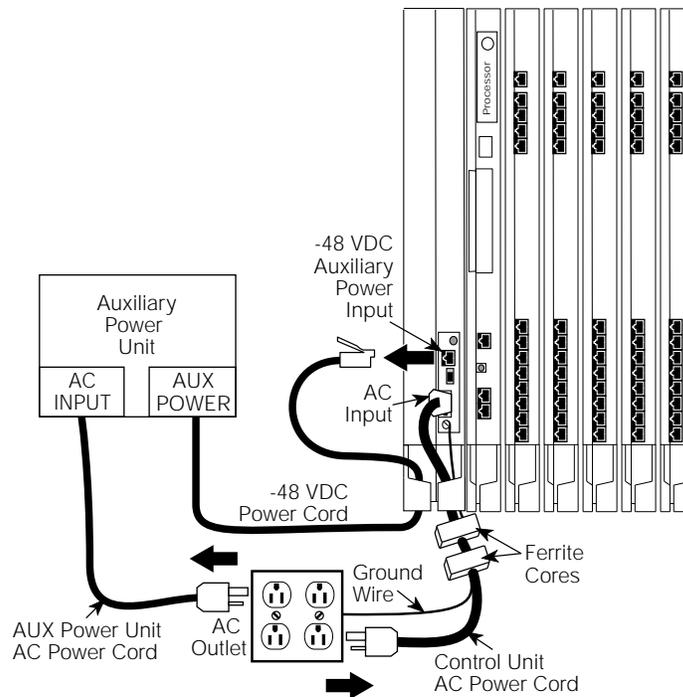


Figure 1-6. Disconnecting AC Power

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 as to how to proceed. As you become more experienced with maintaining and troubleshooting the system, you will most likely develop your own strategy.

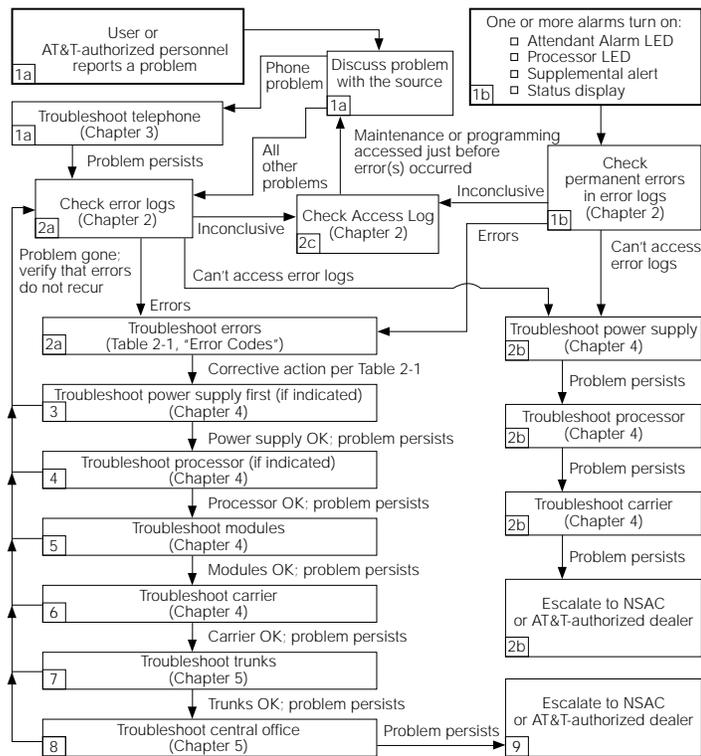


Figure 1-7. Maintenance Strategy

Trouble Reports

System trouble can be reported in two ways:

- By users
- By system alarms (permanent errors)

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 corrects them automatically, if possible.

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 Restart" 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 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**+**Pause** 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 → Restart → 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 "Checking 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 10 errors whenever you want to review the 10 most recently recorded errors—either permanent or transient.

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 they did.

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 10 or Permanent or Transient
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.		
<pre> Maintenance Make a selection System Slot Port Exit </pre>		F1
2 Select Error Log.		
<pre> System: Make a selection Status Upgrd/Instll Error Log Last mm/dd/yy hr:mm Access Log Exit Enter </pre>		F2
3 Select an error log option.		
<pre> System Error Log: Make a selection Last 10 Permanent Transient (most recent alarm) Exit </pre>	<p>If you select Last 10, see "Checking the Last 10 Errors"</p> <p>If you select Permanent, see "Checking Permanent Errors"</p> <p>If you select Transient, see "Checking Transient Errors"</p>	<p>F1</p> <p>F2</p> <p>F3</p>

The most recent alarm message stays on the System Error Log screen until it is replaced by another one. 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

```
Permanent Errors: >
XXXXXXXXXXXXXXXXXXXXXXXXX
Slot.xx Port.xx Count.xxx
First mm/dd/yy hr:mm
Last mm/dd/yy hr:mm
Code xxxx
Exit
```

Additional Information

Press the **More** button to page through the permanent errors.

PgUp

Press the **Drop** button to delete an error log entry.

Alt+**PrtS**

PC

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**.

```
Transient Errors: >
XXXXXXXXXXXXXXXXXXXXXXXXX
Slot.xx Port.xx Count.xxx
First mm/dd/yy hr:mm
Last mm/dd/yy hr: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+**Pau**

PC

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 10 Errors

Follow Steps 1 through 3 above for "Checking the Error Logs." In Step 3, select **Last 10**.

Console Display/Instructions

```
Last 10 System Errors:>
  

XXXXXXXXXXXXXXXXXXXXXXXXX
Slot:xx Port:xx
Last   mm/dd/yy hr:mm
Code   xxxx
Exit
```

Additional Information

PC

Press the **More** button to page through the last 10 errors.



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.
0101	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.
0102	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
0103	ABK CARD WRITE-PROTECTED: The Translation card has the write protection switch on.	Flip the write protection switch on the card to off. If this problem persists try another card and then replace the processor module if the problem remains.
0104	ABK EXTENSION BUSY: A station is in program, administration, or maintenance mode.	Wait until the station changes mode.
0105	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.
0401	MEMORY CARD NOT PRESENT: A PCMCIA memory card is not inserted.	Insert an memory card.
0402	MEMORY CARD OF WRONG TYPE: The wrong type of PCMCIA memory card is inserted.	Remove the current card and insert the appropriate card.
0403	MEMORY CARD WRITE PROTECTED: The memory card has the write protection switch on.	Flip the write protection switch on the card to off. If this problem persists try another card and then replace the processor module if the problem remains.
0404	SOME STATION WAS IN PROGRAM MODE: A station was in program mode.	Wait until the station changes mode.
0405	MEMORY CARD FAILURE: 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.

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	FW UPGRADE ATTEMPT	If FW UPGRADE ATTEMPT is logged and FW UPGRADE COMPLETE is not, the firmware upgrade should be retried. The circuit module should be considered unreliable until a successful upgrade is performed.
1C03	FW UPGRADE ATTEMPT:	No action required.
1C04	FW UPGRADE COMPLETE:	No action required.
1C05	INVALIDE FMW 29 DETECTED: Incompatibility problem. The specified video endpoint or UDM is connected to an 008 or 408 GS/LS MLX with firmware vinatage 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.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
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.
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.
6C01	DSL 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	DSL BLUE ALARM: All ones being received. Service on the link has been lost.	The far end of the network interface is 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
ECD3	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.
ECD4	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.
ECD5	DS1 LOSS OF MULTIFRAME: Service on the link has been lost.	Troubleshoot the T1 trunk. If problem persists, escalate to your technical support organization.
ECD6	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.
ECD7	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
ECD8	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
LC09	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
LC0A	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
LC0B	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.
LC0C	BRI LOSS OF SYNC:	Usually no action is required. Troubleshoot the BRI trunk. If problem persists, contact your technical support organization.
LC0D	BRI SLIPS > 88:	Usually no action is required. Troubleshoot the BRI trunk. If problem persists, contact your technical support organization.
LC0E	BRI NET REQUESTED CLOCK:	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
ECDF	BRI NET DEACTIVATE:	Usually no action is required. The link should return to normal once the test is completed. If problem persists, contact your technical support organization.
EC10	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.
EC11	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.
EC12	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.
EC13	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.
EC14	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.
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.
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% <i>maintenance busy</i> 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 Automatic Maintenance-Busy is enabled or not.	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.

Continued on next page

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 Automatic Maintenance-Busy is enabled or not.	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 whether 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
B40A	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.
B40B	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.
B40C	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.

Continued on next page

Table 2-2 Continued

Error Codes	Description	Action
840D	INCORRECT FIRMWARE STATE: If this error occurs 4 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 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.
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. Replace the card if the problem persists and try again. If the problem 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. Replace the card if the problem persists and try again. If the problem 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. Replace the card if the problem persists and try again. If the problem 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.

Continued on next page

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.

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

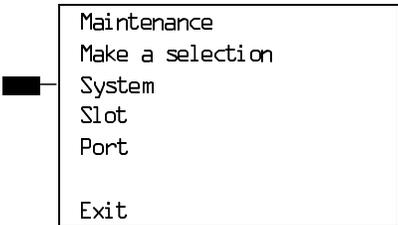
The last 20 events are shown, beginning with the most recently accessed event. When you reach the end of the list, you hear a beep and all variable information is cleared from the screen. To return to the beginning of the list, select **Exit** and then select **Access Log** again.

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.		
		F1

Console Display/Instructions

Additional Information

PC

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 3 indicates that the processor occupies Slot 00.

```
System Inventory:
Slot 00
Board Processor
Hardware Vintage: xx
LEGEND 4.0 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 redisplay the Slot 00 information.

PgUp

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: vv
Exit
```

Additional Information

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 redisplay the Slot 00 information.

PC



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 problems	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.

3-2 Telephone Problems

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 touch-tone receivers (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 touch-tone receivers, (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 Direct Inward Dial (DID) calls, and calls routed to the voice messaging system.

Table 3-4. System Requirement for TTRs

Calls/Hour	Account Codes Used	No 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.

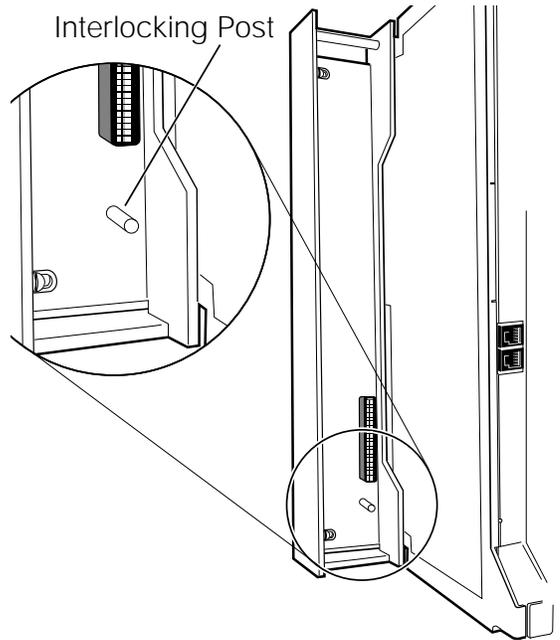


Figure 4-1. Power Supply Interlocking Post

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.

4-4 Control Unit Problems

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.

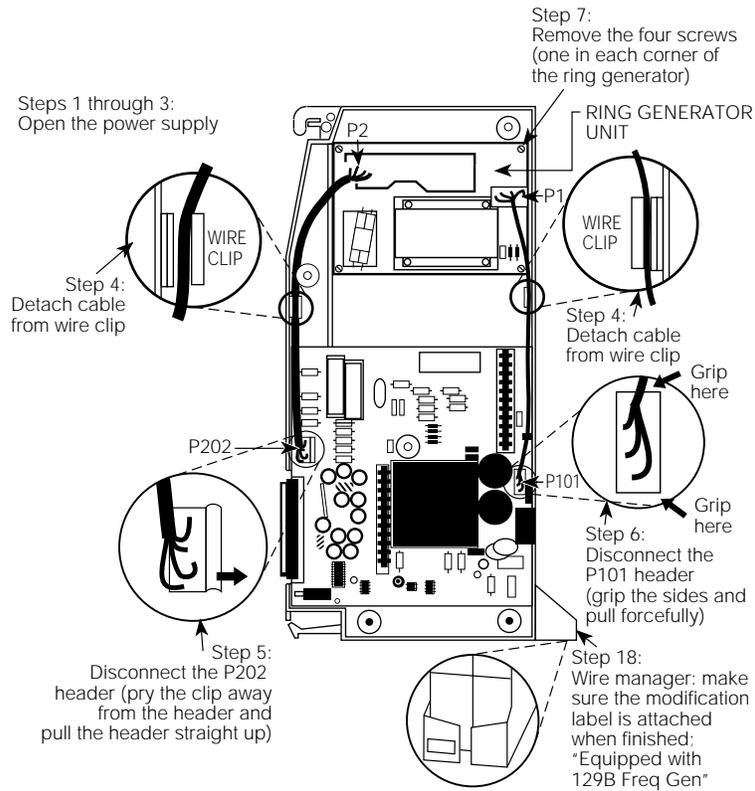


Figure 4-2. Replacing a Ring Generator

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.**

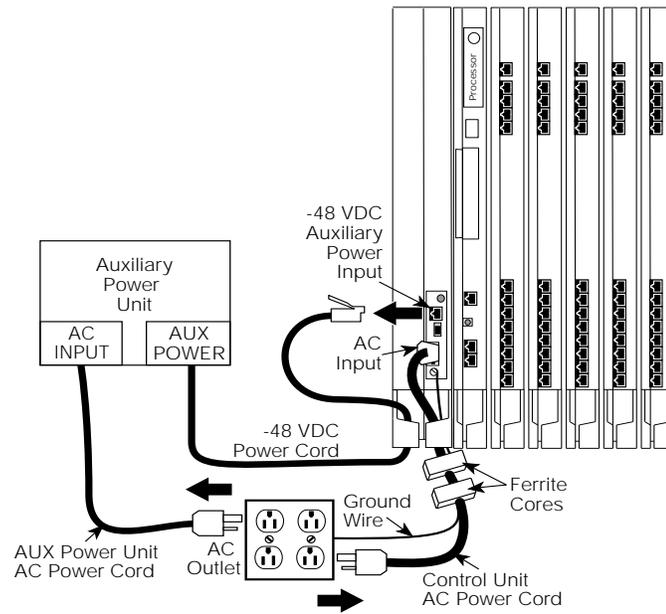


Figure 4-3. Replacing an Auxiliary Power Supply



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," 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**

PC Procedure

F6→**F2**→Type **00**→**F2**→**F1**→Type
Address→**PgUp**

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
```

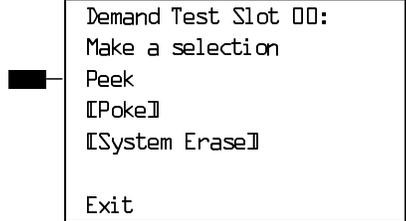
Dial or type 00, then select Enter.

F10

3 Select the Demand Test.

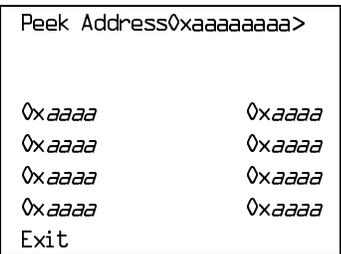
```
Slot 00:
Make a selection
Status
Demand Test
Exit
```

F2

Console Display/Instructions	Additional Information	PC
4 Select the Peek option.		
 <pre> Demand Test Slot 00: Make a selection Peek [[Poke]] [[System Erase]] Exit </pre>	Poke and System Erase are not displayed, which prevents customers from accidentally changing the processor memory.	F1

5 Dial a memory address.		
 <pre> Slot 00 Enter Hex Address: nnnnnnnn Backspace Enter A B C D E F </pre>	Dial [nnnnnnnn], then select Enter.	F6

The screen below shows the details of the address you specified.

 <pre> Peek Address0xaaaaaaaa> 0xaaaa 0xaaaa 0xaaaa 0xaaaa 0xaaaa 0xaaaa 0xaaaa 0xaaaa Exit </pre>	aaaaaaaaa=address entered in Step 5.	PgUp
Press the More button to review the next address.		

Poke



CAUTION:

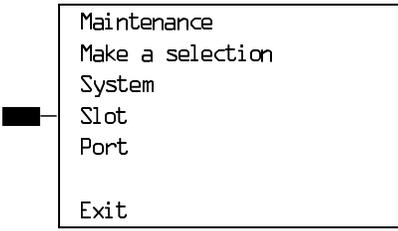
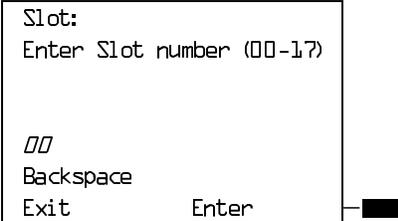
Do not perform Poke unless you are following instructions from your technical support organization.

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.		
		F2
2 Specify Slot 00.		
	Dial or type <i>00</i> , then select Enter .	F10

Console Display/Instructions	Additional Information	PC
3 Select the Demand Test.		
<pre> Slot 00: Make a selection Status Demand Test Exit </pre>		F2
4 Select Poke two times.		
<pre> Demand Test Slot 00: Make a selection Poke [Poke] [System Erase] Exit </pre>	<p>Poke and System Erase are not displayed, which prevents customers from accidentally changing the processor memory.</p>	F2
	<p>Press the Poke button (the left button for Line 4) twice.</p>	F2
5 Select Continue.		
<pre> Poke - WARNING!! SYSTEM MEMORY WILL BE MODIFIED! Continue Cancel Exit </pre>		F1
7 Follow the instructions from your technical support organization to select a memory address.		
<pre> Slot 00 EnterHexAddress: aaaaaaaa Enter Backspace Exit A E C D E F </pre>		

Console Display/Instructions

Additional Information

PC

8 Follow the instructions from your technical support organization to modify the contents of the address entered in Step 7.

```

[]xaaaaaaaa 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**

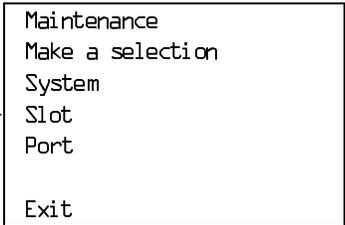
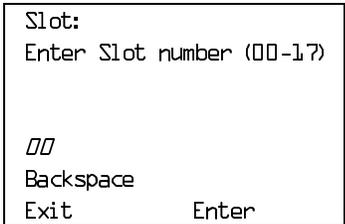
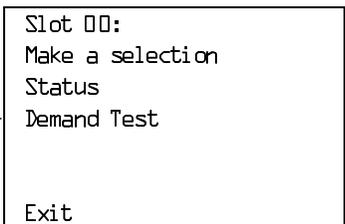
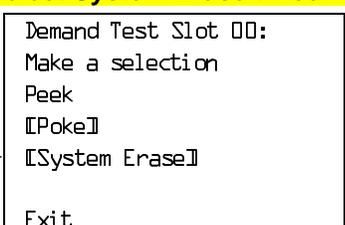
PC Procedure

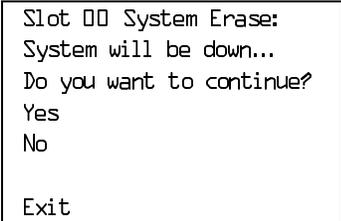
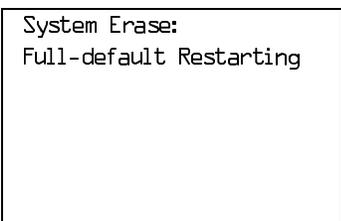
F6 → **F2** → Type **00** → **F2** → **F3** → **F3** → **F2**

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.		
 <pre> Maintenance Make a selection System Slot Port Exit </pre>		F2
2 Specify Slot 00.		
 <pre> Slot: Enter Slot number (00-17) 00 Backspace Exit Enter </pre>	Dial or type <i>00</i> , then select Enter.	F10
3 Select the Demand Test.		
 <pre> Slot 00: Make a selection Status Demand Test Exit </pre>		F2
4 Select System Erase twice.		
 <pre> Demand Test Slot 00: Make a selection Peek [Poke] [System Erase] Exit </pre>	<p>Poke and System Erase are not displayed which prevents customers from accidentally changing the processor memory.</p> <p>Press the System Erase button, the left button for line 5, twice.</p>	F3 F3

Console Display/Instructions	Additional Information	PC
5 Select Yes.		
 <pre>Slot 00 System Erase: System will be down... Do you want to continue? Yes No Exit</pre>		
 <pre>System Erase: Full-default Restarting</pre>		

Forced Installation/Upgrade of System Software



CAUTION:

Forced installation should only be performed 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/Inst11→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 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.

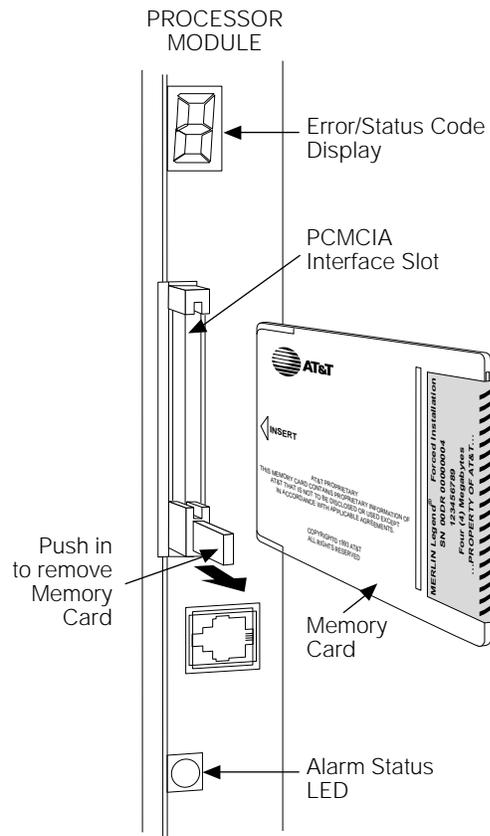


Figure 4-4. Inserting a Memory Card

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/Inst11
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, (RED). 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 only occur 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 will delete 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" 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*.)

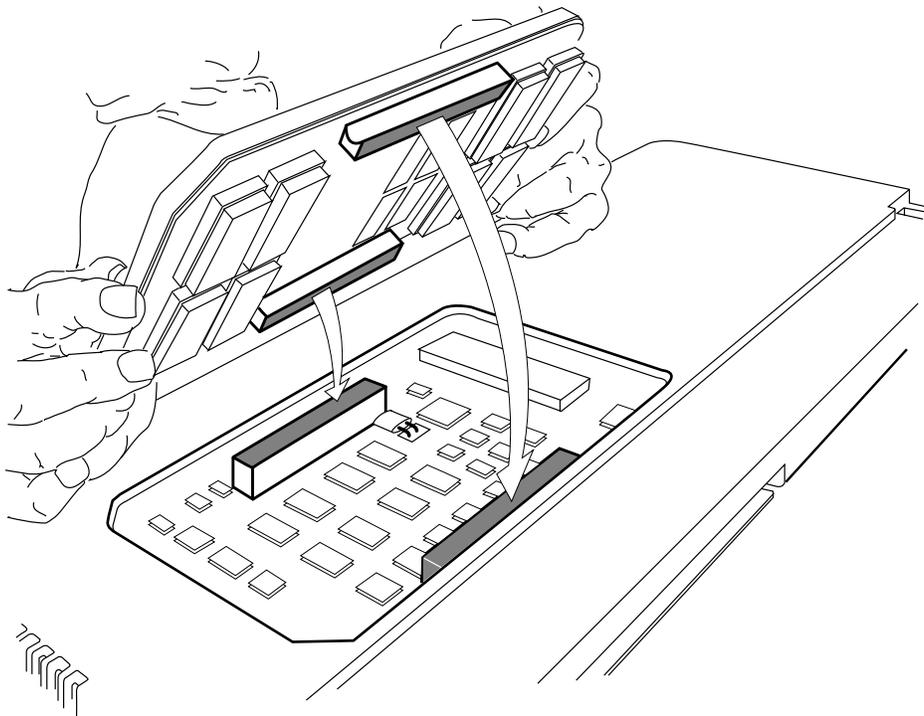


Figure 4-5. Replacing the Feature Module

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.

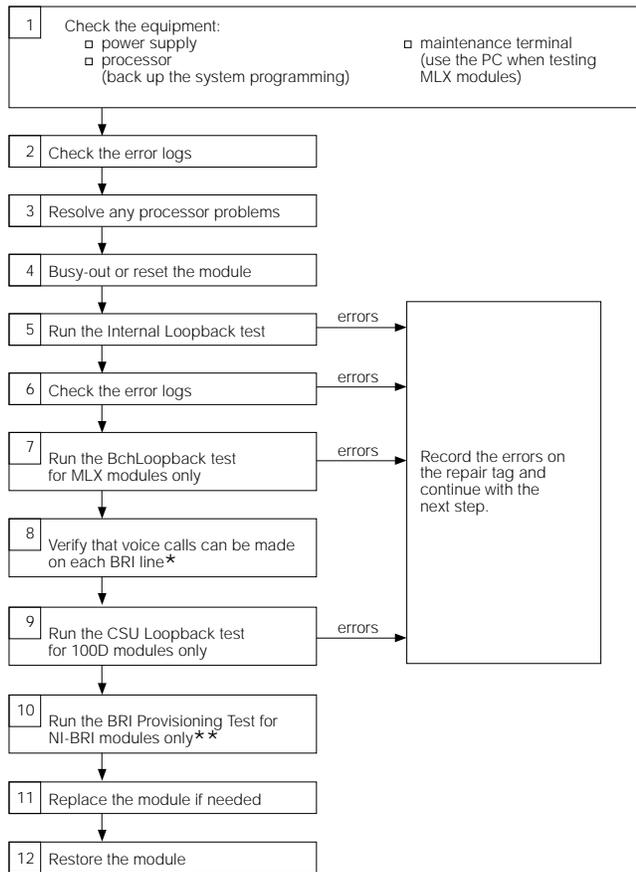
NOTE:

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.

Module Problems



* 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.		
<pre>Maintenance Make a selection System Slot Port Exit</pre>		[F2]
2 Specify the slot number (n=00 to 17).		
<pre>Slot: Enter Slot number (00-17) nn Backspace Exit Enter</pre>	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

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

```

Busy-Out Slot xx:

Busy-Out Complete

Exit
    
```

Additional Information

PC

xx = slot number entered in Step 2

The screen below appears when the busy-out fails again; be sure to specify the correct slot.

```

Busy-Out Slot xx:

Busy-Out FAILED

Exit
    
```

xx = slot number entered in Step 2

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 = 00 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

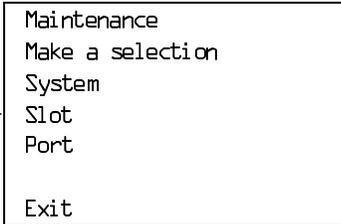
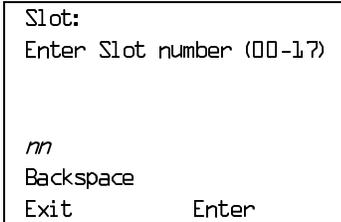
Restore

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 restore the module, follow the steps below.

Console Display/Instructions	Additional Information	PC
1 From the Maintenance menu, select the Slot option.		
		F2
2 Specify the slot number (n = 00 to 17).		
	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

```
Restore Slot xx:

Restore Complete

Exit
```

Additional Information

xx = slot number entered in Step 2

PC

The screen below appears when the Restore fails. Try again, and be sure to specify the correct slot.

```
Restore Slot xx:

Restore FAILED
Board Mismatch

Exit
```

xx = slot number entered in Step 2

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	<p>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:</p> <p>Menu→Maintenance→Slot</p> <p>See “Busy-Out and Reset,” earlier in this chapter, for additional information.</p>
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	<p>Restore the module if it successfully completes all module tests and the errors no longer occur.</p> <p>Restore is in the Slot menu, which you can access by doing the following from the console:</p> <p>Menu→Maintenance→Slot</p> <p>See the “Restore” procedure, earlier in this chapter, for additional information.</p>

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 = 00 to 17).		
<pre>Slot: Enter Slot number (00-17) nn Backspace Exit Enter</pre>	Dial or type [nn], then press Enter.	F10
3 Select Demand Test.		
<pre>Slot xx: Make a selection Status Demand Test Busy-Out Reset Restore Upgrade Exit</pre>	xx=slot number entered in Step 2	F5
<p>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.</p>		
4 Select Internal Loopback Test.		
<pre>Demand Test Slot xx: Make a selection Note:Busy out slot first BoardCntrlr IntLoopback Exit</pre>	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

PgUp

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 → BoardCtrlr → 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 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.

<pre>Maintenance Make a selection System Slot Port Exit</pre>	█		F2
---	---	--	----

2 Specify the slot number (nn = 00 to 17).

<pre>Slot: Enter Slot number (00-17) nn Backspace Exit Enter</pre>	█	Dial or type [nn], then select Enter.	F10
--	---	---------------------------------------	-----

3 Select Demand Test.

<pre>Slot xx: Make a selection Status Demand Test Busy-Out Reset Restore Upgrade Exit</pre>	█	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.		
<pre> Demand Test Slot xx: Make a selection Note: Busy out slot first BoardCtrlr IntLoopback Exit </pre>	xx = slot number entered in Step 2	F2
5 Select Test Once or Repetitive.		
<pre> Demand Test Slot xx: Board aaaaaaaaaaaaaaaaaa Board Controller: Test Once Repetitive Exit </pre>	xx = slot number entered in Step 2	F2 F3
<p>The screen below appears while the test is running. At the same time, if the module has a green LED, it flashes.</p>		
<pre> Demand Test Slot xx: Board aaaaaaaaaaaaaaaaaa Board Controller Test in Progress Exit </pre>	xx = slot number entered in Step 2	F5
<p>The screen below appears only if you selected Test Once and the module passes the test.</p>		
<pre> Demand Test Slot xx: Board aaaaaaaaaaaaaaaaaa Board Controller Test Successfully Completed Exit </pre>	xx = slot number entered in Step 2	

The screen below appears when either 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.



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

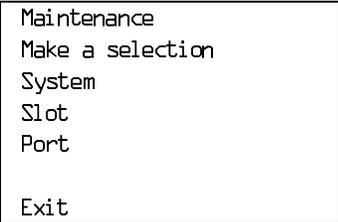
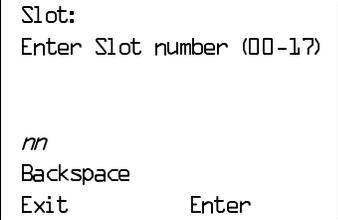
This test verifies that specific communication paths on the MLX or 800 NI-BRI modules are operational. If you have not read "Module Test Process" above, do so.

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 main menu, select the Slot option.		
	F2	
2 Specify the module's 2-digit slot number (nn = 00 to 17).		
	Dial or type [nn], then select Enter.	

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.

Console Display/Instructions	Additional Information	PC
-------------------------------------	-------------------------------	-----------

```

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 B-channels are 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 for instructions.

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 one wire from the pair you have chosen to each clip. 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 don't 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.

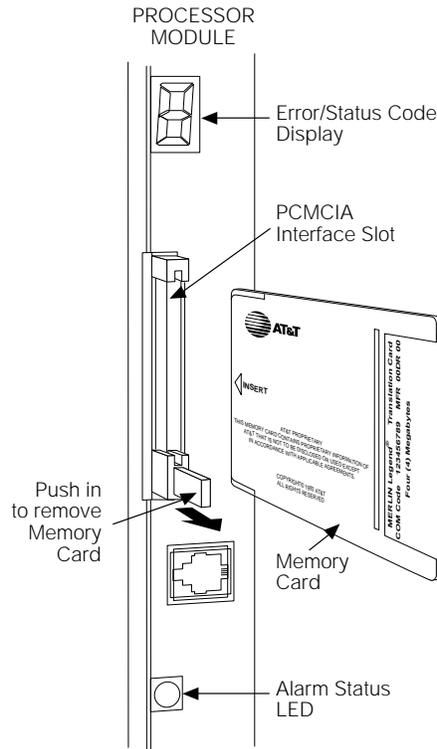


Figure 4-7. Inserting the Upgrade Memory Card

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 = 00 to 17).

```

Slot:
Enter Slot number (00-17)

nn

Backspace
Exit      Enter
    
```

Dial or type [nn], then select Enter.

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

```
Slot xx:
Make a selection
Status      Demand Test
Busy-Out    Reset
Restore     Error Events
CSU-1pbk    Clock
Exit        Upgrade
```

Additional Information

xx = slot number entered in Step 3

PC

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: >
aaaaaaaaaaaaaaaa Ver: aa
Select one
aaaaaaaaaaaaaaaa Ver: aa
aaaaaaaaaaaaaaaa Ver: aa
aaaaaaaaaaaaaaaa 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.		
<div style="border: 1px solid black; padding: 5px;"> <p>Slot xx in Use: Make a Selection</p> <p>■ Continue Busy-Out</p> <p>■ Reset</p> <p>Exit</p> </div>	<p>xx = slot number entered in Step 3</p> <p>Continue Busy-Out does not interrupt calls in progress, but Reset does.</p>	<p>F1</p> <p>F2</p>

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.

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

Console Display/Instructions

```
Upgrade Slot xx:
Module can not be
upgraded.

Exit
```

Additional Information

xx = slot selected in Step 3.

PC

F5

This procedure can only be run 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 Slot

```
Upgrade Slot xx:
No module in slot.

Exit
```

xx = slot selected in Step 3.

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 will 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 not 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.

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 multi-line hunt group. This move involves administering the lines and connecting the cables on the target module. Run the test on the three 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 cables to the original slot and port.

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 will increase the time. Boards with fewer administered lines and no errors will 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:

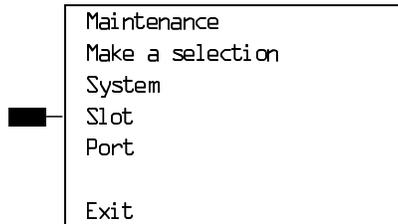
Before proceeding with this test, have available completed copies of *System Planning Form 3-i*, *Incoming Trunks: BRI Options* and the *NI-1 BRI Planner Form*.

Console Display/Instructions

Additional Information

PC

1 From the main menu, select the Slot option.



F2

Console Display/Instructions

Additional Information

PC

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        Provisioning
```

xx=slot number entered in Step 2

F10

4 If the test cannot be run to completion, an error message screen appears, such as the one shown below:

```
Provisioning slot xx:

Slot is not busied-out

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.

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.

The screen below appears only if all sixteen 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 sixteen communication paths are administered on the module or if one or more communication paths fail. On a module with fewer than sixteen 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

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	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	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 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: <ul style="list-style-type: none"> ■ Outgoing Voice Call Test ■ Incoming Voice Call Test

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
Ç0-V <i>continued</i>		<p>Possible causes for this error are:</p> <ul style="list-style-type: none"> ■ <i>No calling party number</i> (Error identified at Incoming Voice Call Test, Step 3) Note: One or both of the following conditions can result in the absence of calling party number: <ul style="list-style-type: none"> - Originator is provisioned for privacy. - Receiver (BRI line under test) is provisioned for non-delivery of calling party information. ■ <i>Outgoing and/or incoming calls are not possible at all times.</i> (Error identified at Outgoing Voice Call Test, Step 3 and/or Incoming Voice Call Test, Step 2) This condition may or may not be detectable by performing the above tests only once. Therefore, repeat the tests several times, mixing outgoing and incoming voice calls, varying the disconnecting end, connecting on some calls but not others, etc. ■ <i>Features provisioned</i> NI-BRI features are provisioned at the CO for features other than normal call handling, such as transfer, conference, or additional call offering. With additional call offering provisioned, a voice call can be presented to a busy facility undetected by both calling and called parties. Therefore, this condition is not detectable by manual testing. The condition is possible if incoming calls can be successfully received.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
C0-D	CO provisioning error for data calls on that facility	<p>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 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:</p> <ul style="list-style-type: none"> ■ Outgoing Data Call Test ■ Incoming Data Call Test <p>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.)</p> <p>Possible causes for this error are:</p> <ul style="list-style-type: none"> ■ <i>No calling party number</i> (Error identified at Incoming Data Call Test, Step 3) Note: One or both of the following conditions can result in the absence of calling party number: <ul style="list-style-type: none"> - Originator is provisioned for privacy. - Receiver (BRI line under test) is provisioned for non-delivery of calling party information. ■ <i>Outgoing and/or incoming calls are not possible at all times.</i> (Error identified at Outgoing Data Call Test, Step 2 and/or Incoming Data Call Test, Step 2) This condition may or may not be detectable by performing the above tests only once. Therefore, repeat the tests several times, mixing outgoing and incoming data calls, varying the disconnecting end, connecting on some calls but not others, etc. ■ <i>X.25 provisioned for either B- or D-channel</i> This condition is not detectable by manual testing.

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	<p>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. Perform the following voice and data 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:</p> <ul style="list-style-type: none"> ■ Outgoing Voice Call Test ■ Incoming Voice Call Test ■ Outgoing Data Call Test ■ Incoming Data Call Test <p>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.)</p> <p>Possible causes for this error are:</p> <ul style="list-style-type: none"> ■ <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>
LG	MERLIN LEGEND BRI error on that facility	This result should never appear; if it does, contact the NSAC.

Continued on next page

Table 4-7 Continued

Result Code	Description	Corrective Action
ADMCO	MERLIN LEGEND administration error and/or CO provisioning error on that facility	<p>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:</p> <ul style="list-style-type: none"> ■ Outgoing Voice Call Test ■ Incoming Voice Call Test <p>and/or</p> <ul style="list-style-type: none"> ■ Outgoing Data Call Test ■ Incoming Data Call Test <p>Possible causes for this error are:</p> <ul style="list-style-type: none"> ■ <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>
ADMIN	No administration or incorrect administration on that facility	<p>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 them 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:</p> <ul style="list-style-type: none"> ■ Outgoing Voice Call Test ■ Incoming Voice Call Test <p>or</p> <ul style="list-style-type: none"> ■ Outgoing Data Call Test ■ Incoming Data Call Test <p>Possible causes for this error are:</p> <ul style="list-style-type: none"> ■ <i>Incorrect SPID</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 fail. ■ <i>Incorrect DN</i> (Error identified at Incoming Voice/Data Call Test, Step 2) Incoming calls fail.

Continued on the next page

Table 4-7 Continued

Result Code	Description	Corrective Action
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. <ul style="list-style-type: none"> ■ 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.
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. Possible causes of this problem are: <ul style="list-style-type: none"> ■ 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.

Continued on the next page

Table 4-7 Continued

Result Code	Description	Corrective Action
?????	Testing was inconclusive because the lines(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 premise 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 either at 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	Additional Information	PC
1 From the Maintenance menu, select the Slot option.		
<pre> Maintenance Make a selection System Slot Port Exit </pre>		F2
2 Specify the 2-digit slot number (nn = 00 to 17).		
<pre> Slot: Enter Slot number (00-17) nn Backspace Exit Enter </pre>	Dial or type [nn], then select Enter.	F10
3 Select Clock.		
<pre> Slot xx: Make a selection Status Demand Test Busy-Out Reset Restore Clock CSU-1pbk Upgrade Exit Provisioning </pre>	xx=slot number entered in Step 2 Provisioning and Clock are 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.		
<pre> Clock Slot xx: mm/dd/yy hh:00-hh:mm Active: xxxx Synch: xxxxx Source: xxxx Port: xx Exit </pre>	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.

<p>LINE LOOPBACK (ACCULINK 3150 CSU) Busy-Out or Reset</p>	<p>For the ACCULINK 3150 only, select front panel Line Loopback command. Details are provided below.</p> <p>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:</p> <p>Menu→Maintenance→Slot.</p> <p>See "Busy-Out and Reset," earlier in this chapter, for additional information.</p>
<p>Interrupting the Test</p>	<p>You can interrupt the test by selecting Exit.</p>
<p>Test Failure</p>	<p>If the test fails, record the errors on the repair tag and replace the module.</p>
<p>Restore</p>	<p>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:</p> <p>Menu→Maintenance→Slot.</p> <p>See the "Restore" procedure, earlier in this chapter, for additional information.</p>

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.

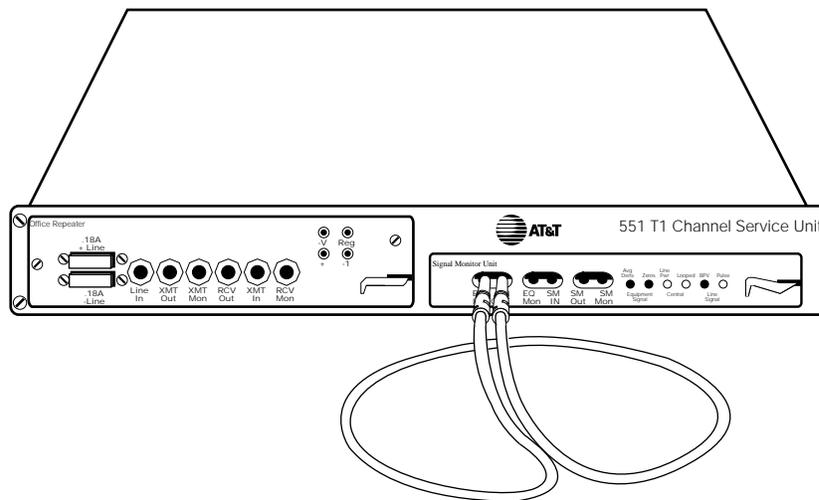


Figure 4-8. 551 T1 CSU Loopback Connection

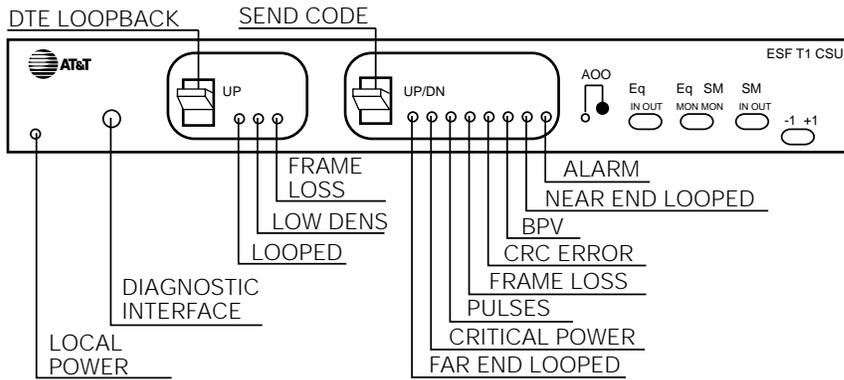


Figure 4-9. ESF T1 CSU DTE Loopback Connection

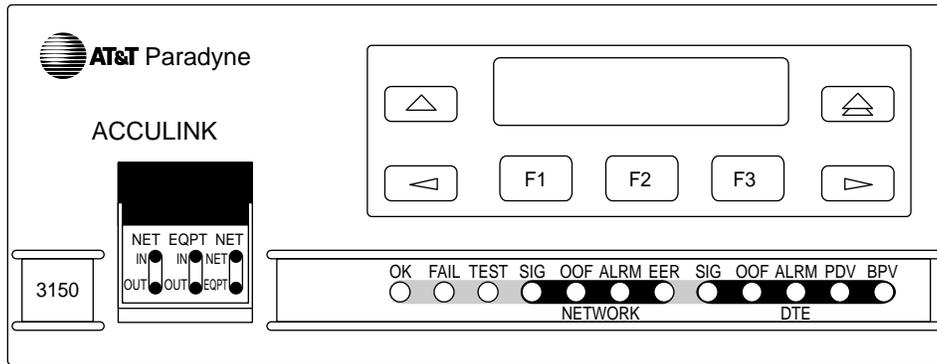


Figure 4-10. ACCULINK 3150 CSU Front Panel

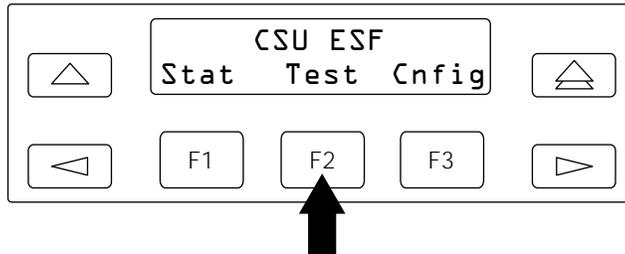


Figure 4-11. ACCULINK 3150 CSU DTE Loopback Command 1

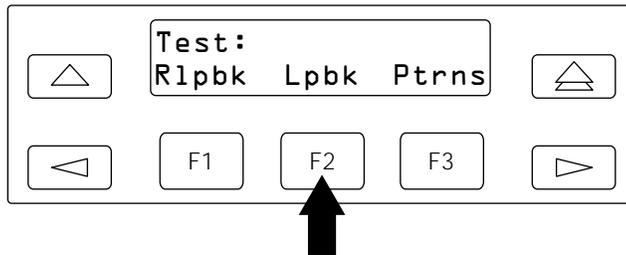


Figure 4-12. ACCULINK 3150 CSU DTE Loopback Command 2

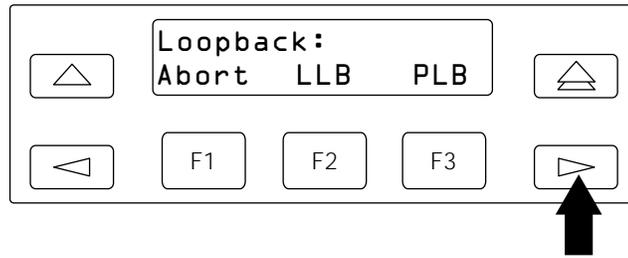


Figure 4-13. ACCULINK 3150 CSU DTE Loopback Command 3

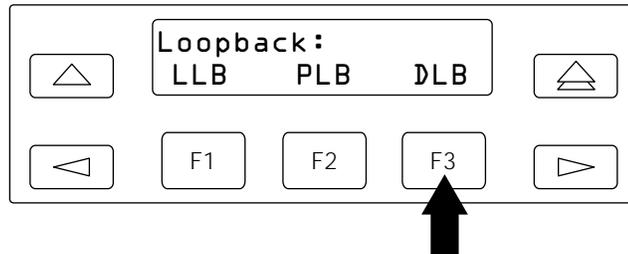


Figure 4-14. ACCULINK 3150 CSU DTE Loopback Command 4

To run the CSU Loopback Test, follow the steps below.

Console Display/Instructions	Additional Information	PC
1 From the Maintenance menu, select the Slot option.		
<pre> Maintenance Make a selection System Slot Port Exit </pre>		F2
2 Specify the 2-digit slot number (nn = 00 to 17).		
<pre> Slot: Enter Slot number (00-17) nn Backspace Exit Enter </pre>	Dial or type [nn], then select Enter.	F10
3 Select the CSU Loopback Test.		
<pre> Slot xx: Make a selection Status Demand Test Busy-Out Reset Restore Error Events CSU-lpbk Clock Exit Upgrade </pre>	<p>xx = slot number entered in Step 2</p> <p>Error Events and Clock are displayed only for the 100D module.</p>	F4

The screen below appears while the test is running. At the same time, the module's green LED flashes.

Console Display/Instructions

```

CSU-1pbk Slot xx:

CSU-1pbk in Progress

Exit
    
```

Additional Information

PC

xx = slot number entered in Step 2

The screen below appears only if the module passes the test. If the test is successful, contact the CO and ask them to check their end.

```

CSU-1pbk Slot xx:

CSU-1pbk Passed

Exit
    
```

xx = slot number entered in Step 2

The screen below appears when the test fails.

```

CSU-1pbk Slot xx:
CSU-1pbk Failed
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
xxx xxx xxx xxx xxx xxx
xxx xxx xxx xxx xxx xxx
xxx xxx xxx xxx xxx xxx
Exit
    
```

xx = slot number entered in Step 2

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.

Console Display/Instructions	Additional Information	PC
1 From the Maintenance menu, select the Slot option.		
<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: black; margin-right: 5px;"></div> <div> Maintenance Make a selection System Slot Port Exit </div> </div>		F2

Console Display/Instructions	Additional Information	PC
2 Specify the 2-digit slot number (nn = 00 to 17).		
<pre>Slot: Enter Slot number (00-17) nn Backspace Exit Enter</pre>	Dial or type [nn], then select Enter.	
3 Select Error Events.		
<pre>Slot xx: Make a selection Status Demand Test Busy-Out Reset Restore Error Events CSU-1pbk Clock Exit Upgrade</pre>	xx = slot number entered in Step 2	F8
4 Select the current hour or a previous hour.		
<pre>Error Events Slot xx: Make a selection Current hr Previous hr Exit</pre>	xx=slot number entered in Step 2	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
MIIS 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**

Console Display/Instructions	Additional Information	PC
1 From the Maintenance menu, select the Slot option.		
<pre> Maintenance Make a selection System Slot Port Exit </pre>		F2
2 Specify the 2-digit slot number (nn = 00 to 17).		
<pre> Slot: Enter Slot number (00-17) nn Backspace Exit Enter </pre>	Dial or type [nn], then select Enter.	F10
3 Select Clock.		
<pre> Slot xx: Make a selection Status Demand Test Busy-Out Reset Restore Error Events CSU-1pbk Clock Exit Upgrade </pre>	<p>xx=slot number entered in Step 2</p> <p>CSU-1pbk and Error Events are displayed only for the 100D module.</p>	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
```

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, 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 each of these modules but not for the power supply.

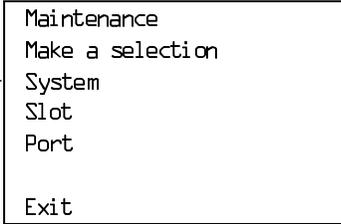
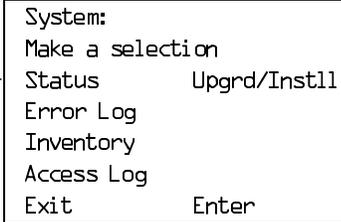
The System Status procedure allows you to check simulated LEDs for the processor and other modules. This is explained in detail in "Reading the System Status Screen," later in this chapter.

Summary

Console Procedure **Menu**→Maintenance→System→Status

PC Procedure **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.		
		F1
2 Select Status.		
		F1

Interpreting the System Status Screen

Console Display/Instructions

```
System Status:
Slot00:Raaa
Slot01:Raaa Yaaa Gaaa
Slot02:Raaa Yaaa Gaaa
Slot03:Raaa Yaaa Gaaa
Slot04:R   Y   G
Exit
```

Additional Information

PC

Raaa=status (On, Off, No) of red LED
Yaaa=status (On, Off, No) of yellow LED
Gaaa=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.

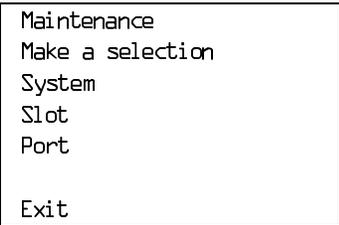
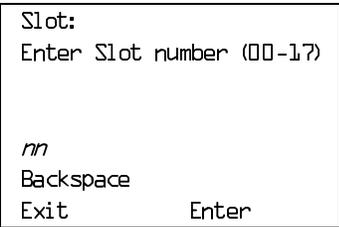
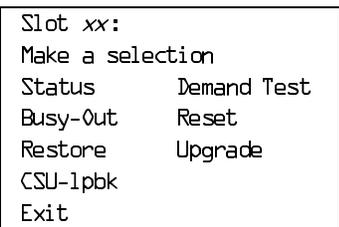
Green LED

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.
```


Console Display/Instructions	Additional Information	PC
1 From the Maintenance menu, select the Slot option.		
		F2
2 Specify the 2-digit slot number (nn = 00 to 17).		
	Dial or type [nn] and select Enter.	F10
3 Select the Status option.		
	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-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.

Checking System and Slot Status

If you selected Slot 00, the screen below appears. For detailed information about this status screen, see "Slot Status," earlier in this chapter.

```
Status Slot 00:
LED:           Raaa
Errors:
Alarms:
Exit
```

Raaa=status (On, Off, No) of red LED.

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 echos 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:

The 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.

NOTES:

1. If the password is not known, check the System Information Report or ask to speak with the system manager.
2. 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

F6→**F3**→**F1**→Type the dial plan no.→**F10**→**F1**

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.		
<pre> Line/Trunk xxx: Make a selection Status Busy Out Restore Exit </pre>	xxx = line number entered in Step 3	F1
<p>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.</p>		
<pre> Line xxx: Dial Plan: xxxx SlotPort: ssp LogicId: xxx Label: xxxxxxxxxxx Maintenance Busy: xxx Exit Next </pre>	xxx = line number entered in Step 3	F10
<p>Select Next to see the status of the next trunk.</p>		

Checking Extension Maintenance-Busy Status

Summary

Console Procedure

Menu→**Maintenance**→**Port**→**Extension**→Dial the dial plan no.→**Enter**→**Status**

PC Procedure

F6)→F3)→F2)→Type the dial plan no.→F10)→F1)

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

Checking Ports

The maintenance-busy status for the extension selected is displayed as a **Yes** or a **No** in the field (line 6) on the screen below.

Console Display/Instructions	Additional Information	PC
<pre>Station: xxxx Dial Plan: xxxx SlotPort: sspp LogicId: xxx Profile: xxxxxxxxxxxx Maintenance Busy: Exit Next</pre>	Select Next to see the status of the next extension.	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

F6→F3→F1→Type the dial plan no.→F10→F1

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.		
<pre>Maintenance Make a selection System Slot Port Exit</pre>		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
Error Events
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: xxxxxxxxxx
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

F6→F3→F1→Type the dial plan no.→F10→F2

To busy-out a trunk, follow the steps below.

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 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

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

Checking Ports

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

Busying-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.		
<pre> Port: Make a Selection Line/Trunk Modem Station B-Channel RS232 Port1 DSL RS232 Port2 Exit Enter </pre>		F8
3 Specify the dial plan DSL number (<i>sspp</i> = 2-digit slot number and 2-digit port number).		
<pre> DSL: Enter DSL (sspp) sspp Backspace Exit Enter </pre>	Dial or type [<i>sspp</i>], then select Enter.	F10
4 Select Busy-Out.		
<pre> DSL xxxx: Make a Selection Status Busy Out Restore Error Events Exit </pre>	<i>sspp</i> = slot/port number entered in Step 3	F2
The screen below is shown until Busy-Out finishes or fails.		
<pre> DSL sspp: Busy-Out in Progress Exit </pre>	<i>sspp</i> = 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.		
<pre>Maintenance Make a selection System Slot Port Exit</pre>		F3
2 Select the Line/Trunk option.		
<pre>Port: Make a Selection Line/Trunk Modem Station B-Channel RS232 Port1 DSL RS232 Port2 Exit Enter</pre>		F1
3 Specify the dial plan number (line) for the trunk (nnn = 801 to 880).		
<pre>Line/Trunk: Enter line number nnn Backspace Exit Enter</pre>	Dial or type [nnn], then select Enter.	F10
4 Select Restore.		
<pre>Line/Trunk xxx: Make a Selection Status Busy Out Restore Exit</pre>	xxx = line number entered in Step 3	F3

Checking Ports

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.

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.

Console Display/Instructions

```
Restore Station: xxxx

Restore in Progress

Exit
```

Additional Information

xxxx = extension number entered
in Step 3

PC

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

Backspace
Exit         Enter
```

Dial or type [*sspp*], then select Enter.

F10

Console Display/Instructions	Additional Information	PC
4 Select Restore.		
<pre>DSL: <i>sspp</i> Make a Selection Status Busy Out Restore Error Events Exit</pre>	<p><i>sspp</i> = slot/port number entered in Step 3</p>	F3
<p>The screen below is shown until Restore finishes or fails.</p>		
<pre>Restore DSL: <i>sspp</i> Restore in Progress Exit</pre>	<p><i>sspp</i> = slot/port number entered in Step 3</p>	
<p>The screen below appears when Restore is completed successfully.</p>		
<pre>Restore DSL: <i>sspp</i> Restore Successfully Completed Exit</pre>	<p><i>sspp</i> = slot/port number entered in Step 3</p>	
<p>The screen below appears when Restore fails. If this occurs, exit and try again.</p>		
<pre>Restore DSL: <i>sspp</i> Restore FAILED Exit</pre>	<p><i>sspp</i> = slot/port number entered in Step 3</p>	

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
RS232 Port2
Exit         Enter
    
```

Select RS232 Port1 or RS232 Port2.

F3

F4

3 Select Reset.

```

RS232 Portx:
Make a selection
Reset
Exit
    
```

x = port selected in Step 2

F1

Console Display/Instructions	Additional Information	PC
4 Select Yes.		
<pre> RS232 Port x Reset: Do you want to continue? Yes Cancel Exit </pre>	<p>x = port selected in Step 2</p>	<p>F2</p>
<p>The screen below is shown until Reset finishes or fails.</p>		
<pre> RS232 Port x Reset: Reset in Progress Exit </pre>	<p>x = port selected in Step 2</p>	
<p>The screen below appears when Reset is completed successfully.</p>		
<pre> RS232 Port x Reset: Reset Successfully Completed Exit </pre>	<p>x = port selected in Step 2</p>	
<p>The screen below appears when Reset fails. If this occurs, exit and try again.</p>		
<pre> RS232 Port x Reset: Reset FAILED Exit </pre>	<p>x = port selected in Step 2</p>	<p>F5</p>

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
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
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 central office (CO) end. First, make sure the correct B-channel is selected. If the correct B-channel is selected, the customer or AT&T 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

To audit calls, follow the steps below.

Console Display/Instructions	Additional Information	PC
1 From the Maintenance Menu, select the Port option.		
<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: black; margin-right: 5px;"></div> <div> Maintenance Make a selection System Slot Port Exit </div> </div>		F3

Console Display/Instructions	Additional Information	PC
2 Select the B-Channel option.		
<pre>Port: Make a Selection Line/Trunk Modem Station B-Channel RS232 Port1 RS232 Port2 Exit Enter</pre>	■	F7
3 Specify the slot and port number (ss=2-digit slot number; pp=2-digit port number).		
<pre>B-Channel Enter B-Channel (sspp) xxxx Exit Enter</pre>	■	F10
4 Select Audit Call.		
<pre>BChannel xxxx: Make a selection Audit Line Audit Call Exit</pre>	■	F2
<p>The screen below appears only if the audit message is successfully created and sent.</p>		
<pre>BChannel xxxx Audit Call Audit Initiated Exit</pre>	■	F2

```
Port:
Make a Selection
Line/Trunk   Modem
Station     B-Channel
RS232 Port1
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
```



F10

Dial or type [sspp] and select Enter.

4 Select Audit Call.		
-----------------------------	--	--

```
BChannel xxxx:
Make a selection
Audit Line
Audit Call

Exit
```



F2

xxxx = slot and port number entered in Step 3.

The screen below appears only if the audit message is successfully created and sent.

```
BChannel xxxx Audit Call

Audit Initiated

Exit
```



F2

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	Additional Information	PC
<pre>BChannel xxxx Audit call Audit Failed Exit</pre>	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.**

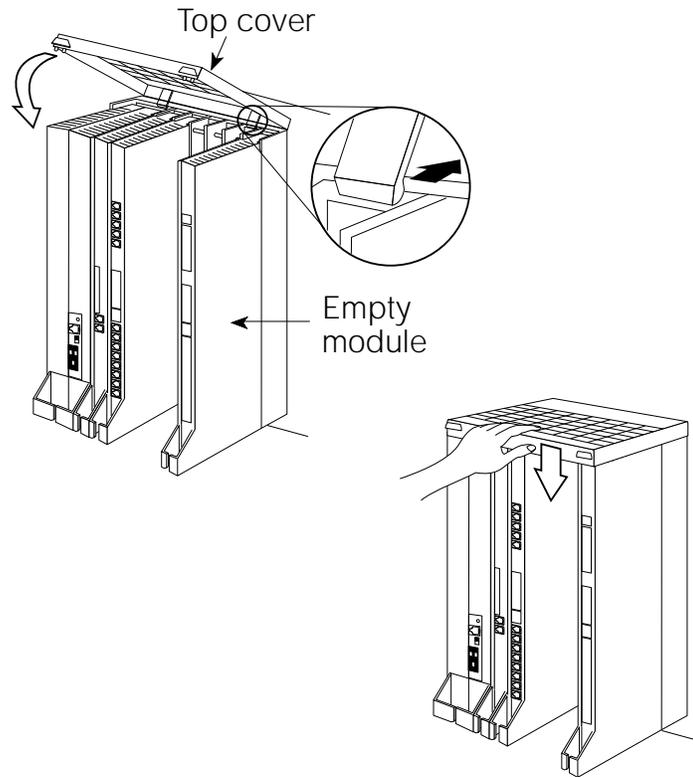


Figure 5-1. Installing the Control Unit Top Cover (Release 2.1 and Later)

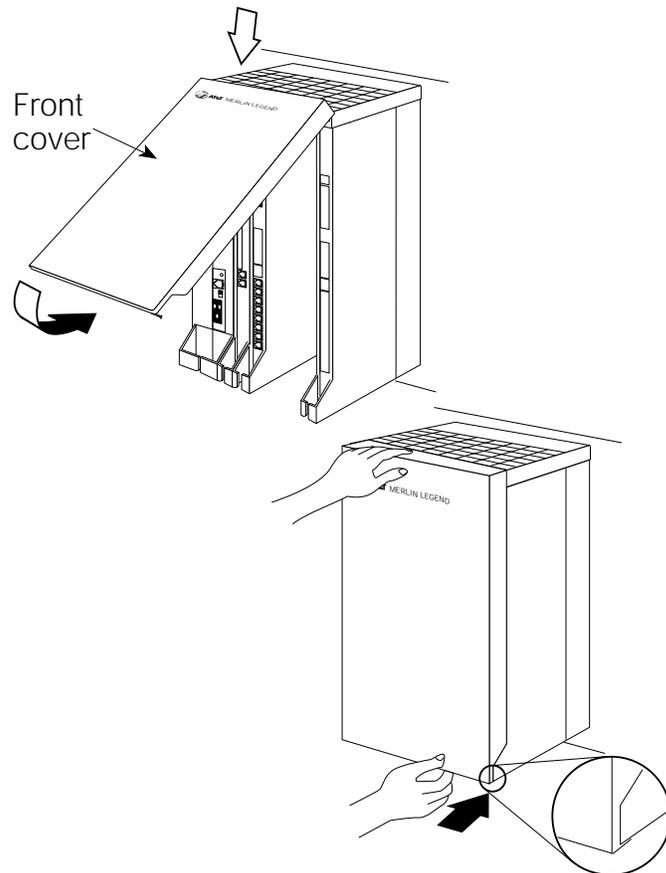


Figure 5-2. Installing the Control Unit Front Cover (Release 2.1 and Later)

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.

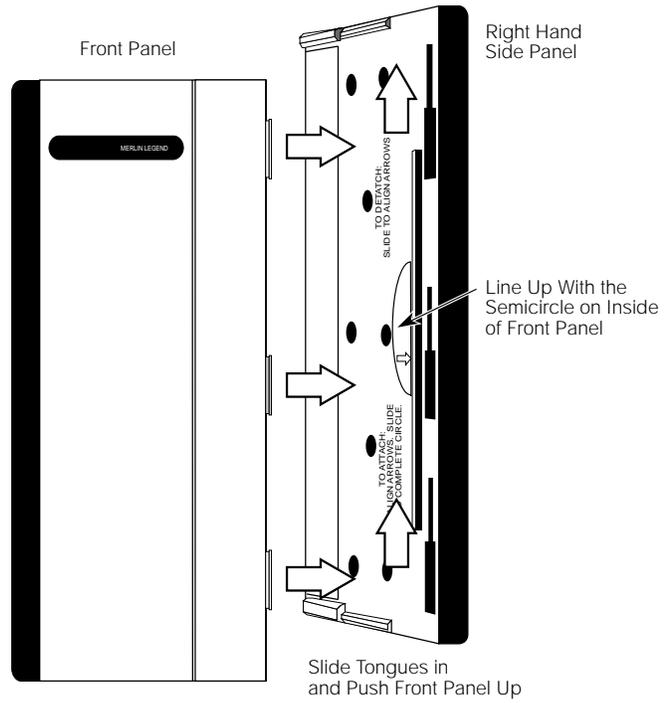


Figure 5-3. Assembling the Control Unit Housing (Release 2.0 and Earlier)

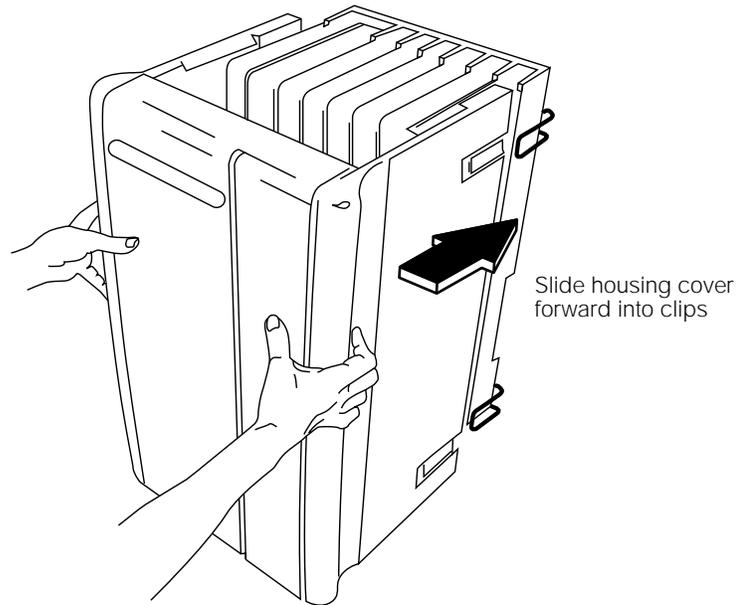


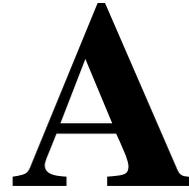
Figure 5-4. Installing the Control Unit Housing (Release 2.0 and Earlier)

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 U.S.A. only, AT&T provides a toll-free 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 AT&T representative. Consultation charges may apply.

Outside the U.S.A., if you need assistance when installing, programming, or using your system, contact your AT&T 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 class A prescrites dans le règlement sur le brouillage radioélectrique edicté 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 AT&T dealer or, **in the U.S.A. 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 par 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 electricien, 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

**TELEPHONE
EQUIPMENT**

SA® L.R. 56280

LISTED
538E

UL®

MADE IN U.S.A.

Complies with Part 68, FCC Rules. See the System Reference Manual for proper FCC Classification.
FCC Reg. Nos. MF: A5593M-7282-MF-E
KF: A5593M-7291-4-KF-E
PF: A55JUSA-65646-PF-E
REN: 1.5A

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.

Use only AT&T 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.

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.

CANADA

DR ID

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 tariffed 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. AT&T 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 AT&T 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 AT&T needs to use the MERLIN LEGEND Communications System to test facilities (lines/trunks). If a caller identifies him or herself as an AT&T 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 AT&T 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 AT&T GBCS Fraud Intervention Center at 1 800 628-2888 (fraud intervention for System 25, PARTNER[®] and MERLIN[®] systems).
- Customers should also take advantage of AT&T 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 AT&T 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 AT&T recommends that you add them. **Assign all voice mail port extensions to this Disallowed List. AT&T 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 AT&T 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 AT&T's 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 AT&T 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

AT&T warrants to you, the customer, that your MERLIN LEGEND Communications System will be in good working order on the date AT&T or its authorized reseller delivers or installs the system, whichever is later ("Warranty Date"). If you notify AT&T or its authorized reseller within one year of the Warranty Date that your system is not in good working order, AT&T 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 AT&T determines that your system cannot be repaired or replaced, AT&T 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 AT&T system.

If you purchased your system directly from AT&T, AT&T will perform warranty repair in accordance with the terms and conditions of the specific type of AT&T maintenance coverage you selected. If you purchased your system from an AT&T-authorized reseller, contact your reseller for the details of the maintenance plan applicable to your system.

This AT&T 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 AT&T will not be responsible under the limited warranty for damages resulting from:

- Failure to follow AT&T's 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

AT&T'S OBLIGATION TO REPAIR, REPLACE, OR REFUND AS SET FORTH ABOVE IS YOUR EXCLUSIVE REMEDY.

EXCEPT AS SPECIFICALLY SET FORTH ABOVE, AT&T, 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 AT&T 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, AT&T 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 AT&T's negligence, AT&T's liability shall be limited to proven damages to person. **No action or proceeding against AT&T 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. AT&T 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

B

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
		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 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.

B-2 Maintenance and Troubleshooting

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						

Figure B-2. Form 2b, System Numbering: Digital Adjuncts

B-4 Maintenance and Troubleshooting

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† (No ♦)	QCC Queue Priority Level† (4 ♦)	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 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 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 ¹	
	7925 ¹	
	7926 ¹	
	7927 ¹	
	7928 ¹	
	7929 ¹	

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	

Listed Directory Number* (QCC Queue)	Factory-Set Number	Renumber to
	800	

Remote Access Code (Form 3a)	Factory-Set Number	Renumber to
	889	

ARS Dial-Out Code [†]	Default	Renumber to
	9	

DSS Page Buttons	
PAGE 1	Beginning extension for range _____
PAGE 2	Beginning extension for range _____
PAGE 3	Beginning extension for range _____

* Hybrid/PBX mode only.
¹ 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

B-6 Maintenance and Troubleshooting

Unit Load Calculation Worksheet

C

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.

Unit Load Calculation Worksheet

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	
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.

Unit Load Calculation Worksheet

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-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>				

* Unit loads are computed per trunk for trunk-type network access lines.

C-4 Maintenance and Troubleshooting

Unit Load Calculation Worksheet

	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Optional Equipment†				
Direct Station Selector‡			0.7	0.9
General Purpose Adapter			0.8	1.0
Hands-Free Unit			0.8	1.0
Headset Adapter				
Total Actual Unit Load				

† The MFM has its own wall power unit located at the telephone and therefore is not added to the unit load calculation.

‡ 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.

Unit Load Calculation Worksheet

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*				
DS1			0.0	0.0
GS/LS			0.0	0.0
Tie			1.4	1.4
Telephones				
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
MDW-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>				

* Unit loads are computed per trunk for trunk-type network access lines.

Unit Load Calculation Worksheet

	Qty	x	Unit Load	= Total
Equipment			Hybrid/PBX or Modified	Square
Optional Equipment†				
Direct Station Selector‡			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 Unit Load for Slots 5 and 6				

† The MFM has its own individual wall power unit located at the telephone and therefore is not added to the unit load calculation.

‡ 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.

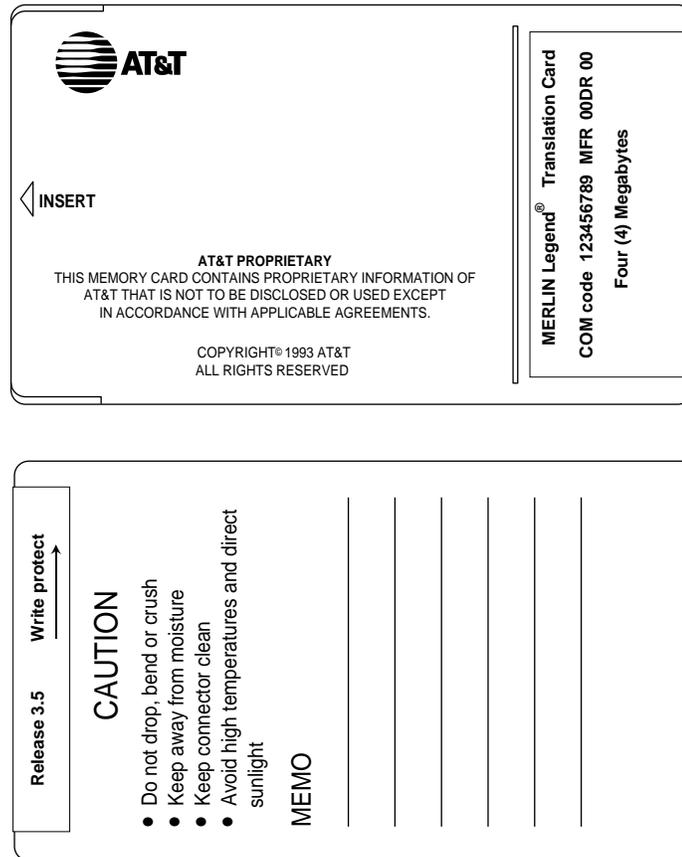


Figure D-1. PCMCIA Translation Memory Card

Inserting the Card

To insert the card, hold the card with the AT&T 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.

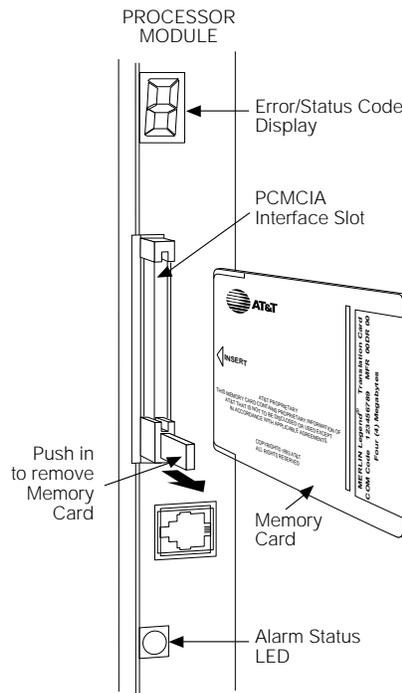


Figure D-2. Inserting the Memory Card

Memory Card Formatting

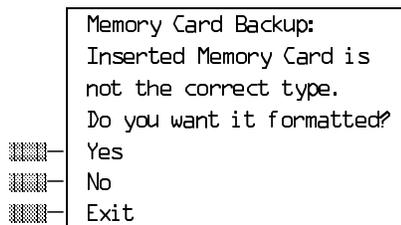
The memory card may have to be formatted before you begin any manual or automatic backup procedures. This section details the screens and messages that appear during the format procedure.



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



If you begin a backup procedure with an unformatted or incorrectly formatted card, this screen appears.

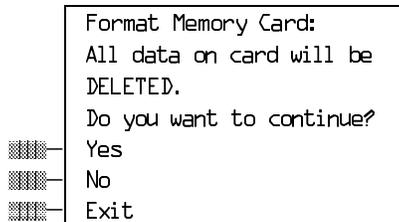
The inserted memory card is not the correct type. You have the option of formatting the memory card as a translation memory card or repeating the backup procedure with a different translation memory card.

NOTES:

1. Only 4-MB Series I or Series II PCMCIA memory cards may be formatted, except those already formatted as translation cards.
2. If a memory card cannot be formatted, a message appears on screen. These messages are noted in the procedures as appropriate.

3. 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



This screen appears if you respond to the system prompt to format the memory card.

Select **Yes** (or press **F3**) 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)→(9) →(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

9

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      Enter
Backspace        Exit
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**.

Note: F6, not F10. F6

Console Display/Instructions	Additional Information	PC
8 Respond to the prompt.		
<pre>Backup <i>filename</i>: Do you want to continue? Yes No Exit</pre>	<p><i>filename</i> = file selected in Step 5 or entered in Step 6</p> <p>Select No to abort the backup. Go to Step 11.</p>	F2
	<p>Select Yes to continue the backup.</p>	F1
9 Observe the backup progress screen.		
<pre>Backup <i>filename</i>: Backup in Progress, Please Wait. xx% completed Exit</pre>	<p><i>filename</i> = file selected in Step 5 or entered in Step 6</p> <p>xx% = percentage of backup completed</p>	⏪
10 Observe the backup completion screen.		
<pre>Backup <i>nnnnnnnnnn</i>: Backup Successfully Completed. Exit</pre>	<p><i>nnnnnnnnnn</i> = backup filename</p>	
11 Return to the System Programming menu.		
<p>Select Exit three times.</p>		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] → [9] → [F3] → [F2] → [Alt] + [PrtScr] Type time → [F10] → [F5] → [F5] To program weekly backup: Insert memory card → [F1] → [9] → [F3] → [F3] → [Alt] + [PrtScr] 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
SysRenumbr Options
Operator    Tables
LinesTrunk AuxEquip
Exit       NightSrvce
```

F1

3 Select Back/Restore.

```
System:
Make a selection
Restart      MaintenBusy
SProg Port  Date
Mode         Time
Board Renum Back/Restore
Exit
```

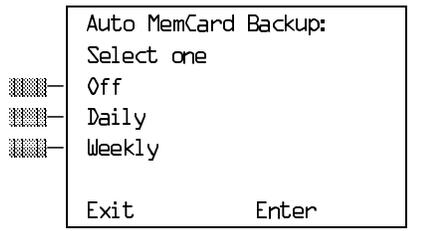
9

4 Select Auto Backup.

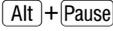
```
Memory Card:
Make a selection
Backup
Restore
Auto Backup

Exit
```

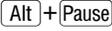
F3

Console Display/Instructions	Additional Information	PC
5 Make a selection.		
 <pre>Auto MemCard Backup: Select one Off Daily Weekly Exit Enter</pre>	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).		
<pre>Daily MemCard Backup: Enter hour (00-23) and minutes (00-59) HHMM xxxx Backspace Exit Enter</pre>	Press Drop .	
2 Enter the time when you want the automatic backup to run every day (hh = 00 to 23, mm = 00 to 59).		
<pre>Daily MemCard Backup: Enter hour (00-23) and minutes (00-59) HHMM Backspace Exit Enter</pre>	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 (xxxxx).		
<pre>Weekly MemCard Backup: Enter day (0-6) hr (00-23) and min (00-59) DHHMM xxxxx Backspace Exit Enter</pre>	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.		
<pre>Weekly MemCard Backup: Enter day (0-6), hr (00-23) and min (00-59) DHHMM Backspace Exit Enter</pre>	0 = Sunday, 1 = Monday, and so on.	
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

PC

x = backup filename

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 → 9 → 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
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
```

9

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.		
<pre> Memory Card Restore: Select one BACK1.mmda AUTO.BACK1 BACK2.mmda AUTO.BACK2 BACK3.mmda Exit Enter </pre>	<p><i>mmda</i> = month and day of backup</p>	<p>Press the button or function key next to your selection. </p>
6 Observe the restore file validation screen.		
<pre> Memory Card Restore: File is being validated. </pre>		
7 Respond to the prompt.		
<pre> Restore n: System will be down ... Do you want to continue? Yes No Exit </pre>	<p><i>n</i> = filename selected in Step 5</p>	<p>Select Yes to continue the restore. </p> <p>Select No to abort the restore. Go back to Step 5. </p>
8 Observe the restore progress screen.		
<pre> Restore n: Restore in Progress, Please Wait. </pre>	<p><i>n</i> = filename selected in Step 5</p>	

Console Display/Instructions	Additional Information	PC
9 Observe the restore file validation screen.		
<pre>Restore n: Restore Successfully Completed. System is Restarting. Please Wait.</pre>	<p>n = filename selected in Step 5</p> <p>The session is finished, and the system restarts. You must enter system programming again to continue</p>	

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

PC

n = filename selected
xxxx = system programming port extension

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 only appears 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

PC

x = filename selected

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 for Key Mode

E

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.

Modifying a Release 2.1 or Earlier
Processor for Key Mode

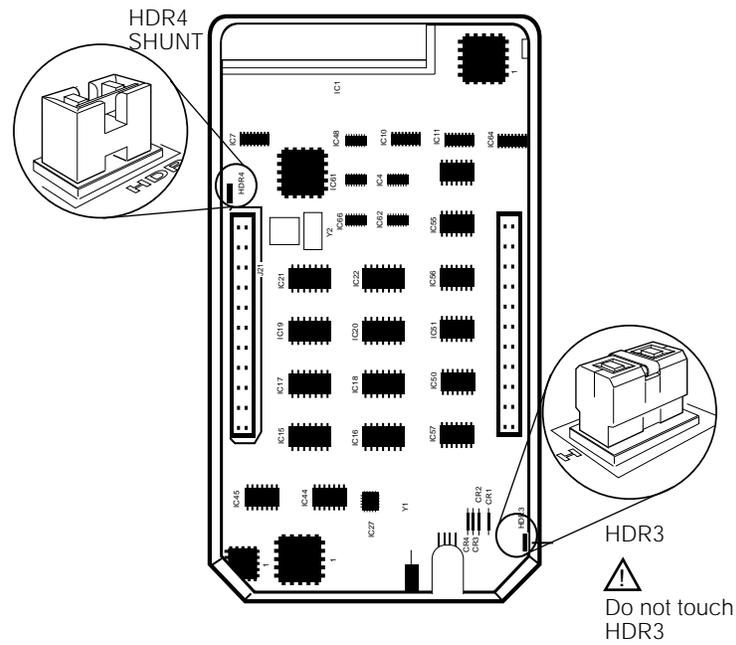


Figure E-1. Modifying the Processor for Key Mode

⚠ 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.

Modifying a Release 2.1 or Earlier Processor for Key Mode

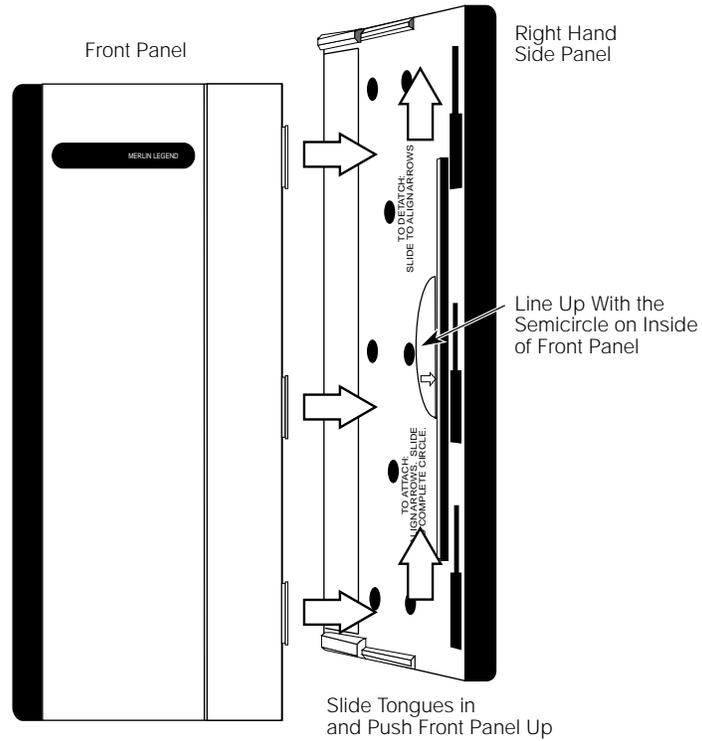


Figure E-2. Installing the Control Unit Housing

NI-1 BRI Provisioning

F

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:

- AT&T 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.

AT&T 5ESS Switch Translations

For the AT&T 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 AT&T 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 SCRN <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 SCRN <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 (**/CFDBLAC**).

The 5ESS limits the number of members of a series completion group to 16 DNs, and the number of lines forwarded via **/CFDBLAC** 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

NI-1 BRI Provisioning

5ESS SWITCH LABNSC1
SCREEN 2 OF 14

RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (DSL INFO)

>11. OE	I 00101209	25. CUT DGTS	2228
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		

SCREEN 3 OF 14

5ESS SWITCH LABNSC1
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	_

SCREEN 4 OF 14

5ESS SWITCH LABNSC1
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	___				

F-6 Maintenance and Troubleshooting

NI-1 BRI Provisioning

```

                    5ESS SWITCH LABNSC1
                    RECENT CHANGE 23.8
SCREEN 5 OF 14          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
    
```

```

                    5ESS SWITCH LABNSC1
                    RECENT CHANGE 23.8
SCREEN 6 OF 14          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
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. CPUO:SELQ1    0      155. ARS:VGRPNM _____ 167. MWY DRING _
144. CPUO:SELQ2    0      156. ARS:DGRPNM _____
145. CPUT:TPREDQ   0      157. FRL      _____
    
```

```

5ESS SWITCH LABNSC1
SCREEN 8 OF 14                                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	

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	___

```

                    5ESS SWITCH LABNSC1
SCREEN 11 OF 14      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. IECP 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             243. DNA            ____
220. BAND         0          232. ICP              244. DNA QTY       _
221. ODB          _          233. HUNT NOTIF      ____

```

```

                    5ESS SWITCH LABNSC1
SCREEN 12 OF 14      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. IECP DNIC        270. H OUT LCN     ____
252. CHL SEL      N          261. PB GRP           271. BUSY LIMIT    ____
253. ISCN         _____  262. ICP              272. PMDR GRP      ____
                    263. HUNT NOTIF  273. PMDR ACT      _

```

NI-1 BRI Provisioning

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. WNDSZ	___	297. H 2W LCN	___
279. LNR HNT TN	___	288. NEW TN	___	298. L OUT LCN	___
280. HUNT DEACT	_	289. IECP 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

NI-1 BRI Provisioning

5ESS SWITCH LABNSC1
SCREEN 1 OF 14

RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT

(*)		SERVICES AND FEATURES	SCREENS
1.	DSL TN C 2228701	-----	-----
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 DGTS	2228
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			

SCREEN 3 OF 14

5ESS SWITCH LABNSC1
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	-

NI-1 BRI Provisioning

```

                    5ESS SWITCH LABNSC1
SCREEN 4 OF 14      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        _____

```

```

                    5ESS SWITCH LABNSC1
SCREEN 5 OF 14     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)

ROW	FEATURE	A				FEATURE	A				FEATURE	A				FEATURE	A			
		A	P	C	R		A	P	C	R		A	P	C	R		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. CPUO:SELQ1	0	155. ARS:VGRPNM	_____	167. MWY DRING	_____
144. CPUO: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

(*)	Feature	Services and Features	Screens
1.	DSL TN C 2228702	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

NI-1 BRI Provisioning

5ESS SWITCH LABNSC1
SCREEN 2 OF 14

RECENT CHANGE 23.8
DSL/BRCS ASSIGNMENT (DSL INFO)

>11. OE	I 00101209	25. CUT DGTS	2228
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		

SCREEN 3 OF 14

5ESS SWITCH LABNSC1
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	-

SCREEN 4 OF 14

5ESS SWITCH LABNSC1
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	___				

NI-1 BRI Provisioning

```

                    5ESS SWITCH LABNSC1
                    RECENT CHANGE 23.8
SCREEN 5 OF 14      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   92. PTC         ___
                    95. E911 PSAP   N

```

```

                    5ESS SWITCH LABNSC1
                    RECENT CHANGE 23.8
SCREEN 6 OF 14      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
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. CPUO:SELQ1    0      155. ARS:VGRPNM _____ 167. MWY DRING _
144. CPUO:SELQ2    0      156. ARS:DGRPNM _____
145. CPUT:TPREDQ   0      157. FRL      _____
    
```

```

5ESS SWITCH LABNSC1
SCREEN 8 OF 14                                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
PARAMETERS)

5ESS SWITCH LABNSC1
RECENT CHANGE 23.8
DSL/BRCB ASSIGNMENT (HIGH RUNNER FEATURE

>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>
SPIDSEFX 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: 201 SIG: 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
```

NI-1 BRI Provisioning

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: O NCOS: O RING: Y
LINE CLASS CODE: ISDNKSET
MAXKEYS: 64
DN IS ASSIGNED AS A DNH HUNT PILOT.
HUNT GROUP: 22 HUNT MEMBER: O
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

NI-1 BRI Provisioning

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: O NCOS: O 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: O NCOS: O RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

NI-1 BRI Provisioning

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: O NCOS: O 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: O NCOS: O RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

NI-1 BRI Provisioning

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: O NCOS: O 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: O NCOS: O RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD

NI-1 BRI Provisioning

```
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: O NCOS: O 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: O NCOS: O RING: Y
OPTIONS:
SFC
PILOT DN: 2257141
GROUP OPTIONS:
CIR RCVD
```

NI-1 BRI Provisioning

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: O NCOS: O 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 NODE NUMBER : 32
PM TERMINAL NUMBER: 322

TEI	LTID	CS	PS	BCH/ISG Bd
---	-----	--	--	-----
DYNAMIC	PSATS 141	Y	N	-
DYNAMIC	PSATS 144	Y	N	-

NI-1 BRI Provisioning

```
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	PS	BCH/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	PS	BCH/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;
ACCESS DATA

EXEC'D
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;

NI-1 BRI Provisioning

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

NI-1 BRI Provisioning

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 DNs forming a circular series completion group.

The screens shown in this section are examples, DNs 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/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0001

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:08
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0003

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:15
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0004

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:19
 0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0005

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:22
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0006

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:26
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0007

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:29
0959 OMT-00/LEONLY 2816/04328

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

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:32
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0009

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:35
0959 OMT-00/LEONLY 2816/04328

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

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:38
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0011

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:40
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0012

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:44
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0013

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:48
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0014

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:51
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0015

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 6:22:55
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0016

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:22:58
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0017

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:01
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0020

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:11
 0959 OMT-00/LEONLY 2816/04328

 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

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:13
 0959 OMT-00/LEONLY 2816/04328

 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

NI-1 BRI Provisioning

CONTINUATION TEXT 0022

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:16
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0023

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:20
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0024

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:23
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0025

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:27
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0026

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:30
 0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0027

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:34
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0028

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:37
 0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0029

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:40
0959 OMT-00/LEONLY 2816/04328

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

M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:43
0959 OMT-00/LEONLY 2816/04328

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

NI-1 BRI Provisioning

CONTINUATION TEXT 0031
M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:46
0959 OMT-00/LEONLY 2816/04328

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
M NAVK1/BELLCORNJRB/APS 13.0 PS0071/000 96-01-18 16:23:49
0959 OMT-00/LEONLY 2816/04328

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

#

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 <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 <i>digital transmission</i> .
analog data station	See <i>modem data station</i> .
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, <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 (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. See also <i>synchronous data transmission</i> .
AT&T 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.
AT&T Switched Network	See <i>ASN</i> .
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 <i>ALS</i> .
Automatic Number Identification	See <i>ANI</i> .
automatic ringdown tie-trunk	See <i>automatic-start tie trunk</i> .
Automatic Route Selection	See <i>ARS</i> .

automatic-start tie trunk	<i>Tie trunk</i> 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 <i>bipolar violation</i> . See also <i>bipolar signal</i> .
backup	Procedure for saving a copy of system programming onto a floppy disk or <i>memory card</i> . See also <i>restore</i> .
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 <i>Remote Access</i> feature of the system.
basic carrier	Hardware that holds and connects the <i>processor</i> , <i>power supply</i> , and up to five modules in the system. See also <i>expansion carrier</i> .
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 <i>bit rate</i> and <i>bps</i> .
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 <i>B-channel</i> .
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 <i>DEFINITY</i> , which provides features and services to telephone users. See also <i>Hybrid/PBX mode</i> and <i>Key mode</i> .
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 <i>B8ZS</i> .
bipolar signal	Digital signal in which pulses (ones) alternate between positive and negative. See also <i>AMI</i> , <i>B8ZS</i> , and <i>bipolar violation</i> .
bipolar violation	Condition occurring when two positive or two negative pulses are received in succession. See also <i>AMI</i> and <i>B8ZS</i> .
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 <i>baud rate</i> .
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 <i>glare</i> .
BMI	(Broadcast Music Incorporated)
board	A <i>module</i> , 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	<i>SPM</i> procedure for assigning <i>line/trunk and extension modules</i> to slots on the <i>control unit</i> .
board renumbering	System programming procedure for renumbering <i>line/trunk and extension</i> modules that have already been assigned to specific <i>slots</i> on the <i>control unit</i> .
BRI	(Basic Rate Interface) Standard interface that specifies the protocol used between two or more communications systems. BRI provides two 64-kbps <i>B-channels</i> for voice and/or data and one 16-kbps <i>D-channel</i> , 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 <i>CAS</i> .
Call Accounting Terminal	See <i>CAT</i> .
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 <i>ANI</i> .

Calling group	Team of individuals who answer the same types of calls.
Call Management System	See <i>CMS</i> .
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 <i>system programming</i> and <i>extension programming</i> .
central office	See <i>CO</i> .
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 <i>CSU</i> .
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 <i>COR</i> .
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 <i>CCS</i> .
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	<i>See modem pool.</i>
COR	(class of restriction) Various types of restrictions that can be assigned to <i>remote access</i> trunks or barrier codes. These restrictions consist of calling restrictions, <i>ARS</i> Facility Restriction Levels (<i>FRLs</i>), 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 <i>DS1</i> facilities with the extended superframe format (<i>ESF</i>).
CSU	(channel service unit) Equipment used on customer premises to provide <i>DS1</i> facility terminations and signaling compatibility.
cyclic redundancy check	<i>See CRC.</i>

D

D4 framing format	<i>Framing format</i> 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 ESF.</i>
Data-channel	<i>See D-channel.</i>

data communications equipment	See <i>DCE</i> .
data hunt group	See <i>DHG</i> .
data module	See <i>ISDN Terminal Adapter</i> .
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 <i>DTE</i> and <i>data terminal</i> .
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 <i>dial-repeating tie trunk</i>
DFT	(direct facility termination) See <i>personal line</i> .

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 <i>feature code</i> .
Dialed Number identification Service	See <i>DNIS</i> .
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 <i>analog transmission</i> .
Digital Communications Protocol	See <i>DCP</i> .
digital data station	See <i>ISDN terminal adapter data station</i> .
Digital Signal 0	See <i>DS0</i> .

Digital Signal 1	See <i>DS1</i> .
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 <i>analog transmission</i> .
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 <i>personal line</i> .
Direct Inward Dialing	See <i>DID</i> .
Direct-Line Console	See <i>DLC</i> .
Direct Station Selector	See <i>DSS</i> .
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 (<i>ASM</i>); 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</i> 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 2-state voltage conditions (on the Ear and Mouth leads) for analog applications and through two <i>bits</i> for digital applications. See also <i>tie trunk</i> .
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 <i>ESS</i> .

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 <i>D4 framing format</i> .
ESS	(Electronic Switching System) Class of central office (CO) switching systems developed by AT&T 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 <i>data station</i> .
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 <i>centralized telephone programming</i> and <i>system programming</i> .
extended superframe format	See <i>ESF</i> .

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 <i>FRL</i> .
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 procedure; system prevents initiation of new calls.
foreign exchange	See <i>FX</i> .
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 <i>ring generator</i> .
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 <i>GPA</i> .
glare	Condition that occurs when a user tries to call out on a <i>loop-start</i> 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 *Behind Switch mode*.

Hybrid/PBX mode One of three modes of system operation, in which the system uses trunk *pools* and *ARS* in addition to *personal lines*. 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 *Tie trunk* 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 <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 ExpressRoute 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."
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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 (**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 *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. See also <i>line</i> and <i>trunk</i> .
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	An AT&T Music on Hold enhancement that promotes a company's products or services or provides custom music selection.
Mbps	megabits per second
Megacom	AT&T's tariffed digital <i>WATS</i> offering for outward calling.
Megacom 800	AT&T's 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 PCMCIA 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 tip/ring alerts, and an <i>SAA</i> mode for -48 VDC alerts. 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-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 <i>MFM</i> .
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 zeros 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 to the communications system or the telephone network.

OPT	(off-premises telephone) <i>Single-line telephone</i> or other <i>tip/ring</i> 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 <i>bit</i> 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: cardfile, telephone programming application, call log and viewer, incoming call management and identification and applications manager.
pass-through	Connection from the internal <i>modem</i> 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 <i>memory card</i> .

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 <i>jack</i> . Also, refers to <i>extension</i> 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 <i>PFT</i> .
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 twenty-three 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.
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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 <i>ROM</i> .
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 <i>backup</i> .
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.
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SA buttons	Telephone buttons that provide a single interface to users for both inside and outside calling.
SDN	(Software Defined Network) AT&T 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 <i>SDN</i> .
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) <i>DOS</i> - or <i>UNIX</i> 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 <i>extension</i> .
station jack	See <i>extension jack</i> .
Station Message Detail Recording	See <i>SMDR</i> .
Supplemental Alert Adapter	See <i>SAA</i> .
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 <i>asynchronous data transmission</i> .
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 <i>SA buttons</i> .
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 <i>extension programming</i> and <i>centralized telephone programming</i> .
System Programming and Maintenance	See <i>SPM</i> .

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.

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.

Index

#

- 008 module, 2-10
- 008 OPT module
 - Touch-Tone Receivers, 3-10
- 012 modules
 - apparatus codes, 4-5
 - PEC codes, 4-5
 - ring generators, 4-5
 - Touch-Tone Receivers, 3-10
- 016 modules
 - firmware upgrades, 4-63
 - ring generators, 4-5
 - Touch-Tone Receivers, 3-10
- 100D module
 - automatic tests, 4-101-4-2
 - clock status
 - procedure, 4-91
 - summary, 4-90
 - CSU Loopback Test, 4-92-4-101
 - error events
 - procedure, 4-102-4-4
 - summary, 4-102
 - restoring, 4-101
- 400 GS/LS
 - Touch-Tone Receivers, 3-10
- 408 GS/LS-MLX module, 2-10, 4-37
- 551 T1 Channel Service Unit (CSU), 4-92
- 551 T1 connection, 4-93-4-94
- 800 DID modules
 - Touch-Tone Receivers, 3-10
- 800 GS/LS-ID module
 - firmware upgrades, 4-63
- 800 LS-ID modules

- Touch-Tone Receivers, 3-10
- 800 NI-BRI modules
 - B-Channel Loopback Test, 4-56
 - Clock status, 4-90-4-91
 - firmware upgrades, 4-63
 - Incoming Data Call Test, 4-89-4-90
 - Incoming Voice Call Test, 4-87-4-88
 - module problems, 4-74
 - NI-1 BRI Provisioning Test, 4-75
 - Outgoing Data Call Test, 4-88-4-89
 - Outgoing Voice Call Test, 4-86-4-87

A

- Access log
 - checking, 1-24-1-25
 - reviewing, 2-23-2-25
- ACCULINK 3150 Channel Service Unit (CSU), 4-92
- ADMIN Jack, 1-5
- Alarm
 - checking error logs, 1-23-1-24
 - clearing, 1-20
 - generated by system, 1-19-1-20
- Alarm message, 2-3
- Analog multiline telephone, 3-4
- Apparatus codes, 012 modules, 4-5
- Area Codes, A-7
- Attendant, dialing, 1-9-1-10
- Audit procedure
 - calls, 5-31, 5-34-5-36
 - lines, 5-31-5-34
- Automatic tests, 4-101-4-2
- Auxiliary power unit
 - CAUTION, 4-9
 - replacing, 4-8-4-9

B

- B-Channel Loopback Test
 - error messages, table, 4-60
 - interpreting results, 4-59
 - procedure, 4-57-4-59
 - results, 4-79-4-86
 - summary, 4-56-4-57
- Behind Switch mode, 1-27
- Board Controller Test
 - error messages, table, 4-55
 - LEDs, 4-54
 - procedure, 4-52-4-55
 - results, 4-55
 - summary, 4-52
- BRI, see Basic Rate Interface (BRI)
- Busy-out
 - Digital Subscriber Line (DSL), 5-18-5-20
 - extension, 5-16-5-18
 - overview, 4-38-4-39
 - procedure, 4-39-4-41
 - summary, 4-39
 - trunk, 5-12-5-16

C

- Call Forwarding feature, 3-5
- Canadian Department of Communications (DOC), A-2
- Carrier
 - removing, 4-106-4-7
 - replacing, 4-107
 - types of problems, 4-106
- Central office, checking problems, 1-26
- Circuit module firmware
 - upgrading
 - error conditions, 4-70-4-74
 - procedure, 4-65-4-70

- summary, 4-64
- Circuit module firmware, upgrading
 - overview, 4-63-4-64
- Circuit pack, 3-1
- Clock status
 - 100D module, 4-90
 - 800 NI-BRI module, 4-90-4-91
- Cold start, 1-21, see Restart
- Control unit
 - housing
 - installing Release 2.0 or earlier, 5-40-5-42
 - installing Release 2.1 or later, 5-36-5-39
 - removing, 1-15-1-16
 - power supply problems, 4-2-4-11
 - powering down the system, 4-1-4-2
 - processor problems, 4-12-4-33
 - ring generator, 4-4-4-7
 - WARNING, 4-1
- CSU Loopback Test
 - error messages, 4-100
 - procedure, 4-93-4-99
 - restoring module, 4-101
 - results, 4-99-4-100
 - summary, 4-92-4-93

D

- Dial tone, 3-8
- DID, see Direct Inward Dialing (DID)
- Digital Subscriber Line (DSL)
 - busy-out, 5-18-5-20
 - maintenance-busy status, 5-12-5-13
 - restoring, 5-24-5-26
- Direct Inward Dialing (DID) module
 - Touch-Tone Receivers, 3-10
- Direct Inward Dialing (DID) modules
 - power requirements, 1-26-1-27
- Direct Station Selector (DSS), 3-6

DN, see Directory Number (DN)

E

Electromagnetic interference
information, A-2
Equal Access Codes, A-7
Error code display, 1-19
Error codes, 2-5-2-23
Error events, 4-102-4-4
Error log
checking, 1-23-1-24, 2-2-2-5
interpreting error codes, 2-5-2-23
last 10 errors, 2-5
overview, 2-1
permanent errors, 2-4
printing, 2-2
transient errors, 2-4
trouble accessing, 1-24
Error messages
B-Channel Loopback Test, 4-60
Board Controller Test, 4-55
CSU Loopback Test, 4-100
firmware upgrade, 4-70-4-74
forced installation, 4-25-4-28
Internal Loopback Test, 4-51
NI-BRI Provisioning Test, 4-80-4-86
Error thresholds, 2-2
ESF T1 Channel Service Unit (CSU),
4-92
ESF T1 CSU DTE Loopback Test, 4-92-
4-100
Exchange Codes, A-7
Extension
busy-out, 5-16-5-18
maintenance-busy status, 5-10-5-12
restoring, 5-22-5-24

F

Feature Access Code, 3-6
Feature module, replacing
diagram, 4-32
procedure, 4-31-4-33
Federal Communication Commission
(FCC), A-2
Forced installation
codes displayed during, 4-25-4-26
error conditions during, 4-25-4-29
procedure, 4-20-4-25
summary, 4-19-4-20
Frigid start, 1-22, 4-17-4-19, see System
Erase
Front cover
MERLIN II communication system,
1-15-1-16
Release 2.1 or later, 1-15-1-16,
5-37, 5-39

H

Hardware vintage, 2-25
Helpline, AT&T, A-1
Housing
installing
Release 2.1 or earlier, 5-40-5-42
Release 2.1 or later, 5-36-5-39
removing, 1-15-1-16
Hybrid/PBX mode, 1-27

I

ICLID, see Incoming Call Line
Identification
Incoming Data Call Test, 4-89-4-90
Incoming trunk, 5-4-5-5
Incoming Voice Call Test, 4-87-4-88

Interlocking post, 4-3-4-4
Internal Loopback Test
 errors, 4-51
 interpreting results, 4-50-4-51
 LEDs, 4-49
 procedure, 4-47-4-50
 summary, 4-46-4-47
Internal Loopback test
 summary, 4-46-4-47

J

Jack assignment, 1-23

K

Key mode, 1-27

L

Labeling wires, 3-2-3-4
Last 10 errors, 2-5
LEDs
 Board Controller Test, 4-54
 Internal Loopback Test, 4-49
 NI-BRI Provisioning Test, 4-80
 power supply, 4-2-4-3
 processor module, 4-24
 System status screen, 4-107-4-8,
 4-109-4-10
Line noise, 1-6
Lines, see Trunks

M

Maintenance, 1-2
 programming
 on-site, 1-3-1-5
 remote, 1-6-1-7
 strategy, 1-18-1-26
 terminal, 1-1-1-2
 tools, 1-2
Maintenance-busy
 causes, 5-6-5-7
 overview, 5-5-5-6
 status
 Digital Subscriber Line (DSL),
 5-12-5-13
 extension, 5-10-5-12
 trunk, 5-8-5-10
Manual call tests, 800 N1-BRI module,
4-86-4-90
Memory card
 inserting, 4-20-4-21
 messages, 4-26-4-28
MERLIN II Communication System, 1-15
MLX telephone
 display buttons, 3-8
 tests, 3-6-3-8
MLX-20L console
 failure, 1-3
 setting up
 diagram, 1-4
 procedure, 1-3
Modem
 dialing, 1-10-1-11
 resetting, 5-29-5-30
Module testcomponent check, 4-36

Index

Module tests
 busy-out or reset, 4-36
 internal loopback, 4-1
 notes, 4-36
 overview, 4-33-4-34
 procedure, 4-37-4-38
 process, diagram, 4-34-4-36

Modules
 100D problems, 4-74-4-75
 persistent problems, 4-38
 replacing, 4-61-4-62
 test component check, 4-36

Multi-function Module (MFM), 3-7-3-8
Mute LED, 3-6

N

National Service Assistance Center
 (NSAC), A-5
NI-1 BRI Provisioning Test, 4-75
NI-BRI Provisioning Test
 error messages, 4-78
 error messages:, 4-80-4-86
 LEDs, 4-80
 procedure, 4-76-4-80
 summary, 4-75-4-76
No dial tone, 3-8
Null Board, see Phantom Board

O

Outgoing Data Call Test, 4-88-4-89
Outgoing trunk, 5-3-5-4
Outgoing Voice Call Test, 4-86-4-87

P

Password
 changing, 1-9
 choosing, A-26
 entering, 1-9
 required for remote maintenance,
 1-9
PC (personal computer), setting up, 1-5
PCMCIA card, see Memory Card
PCMCIA interface slot, 4-63
PEC codes
 for 012 modules, 4-5
Peek, 4-12-4-14
 CAUTION, 4-12
Permanent error, 2-4, 5-6
Phantom modules, 2-27
Poke, 4-15-4-17
Port menu, 5-8
Power supply
 auxiliary power unit, 4-8-4-9
 interlocking post, 4-2, 4-3-4-4
 LED, 1-24, 4-2-4-3
 replacing, 4-10-4-12
 upgrading, 1-28
Powering down the system, 4-1-4-2
Print
 options, 1-22
 reports, 1-14
Processor module
 ADMIN jack, 1-5
 checking, 1-25
 error codes/status display, 1-19
 error conditions, 4-25-4-29
 LEDs, 4-24
 problems, 4-12-4-33
 replacing, 4-29-4-31

Programming maintenance

- backup, 4-1-4-2
- on-site, 1-3-1-5
- remote, 1-6-1-7

R

- Release 2.0 and earlier, 1-16
- Release 2.0 and later, 1-13
- Release 2.1 or later, 1-15
- Release 3.0 and later, 1-19, 1-6
- Remote equipment, setting up, 1-7
- Replacing modules, 4-60
- Reset
 - modem, 5-29-5-30
 - overview, 4-38-4-39
 - procedure, 4-41-4-43
 - RS-232 port, 5-27-5-28
 - summary, 4-41
- Restart, 1-21
- Restore
 - Digital Subscriber Line (DSL), 5-24-5-26
 - extension, 5-22-5-24
 - procedure, 4-44-4-46
 - summary, 4-44
 - trunk, 5-20-5-22
- Ring failure, 3-8
- Ring generator, 4-4-4-7
- Ringer Equivalence Number (REN), A-5
- ROM ID, 2-25
- RS-232 port, resetting, 5-27-5-28

S

- Security Hints
 - choosing passwords, A-26
 - description, A-22
 - Educating Users, A-23, A-24, A-25
 - establishing a policy, A-25
 - limiting Outcalling, A-27
 - physical security, A-26
- Security information, A-12
- Single-line telephone, 3-5
- Slot status
 - information provided, 4-110
 - procedure, 4-110-4-12
 - summary, 4-110
- Software installation
 - error conditions during, 4-25-4-29
 - procedure, 4-20-4-25
 - summary, 4-19
- Software vintage, 2-25
- Speaker LED, 3-6
- SPID, see Service Profile Identifier (SPID)
- SPM
 - accessing, 1-8-1-11
 - display, 1-12-1-14
 - exiting, 1-15
 - functions, 1-13-1-14
 - jack, 1-5
- Station Message Detail Recording (SMDR) printer, 1-22
- Status display, 1-19
- Support telephone number, A-1
- System busy message, 4-28
- System Erase, 1-22, 4-17-4-19
- System Information Report, 1-9
- System inventory, 2-25-2-27

Index

System status
 procedure, 4-108
 screen, 4-108-4-10
 summary, 4-108
System trouble reports, 1-19

T

Telephone problems
 analog multiline, 3-4
 Call Forwarding, 3-5
 CAUTION, 3-1
 determining cause, 1-23
 general, 3-1-3-2, 3-4
 MLX, 3-6-3-8
 single line, 3-5
 symptom list, 3-2
 voice transmission, 3-4
 wiring, 3-2-3-4
Test
 automatic, 4-101-4-2
 B-channel Loopback, 4-75-4-90
 board controller, 4-52-4-56
 CSU Loopback, 4-92-4-101
Toll fraud
 detecting, A-24
 preventing, 1-6, A-12, A-14
Top cover
 Release 2.1 or later, 5-36-5-37, 5-38
Top cover, Release
 2.1 or later, 1-15-1-16
Touch-tone receivers
 calculating system requirements,
 3-8-3-10
 list of modules supplying, 3-10
 required by VMS, 3-9
 system requirements, 3-10
Transient errors, 2-4
Transient/permanent error thresholds,
 2-2

Trouble reports, 1-19
Trunk
 busy-out, 5-12-5-16
 incoming, 5-4-5-5
 maintenance-busy status, 5-8-5-10
 manual correction of problems, 5-2-
 5-3
 outgoing, 5-3-5-4
 restoring, 5-20-5-22
 symptom list, 5-1-5-2
 testing automatically, 5-5

U

Unit loads, 1-26-1-28
Upgrade memory card, inserting, 4-65
Upgrading
 power supply, 1-28

V

Voice messaging, failure to transfer, 3-8
Voice transmission, 3-4

W

Warm start, 1-21
Wires, 4-62-4-63
Wiring problems, 3-2-3-4

